



2022 4<sup>th</sup> International  
Conference on Sustainable  
Technologies for Industry 4.0

# STI | 2022

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# STI 2022

## 2022 4<sup>th</sup> International Conference on Sustainable Technologies for Industry 4.0

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**Prof. Mesbahuddin Ahmed**  
Chairman  
Bangladesh Accreditation Council (BAC)

## MESSAGE

I am immensely delighted to know that the Faculty of Science and Engineering is going to organize an international conference on sustainable technologies, titled 2022 4<sup>th</sup> International Conference on Sustainable Technologies for Industry 4.0 (STI 2022), which is technically co-sponsored by the IEEE Computer Society, Washington, D.C., USA.

I am happy to see that an international conference on a contemporary domain like sustainable technologies for industry 4.0 is taking place in Bangladesh. As we all know that the industry 4.0 has brought many changes in various aspects of human life, including the education system. Technologies began to penetrate to the educational process a long time ago when both the students and teachers had started using technologies in fundamental ways in the education system, which is commonly known as Education 2.0. Afterwards, Education 3.0 had emerged after technological advancement, especially the widespread adoption of a more user-generated Internet. This era enabled students to access their own information sources, the ability to learn electronically and platforms to communicate with teachers and other students.

At present, Education 4.0 is emerging, which connects the education system with the fourth industrial revolution and focuses on transforming the future of education through advanced technology and automation. Consequently, the conventional educational paradigm needs to be revisited and reframed, where a student can determine their learning rather than being offered by the teachers in a rigid structure. You would be happy to know that the Bangladesh Accreditation Council (BAC) is working towards that through implementing the national qualifications framework (NQF) and accrediting the academic programs and higher education institutions.

On behalf of the Bangladesh Accreditation Council, I would like to express my warm welcome to all the foreign and the local guests at the permanent campus of Green University of Bangladesh. I wish all the success of this conference.



**Prof. Mesbahuddin Ahmed**





# MESSAGE

**Prof. Dr. Md. Sazzad Hossain**  
Member  
University Grants Commission of Bangladesh



I am very glad that the organizing committee of 2022 4th International Conference on Sustainable Technologies for Industry 4.0 (STI 2022) has invited me as the chief guest at the closing ceremony of the conference on December 18, 2022 at Permanent Campus, Purbachal American City, Rupganj, Narayanganj. This is my second visit to the conference after joining its maiden edition in 2019. I am happy to see that the Faculty of Science and Engineering of Green University of Bangladesh have completed three more editions in three consecutive years. Consequently, I would like to express my heartiest appreciation to all the responsible faculty members, employees and other staff who are working to make this event successful.

As we all know that the Industry 4.0 focuses on the latest trends of data exchange and automation in manufacturing technologies by incorporating various techniques, including Internet of Things, Cyber-Physical systems, Cognitive Computing, Cloud computing, smart grids, and others to build intelligent or smart factories. It is considered as the revolutionary digital transformation of production/manufacturing and other related industries. However, while developing new technologies, we should not overlook their environmental impacts, where sustainable technologies can play an important role.

I am delighted to see that in this conference, both these contemporary domains are taken into account. Again, this is my firm belief that the latest edition of STI will be a significant platform for the researchers, professionals, experts, and practitioners in exhibiting their scientific accomplishments and advancements in these areas of interest.

I wish the conference all the success and hope that it will be a worldwide recognized platform for researchers, academicians and experts to transform the world.

**Prof. Dr. Md. Sazzad Hossain**



# MESSAGE

**Mohammed Abdullah Al-Mamun**  
Chairman, Board of Trustees  
Green University of Bangladesh



I am very much delighted to share that the Faculty of Science and Engineering of Green University of Bangladesh (GUB) is organizing the 2022 4th International Conference on Sustainable Technologies for Industry 4.0 (STI 2022). This is the fourth edition of the conference that is taking place in four consecutive years and the latest edition will be organized during 17-18 December, 2022 at the permanent campus of GUB located at Purbachal American City, Rupganj, Narayanganj. As the chief patron of the conference, I would like to express my heartfelt greetings to all the participants in this blissful occasion.

You would be happy to know that as one of the prominent and research-oriented private universities in Bangladesh, GUB stimulates young researchers' minds and has built an excellent research environment for the students and academics. I am happy that all editions of STI, including the latest edition have focused on two contemporary research domains, namely Sustainable Technologies and Industry 4.0. By latter topic, this conference promotes automation in manufacturing technologies and others which are related to industry 4.0 and the earlier topic encourages to consider environmental issues while developing these latest technologies.

Alike the other editions of the conference, the latest edition also provides a platform to the world's renowned researchers and industry experts to showcase their novel scientific ideas, achievements, and industrial innovation in their respective fields. This flagship conference will also motivate the new researchers to explore new research ideas from the presented articles.

Finally, I would like to thank the respected Vice Chancellor, General Chair, and Organizing Chair of the conference, and all the faculty members and staff of the Faculty of Science and Engineering as well as the Green University of Bangladesh for organizing such a prestigious conference. In my opinion, the successful arrangement of this event will bring a greater brand value to the GUB family and I take pride to be a part of this event. Again, I pledge to continue my support for scientific and technological events like this.

I wish a grand success for the 2022 4th International Conference on Sustainable Technologies for Industry 4.0 (STI 2022).

**Mohammed Abdullah Al-Mamun**





# MESSAGE

**Prof. Dr. Md. Golam Samdani Fakir**  
Vice-Chancellor  
Green University of Bangladesh



I am immensely delighted by the fact that the Faculty of Science and Engineering (FSE) is organizing an international conference on Sustainable Technologies for industry 4.0 (STI 2022) on 17th-18th December, 2022 for the fourth time in a row. This conference is a step towards achieving the vision to assemble researchers and experts from industries at home and abroad to share their innovative ideas and research findings on the latest technological trends in the fields of Computer Science and Engineering, Electrical and Electronics Engineering, and Textile Engineering. STI thereby envisions to generate a common platform for academics and industry professions to effectively and collectively progress towards Industry 4.0 through sustainable technology.

I am confident that the STI-2022 will be a vibrant and thriving conference like previous editions. I want to express my gratitude to the STI-2022 general chair, the organizing chair, and the entire team for their hard works and relentless efforts. Through such initiatives, we, STI team are always striving to set the bar higher and become a ranked conference in the near future. This year's edition hopefully will be another landmark achievement of FSE and Green University as a whole.

I would like to thank the participants for their contributions in making the conference a great success. I would like to thank all the authors, speakers, attendees, and volunteers for their wonderful efforts.

I wish the spellbound glorious success of this STI-2022 conference.

**Prof. Dr. Md. Golam Samdani Fakir**



# MESSAGE

**Prof. Dr. Md. Abdur Razzaque**  
General Chair  
STI 2022



With pleasure, I would like to deliver my warm greetings and heartfelt welcome to the STI 2022 4th International Conference on Sustainable Technologies for Industry 4.0 (STI), taking place in the permanent campus of Green University of Bangladesh at Purbachal American City, Dhaka, Bangladesh, during 17-18 December 2022. This flagship event is organized by the Faculty of Science and Engineering, Green University of Bangladesh.

The Organizing Committee decided to run STI 2022 in the blended mode for the safety and well-being of all participants. To provide maximum flexibility for the participants, the STI 2022 conference will include online technical presentations and live plenary sessions. This year, STI received a total number of 376 submitted papers from 3 different tracks, out of which 144 papers were accepted for presentation and publication in the IEEE Digital Library, yielding an acceptance rate of 0.38%. Experts conducted double-blind peer reviews on every manuscript and each submission received an average of 2.6 reviews. The submitting authors originate from 35+ countries including the US, UK, Germany, Denmark, Spain, China, Japan, Malaysia, Australia, etc., and submitted by 895 authors in total. About 107 Technical Program Committee Members and 210 reviewers from 20+ countries contributed their scholarly efforts to ensure quality reviews. In 3 different tracks, this conference will cover Augmented Reality, Virtual Reality, Bioinformatics, AI and Machine Learning in Smart Grid Power Systems, Big Data Analytics, and Blockchain Technologies, VLSI Design and Graph Theory, Signal Processing, Telecommunications, and RF engineering, Sustainable Machine Design, Autonomous, and Unmanned Aerial Vehicles, Smart Education (Education 4.0) Smart Education (Education 4.0) which are the driving forces of the fourth industrial revolution.

The STI 2021 conference aims to present theoretical and empirical studies that contribute to developing a better understanding of Sustainable Technologies for Industry 4.0. The Fourth Industrial Revolution or Industry 4.0 is both an opportunity and a challenge to enhance global manufacturing output to meet the rising human needs without hurting the environment. Industrial automation, connection, and aggregation of different data in corporate information systems are phenomena that need to be studied in-depth, such studies would make them contribute to the new business strategy, bringing concrete benefits. However, it is not possible to talk about innovation and industry without reference to sustainable innovation and development.

Around seven eminent Keynote Speakers will motivate us in Focus Sessions, providing a glimpse of contemporary, cutting-edge concerns. Prof. Bidyut B. Chaudhuri, IEEE Life Fellow from Techno India University, Kolkata; Frede Blaabjerg, IEEE Fellow, Aalborg University, Denmark; Erik Cambria, IEEE Fellow, Founder of SenticNet, Singapore; Z.Y. Dong, IEEE Fellow, Nanyang Technological University, Singapore; Takeshi Koshiba, Professor, Waseda University Tokyo, Japan; Atif Iqbal, Fellow IET (UK), Fellow IE (India), Professor, Qatar University; Tao Hui, Dean, School of Fashion, Wuhan Textile University are expected to share their valuable talks.

Last, but not least, I would like to express my sincere gratitude to all authors, presenters, panelists, reviewers, and technical and organizing committee members for their continued support, input, and energy to make this program impressive and joyful.

Wish you a very hearty greeting and an enjoyable stay in STI 2022!

**Prof. Dr. Md. Abdur Razzaque**





# MESSAGE

**Prof. Dr. Md. Fayzur Rahman**  
Treasurer  
Green University of Bangladesh



The 2022 4th International Conference on Sustainable Technologies for Industry 4.0 (STI) addresses two vital aspects - "Sustainable Technology" & "Industry 4.0". Sustainable technology is a broad phrase for technological innovation that helps both the environment and society advance. The purpose of these methods is to produce something that won't have a negative impact on the environment in any form. Technologies such as artificial intelligence, robotics, the Internet of Things, autonomous vehicles, real-time healthcare, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, quantum computing, and many others are all part of what is known as "Industry 4.0," or the Fourth Industrial Revolution.

There needs to be a rethinking of development and accountability in light of the "Global Challenges." The unrestrained use of our environment has brought us to a head of many difficulties. Natural resource scarcity is expected to worsen as the world's population and energy needs continue to rise. The success of "Our Common Future" depends on the responsible administration of Earth's natural resources and environment in accordance with the tenets of sustainable development.

In order to meet the world's difficulties, we must collaborate across borders and between institutions. Protecting our home planet Earth, maintaining its natural resources for the benefit of future generations, addressing the challenges of an aging population, and making our urban centers fit for the 21st century all need concerted efforts that must be coordinated on a global scale.

Within the realm of science and technology, STI 2022 aspires to help address the "Global Challenges." One of the greatest sources of motivation is the success of an event. It is my hope that we are successful in the arrangement of STI 2022. In addition, I hope that today is a productive one, full of thought-provoking conversations and the sharing of information that will help us envisioning a future that is both prosperous and environment friendly.

**Prof. Dr. Md. Fayzur Rahman**



# MESSAGE

**Nita Patel**  
President  
2023 IEEE Computer Society



Welcome to the 2022 4th International Conference on Sustainable Technologies for Industry 4.0 (STI 2022) in Dhaka, Bangladesh! I am honored to welcome you to this prestigious international event. Congratulations to the organizing committee for their tremendous work in creating an exciting event with an incredible selection of keynote speakers in a beautiful location at Green University of Bangladesh. With three engaging and varied conference tracks, STI 4.0 provides a platform to discuss innovative research areas related to smart industries, smart grids, intelligent transportation, real-time healthcare, and others that are bolstered by automation and cyber-physical systems. With esteemed keynote speakers, insightful technical presentations, and collaborative networking opportunities, the flagship event will be one not to be missed.

**Nita Patel**





## MESSAGE

**Prof. Dr. Md. Saiful Azad**

Organizing Chair of STI 2022  
Dean (Acting), Faculty of Science and Engineering  
Green University of Bangladesh



It is an immense pleasure for me to welcome you all to the 2022 4th International Conference on Sustainable Technologies for Industry 4.0 (STI 2022), which is organized by the Faculty of Science and Engineering (FSE), Green University of Bangladesh (GUB) during 17-18 December, 2022 at Purbachal American City, Rugganj, Narayanganj. This event is technically co-sponsored by the IEEE Computer Society, Washington, D.C., USA and financially co-sponsored by the hosting organization, Green University of Bangladesh (GUB) alongside other sponsors.

On behalf of the Organizing Committee, I would like to take this opportunity to express my warm welcome to all the participants, including keynote speakers, authors, academics, specialists, reviewers, industry professionals, guests, and others to this prestigious event. You would be happy to know that in the latest edition of STI, we have received the highest number of submissions among all the editions, i.e., 376, which is more than two times of our previous edition. Among them, only 134 papers are selected for presentation, yielding an acceptance rate of 35 percent only. Again, the involvement of international participants has increased in this edition. More specifically, in this edition, we have participants from 35+ countries, which is again the highest among all the editions of STI. These statistics demonstrate the growth and acceptance of this conference among the research communities and practitioners.

Alike the previous edition, we are organizing another flagship event for the second time, called "STI EXPO – 2022" in conjunction with the STI to create a common platform for the researchers and industry practitioners to discuss, plan, and suggest the activities that would facilitate the implementation of Industry 4.0 in Bangladesh. I am happy to see the response that we have received from various industries and practitioners for this event.

Finally, I want to express my deep gratitude to the chief patron, patron, general chair, chairs and members of various subcommittees, and all the faculty members and staff of FSE as well as the University for their unconditional supports and hard works. I would also like to express my gratitude to the technical and organizing committee members, panelists, reviewers, session chairs, and all other contributors for supporting this conference through their various services. We believe that this conference will bring benefit to the participants intellectually and technically, and will pave the path for the future collaborations among the researchers and practitioners around the globe.

Wishing you a warm welcome and enjoyable STI !

**Prof. Dr. Md. Saiful Azad**



## KEYNOTE SPEAKER

**Bidyut B. Chaudhuri**

IEEE Life Fellow  
Techno India University  
Kolkata, India



## On Bengali (Bangla) Language and Script based Technology Development

### Abstract

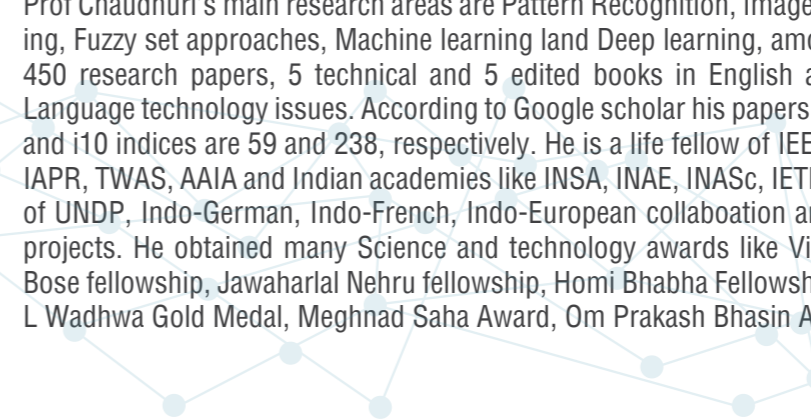
The struggle for retaining Bengali as the principal language has resulted in the birth of the independent country, Bangladesh. Hence, apart from literary work, special research and development should be a priority for developing its technological applications. Some good work has indeed been done on the technology development of Bengali, like Font generation and word-processing in computers and mobile phones, primary spell checker, electronic Bengali dictionary etc. But the degree of progress is slower than what is needed to be comparable to the development made in the language like English. The first part of our talk will discuss this issue and how we can speed up its progress.

The second part of the talk will be more specific, namely machine reading of texts generated in Bengali alphabetic system. This task is called OCR i.e. Optical Character Recognition, whereby the computer is able to read the image of a document containing Bengali Language text. If the document contains machine printed text, the current software technology can read it quite well. But if the document is a page handwritten by some person, this is still a difficult task. This part will discuss the current state of the international research and the work done by this speaker.

### Biography

Prof Chaudhuri, currently Pro Vice-Chancellor of Techno India University, was born in 7 December, 1950. After school exams he went to Kolkata Presidency college and then to Kolkata University to get B Sc (Hons in Physics), B Tech and M Tech degrees in Radio Physics and Electronics. He received PhD from IIT Kanpur in 1980 and joined Indian Statistical Institute as junior Faculty member. He went for Post Doc work at Queens University, UK with a Leverhulme fellowship. Subsequently, he travelled to numerous Universities around the globe on academic assignments.

Prof Chaudhuri's main research areas are Pattern Recognition, Image processing, Natural Language Processing, Fuzzy set approaches, Machine learning and Deep learning, among others. He has published more than 450 research papers, 5 technical and 5 edited books in English as well as 4 Bengali books on Bengali Language technology issues. According to Google scholar his papers are cited 16,651 times while his H-index and i10 indices are 59 and 238, respectively. He is a life fellow of IEEE and Fellow of international bodies like IAPR, TWAS, AAIA and Indian academies like INSA, INAE, INASc, IETE etc. He acted as PI of research projects of UNDP, Indo-German, Indo-French, Indo-European collaboration and many Indian organization sponsored projects. He obtained many Science and technology awards like Vikram Sarabhai Research Award, Sir J C Bose fellowship, Jawaharlal Nehru fellowship, Homi Bhabha Fellowship, INAE Distinguished Professorship, R L Wadhwa Gold Medal, Meghnad Saha Award, Om Prakash Bhasin Award, etc.





## KEYNOTE SPEAKER

### Frede Blaabjerg

IEEE Fellow  
Aalborg University  
Denmark



## Design for Reliability in Power Electronic Systems

### Abstract

In recent years, the automotive and aerospace industries have brought stringent reliability constraints on power electronic converters because of safety requirements. Today customers of many power electronic products expect up to 20 years of lifetime and they also want to have a “failure free period” and all with focus on the financials. The renewable energy sectors are also following the same trend, and more and more efforts are being devoted to improving power electronic converters to account for reliability with cost-effective and sustainable solutions. This presentation will introduce the recent progress in the reliability aspect study of power electronic converters for power electronic applications with special focus on renewables. It will cover the following contents: the motivations for highly reliable electric energy conversion in renewable energy systems; the reliability requirements of typical renewable energy systems and its implication on the power electronic converters; failure mechanisms and lifetime models of key power electronic components (e.g., power semiconductor switches, capacitors, and fans); long-term mission profiles in Photovoltaic (PV) and wind power applications and the component level stress analysis; reliability analysis methods, tools, and improvement strategies of power electronic converters for renewable energy systems. A few case studies on PV and wind power based renewable energy systems will also be discussed.

### Biography

Frede Blaabjerg (S'86–M'88–SM'97–F'03) was with ABB-Scandia, Randers, Denmark, from 1987 to 1988. From 1988 to 1992, he got the PhD degree in Electrical Engineering at Aalborg University in 1995. He became an Assistant Professor in 1992, an Associate Professor in 1996, and a Full Professor of power electronics and drives in 1998 at AAU Energy. From 2017 he became a Villum Investigator. He is honoris causa at University Politehnica Timisoara (UPT), Romania in 2017 and Tallinn Technical University (TTU), Estonia in 2018. His current research interests include power electronics and its applications such as in wind turbines, PV systems, reliability, harmonics and adjustable speed drives. He has published more than 600 journal papers in the fields of power electronics and its applications. He is the co-author of four monographs and editor of ten books in power electronics and its applications.

He has received 38 IEEE Prize Paper Awards, the IEEE PELS Distinguished Service Award in 2009, the EPE-PEMC Council Award in 2010, the IEEE William E. Newell Power Electronics Award 2014, the Villum Kann Rasmussen Research Award 2014, the Global Energy Prize in 2019 and the 2020 IEEE Edison Medal. He was the Editor-in-Chief of the IEEE TRANSACTIONS ON POWER ELECTRONICS from 2006 to 2012. He has been Distinguished Lecturer for the IEEE Power Electronics Society from 2005 to 2007 and for the IEEE Industry Applications Society from 2010 to 2011 as well as 2017 to 2018. In 2019-2020 he served as a President of IEEE Power Electronics Society. He has been Vice-President of the Danish Academy of Technical Sciences. He is nominated in 2014-2021 by Thomson Reuters to be between the most 250 cited researchers in Engineering in the world.

## KEYNOTE SPEAKER

### Erik Cambria

IEEE Fellow  
Founder of SenticNet Lab,  
Nanyang Technological University, Singapore



## Neurosymbolic AI for Explainable Sentiment Analysis

### Abstract

With the recent developments of deep learning, AI research has gained new vigor and prominence. However, machine learning still faces three big challenges: (1) it requires a lot of training data and is domain-dependent; (2) different types of training or parameter tweaking leads to inconsistent results; (3) the use of black-box algorithms makes the reasoning process uninterpretable. At SenticNet, we address such issues in the context of NLP via sentic computing, a neurosymbolic approach that aims to bridge the gap between statistical NLP and the many other disciplines necessary for understanding human language such as linguistics, common-sense reasoning, and affective computing. Sentic computing is both top-down and bottom-up: top-down because it leverages explainable symbolic models such as semantic networks and conceptual dependency theory to encode meaning; bottom-up because it uses powerful subsymbolic methods such as transformers and contrastive learning to infer syntactic patterns from data.

### Biography

Erik Cambria is the Founder of SenticNet, a Singapore-based company offering B2B sentiment analysis services, and an Associate Professor at NTU, where he also holds the appointment of Provost Chair in Computer Science and Engineering. Prior to joining NTU, he worked at Microsoft Research Asia (Beijing) and HP Labs India (Bangalore) and earned his PhD through a joint programme between the University of Stirling and MIT Media Lab. His research focuses on neurosymbolic AI for explainable natural language processing in domains like sentiment analysis, dialogue systems, and financial forecasting. He is recipient of several awards, e.g., IEEE Outstanding Career Award, was listed among the AI's 10 to Watch, and was featured in Forbes as one of the 5 People Building Our AI Future. He is an IEEE Fellow, Associate Editor of many top-tier AI journals, such as Information Fusion and IEEE Transactions on Affective Computing, and is involved in various international conferences as program chair and SPC member.

## KEYNOTE SPEAKER

### Z.Y. Dong

IEEE Fellow  
Nanyang Technological University  
Singapore



## Smart Electric Vehicle Management and Planning

### Abstract

Electrification of the transportation sector has been happening in many countries under the zero carbon emission initiative targeting at, in most cases, the second largest emission sector – transportation sector. As such, many countries have been observing rapid growth in Electrical Vehicle (EV) uptake. While serving the emission reduction purpose, EVs also pose potential challenges for the power grid in view of system security and reliability. Better utilization of the EVs also encourages development and deployment of smart EV management and innovative economic models for the benefit of different stakeholders related to EV and EV charging. In this presentation, AI enabled smart EV charging management and new sharing framework for EV uptake will be given with case studies of both research examples and industrial practices.

### Biography

Z.Y. Dong (M'99-SM'06-F'17) is currently Professor of Power Engineering with Nanyang Technological University, Singapore. His previous roles include SHARP Professor and inaugural Director of UNSW Digital Grid Futures Institute, Director of ARC Research Hub for Integrated Energy Storage Solutions, Ausgrid Chair and Director of Ausgrid Centre for Intelligent Electricity Networks providing R&D support for the AU\$500m Smart Grid, Smart City national demonstration project. His research interest includes power system planning, load modelling, smart grid, smart cities, energy market, renewable energy and its grid connection, and computational methods and their application in power system analysis. He has been serving as editor/associate editor of several IEEE transactions and IET journals. He is a Fellow of IEEE.

## KEYNOTE SPEAKER

### Choong Seon Hong

Senior Member, IEEE  
Kyung Hee University  
South Korea



## Machine Learning for Space-Air-Terrestrial Networking

### Abstract

The conceptualization on 6G's vision and enabling technologies have recently gained attention in both academics and industry. Artificial intelligence (AI) represents one of the biggest emerging opportunities in technology, especially for tasks such as wireless resource management, networking planning, and power saving. Aerial supporting networking becomes promising technology for enabling computation-oriented communications (COC) applications such as virtual and augmented reality (VR and AR), real-time monitoring, and surveillance. In 5G and upcoming 6G cellular networks, reconfigurable intelligent surface (RIS) has perceived a prodigious interest to develop a new communication infrastructure by utilizing unnamed aerial vehicle (UAV) with RIS due to flexibility, line-of-sight (LOS) transmission, spectral efficiency enhancement, and cost-effectiveness. To guarantee last-mile internet connectivity, the next generation of networking has made satellite communication possible. Thus, the low earth orbit (LEO) satellite system assures future networking to manage the space-air-sea (SAS) communication system. This talk will cover the role of AI in managing and controlling the aerial and space-supported networking for future internet and its services.

### Biography

Choong Seon Hong (Senior Member, IEEE) received his Ph.D. degree from Keio University, Tokyo, Japan, in 1997. In 1988, he joined KT, Gyeonggi-do, South Korea, where he was involved in broadband networks as a member of the Technical Staff. Since 1993, he has been with Keio University. He was with the Telecommunications Network Laboratory, KT, as a Senior Member of Technical Staff and as the Director of the Networking Research Team until 1999. Since 1999, he has been a Professor with the Department of Computer Science and Engineering, Kyung Hee University. His research interests include future Internet, intelligent edge computing, network management, and network security.

Dr. Hong is a member of the Association for Computing Machinery (ACM), the Institute of Electronics, Information and Communication Engineers (IEICE), the Information Processing Society of Japan (IPSJ), the Korean Institute of Information Scientists and Engineers (KIISE) and others. He has served as the General Chair, the TPC Chair/Member, or an Organizing Committee Member of international conferences, such as the Network Operations and Management Symposium (NOMS), International Symposium on Integrated Network Management (IM), Asia-Pacific Network Operations and Management Symposium (APNOMS) and others. He was an Associate Editor of the IEEE Transactions on Network and Service Management and the IEEE Journal of Communications and Networks and an Associate Editor for the International Journal of Network Management and an Associate Technical Editor of the IEEE Communications Magazine, and guest editor of IEEE Network Magazine. He currently serves as an Associate Editor for the International Journal of Network Management and Future Internet Journal.



## KEYNOTE SPEAKER

**Atif Iqbal**

Fellow IET (UK), Fellow IE (India)  
Qatar University, Qatar



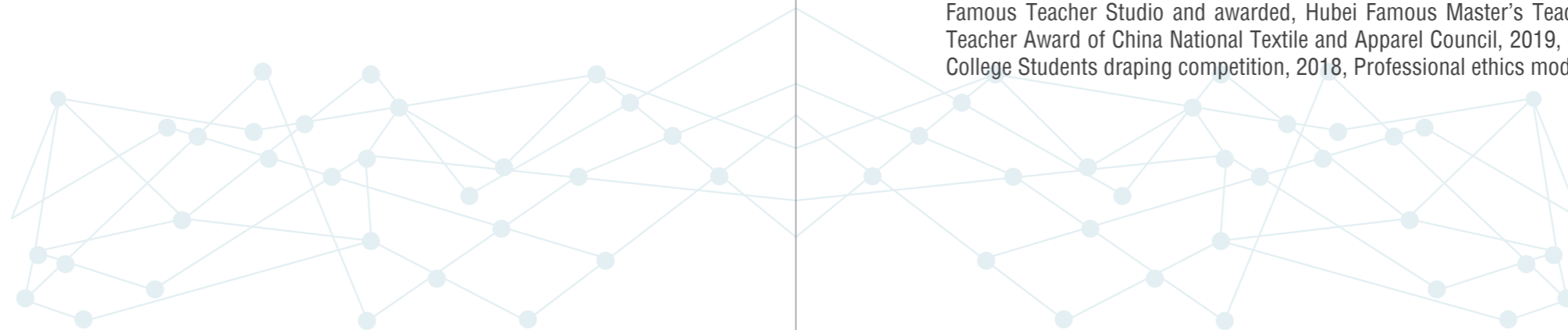
### Opportunities and Challenges in Grid-Connected Distributed Energy Sources

#### Abstract

The world is moving towards decentralized power station, formally called distributed power generation. The main sources of distributed power generations are solar power and wind power systems. Wind energy is also one of the most important and promising sources of renewable energy, mainly because it is economically competitive and technically sound solution to reduce greenhouse gas emissions. Grid-connected photovoltaic (PV) systems are one of the fastest growing renewable energy conversion systems in the world. The main reason for this remarkable development is the cost reduction of PV modules and the introduction of economic incentives or subsidies due to growing environmental concerns. Power electronics, used as an interface between the distributed generation sources and the electricity grid play an important role in facilitating an efficient and optimal energy transfer, as well as increasing system reliability and utilizing an economically viable solution. The talk will focus on the energy scenario, existing international standards in relation to the grid-connected distributed energy source, existing inverter topologies, their classifications and operations, issues, challenges and future directions.

#### Biography

Dr. Atif Iqbal (Senior Member, IEEE, Fellow IET (UK), Fellow IE (India), Vice-Chair IEEE Qatar Section) received the B.Sc. and M.Sc. degrees in engineering (power system and drives) from Aligarh Muslim University (AMU), Aligarh, India, in 1991 and 1996, respectively, and Ph.D. degree from Liverpool John Moores University, Liverpool, U.K., in 2006, and the D.Sc. degree (Habilitation) in control, informatics, and electrical engineering from the Gdansk University of Technology, in 2019. He is a Full Professor with the Department of Electrical Engineering, Qatar University, Doha, Qatar. His research interests include smart grid, complex energy transition, distributed energy generation.



## KEYNOTE SPEAKER

**Tao Hui**

Dean, School of Fashion  
Wuhan Textile University  
China



### Cross-cultural Thinking in the Development of a Sustainable Fashion Education System: A Collaborative Approach with Industry, Policy, and the Educational Sector

#### Abstract

It is suggested that the education sector is the key aspect in making a larger-scale revolution for globalization in the development of a sustainable fashion scheme. This research will provide a practice-based creative educational system ideology that will have long-term consequences on fashion education for the sustainability of the clothing sector. Based on our previous research in the field of education, and conducted investigations as well as studies on the current situation of sustainable clothing education in China. This research aims to introduce a cross-cultural development approach in the fashion education system. To demonstrate the concept this study will apply a mixed method of qualitative analysis and practice-based data interpretation. First, a qualitative analysis will be conducted for the outcome of the collaborative educational project with other countries' universities and industries to have an idea of cross-cultural education. Secondly, a group of students will involve doing practice in the industry for sustainable fashion implementation as part of the course to get analytical data from industrial aspects for practice-based education development.

#### Biography

Professor Tao Hui, Dean, School of Fashion, Wuhan Textile University. She was born in February, 1969, Wuhan, Hubei Province, China. Her research interest was in Chinese Traditional Etiquette Costume Culture and Design Innovation Sustainable Development of Fashion Industry, Fashion Design Education and Internationalization. She is a Professor of Wuhan Textile University, master tutor, visiting scholar of University of Manchester, UK. The leader of the national quality resource sharing course "Clothing Structure Design"; the head of the construction of the national first-class professional project of "Clothing and Apparel Design", and leader of the provincial first-class course of "Clothing Structure Design". She is an editorial board member of 'Fashion Guide', Journal of Wuhan Textile University, Prof. Tao Hui bagged many awards like: Host of Hubei Famous Teacher Studio and awarded, Hubei Famous Master's Teacher, 2021, "Textile Light" Outstanding Teacher Award of China National Textile and Apparel Council, 2019, Excellent instructor of the 2nd Chinese College Students draping competition, 2018, Professional ethics model of Wuhan Textile University, 2016.



## KEYNOTE SPEAKER

### Nowshad Amin

Head of the Solar Energy Research Unit  
Universiti Tenaga Nasional  
Malaysia



## Hope on Solar PV Energy to Achieve Carbon Neutrality by 2050

### Abstract

Amid imminent conventional fuel crisis, energy supply in the form of electricity may face serious consequences in many developing countries. Many developed nations are already aligning themselves towards alternatives to fossil fuels in their long-term energy roadmap, attributing to the tremendous development of renewable energy resources especially solar photovoltaic energy technologies in recent years. Over the past few decades, solar energy in the form of solar photovoltaics (PV) has demonstrated to be the most potential renewable energy resource to date. We have come across solar cells of few generations after being demonstrated first at Bell Labs (with 6% conversion efficiency) in 1954 to Giga watt-peak capacity solar farms for electrical power generation. So far, researchers around the world try to find energy harvesting in the form of electricity with many kinds of solar cells starting from inorganic silicon based to organic based ones. The cost-efficiency has become praiseworthy whereby \$/Wp cost of solar PV has reduced tremendously with many consumer-friendly policies around the world. This talk will demonstrate most recent status of overall solar PV technologies and future trend. This will boost the hope on solar photovoltaic energy to be in-line with the carbon neutrality commitment of the countries around the globe by 2050 apart from achieving SDG7 pledges of UN.

### Biography

Professor Dr. Nowshad Amin is working at the College of Engineering and currently Head of the Solar Energy Research Unit under The Institute of Sustainable Energy of Universiti Tenaga Nasional (@UNITEN, The Energy University) of Malaysia. He is also an honorary professor to the Faculty of Engineering and Built Environment of Universiti Kebangsaan Malaysia (@UKM, The National University of Malaysia), where he earlier worked over 11 years till 2018. After his higher secondary education from native country, Bangladesh, he received the Japanese Ministry of Education (MONBUSHO) scholarship in 1990 to study electrical engineering, where he achieved Bachelor (1996) from Toyohashi University of Technology, subsequently Masters (1998) and PhD (2001) from Tokyo Institute of Technology, Japan. His areas of expertise include solar cell materials and device development as well as applications. He has been serving as the project-leader as well as co-researcher of many government (Malaysia) and international (NSF-USA, Saudi National Grant, Qatar Foundation etc.) funded projects. He has authored numerous peer-reviewed publications (journals and proceedings), a few books and book chapters. He is actively involved in promoting Renewable Energy to the developing countries in South and South-East Asia, working as an enthusiastic promoter for the affordable solar photovoltaic (PV) technologies.

## FACULTY OF SCIENCE & ENGINEERING

Welcome to the Faculty of Science and Engineering, Green University of Bangladesh. It was founded in 2003 and now, it encompasses three departments, namely Computer Science and Engineering (CSE) — established in 2003; Electrical and Electronic Engineering (EEE) — established in 2003; and Textile Engineering (TEX) — established in 2008. The role of deanship (Acting) of this faculty is carried out by Prof. Dr. Md. Saiful Azad, an academic leader and a devoted researcher in the field of Systems and Security.

Green University of Bangladesh (GUB) believes in offering quality education to all the students through their trained and experienced faculty members. For that, GUB arranges a four (4) months long training session, entitled “Certificate Course in Teaching and Learning (CTL)” for all the newly recruited faculty members conducted by Prof. Dr. Md. Golam Samdani Fakir, honorable Vice-Chancellor of Green University of Bangladesh. Alongside teaching, GUB encourages their faculty members to conduct research in order to contribute to their respective research areas and enhance their knowledge thereby. For facilitating research, GUB offers research grants to their faculty members.

The Faculty of Science and Engineering (FSE) is also providing several platforms to conduct and showcase their research contributions. For instance, the FSE is regularly publishing the GUB Journal of Science and Engineering (GUBJSE) from 2014 and currently indexed/abstracted in J-Gate, Google Scholar, BanglaJOL, Copernicus, and others. The FSE also organizes an international conference regularly, named “International Conference on Sustainable Technologies for Industry 4.0 (STI)”. Only conference in Bangladesh, which is technically sponsored by the central IEEE Computer Society. All the papers of every edition are included in the IEEE xplore digital library within a short period of time. From the very first edition, all the accepted papers are included in the Scopus and other renowned databases. With each subsequent edition, involvement of international participants is increasing, e.g., 2019: 20 countries, 2020: 22 countries, and 2021: 35 countries. The 1st edition of STI 2019 was held during 24-25 December where around 12 distinguished keynote speakers, 200+ authors, 100+ senior academicians, 30+ industry practitioners from 20+ countries of the World had gathered. The 2nd edition of STI 2020 was held during 19-20 December where around 12 distinguished keynote speakers, 290+ authors, 100+ senior academicians, 30+ industry practitioners from 22+ countries of the World had gathered. The 3rd edition of STI 2021 was held during 18-19 December where around 10 distinguished keynote speakers including seven (7) IEEE fellows have joined us as keynote speakers, and it is a common practice. Besides, the authors, senior academicians, industry practitioners from 35+ countries of the World had gathered in STI. This year, the latest edition of STI (STI 2022) is happening in an extensive manner, which you can realize from this conference proceedings.

### Department of Computer Science and Engineering

The degree program of Bachelor of Science in Computer Science and Engineering is accredited by Board of Accreditation for Engineering and Technology Education (BAETE) of Institution of Engineers Bangladesh (IEB). The Department of CSE has started an Outcome Based Education (OBE) System since Spring 2019. The department is conducting courses, examinations, thesis/project, internship, industrial training, etc. following the guidelines of OBE system. The chairperson role of this department is currently looked after by Prof. Dr. Md. Saiful Azad.

Total number of students in both day and evening batches is 2430. Among them, the day batch consists of 2000 and the evening batch consists of 430 students, respectively.

There are 79 faculty members including one distinguished professor, two professors, three associate professors, eight assistant professors, seven Sr. Lecturers, and fifty-eight lecturers. In addition, one assistant professor, two senior lecturers and eleven lecturers are now on leave to pursue their higher studies in USA, Europe, Canada, Australia, and so on.



One of the main aspects of the Computer Science and Engineering course is that almost all of the theory courses are associated with corresponding lab courses. Right now, we have eleven fully equipped laboratories for the students of Computer Science and Engineering such as Programming Laboratory, Networking and System Laboratory, Software Engineering Laboratory, Computing Laboratory I, Research Laboratory, Computing Laboratory II, Algorithms Laboratory, Artificial Intelligence and Machine Learning Laboratory, Database & Data Warehouse Laboratory, Mobile Application Development Laboratory, and Hardware Laboratory. According to the guideline of University Grants Commission (UGC) of Bangladesh & BAETE requirements, we have reviewed and prepared our 144 credits length B.Sc. in CSE curriculum recently taking comments from both academic and industry experts.

We are very glad to share that the Green University of Bangladesh has got the great honor to organize the biggest and most prestigious programming competition for students, named “ICPC Asia Dhaka Regional”, which will be organized on March 11, 2022. It is noteworthy to mention that the International Collegiate Programming Contest (ICPC) is an algorithmic programming contest, where the best brains compete annually in terms of speed, creativity and innovation in solving problems. This contest also provides a platform for industry and academia to encourage and draw the public's attention to the next generation of IT professionals as they pursue excellence.

In every year, CSE department organizes a gala ICT event titled “CSE Carnival”. This festival includes various events like Inter-Departmental Programming Contest (IDPC), Industrial talk, Workshops, Career counseling session for CSE graduates, Project showcasing and competition, Gaming contest, and Cultural program which helps our students to be more competitive.

The department has academic and industrial collaborations with reputed institutions at home and abroad.

### Department of Electrical and Electronic Engineering

In 2018, the B.Sc. in Electrical and Electronic Engineering (EEE) degree program got the most prestigious accreditation from Board of Accreditation for Engineering and Technical Education (BAETE), Institute of Engineers Bangladesh (IEB). The Department of EEE started an Outcome Based Education (OBE) System since Spring 2019. This department is now lead by Dr. ASM Shihavuddin, a talented, experienced and devoted academician.

Total number of students in both day and evening batches is 1074. Among them, the day batch consists of 570 and the evening batch consists of 504 students, respectively.

At present, there are 62 faculty members including one distinguished professor, two professors, four associate professors, six assistant professors, and forty-nine lecturers. In addition, one assistant professor and nine lecturers are now on leave to pursue their higher studies in USA, Europe, Canada, Australia, and so on.

This department has already established 15 laboratories. Each and every semester, the department is upgrading and improving the laboratories with new equipment and hence the experiments are performed properly. The EEE department has already established Electrical Circuit Laboratory, Electronics Laboratory, Digital Electronics Laboratory, Power Electronics Laboratory, Microprocessor and Interfacing Laboratory, Electrical Drawing Laboratory, Power System Protection Laboratory, Control Systems Laboratory, Digital Signal Processing Laboratory, Energy Conversion Laboratory, Numerical Analysis Laboratory, Communication Engineering Laboratory, Project Laboratory, Computer Programming Laboratory, Physics Laboratory.

The department is now working on Outcome Based Education (OBE) which is very important in the challenging world of the 21st century. Therefore, the syllabus of the EEE Department has been designed so that it can cover a broad range of disciplines related to the different fields of Electrical Engineering. The whole degree is of 144 credit hours.

The EEE department organizes a ceremony titled “EEE Day” every year. During the EEE day program, the department organizes a job fair, where a number of industries participate. They collect CVs from students.

The students are sent to visit different industries every semester. To earn industrial experience, they are placed in industries for two months regularly. As per the requirement of OBE, Integrated Design Project has been incorporated into the curriculum.

### Department of Textile Engineering

The Textile Engineering Department of Green University of Bangladesh started its journey from 2008. Since its inception, the Department has been playing a dominant role in offering quality education. At present, the Department of Textile Engineering of the Green University is a leading Department for Textile Engineering education in Bangladesh.

Total number of students in both day and evening batches is 442. Among them, the day batch consists of 343 and the evening batch consists of 99 students, respectively.

At present, there are 25 faculty members including one distinguished professor, one professor, two associate professors, two assistant professors, and nineteen lecturers. In addition, one Assistant professor and four lecturers are now on leave to pursue their higher studies. The textile engineering department is currently lead by Prof. Dr. Nitai Chandra Sutradhar, a legendary academician in the field of textile education in Bangladesh. The Bachelor of Science in Textile Engineering program is designed to give students the fundamentals of the latest Textile Engineering to develop a broader view leading to a more intelligent approach to industrial and organizational problems. In addition to theoretical lectures, this program offers extensive laboratory practice, field trips, research projects, and an industrial internship facility in modern textile mills.

The major focus of the B.Sc. in Textile Engineering curriculum is on four major areas – Yarn Manufacturing, Fabric Manufacturing, Wet Processing, and Apparel Manufacturing. Undergraduate students specialize in one of these groups without compromising fundamental knowledge in Textile.

The existing syllabi of the regular four-year B.Sc. in Textile Engineering program and the B.Sc. in Textile Engineering program for diploma holders have been reviewed and updated in 2018 based on guidelines of the UGC. The whole degree is of 161 credit hours.

The Department has eight well-equipped laboratories and highly qualified and experienced faculty members having degrees from home and abroad. The Department has been offering regular B.Sc. in Textile Engineering courses of four-year duration and B.Sc. in Textile Engineering courses for Diploma holders.

The Textile Engineering Department is in the process of introducing an Outcome Based Education (OBE) system. In 2018, an IEB evaluation team visited the department giving a positive response.

The Department has academic collaboration with leading Textile Departments at home and abroad to facilitate student exchange, scholarship, joint research, and credit transfer.

## Permanent campus

The permanent campus of Green University of Bangladesh is now under construction at Purbachal American City. It will be one of the largest private university campuses in Bangladesh with improved facilities for the students. The Green University Permanent Campus at Purbachal American City includes Separate Academic Buildings for conducting classes and laboratories, Administrative Building, Hostel for local and international students, Country's one of the largest IT Center, Multipurpose Hall, Modern Conference Hall, IT-based Library, Different laboratories, Indoor and outdoor games facilities, Playgrounds, Medical Center, Cafeteria, Gymnasium and Transport facilities for the students, etc.

At present, the total number of students in both day and evening batches in the Faculty of Science and Engineering of the permanent campus is 1526. Among them the Department of Computer Science & Engineering consists of 813, Department of Electrical & Electronic Engineering consists of 490 and Department of Textile Engineering consists of 223 students respectively.

At present, there are several laboratories for the Faculty of Science and Engineering in permanent campus including Programming Laboratory, Networking Laboratory, Multimedia & Graphics Laboratory, Artificial Intelligence and Machine Learning Lab, Big Data Analytics Lab, Electrical Circuit Laboratory, Electronics Laboratory, Energy Conversion Laboratory, Wet Processing Laboratory, Textile Testing & Quality Control, Apparel Manufacturing Laboratory, Physics Laboratory, and Chemistry laboratory.

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 Green University of Bangladesh, Bangladesh  
 Green University of Bangladesh, Bangladesh  
 Green University of Bangladesh, Bangladesh  
 The National University of Malaysia  
 Sheffield Hallam University, UK  
 University of Liberal Arts Bangladesh, Bangladesh  
 King Abdul Aziz University, Saudi Arabia  
 Institut Teknologi Sumatera, Lampung, Indonesia  
 Universiti Malaysia Perlis, Malaysia  
 Green University of Bangladesh, Bangladesh  
 Dept. of Computer Science, National University, Bangladesh  
 Northeastern University, USA  
 National Technical University of Athens, Greece  
 Bangkok University, Thailand  
 Green University of Bangladesh, Bangladesh  
 Curtin University, Australia  
 Shahjalal University of Science and Technology, Bangladesh  
 Murdoch University, Australia  
 Green University of Bangladesh, Bangladesh  
 Jagannath University, Bangladesh  
 University of Dhaka, Bangladesh  
 Jagannath University, Bangladesh  
 Primeasia University, Bangladesh  
 Military Institute of Science and Technology, Bangladesh  
 Green University of Bangladesh, Bangladesh  
 UCSI University, Malaysia  
 University of Adelaide, South Australia  
 Deakin University, Australia  
 King Abdullah University of Science and Technology, Saudi Arabia  
 North South University, Bangladesh  
 Latrobe University Melbourne, Australia  
 University of Sindh, Pakistan  
 Ahsanullah University of Science & Technology, Bangladesh  
 East West University, Bangladesh  
 Ahsanullah University of Science and Technology, Bangladesh  
 Jatiya Kabi Kazi Nazrul Islam University, Bangladesh  
 Bangladesh University of Textiles, Bangladesh  
 Jagannath University, Bangladesh  
 Technical University of Denmark, Denmark  
 Japan Advanced Institute of Science and Technology, Japan  
 Universiti Malaysia Perlis, Malaysia  
 Toyohashi University of Technology, Japan  
 Teesside University, UK

**BRIEF PROGRAM SCHEDULE | STI 2022**

Time	Event
<b>DAY 1 – Saturday, 17 December 2022</b>	
08:30 AM – 09:00 AM	Kit Collection and Breakfast
09:00 AM – 09:30 AM	Conference Highlights and Greeting Exchanges
09:30 AM – 10:30 AM	Inaugural Session
10:30 AM – 11:15 AM	Keynote 01: Prof. Dr. Bidyut B. Chaudhuri, IEEE Life Fellow, Techno India University, Kolkata
11:15 AM – 11:30 AM	Health Break
11:30 AM – 13:00 PM	Parallel Technical Sessions (T1)
13:00 PM – 14:00 PM	Prayer and Lunch Break
14:00 PM – 14:45 PM	Keynote 02: Prof. Dr. Erik Cambria, IEEE Fellow, Founder of SenticNet Lab, Singapore Keynote 03: Prof. Dr. Nowshad Amin, Universiti Tenaga Nasional, Malaysia
14:45 PM – 15:00 PM	Short Break
15:00 PM – 16:30 PM	Parallel Technical Sessions (T2)
16:30 PM – 16:45 PM	Health Break
16:45 PM – 17:30 PM	Keynote 04: Prof. Dr. Frede Blaabjerg, IEEE Fellow, Aalborg University, Denmark
17:30 PM – 18:00 PM	Prayer Break
18:00 PM – 19:00 PM	Advisory and Organizing Committee Meeting

<b>DAY 2 – Sunday, 18 December 2022</b>	
08:30 AM – 09:00 AM	Breakfast
09:00 AM – 09:30 AM	Conference Highlights and Greeting Exchanges
09:30 AM – 10:30 AM	Keynote 05: Choong Seon Hong, Senior Member, IEEE, South Korea
10:30 AM – 11:15 AM	Keynote 06: Prof. Dr. Z. Y. Dong, IEEE Fellow, Nanyang Technological University, Singapore
11:15 AM – 11:30 AM	Health Break
11:30 AM – 13:00 PM	Parallel Technical Sessions (T3)
13:00 PM – 14:00 PM	Prayer and Lunch Break
14:00 PM – 14:45 PM	Keynote 07: Prof. Tao Hui, Dean, School of Fashion, Wuhan Textile University, China Keynote 08: Prof. Dr. Atif Iqbal, Fellow IET (UK), Fellow IE (India), Qatar University, Qatar
14:45 PM – 15:00 PM	Short Break
15:00 PM – 16:30 PM	Parallel Technical Sessions (T4)
16:30 PM – 16:45 PM	Health Break
16:45 PM – 17:30 PM	Workshop / Expo / Interactive Poster Session
17:30 PM – 18:00 PM	Prayer Break
18:00 PM – 20:00 PM	Award Giving Ceremony followed by the Gala Dinner

**PROGRAM SCHEDULE FOR KEYNOTE SESSIONS | STI 2022**

**Day - 1**

<p><b>D1K1</b></p> <p>Saturday, 17 Dec 2022 10:30 AM – 11:15 PM Room# PCR-302</p>	<p><b>Keynote 01: On Bengali (Bangla) Language and Script based Technology Development</b></p> <p><b>Prof. Dr. Bidyut B. Chaudhuri, IEEE Life Fellow</b> Techno India University, Kolkata</p> <p><b>Session Chairs:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Dr. Md. Haider Ali</li> <li>2. Prof. Dr. Md. Monirul Islam</li> </ol>
<p><b>D1K2</b></p> <p>Saturday, 17 Dec 2022 14:00 PM – 14:45 PM Room# PCR-302</p>	<p><b>Keynote 02: Neurosymbolic AI for Explainable Sentiment Analysis</b></p> <p><b>Prof. Dr. Erik Cambria, IEEE Fellow</b> Founder of SenticNet, Singapore</p> <p><b>Session Chairs:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Dr. Mohammad Kaykobad</li> <li>2. Prof. Dr. Mohammad Shorif Uddin</li> </ol>
<p><b>D1K3</b></p> <p>Saturday, 17 Dec 2022 14:00 PM – 14:45 PM Room# PCR-309</p>	<p><b>Keynote 03: Hope on Solar PV Energy to Achieve Carbon Neutrality by 2050</b></p> <p><b>Prof. Dr. Nowshad Amin</b> Universiti Tenaga Nasional, Malaysia</p> <p><b>Session Chairs:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Dr. Celia Shahnaz</li> <li>2. Dr. Molla Shahadat Hossain Lipu</li> </ol>
<p><b>D1K4</b></p> <p>Saturday, 17 Dec 2022 16:45 PM – 17:30 PM Room# PCR-302</p>	<p><b>Keynote 04: Design for Reliability in Power Electronic Systems</b></p> <p><b>Prof. Dr. Frede Blaabjerg, IEEE Fellow</b> Aalborg University, Denmark</p> <p><b>Session Chairs:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Dr. Md. Ashrafal Hoque</li> <li>2. Prof. Dr. ASM Shihavuddin</li> </ol>

**PROGRAM SCHEDULE FOR KEYNOTE SESSIONS | STI 2022**

**Day - 2**

<p><b>D2K5</b></p> <p>Sunday, 18 Dec 2022 09:30 AM – 10:30 AM Room# PCR-302</p>	<p><b>Keynote 05: Recent Development in Quantum Computation and its Impact on Information Security and Machine Learning</b></p> <p><b>Prof. Dr. Choong Seon Hong, Senior Member, IEEE</b> Kyung Hee University, South Korea</p> <p><b>Session Chairs:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Dr. Hafiz Md. Hasan Babu</li> <li>2. Prof. Dr. M. Sohel Rahman</li> </ol>
<p><b>D2K6</b></p> <p>Sunday, 18 Dec 2022 10:30 AM – 11:15 AM Room# PCR-302</p>	<p><b>Keynote 06: Smart Electric Vehicle Management and Planning</b></p> <p><b>Prof. Dr. Z. Y. Dong, IEEE Fellow</b> Nanyang Technological University, Singapore</p> <p><b>Session Chairs:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Dr. Md. Adnan Kiber</li> <li>2. Prof. Dr. Md. Fayzur Rahman</li> </ol>
<p><b>D2K7</b></p> <p>Sunday, 18 Dec 2022 14:00 PM – 14:45 PM Room# PCR-302</p>	<p><b>Keynote 07: Cross-cultural Thinking in the Development of a Sustainable Fashion Education System: A Collaborative Approach with Industry, Policy, and the Educational Sector</b></p> <p><b>Prof. Tao Hui, Dean, School of Fashion</b> Wuhan Textile University, China</p> <p><b>Session Chairs:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Dr. Nitai Chandra Sutradhar</li> <li>2. Dr. Md. Shariful Alam</li> </ol>
<p><b>D2K8</b></p> <p>Sunday, 18 Dec 2022 14:00 PM – 14:45 PM Room# PCR-309</p>	<p><b>Keynote 08: Opportunities and Challenges in Grid-Connected Distributed Energy Sources</b></p> <p><b>Prof. Dr. Atif Iqbal, Fellow IET (UK), Fellow IE (india)</b> Qatar University, Qatar</p> <p><b>Session Chairs:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Dr. Khawza Iftekhar Uddin</li> <li>2. Prof. Dr. Quamrul Ahsan</li> </ol>
<p><b>D2W</b></p> <p>Sunday, 18 Dec 2022 04:45 PM – 05:30 PM Room# PC-Lobby</p>	<p><b>Workshop: Basic Bioinformatics Tools &amp; Techniques</b></p> <p><b>Dr. Mohammad Ali Moni</b> The University of Queensland, Australia</p> <p><b>Session Chairs:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Dr. Md. Mamun-Or-Rashid</li> <li>2. Prof. Dr. Mohammad Shorif Uddin</li> </ol>
<p><b>D2Expo</b></p> <p>Sunday, 18 Dec 2022 04:45 PM – 05:30 PM Room# PCR-302</p>	<p><b>STI Expo 2022</b></p> <p><b>Session Chairs:</b></p> <ol style="list-style-type: none"> <li>1. Prof. Dr. ASM Shihavuddin</li> </ol>



## STI 2021 PROGRAM SCHEDULE FOR TECHNICAL SESSIONS | STI 2022

### Day - 1 : Technical Session - 1

<b>D1T1P1</b>		Parallel Session 1 (Track 1): <b>Computer Vision and Pattern Recognition</b>
Saturday, 17 Dec 2022 11:30 AM – 01:00 PM Room# PCR-306		Session Chairs: 1. Prof. Dr. Md. Zahidul Islam 2. Dr. Md. Mostafijur Rahman
Sl. No.	Paper ID	Paper Title
1.	1351	A Comparison between YOLOV7 and YOLOV5-based detection of Combat Targets and Camouflaged Militia
2.	742	An automated detection of Scabies skin disease Using Image Processing and CNN
3.	9032	Automatic Bangla License Plate Recognition System for Low-Resolution Images
4.	5830	A New Approach to Detect Deepfake Video using Multi-Input Convolutional Neural Network

<b>D1T1P2</b>		Parallel Session 2 (Track 1): <b>Computational Linguistics and Natural Language Processing</b>
Saturday, 17 Dec 2022 11:30 AM – 01:00 PM Room# PCR-307		Session Chairs: 1. Prof. Dr. Mohammad Shamsul Arefin 2. Dr. Mazharul Haque
Sl. No.	Paper ID	Paper Title
1.	3315	A Cross-Corpus Deep Learning Approach to Social Media Emotion Classification
2.	1505	An Application Programming Interface to Recognize Emotion using Speech Features
3.	1570	A New Approach to Analysis of Public Sentiment on Padma Bridge in Bangla Text
4.	3754	Sentiment Analysis on COVID-19 Vaccination in Bangladesh

<b>D1T1P3</b>		Parallel Session 3 (Track 2): <b>Advances in Power Electronics towards Industry 4.0</b>
Saturday, 17 Dec 2022 11:30 AM – 01:00 PM Room# PCR-309		Session Chairs: 1. Prof. Dr. Abdur Razzaq 2. Dr. Molla Shahadat Hossain Lipu
Sl. No.	Paper ID	Paper Title
1.	4472	Design and Implementation of a Sine-Wave Inverter using Microcontroller with Modified Pulse Width Modulation Technique
2.	4744	High Frequency Closed-Loop H-Bridge Converter with CC-CV Mode for Electric Three-Wheelers Battery Charging Application
3.	6297	A Quick Review of Non-isolated Bidirectional Converters as EV Chargers
4.	7362	A 1kW Transformerless Inverter with Microcontroller-based Battery Charging System for Off-Grid Photovoltaic Modules
5.	7447	Performance Analysis of a DQ0 Controlled Grid Forming Inverter for Grid Connected Photovoltaic System: A Case Study

<b>D1T1P4</b>		Parallel Session 4 (Track 2): <b>Energy Management and Optimization</b>
Saturday, 17 Dec 2022 11:30 AM – 01:00 PM Room# PCR-404		Session Chairs: 1. Dr. Ashik Ahmed 2. Dr. Ahsanul Alam
Sl.	Paper ID	Paper Title
1.	8898	Design of Grid Forming Inverter for Integration of Large-Scale Wind Farm in Weak Grid
2.	2253	Design and Implementation of a Data-Driven Fuel Management System
3.	2319	Energy Management System for Micro Grid Environment
4.	7674	Exergy-based performance evaluation of the thermal power plants in Bangladesh for in-depth understanding and future recommendations

<b>D1T1P5</b>		Parallel Session 5 (Track 2): <b>Sensor and Optics</b>
Saturday, 17 Dec 2022 11:30 AM – 01:00 PM Room# PCR-506		Session Chairs: 1. Prof. Dr. Samia Subrina 2. Dr. A. A. Monzur Ul Akhbir
Sl. No.	Paper ID	Paper Title
1.	2530	Dual Side Polished PCF Based Surface Plasmonic Refractive Index Sensor for Detection of Water Pollution
2.	4459	Multiple Optical Ring Resonators for Free Spectral Range Squeezing
3.	2506	Remotely Controlled Real-Time Health Surveillance System of COVID-19 Patients
4.	6036	DROM: Read Only Memory Storage in DNA Computing

<b>D1T1P6 (Virtual)</b>		Parallel Session 6 (Track 1): <b>IOT and Machine Learning</b>
Saturday, 17 Dec 2022 11:30 AM – 01:00 PM Room# PCR-602		Session Chairs: 1. Prof. Dr. Md. Shariful Islam 2. Prof. Dr. Md. Obaidur Rahman
Sl.	Paper ID	Paper Title
1.	9964	An IoT Based Intelligent Healthcare Solution With ESP32 Using Machine Learning Model
2.	641	Assessment of Sentiments: A Performance Evaluation on Bangla Noisy Text
3.	3093	A Fusion of Three Custom-tailored Deep Learning Architectures for Waste Classification
4.	6429	Comparative Analysis of Fine-Tuned MobileNet versions to Detect Brain Tumors from MRI images
5.	6732	An Ensemble Based Stacking Architecture For Improved Bangla Optical Character Recognition

<b>D1T1P7</b>		Parallel Session 7 (Track 3): <b>Textile Engineering Applications</b>
Saturday, 17 Dec 2022 11:30 AM – 01:00 PM Room# PCR-601		Session Chairs: 1. Dr. Ahmed Jalal Uddin 2. Dr. Md. Shariful Alam
Sl.	Paper ID	Paper Title
1.	1366	An Eight Point Model for Addressing Challenges of Online Education at Tertiary Level
2.	2016	Performance Analysis of Lean Tools Implementation in Garment Industry: A Case Study
3.	2653	Removal of azo dye from Textile effluent by activated charcoal extracted from jute stick.
4.	2710	DFT Based Pharmacokinetic, ADMET, QSAR and Molecular Docking Studies of Some Polyphenolic Derivatives Against HCV NS5B Polymerase
5.	4137	Characterization of Heat Insulating Ceramic Fiber Raw Material for Insulation

### Technical Session 2

<b>D1T2P1</b>		Parallel Session 1 (Track 1): <b>Artificial Intelligence and Machine Learning</b>
Saturday, 17 Dec 2022 03:00 PM – 04:30 PM Room# PCR-309		Session Chairs: 1. Prof. Dr. Md. Atiqur Rahaman Ahad 2. Prof. Dr. Sejuti Rahman
Sl.	Paper ID	Paper Title
1.	9732	Mutual Information on Low-rank Matrix for Effective Intrusion Detection
2.	1198	Anomaly Based Network Intrusion Detection Using Ensemble Classifiers
3.	6131	Fraud Detection of Credit Card using Data Mining Techniques
4.	3457	A Novel Approach to Reduce Air Pollution Through Machine Learning Based PM2.5 Prediction
5.	3524	An Empirical Study of Pre-Trained CNN Models on COVID-19 CT Scan Images



<b>D1T2P2 (Virtual)</b> Saturday, 17 Dec 2022 03:00 PM – 04:30 PM Room# - PCR-602		
Parallel Session 2 (Track 2): <b>Artificial intelligence and machine learning for engineering applications</b> Session Chairs: 1. Prof. Dr. Mohammed Imamul Hassan Bhuiyan 2. Dr. Kafiul Islam		
Sl.	Paper ID	Paper Title
1.	5029	Revealing Climate Change from Moon Images with Dimensionality Reduction and Machine Learning
2.	9168	Vowel Recognition for Isolated Digit Using Wavelet Transform at Decomposition Level 3
3.	7274	Estimating Earth's Albedo from Moon Images using Random Forest will Enable Climate Change Monitoring
4.	6326	A Time of Use Tariff Based Demand Side Management Algorithm for Residential Consumers
5.	6782	Internet of Things (IoT) for Water Quality Monitoring and Consumption Management

<b>D1T2P3</b> Saturday, 17 Dec 2022 03:00 PM – 04:30 PM Room# PCR-307		
Parallel Session 3 (Track 1): <b>Internet of Things (IoT), Cloud and Big Data Analysis</b> Session Chairs: 1. Prof. Dr. M Shamim Kaiser 2. Prof. Dr. Muhammad Golam Kibria		
Sl. No.	Paper ID	Paper Title
1.	2070	Risk Analysis and Support System for Autistic Children using IoT
2.	2740	Trade-off Between Latency and Energy for Offloading Tasks in Maritime Internet of Things
3.	4915	Cost-effective IoT-Based Smart Stick for Visually Impaired Person
4.	9805	An SDN-based Secure Model for IoT Network in Smart Building
5.	6822	Low-cost Task Offloading Scheme for Mobile Edge Cloud and Internet Cloud Using Genetic Algorithm

<b>D1T2P4</b> Saturday, 17 Dec 2022 03:00 PM – 04:30 PM Room# PCR-306		
Parallel Session 4 (Track 1): <b>Augmented Reality, Virtual Reality and Bioinformatics</b> Session Chairs: 1. Dr. Muhammad Nazrul Islam 2. Dr. Habibur Rahman		
Sl. No.	Paper ID	Paper Title
1.	1342	Identification of Influential Genes for Colorectal Cancer by Machine Learning Approaches
2.	4655	An Improved Model for Nutrient deficiency diagnosis of Rice Plant by Ensemble Learning
3.	7546	An Automatic Detection of Pneumonia from Chest Ionizing Radiation Images Using Machine Learning Algorithm
4.	7786	Heart Diseases Prediction Using Multiple Machine Learning Techniques
5.	6229	Curvelet Transformed NIG Image-based Breast Tumor Classification Using Deep Learning

<b>D1T2P5</b> Saturday, 17 Dec 2022 03:00 PM – 04:30 PM Room# PCR-404		
Parallel Session 5 (Track 2): <b>Control and power system</b> Session Chairs: 1. Dr. Nahid Al Masood 2. Dr. Ahsanul Alam		
Sl. No.	Paper ID	Paper Title
1.	3513	Eye Controlled Wheelchair for Physically Disabled Persons using Viola Jones Algorithm and Hough Transform
2.	7150	High Altitude Airborne Hybrid Power Generation System Design in Saint Martin's Island
3.	9184	Design of A Microcontroller Based System for Harvesting Electricity from Exercise Bike
4.	8185	A Novel Asymmetric Nine Level Inverter with Reduced Device Count Suitable for Renewable Energy Applications

<b>D1T2P6</b> Saturday, 17 Dec 2022 03:00 PM – 04:30 PM Room# PCR-506		
Parallel Session 6 (Track 2): <b>Energy storage and e-transportation</b> Session Chairs: 1. Prof. Dr. Ziaur Rahman Khan 2. Dr. Ratil H Ashique		
Sl. No.	Paper ID	Paper Title
1.	2061	Deep Learning Enabled State of Charge Estimation for Electric Vehicle Batteries Under Noise Effects
2.	2970	Prospect of Electric Boat in Dhaka: An Alternate Way of Transportation
3.	3930	Management and Control Strategies of Battery Switching in a Hybrid Energy Storage System
4.	4486	Hydrogen Fuel Cell Based Low Power DC Motor Driven Energy Efficient Electric Vehicle: A Comparative Analysis
5.	8217	Designing SWET Based Hybrid Charging Stations for Electric Vehicles at Dhaka-Mawa Expressway in Bangladesh

<b>D1T2P7 (Virtual)</b> Saturday, 17 Dec 2022 03:00 PM – 04:30 PM Room# PCR-601		
Parallel Session 7 (Track 1): <b>Deep Learning, Image Processing and Medical Imaging</b> Session Chairs: 1. Prof. Dr. Md. Mijanur Rahman 2. Dr. Muhammad Abul Hasan		
Sl. No.	Paper ID	Paper Title
1.	7434	An Approach to Identify Diseases in Betel Leaf Using Deep Learning Techniques
2.	7188	Computer Vision Based Avalanche Monitoring and Warning System
3.	6781	Segmentation of Hemorrhagic Areas in Human Brain from CT Scan Images
4.	9054	A Deep Feature Ensemble-Based Hybrid Model for MRI Brain Tumor Multi-Classification
5.	4729	Sign Language Recognition for Bangla Alphabets Using Deep Learning Methods

**DAY – 2: Technical Session-3**

<b>D2T3P1</b> Sunday, 18 Dec 2022 11:30 AM – 01:00 PM Room# PCR-306		
Parallel Session 1 (Track 2): <b>Renewable energy technologies</b> Session Chairs: 1. Prof. Dr. Abdul Hasib Chowdhury 2. Dr. Ahmed Al Mansur		
Sl.	Paper ID	Paper Title
1.	1109	Effects of Aging Factors on PV Modules Output Power: An Experimental Investigation
2.	1577	A LED-based Functional Light Source for Characterization of Thin Film Solar Cells
3.	5528	Soil Impact on Photovoltaic Performance: A Laboratory-based Investigation
4.	8346	Forecasting of Solar Photovoltaic Output Energy using LSTM Machine Learning Algorithm
5.	9607	Solar Battery Charging Station for Electric Vehicles: Part I- Screening, Modeling, and Feasibility Analysis

<b>D2T3P2</b> Sunday, 18 Dec 2022 11:30 AM – 01:00 PM Room# PCR-307		
Parallel Session 2 (Track 2): <b>IoT and cloud computing</b> Session Chairs: 1. Dr. Monirujjaman Khan 2. Dr. Nazmus Shakib		
Sl.	Paper ID	Paper Title
1.	1721	Design and Development of an IoT-based Smart System to Monitor and Control Environment of a Laboratory
2.	5091	IoT Based Transformer Load Sharing & Health Monitoring System
3.	7678	Cloud-Based Solar-Powered Remote Sensing and Monitoring for Severely Ill Patients Vitals to Ensure Appropriate Treatment and Medical Team Safety
4.	6904	Machine Learning for Load Forecasting in a Green Data Center



<b>D2T3P3</b>		Parallel Session 3 (Track 1): <b>Artificial Intelligence and Machine Learning</b> Session Chairs: 1. Prof. Dr. Syed Akhter Hossain 2. Prof. Dr. Ahsan Habib Tareque
Sunday, 18 Dec 2022 11:30 AM – 01:00 PM Room# PCR-309		
Sl.	Paper ID	Paper Title
1.	2309	Identification of Influential Genes for Lung Cancer Using Machine Learning Approaches
2.	2681	Bangla E-Commerce Sentiment Analysis Using Machine Learning Approach
3.	5490	Performance Analysis Rice Yield Model based on Historical Weather Dataset in Bangladesh
4.	4943	Contourlet Transformed Nakagami Image-based Breast Tumor Classification Using Deep CNN
5.	9315	Sedimentation Analysis on Padma River Using Machine Learning Techniques

<b>D2T3P4</b>		Parallel Session 4 (Track 2): <b>Materials and nanofabrication</b> Session Chairs: 1. Dr. Sajid Mohaimin Chowdhury 2. Dr. A. A. Monzur Ul Akhir
Sunday, 18 Dec 2022 11:30 AM – 01:00 PM Room# PCR-404		
Sl.	Paper ID	Paper Title
1.	2393	Spherical and Rod-shaped Gold Nanoparticles for Surface Enhanced Raman Spectroscopy
2.	5156	A 7nm Gate-All-Around Nanowire n-FET for DNA Sequencing
3.	8996	A DFT Investigation on Structural, Electric, and Thermodynamic Properties of Transition Metal (Cr, Mo, and W) Doped in Small Arsenic Cluster (As <sub>15</sub> )
4.	9176	Mathematical Models for Tumor Cell Growth Estimation: An Analytical Review

<b>D2T3P5 (Virtual)</b>		Parallel Session 5 (Track 2): <b>Microwave and Antennas</b> Session Chairs: 1. Prof. Dr. Rezwan Khan 2. Dr. Nazmus Shakib
Sunday, 18 Dec 2022 11:30 AM – 01:00 PM Room# PCR-602		
Sl.	Paper ID	Paper Title
1.	4640	Study on Plausible Application of Bangabandhu Satellite -2 as a Search and Rescue Satellite Under Cospas-Sarsat Programme
2.	4936	Design and Analysis of a Dual-Band Miniaturized Rectangular Patch Antenna for Millimeter-Wave Applications
3.	5755	Design and Performance Analysis of a Novel 3.5 GHz Q-Slot Antenna for Body-Centric Communications
4.	3253	Design of a Slotted Patch Circular Antenna Array for Breast Tumor Identification
5.	7119	TT-Mote: An Architecture towards Perpetual Wireless Sensor Networks (WSN)

<b>D2T3P6</b>		Parallel Session 6 (Track 3): <b>Textile Engineering Applications</b> Session Chairs: 1. Prof. Dr. Lal Mohan Baral 2. Dr. Jagannath Biswas
Sunday, 18 Dec 2022 11:30 AM – 01:00 PM Room# PCR-506		
Sl.	Paper ID	Paper Title
1.	5124	Investigation of the Performance of Hemp-Containing Recycled Fabrics with Digital Design
2.	6580	Ultra-sensitive detection of nitrate ions by Cu-electrodeposited gold electrode
3.	7454	Effect of Elastane on Physical Properties of Double Jersey Knit Fabric for Active Wear
4.	7975	Performance Analysis of Effective Sensors for Determining Reliable Flare Altitude of Fixed Wing UAV

<b>D2T3P7 (Virtual)</b>		Parallel Session 7 (Track 1): <b>Deep Learning, Image Processing, Medical Imaging</b> Session Chairs: 1. Prof. Dr. Hasanul Kabir 2. Prof. Dr. Mohammad Abu Yousuf
Sunday, 18 Dec 2022 11:30 AM – 01:00 PM Room# PCR-601		
Sl.	Paper ID	Paper Title
1.	365	Bangladeshi Local Vehicle Recognition with A Comprehensive Dataset using Transfer Learning Techniques
2.	4937	SkinNet: An Improved Skin Cancer Classification System Using Convolutional Neural Network
3.	7989	SERNet: A Novel Speech Emotion Recognition System Using Ensemble Deep Learning Approach
4.	7182	Implementation of Encoder-Decoder based Long Short-Term Memory Network for Short-Term Electrical Load Forecasting
5.	9269	Martian Craters Detection Using Neural Network Approach from Grayscale Satellite Imageries

### Technical Session 4

<b>D2T4P1</b>		Parallel Session 1 (Track 1): <b>HCI, Algorithms, and Blockchain</b> Session Chairs: 1. Prof. Dr. Md. Mustafizur Rahman 2. Prof. Dr. Md. Motaharul Islam
Sunday, 18 Dec 2022 03:00 PM – 04:30 PM Room# PCR-309		
Sl.	Paper ID	Paper Title
1.	708	A New Perspective of Improving Initialization for Particle Swarm Optimization
2.	5809	Blockchain in Human Resource Management to Hire the Right Candidate
3.	4298	A Hybrid Method for Analyzing the Situation Based on Cumulative Fully Vaccinated and Confirmed Cases of Covid-19 in Malaysia
4.	3650	An Article Recommendation Technique from a Multi-Layer Reference Article Graph for Facilitating Chronological Learning
5.	1681	An Energy Efficient Model of Software Development Life Cycle for Mobile Application

<b>D2T4P2</b>		Parallel Session 2 (Track 1): <b>Computational Linguistics and Machine Learning</b> Session Chairs: 1. Prof. Dr. Moshikul Haque 2. Prof. Dr. Md. Golam Rabiul Alam
Sunday, 18 Dec 2022 03:00 PM – 04:30 PM Room# PCR-307		
Sl.	Paper ID	Paper Title
1.	3896	A Benchmark of Machine Learning and Deep Learning Algorithms for Detecting Fake News in Bangla Language
2.	6716	A Multiclass Approach to Identify Misogynistic Bangla Text from Social Media
3.	7338	A Robust Approach to Identify Banglish Words using Bangla Scripts
4.	7918	SPOT (Sales Production based On Time-Series): A Comprehensive Approach to Sales Forecasting using Contextually-tailored Time Series Analysis

<b>D2T4P3</b>		Parallel Session 3 (Track 1): <b>Computer Vision and Pattern Recognition</b> Session Chairs: 1. Prof. Dr. Md. Zahidul Islam 2. Dr. AFM Shahab Uddin
Sunday, 18 Dec 2022 03:00 PM – 04:30 PM Room# PCR-306		
Sl.	Paper ID	Paper Title
1.	7344	An Effective Approach for Bengali Handwritten Punctuation Recognition by Using a Low-cost Convolutional Neural Network
2.	9489	Object Detection and Tracking: Deep Learning based Novel Tools to Generate Robust Human and Machine-Annotated Ground Truth Data for Training AI Models
3.	8347	Real-Time Computer Vision Based Autonomous Navigation System for Assisting Visually Impaired People using Machine Learning
4.	8753	Automatic 3D Animated Bangla Sign Language Gestures Generation from Bangla Text and Voice



<b>D2T4P4</b> Sunday, 18 Dec 2022 03:00 PM – 04:30 PM Room# PCR-602		
Parallel Session 4 (Track 1): <b>Computer Networks and Information Security</b> Session Chairs: 1. Prof. Dr. Anupam Kumar Bairagi 2. Prof. Dr. Tushar Kanti Saha		
Sl.	Paper ID	Paper Title
1.	2461	High Performance Computing in Decentralized Network
2.	6978	Fault Tolerance and Cost Effectiveness Analysis of Low-Powered 3D-TESH Network
3.	3850	Privacy, Security and Usability Comparison of Online Learning Platforms in Developing Countries: A Study on Bangladeshi Universities
4.	5068	Multiple Circular Ring-canals on the Starfish Routing Backbone in Wireless Sensor Networks
5.	5434	Analysis of Data Transfer Mechanism among Wireless Devices in AsthaNet Healthcare Network

<b>D2T4P5 (Virtual)</b> Sunday, 18 Dec 2022 03:00 PM – 04:30 PM Room# PCR-601		
Parallel Session 5 (Track 2): <b>Recent trends in Electrical Engineering</b> Session Chairs: 1. Dr. Abdul Rauf Bhatti 2. Dr. Ratil H Ashique		
Sl.	Paper ID	Paper Title
1.	6547	Designing and Performance-Analysis of a 3 DOF Robotic Manipulator Arm and its Higher Order Integration for 7 DOF Robotic Arm
2.	2689	Performance Evaluation of 2.4 kW Alkaline Fuel Cell Stack for Emergency Applications
3.	9643	An IoT based Smart Robot that Aids in the Prevention of COVID19 Spread
4.	9304	An Efficient Lead-free SnBr3 based Perovskite Solar Cell: Design and Optimization using SCAPS-1D
5.	5334	Design and Fabrication of an Automotive Electromagnetic Braking System

<b>D2T4P6 (Virtual)</b> Sunday, 18 Dec 2022 03:00 PM – 04:30 PM Room# PCR-506		
Parallel Session 6 (Track 2): <b>Hybrid Automotive Systems</b> Session Chairs: 1. Dr. Mahidur Sarker 2. Dr. Molla Shahadat Hossain Lipu		
Sl.	Paper ID	Paper Title
1.	3751	Economical Design of Hybrid Solar Charging Station for Electric Vehicles (EVs) on the Dhaka-Chattogram Highway
2.	9090	Comparative Study of CZTS Solar Cell with Different Buffers and BSF Layer
3.	7146	Design and Analysis of a Hybrid Power Charging Station for Electric Vehicles at Patenga, Chittagong
4.	842	A Hybrid Bipolar DC-Link Converter Based on SEPIC-Cuk Combination.
5.	3824	Optimizing LQG Controller for a Single-Phase Power Inverter in an AC Microgrid System
6.	6934	Design and Characterization of Photonic Crystal Fiber Based Surface Plasmon Resonance Refractive Index Sensor

<b>D2T4P7 (Virtual)</b> Sunday, 18 Dec 2022 03:00 PM – 04:30 PM Room# PCR-404		
Parallel Session 7 (Track 2): <b>Power Systems Designs</b> Session Chairs: 1. Prof. Dr. A H M Abdur Rahim 2. Dr. Ahmed Al Mansur		
Sl.	Paper ID	Paper Title
1.	886	A Proposed Hybrid Microgrid Model for 37no Haliashahar ward of Chattogram City Corporation, Bangladesh Using MATLAB Simulink
2.	6831	Closed-Loop Switched Capacitor Cuk Converter Topology for Voltage Regulation and PFC Applications.
3.	8081	Modification of Dynamic Logic Circuit Design Technique for Minimizing Leakage Current and Propagation Delay
4.	6113	Environmental Impact of Land Use and Land Cover Change in Rampal, Bangladesh: A Google Earth Engine-Based Remote Sensing Approach

<b>D2T4P8 (Virtual)</b> Sunday, 18 Dec 2022 03:00 PM – 04:30 PM Room# PCR-302		
Parallel Session 8 (Track 1): <b>Deep Learning, Image Processing and Medical Imaging</b> Session Chairs: 1. Prof. Dr. Farhad Rabbi 2. Prof. Dr. Abul L. Haque		
Sl.	Paper ID	Paper Title
1.	8885	Event Detection from Cricket Videos Using Video-Based CNN Classification of Umpire Signals
2.	1204	Exploiting Deep Learning Based Classification Model for Detecting Fraudulent Schemes over Ethereum Blockchain
3.	1118	Book Review Sentiment Classification in Bangla using Deep Learning and Transformer Model
4.	146	PestDetector: A Deep Convolutional Neural Network to Detect Jute Pests
5.	3415	Bengali Handwritten Digit Recognition using CNN with Explainable AI

**Interactive Poster Session**

<b>D2IPS</b> Sunday, 18 Dec 2022 04:45 PM – 05:30 PM Room# PCR-309		
<b>Interactive Poster Session</b> Judges Panel: 1. Dr. Ratil H. Ashik 2. Dr. Jagannath Biswas 3. Dr. Fernaz Narin Nur 4. Dr. Md. Abu Layek 5. Dr. Maheen Islam 6. Dr. Selina Sharmin 7. Dr. Nazma Tara 8. Dr. Sajeeb Saha		
Sl.	Paper ID	Poster Title
1.	4106	Real-time Air Pollution Monitoring by Drones for Mobile Smart Sensing in Hard-to-Reach Areas
2.	4313	A Convenient Model to Detect Facial Expressions by Machine Learning
3.	5675	A New Technique to Classification of Bengali News Grounded on ML and DL Models
4.	5904	A Texture Descriptor Evaluation window based Adjacent Distance Local Ternary Pattern EAdLTP for Image Classification
5.	7284	Comparison Of Properties of Perovskite Solar Cell Material CsPbI3: A First Principal Study
6.	8636	Energy Efficient Resource Management for Multicore Processors
7.	9239	Damage detection of old structure with deep learning: An onsite survey





**ABSTRACTS | STI 2022****Day- 01: 17 Dec 2022, Time: 11:30 AM, Technical Session- 01, Parallel Session- 01**

Venue: PCR-306, Session Chairs: Prof. Dr. Md. Zahidul Islam, Dr. Md. Mostafijur Rahman

**PID: 1351 | A Comparison between YOLOV7 and YOLOV5-based detection of Combat Targets and Camouflaged Militia**

Md Sabid Hasan, Faiyaz Fahim, Abdulla Al Farabi, and Fariha Rahman

**Abstract** – Animals frequently use the camouflage method to disguise themselves. On the battlefield, it is also employed to cover military equipment. Camouflaged objects blend into their environment by adopting colors and textures that match their surroundings. Because of its size and extreme likeness to its surroundings, a camouflaged object cannot be recognized using a general detection approach, making its detection more challenging than that of a general object. This work analyzes the available approaches to address the issue and proposes a camouflage object identification algorithm based on the YOLOv7 algorithm. The self-created military camouflage target data set was used for training and testing, and compared with YOLOv5 with multiple data sets.

**PID: 742 | An automated detection of Scabies skin disease Using Image Processing and CNN**

Monishanker Halder, Hussain Moh. Emrul Kabir, Afsana Mimi Rity, and Arobindo Vowmik

**Abstract** – In every year, human faces several types of skin diseases. Bacteria, fungal infections, viruses, allergies, etc. are the reason for different types of skin diseases. Many people don't show interest in identifying or treatment for skin diseases because of the cost of diagnosis which is expensive and lack of concentration. Image processing is one the easiest way to detect skin diseases by classifying the image of the affected area. A dermatologist can easily identify the problem by using the image processing technique. Feature extraction helps to classify skin diseases effectively. In this paper, we focused on Scabies which is one of the most common skin diseases. We proposed a methodology using image processing and CNN to detect scabies. Here thresholding is used for segmenting the affected area and CNN is used for classifying images. We used different types of data augmentation techniques for increasing data where each of the images was considered unique. Our proposed method is simple and easy to use. In this research, RGB images are used and we made a dataset where all images are collected from different sources in the internet for training the system. The proposed methodology can detect scabies with an accuracy of 97.25%.

**PID: 9032 | Automatic Bangla License Plate Recognition System for Low-Resolution Images**

Naimul Haque, Samira Islam, Rabeiya Afrose and Mohammad Shorif Uddin

**Abstract** – Automatic License Plate Recognition (ALPR) System is a crucial task that is used in numerous critical situations. Although there are several ways to accomplish license plate recognition, our method is intended to be effective not just on license plates with high resolution, but even when the license plate (LP) is of very low resolution (LR). Previous works on ALPR systems emphasized achieving recognition benchmarks on LP images that are close to the sensor. However, if the camera is far from the vehicle, the generated detected frame yields an LP image of LR, which is hard for the recognition model to classify. Our method employed Enhanced Super Resolution Generative Adversarial Networks (ESRGANs) to upscale the  $[32 \times 24]$  LR image to the high resolution of dimension  $[256 \times 192]$  with a scale factor ratio of 8. For training purposes, we also collected and trained the models on a dataset of 2211 images. The Peak signal-to-noise ratio (PSNR) for the reconstruction on 200 testing samples is 12.587. The optical character recognition accuracy for the reconstructed and ground truth images are 78% and 91% respectively.

**PID: 5830 | A New Approach to Detect Deepfake Video using Multi-Input Convolutional Neural Network**

Muhammad Anisur Rahman, and Mohammad Ehsan Shahmi Chowdhury

**Abstract** – In this modern age, Deepfake videos are spreading around, having a severe impact on the social and personal lives of the general public. Efficient techniques, operating better than others, is hence in the requirement. In this research, combination of many objects like left eye, right eye and mouth shapes from image frames of videos are taken into consideration, thus achieving better accuracy than other detection techniques. In this proposal, deep learning techniques, specially the multi-input Convolution Neural Network, are executed. The proposal firstly detects the face, followed by specific objects such as left eye, right eye and mouth. Then multi-input CNN is applied that classifies the data based on eyes and mouth. After applying multi-input CNN, the accuracy increases impressively. Novel techniques are used to extract specific features like eyes, mouth. Memory storage was a concern for the proposal. Despite this, comparison with other relevant research works proved better accuracy and data analysis.

**Day- 01: 17 Dec 2022, Time: 11:30 AM, Technical Session- 01, Parallel Session- 02**

Venue: PCR-307, Session Chairs: Prof. Dr. Mohammad Shamsul Arefin, Dr. Mazharul Haque

**PID: 3315 | A Cross-Corpus Deep Learning Approach to Social Media Emotion Classification**

Arman Sharker, Mohammad Abdur Rafi Farhab, Tahrima Akter Tamanna, Umma Rumman, Md. Tanvir Rouf Shawon, Nibir Chandra Mandal

**Abstract** – Emotion Detection refers to the identification of emotions from contextual data in the form of written text, such as comments, posts, reviews, publications, articles, recommendations, conversations, and so on. Because of the Internet's exponential uptake and the recent coronavirus outbreak, social media platforms have become a crucial means of sharing thoughts and ideas throughout the entire globe, creating rapid data growth through users' contributions on various platforms. The necessity to acquire knowledge of their behaviors is a matter of great concern for both internet safety and privacy. In this study, we categorize emotional sentiments using deep learning models along with hybrid approaches such as LSTM, Bi-LSTM, and CNN+LSTM. When compared to existing state-of-the-art methods, the experiments showed that the suggested strategy is more robust and achieves an expressively higher quality of emotion detection with an accuracy rate of 94.16%, including strong F1-scores on complex and difficult emotion categories such as Fear (93.85%) and Anger (94.66%) through CNN+LSTM.

**PID: 1505 | An Application Programming Interface to Recognize Emotion using Speech Features**

Shimul Chandra Das, Md. Benajir Alam, Most. Sumiya Akter Moon and Md. Solaiman Mia

**Abstract** – With the recent increasing interest in the study of the emotional component of speech signals, a number of methods have been put forth to ascertain the emotional content of uttered words. Often, we can tell how someone is feeling by looking at their faces. Another method is to detect someone's emotions by auditory cues or speech. With a more straightforward architecture and fewer learnable parameters, the aim of this paper is to identify someone's emotion from an audio input. Three aspects have been suggested in the proposed methodology named MFCC (Mel-frequency Cepstral Coefficients), Mel-spectrogram and Chromagram, and MLP (Multilayer Perceptron). These features have been employed in this paper, because they perform better. MLP is a supervised machine learning, which is frequently used in various research to categorize human voice recognition. In addition, MLPs are appropriate for classification prediction issues where inputs are given as a class or label. They are also appropriate for regression prediction issues in which a realvalued quantity is forecasted from a collection of inputs. With the help of our proposed methods, we are able to achieve an accuracy of 80% on the RAVDESS Dataset.



**PID: 1570** | **A New Approach to Analysis of Public Sentiment on Padma Bridge in Bangla Text**  
Tamim Al Mahmud, Sazedra Sultana, Tanjin Irfan Chowdhury, and Fahim Raihan Anando

**Abstract** – Opinion mining or emotion analysis of people is generally called sentiment analysis. Sentiment analysis is necessary for getting customer or user notions about any products or services. This research paper investigated and recorded the public sentiment on Padma Bridge. As a result, the Government of Bangladesh can make decisions easily on future megaconstruction projects based on the recorded results. Padma bridge is a mega construction event for Bangladesh due to the big budget and banned World Bank loans. Bangladeshi people express their feelings, suggestions, opinions, and thoughts about the Padma Bridge project on Facebook, YouTube and other social media. The main focus of this paper is sentiment analysis of people's reactions to Padma bridge is based on the Bangla comment dataset. We have collected more than 15K data which has two types of sentiment: Positive and Negative. Then we used three machine learning models (SVM, RF, LSVC) and one deep learning model (LSTM) for sentiment analysis. In our proposed system, we used an innovative voting method that can count and compare the sentiments produced by the mentioned ML and DL models. Finally, our model makes decision-based on the maximum voting results. This paper concludes that the voting method technique improves the accuracy by around 7.5% compared to every single ML and DL model.

**PID: 3754** | **Sentiment Analysis on COVID-19 Vaccination in Bangladesh**  
Sheikh Abu Jubayer, Shila Akter Hafsha

**Abstract** – The COVID-19 pandemic has caused a shocking loss of life on a worldwide scale and influenced every sector of Bangladesh very badly. The simplest method for preventing infectious diseases is vaccination. Bangladeshi netizens discuss their opinions, feelings, and experiences associated with the COVID-19 vaccination program on social media platforms. The purpose of this research is to conduct a sentiment analysis of the vaccination campaign, and for this purpose, the reactions of Bangladeshi netizens on social media to the vaccination program were collected. The dataset was manually labelled into two categories: positive and negative. Then process the dataset using Natural Language Processing (NLP). The processed data is then classified using various machine learning algorithms using Ngram as a feature extraction method. The recall, precision, f1score, and accuracy of various algorithms are all measured. The experiment results show that 61% of the reviews indicate the positive aspects of the vaccination program, while 39% are negative. For unigram, bigram, and trigram, the very best accuracy was achieved by Logistic Regression (LR) at 80.70%, 79.45%, and 78.65%.

**Day- 01: 17 Dec 2022, Time: 11:30 AM, Technical Session- 01, Parallel Session- 03**

Venue: PCR-309, Session Chairs: Prof. Dr. Abdur Razzaq, Dr. Molla Shahadat Hossain Lipu

**PID: 4472** | **Design and Implementation of a Sine-Wave Inverter using Microcontroller with Modified Pulse Width Modulation Technique**  
Razibul Awal, Md. Fayzur Rahman, Ali Ahmad, Md. Tariqul Islam, Md. Ahsanul Alam, Sameya Afrin July, and Asm Shihavuddin

**Abstract** – Due to constantly increasing demand and generation gap, the people of Bangladesh are constantly facing load shedding. Additionally, because of rising fuel prices in the international market, the cost of power generation is increasing. This research proposes a cheap but effective modified sine wave inverter for photovoltaic systems. The harmonics performance of this proposed model is much better than traditional push pull inverter. A feedback system is included for low voltage recovery in output. This system also employs a high voltage protection system, low voltage protection system, overload protection system, low battery protection system, etc for the inverter's safety purpose. From the simulation result, it is seen that the total harmonics distortion (THD) of this inverter is around 56.11% but by inserting a small LCL filter, this THD value reduces to 0.08%. A single-phase laboratory prototype is then developed to ensure the simulation results are accurate and the proposed topology can be implemented successfully.

**PID: 4474** | **High Frequency Closed-Loop H-Bridge Converter with CC-CV Mode for Electric Three-Wheelers Battery Charging Application**  
Abdullah Al Mamun, Mohammad Rejwan Uddin, Khan Farhan Ibne Faruque, Md. Iftadul Islam Sakib, Khosru M Salim

**Abstract** – Owing to its simplicity and low cost, a transformer in step-down configuration and a rectifier operating at mains frequency has been the most popular method for charging lightweight electric three-wheelers (ETWs) and auto-rickshaws. Due to a lack of feedback or sensing, the conventional battery charger cannot control output voltage/current. This makes battery charging inconsistent & unreliable, which causes over-charging, overheating, waste of energy, and increased battery aging over time. This research presents the design and development of a battery charger based on a high-frequency full-bridge DC-DC converter. A modified digital closed-loop control system is used in the proposed charging system's lightweight size and light weight to independently regulate output voltage and current. This system can be used to charge ETW batteries effectively at preset voltage and current levels while automatically adhering to custom charging scheme based on battery type & SOC. Additionally, a hardware-prototype rated at 60V and 1.2kW is made for performance evaluation and result analysis.

**PID: 6297** | **A Quick Review of Non-isolated Bidirectional Converters as EV Chargers**  
Ratil H Ashique, Mohammad Monirujaman Khan, Shahriar Mahmud Kabir, Ahmed Al Mansur, Mohammad Kamrozzaman Kiron

**Abstract** – The dc to dc power conversion is becoming widespread in modern power and energy systems. In particular, the electric vehicle charging requires dc-dc power conversion as indispensable part of the system. Furthermore, the renewable energy integrated charging systems use dc-dc power converters to interface with the existing grid. On top of that, with the advent of high-power dc chargers, the charging efficiency is largely dependent on the performance of the power converters. This paper presents a brief topological review of the non-isolated dc-dc converters focusing on their merits and demerits as an effort to evaluate the circuits as EV chargers. A characteristic comparison of the topologies is also presented relating to efficiency, reliability, step up & stepdown ratio, voltage range of operation, input current ripple and output voltage ripple based on simulation results.

**PID: 7362** | **A 1kW Transformerless Inverter with a Microcontroller-based Battery Charging System for Off-Grid Photovoltaic Modules**  
Razibul Awal, Ahmed Al Mansur, Md. Imamul Islam, Tuhibur Rahman, Ratil H. Ashique, Mohammad Asif Ul Haq, Md. Hasan Maruf, ASM Shihavuddin, Molla Shahadat Hossain Lipu and Md. Ruhul Amin

**Abstract** – In off-grid photovoltaic systems, the reduction of the size and weight of an Inverter is a challenging issue. A Transformerless inverter is a smart solution to this problem. Therefore, in this work, a 1kW off-grid inverter is implemented which is transformerless and integrated with a battery charging facility. A microcontroller-based controlling unit is used for both the proposed inverter and battery charge controller. The inverter is tested in a laboratory environment using a 40W photovoltaic (PV) panel. An indoor sunlight source is developed to generate sunlight as the PV input. The PV module output is examined by a professional PV system analyzer, PROVA 1011. The experimental results show that the inverter is working at 98.7% efficiency to operate an AC load from a battery. Besides, the battery charging current and voltage is monitored by an LCD. Finally, over-voltage and current protection units are tested to validate the reliability of the protection unit of the proposed inverter.



**PID: 7447** | **Performance Analysis of a DQ0 Controlled Grid Forming Inverter for Grid Connected Photovoltaic System: A Case Study**

Md. Mahadi Hasan, Abdul Hasib Chowdhury

**Abstract** – Nowadays, it is common to use grid forming inverters, particularly for isolated microgrid applications that employ control algorithms based on dq0 transformation. To the best of the authors' knowledge, there hasn't been a thorough analysis of the operation of this inverter under grid connected conditions for dynamic operating conditions and its comparison with the traditional control based inverter from the perspective of stability and reliability. So, the contributions of this paper is that, the paper presents a comprehensive analysis of the grid forming inverter adopting dq0 control algorithm under five different case studies and compare the performance of the inverter with conventional inverter without any voltage and current control loop. The simulation results verified the improved frequency nadir, rate of change of frequency (ROCOF) and power flow oscillations. From the simulation, it was discovered that the ROCOF was improved by 0.4% for dynamic weather conditions and 0.45% for short circuit faults. For modelling and simulation purposes, MATLAB/SIMULINK software has been used.

**Day- 01: 17 Dec 2022, Time: 11:30 AM, Technical Session- 01, Parallel Session- 04**

Venue: PCR-404, Session Chairs: Dr. Ashik Ahmed, Dr. Ahsanul Alam

**PID: 8898** | **Design of Grid Forming Inverter for Integration of Large-Scale Wind Farm in Weak Grid**  
Rony Ahmed Khan, Farzana Akter, Sheake Khaled, Md Parvez Akter and Khan Rahmat Ullah

**Abstract** – The current Australian electricity networks are being augmented with large numbers of inexhaustible renewable energy resources (inverter-based asynchronous generators). This integration is weakening (low inertia and system strength) the national electricity grid due to the lack of synchronous generations. A weaker grid often causes lowfrequency oscillations, and voltage instability, and hampers voltage ride-through capabilities of renewable resource-based asynchronous generators. Synchronous Condensers (SC) can eventually overcome these limitations of weaker grids. However, the SC is not favorable to the power plant developers due to its higher capital and operating costs, longer lead time (at least 2 years), transportation complexities to the remote wind/solar farm locations and no opportunities for revenue structuring. Therefore, Grid Forming (GFM) inverter technologies are becoming popular for overcoming the complexities of renewable energy resources integrations into weaker grids. This paper presents the dynamic performance of a GFM inverter for integrating a large-scale wind farm in a weak grid. A 100 MW wind farm with a 25 MVA GFM inverter has been developed in PSCAD/EMTDC environment. The effectiveness of the proposed system has been verified through the simulation results under different test conditions.

**PID: 2253** | **Design and Implementation of a Data-Driven Fuel Management System**  
S.M.G Mostafa, Abdullah Al Masum, Md Shahidul Islam, Md. Shakib Hossain, M. Shafiul Alam, Aasim Ullah, Md.Shahid Ullah and Shah Ashrafal jahan

**Abstract** – Currently, fuel stations are operated manually, with a controlling unit that performs a variety of tasks. Manual fuel stations take longer to set up and require a lot of manpower. Furthermore, it is prone to errors and has a higher probability of human-caused errors. Fuel stations cannot be built in remote areas because of these restrictions. The primary purpose of this study is to build an automated fuel dispensing system that integrates RFID technology and a GSM module to address all of the problems highlighted. A user can use an RFID-based prepaid card to access fuel at fuel stations with this system. When a user wants to fill their tank from a fuel dispenser, they must first place their RFID tag in close proximity to the RFID reader before entering the amount. The Arduino reads the information from the RFID system and acts accordingly depending on the requirement of the customer, as well as deducting the appropriate amount from the user's card. Furthermore, if a consumer attempts to scan an unregistered card, the RFID system will refuse the

transaction. The system can calculate the amount of fuel dispensed from the user's RFID card automatically, and send that information, as well as the card's remaining balance, to the customer's phone via GSM technology. In the event that the tag's balance falls below a certain threshold, the customer is given the option to recharge it. To store all types of data related to the fuel dispensing system, the system employs an offline database system. The RFID and Arduino Mega are used to improve the current fuel dispensing system by reducing human labor and providing an auto-guided mechanism to complete tasks in a systematic manner. As a result, the system is extremely reliable and time saving.

**PID: 2319** | **Energy Management System for Micro Grid Environment**  
Mutasim Billah, Ashikul Islam Shipon, Mst. Jannatul Ferdous, Razibul Awal, Ahmed Al Mansur, Ratil H Ashique

**Abstract** – In this paper, an energy management system for micro grid is designed to extract the maximum energy through optimization. The main focus is to design the fully automated control system integrated with an optimization algorithm. The algorithm helps the system to automatically detect the available energy source and charge the battery pack or energy storage. The experimental prototype system is designed for a 500W load. The system incorporates a 10W solar panel, a wind energy emulator and the a 220V AC emulated as the grid connected to the battery pack. It is observed that the controller can divert the power flow to the load automatically depending on the power demand and availability. The results of the test confirm the effectiveness of the controller.

**PID: 7674** | **Exergy-based performance evaluation of the thermal power plants in Bangladesh for in-depth understanding and future recommendations**  
Sameya Afrin July, Md Hasan Maruf, Md Mahmudul Hasan, Ratil H Ashique, Ahmed Al Mansur and ASM Shihavuddin

**Abstract** – Exergy analysis is based on the second law of thermodynamics and is a complementary way to investigate power plants performance compared to sole energy-based evaluation. Considering five renowned thermal power plants from Bangladesh, this work investigates power plants energy production data from last 05 cycle years to identify plants efficiency and sustainability, together with corresponding suggestions for improvement. Exergetic parameters such as depletion number, exergy sustainability index, relative irreversibility, lack of production, waste exergy ratio, environmental effect factor, improvement potential, and environmental exergy loss are also investigated. Those values pointed to the plants planning and maintenance performed over the years. Highest overall energy and exergy efficiencies found in FY 2018-2019 which is 151.65% and 150.1%. In that case most efficient two power plants are APSC and BPP's efficiency varies between 37%-50.04% and 24.24%-31.57% respectively. Depletion Number which indicates fuel depleted rate and it varies between 62%-49% and 75%-68% for APSC and BPP respectively. Evaluating all the parameters this work proposed a data-driven recommendation to achieve efficient, sustainable, and environment-friendly power generation in Bangladesh.



**Day- 01: 17 Dec 2022, Time: 11:30 AM, Technical Session- 01, Parallel Session- 05**

Venue: PCR-506, Session Chairs: Prof. Dr. Samia Subrina, Dr. A. A. Monzur UI Akhir

**PID: 2530 | Dual Side Polished PCF Based Surface Plasmonic Refractive Index Sensor for Detection of Water Pollution**

Md. Kamrujjaman, Md. Anwar Hossain, Nguyen Hoang Hai, and Feroz Ahmed

**Abstract** – In this work, a photonic crystal fiber (PCF) based surface plasmon resonance (SPR) sensor has been designed for water pollution detection. Using the finite element method (FEM), the performance of a dual-side polished PCF has been investigated and reported. The plasmonic material for this design is a thin silver (Ag) layer deposited outside the PCF framework. In addition, a thin layer of Titanium Oxide (TiO<sub>2</sub>) was added to protect the silver layer from oxidation. Utilizing the wavelength interrogation method in the sensing range of RI 1.31-1.35, the proposed sensor shows a maximum sensitivity of 3000 nm/RIU at a silver layer thickness of 40 nm. A sensitivity of 2250 nm/RIU was obtained, particularly in the specific value of RI-1.33. Furthermore, a maximum sensitivity of 475 RIU-1 and a maximum sensor resolution of  $5.83 \times 10^{-6}$  RIU were obtained utilizing the amplitude interrogation method. Since the sensor has a sensing range of 1.31 to 1.35 with high sensitivity, it would be a great option for biosensing, organic chemical sensing, and other analytes detection in that range.

**PID: 4459 | Multiple Optical Ring Resonators for Free Spectral Range Squeezing**

Sifat Rahman, Siam Uddin, and Al Hasan Sony

**Abstract** – Optical ring resonators are an integral component of large-scale photonic circuits having the potential to be used in ultrafast data communication and numerous sensing application. Ring resonator coupled to a bus waveguide has the ability to function as spectral filter, temperature sensor, biosensor etc. where multiple rings are promising to enhance the capabilities and performance in order to apply its functionalities for Dense WDM and Sensing applications. However, matching the resonant wavelength in multiple ring resonator case is still challenging to optimize. Consequently, it is essential to precisely design and analyze ring resonators' structural characteristics to have a thorough understanding of the features that could operate as the controlling factors. Therefore, in this study, the design criteria and the feedback of a double micro ring resonator (DMRR) has been analyzed by 2D Finite Element Method. We demonstrate that both rings are simultaneously resonant, at 1550 nm which is the telecommunication wavelength, with the analysis of a double MRR simulation performed using COMSOL Multiphysics.

**PID: 2506 | Remotely Controlled Real-Time Health Surveillance System of COVID-19 Patients**

Shammi Afroj Mim, Naznin Sultana Tuhin, Md. Mehedi Hasan, and Md. Hasan Maruf

**Abstract** – This work focuses on the development of a portable physiological monitoring framework that can continuously monitor the patient's heartbeat, oxygen levels, temperature, ECG measurement, blood pressure, and other fundamental patient's data. As a result of this, the workload and the chances of being infected by COVID-19 of the health workers will be reduced and an efficient patient monitoring system can be maintained. In this paper, an IoT based continuous monitoring system has been developed to monitor all COVID-19 patient conditions and store patient data in the cloud server using Wi-Fi Module-based remote communication. In this monitoring system, data stored on IoT platform can be accessed by an authorized individual and ailments can be examined by the doctors from a distance based on the values obtained. If a patient's physical condition deteriorates, the doctor will immediately receive the emergency alert notification. This model proposed in this research work would be extremely important in dealing with the Corona epidemic around the world.

**PID: 6036 | DRAM: Read Only Memory Storage in DNA Computing**

Tamanna Tabassum, Fatema Akter and Mohammed Nasir Uddin

**Abstract** – Biomolecular programming performs computing utilizing many sorts of reactions and stores the information in biological macromolecules (proteins and nucleic acids). DNA (Deoxyribose Nucleic Acid) exhibits highly predictable molecular behavior, which assists in the construction of logical versions of operating systems and molecular computers. Read Only Memory (ROM), is a form of electronic storage that is built into a device during the manufacturing process. It might be a programmable general-purpose logic device, and a client can customize the storage device as a basic logic gate operation to complex mechanisms on a chip. In this proposed work, a ROM is designed using DNA-based gates. The attributes of DNA-based computing enable DNA-based ROM to execute billions of operations consecutively as well as provide immense storage in a compact space.

**Day- 01: 17 Dec 2022, Time: 11:30 AM, Technical Session- 01, Parallel Session- 06**

Venue: PCR-602, Session Chairs: Prof. Dr. Md. Shariful Islam, Prof. Dr. Md. Obaidur Rahman

**PID: 9964 | An IoT Based Healthcare Solution With ESP32 Using Machine Learning Model**

Tasnim Hossain Orpa, Adil Ahnaf, Tareque Bashar Ovi, and Mubdiul Islam Rizu

**Abstract** – The pandemic in 2020 has brought unprecedented changes in all possible affairs of life and the healthcare sector is no exception to it. The situation stimulated an increment of the overall use of IoT. In healthcare sector IoT can be an impactful add-on to ensure remote healthcare and non-contact treatment of patients. Such facilities can ensure continuous inspection of patients over the time to help in better treatment. Additionally, the real time data clouding can come handy where large number of documentation of data is needed. This paper proposes an IoT healthcare device with embedded temperature, beats per minute and SpO<sub>2</sub> and intelligent prediction of one's health status by machine learning model named LightGBM with a prediction accuracy of 91.12%. Furthermore, data clouding system has also been developed for public and local server to share real time data with other users and doctors. The proposed technology has been designed to assist non-tech users all around the world with a user-friendly approach to get accustomed to smart health care.

**PID: 641 | Assessment of Sentiments: A Performance Evaluation on Bangla Noisy Text**

Md. Rashedul Hasan Safa, Ayesha Siddika, Raihana Tabassum, Annajiat Alim Rasel

**Abstract** – The fact that people have sentiments is perhaps the most significant distinction between robots and humans. Researchers have been working on ways to imitate sentimentality in computers for decades. The majority of recent Sentiment Analysis research in Natural Language Processing (NLP) has concentrated on the English language. Because of the rich grammatical structure of the text, a few notable studies have been conducted in the Bangla language sector. It should also be highlighted that Bangla lacks a comprehensive dataset. As a consequence, current research projects including Bangla have failed to yield findings that are similar to those produced by researchers in other languages and reusable for future study. In this work three categorical machine learning models namely classical, neural network, and transformers that are prevalent in sentiment analysis tasks have been evaluated on a recently introduced noisy Bangla dataset. The experimental outcome showed that the classical machine learning model Support Vector Machine trained with n-gram feature extractors from the category of classical methods performed preferably in contrast to the models in the same category and other categories of approaches implemented. The results acquired in this work can be subsidiary in terms of understanding the impact of the content and human perception from comments that include distorted words or regional dialects associated with different media domains.



**PID: 3093** | **A Fusion of Three Custom-tailored Deep Learning Architectures for Waste Classification**  
Naimur Rahman and Sajib Kumar Das

**Abstract** – Population growth is exploding exponentially in this current world. Due to this escalating population and urbanization, the overall amount of waste is experiencing a rapid growth worldwide. Consequently, plenty of waste contributes to climate change, affecting our ecosystems and species. Fortunately, trash management would help alleviate some of these effects since a large quantity of trash is highly biodegradable and recyclable. However, classifying waste manually based on its contents is highly expensive and time-consuming. This is why the classification of wastes based on their contents is a critical criterion for ensuring cost-effective performance throughout recycling procedures. This paper proposes a hybrid deep-learning framework to classify waste into four categories: paper, glass, plastic, and organic. To address the lack of sufficient data, we used the augmentation function to augment the data. Later, in order to remove any duplicates that might have existed in the updated dataset, we also applied an image hashing technique that tackles the problem of overfitting. After preprocessing, we integrate three different models (2 EfficientNet models with noisystudent and imagenet and a custom convolutional neural network model) and provide prediction, and a heatmap of the explainable Artificial Intelligence (X-AI) generated images based on the test dataset to improve the trustworthiness of the inference. In comparison to various earlier state-of-the-art studies in the area of waste management, our technique performed substantially better, scoring at around 97% accuracy.

**PID: 6429** | **Comparative Analysis of Fine-Tuned MobileNet versions to Detect Brain Tumors from MRI images**  
Bahauddin Taha, Fahmida Rahman Liza, Md Moniruzzaman, and Md Samsuzzaman

**Abstract** – A prominent area of research in the realm of medical imaging is the categorization of brain tumors into multiple classes. Researchers have devised a variety of strategies to improve categorization accuracy. Brain tumor diagnosis and classification using standard medical data analysis is a difficult and time-consuming job. Biomedical investigation demonstrates that systematic categorization with human involvement may result in erroneous diagnosis and prognosis. One of the most remarkable approaches for dealing with this issue is to utilize deep learning algorithms. This study examines an intra-version comparison of MobileNet models with the goal of identifying brain tumors using MRI images. This research aims to evaluate the effectiveness of each version of MobileNet — MobileNetV1, MobileNetV2, and MobileNetV3, to pinpoint the three distinct forms of brain tumors which are pituitary, glioma, and meningioma. Multiple evaluation metrics, including sensitivity, specificity, F1-score, accuracy, and negative likelihood ratio have been used to evaluate the effectiveness of these models. According to a comparative analysis of these models, MobileNetV2 tends to perform better than other versions achieving a train and test accuracy of 99.73% and 97.86%.

**PID: 6732** | **An Ensemble Based Stacking Architecture For Improved Bangla Optical Character Recognition**  
Tareque Bashar Ovi, and Adil Ahnaf

**Abstract** – Since Bangla is the seventh most spoken language in the world, handwritten character recognition for Bangla holds a significant position. However, the task is challenging as there exists wide range of individual writing styles and structural similarities across characters. Deep learning models like CNN have been employed to categorize Bangla characters although the accuracy hasn't improved much. In this research, the comparison of accuracy between the use of single machine learning model to stacking of the models has been shown by ROC curves. Stacking of Random Forest, Extra Trees, and XGBoost models based on ensemble and feature extraction has been used in this research that outperformed all current models in the Bangla OCR with 99.98% accuracy on the CMATERdb 3.1.3.3 dataset.

**Day- 01: 17 Dec 2022, Time: 11:30 AM, Technical Session- 01, Parallel Session- 07**

Venue: PCR-601, Session Chairs: Dr. Ahmed Jalal Uddin, Dr. Md. Shariful Alam

**PID: 1366** | **An Eight Point Model for Addressing Challenges of Online Education at Tertiary Level**  
Arifa Rahman, Md. Golam Samdani Fakir, Md. Abdur Razzaque, Hasan Al Zubayer Rony, and ASM Shihavuddin

**Abstract** – The purpose of the study is to explore the feasibility of online education from the perceptions, preparations, and prospects of teachers and students at a private university and to form a model for implementing a sustainable online education system in a developing country. The study and the proposed model are inspired by a mixed-method study, collecting primary empirical data through an online survey, phone interviews, and focus group discussions. The sample size was 2340 including randomly selected teachers and students. Our study finds that a satisfactory number of students and teachers are ready for entering into online education despite financial and technical challenges. The perceptions are changing comparatively positively than before, and blended learning opportunities seem promising. A structured model and related studies can contribute to strategic discussions in higher education policies for online education.

**PID: 2016** | **Performance Analysis of Lean Tools Implementation in Garment Industry: A Case Study**  
Mehnaz Jebin, Md. Mazharul Helal, Md. Kaikobad, Md Mutasim Uddin and Md. Mahburur Rahman

**Abstract** – Lean manufacturing is a holistic idea that uses for the identification and removal of production-related wastes. The major goals of applying lean tools are to boost productivity, decrease lead times, improve poor line balancing, decrease WIP, improve quality, increase design flexibility, decrease costs, etc. The garment industry offers a lot of room for development adopting lean concepts, despite intense competition. The purpose of this study is to examine how lean manufacturing practices might improve manufacturing performance in the Bangladesh's apparel industry. Through investigation, in the study, high work-in-process, improper line balancing, high cycle time, and long production lead times, unbalanced work load have been discovered throughout the selected organization. In this paper, existing layouts of the sewing section of the selected industry were examined, and then layouts to improve productivity are recommended and value stream mapping, cellular manufacturing principles, 5S etc. lean tools are utilized to determine the increased level of performance and productivity, particularly in this garment industry. After implementation of these lean tools, results observed involve, production output is increased by 17.80%, efficiency is increased by 12.46%, SMV of product is standardized to 18.68 min., defects per hundred units is reduced to 10% and order change over time is reduced by 37%. A single organization was the subject of the implementation study for this project. Hence the conclusions drawn from the execution of this implementation study are feasible and adaptable in similar organizations.

**PID: 2653** | **Removal of azo dye from Textile effluent by activated charcoal extracted from jute stick**  
Nusrat Jahan Mousumia, Md. Mohinuddina, Md Mutasim Uddina, Mohammad Shariful Alama, Jagannath Biswasa, Md. Mahburur Rahman

**Abstract** – The textile industry consumes a lot of water during production and generates a massive amount of effluents, including synthetic dyes, into the environment, which raises public concern. Azo dyes that are predominantly utilized in the textile sector are regarded to offer serious health hazards. Several physicochemical and biological techniques for dye removal from waste water have been investigated in recent decades. However, all the techniques are not free from drawbacks, as well as some of them are not economically feasible, and hence further development of the techniques is required. Adsorption is an effective method and require minimal capital and functioning cost. Jute sticks are a typical fuel source in Bangladeshi villages. After burning jute sticks as fuel, it turns into highly cost-effective activated charcoals which are capable of removing Levafix Amber (most used azo dye) from textile effluent. So, in this article we reported a cost effective, ecofriendly method for the removal of Levafix Amber dye. The most notable benefits of our approach are its low cost, simplicity, and lack of the need for costly instruments.



**PID: 2710** | **Polyphenolic derivatives: ADMET, QSAR and molecular docking studies against hepatitis C virus NS5B polymerase**

Ishmam Ibnul Arabi, Mohammad Shariful Alam, Md. Mohinuddin, Abrar Yasir Abir, Jannatul Ferdousi, Moon and Jagannath Biswas

**Abstract** – In this study, several synthesized polyphenolic derivatives were chosen for computational analysis. In order to determine their chemical descriptors, quantum chemical analysis was conducted by computational simulation using DFT (B3LYP) with 3-21G basis set. By using molecular docking simulations, the binding energy and binding strategies of certain viral proteins associated with the Hepatitis C virus (2IJN and 3MWV) were investigated, and an adequate binding affinity was determined. Pharmacokinetic prediction showed enhanced drug-likeness profiles for all polyphenolic derivatives based on QSAR analysis. Finally, these compounds can be described as molecules with high antiviral potential that have been modified in terms of their structural side chains.

**PID: 4137** | **Characterization of Heat Insulating Ceramic Fiber Raw Material for Insulation**

T. M. S. A. Hossain, M. Hasanuzzaman, M. A. Hakim and M. F. Islam

**Abstract** – New environmentally-friendly heat insulation materials, which are made from local raw materials can serve as an alternative to heat insulation materials already existing in the market, using clay as a raw material in its production, but dolomite is used as bio-solubility, thus obtaining material with the necessary heat and acoustic insulation qualities, as well as fire-resistance and chemical stability in an aggressive environment and providing to the development of industries in Bangladesh. Bangladesh is a developing country in the region of South Asia. Day by day its industrial growth is increasing very fast. Natural gas is used in the furnace region of all industries. It is a matter of disappointment to us that all industries never use proper insulation for saving natural gas and the environment. For saving our natural gas, all industries must maintain proper furnace insulation not only for carbon emission but also for the cost-effectiveness of product price. Like many insulators, ceramic fiber is a key material for industrial furnace insulation. For continuous ceramic fiber fabrication, raw materials resources are important factors. In Bangladesh raw materials are also available due to geological position. But clay raw materials are not only used as traditional raw materials but also used as heat-insulating materials. For developing ceramic fiber-related insulation in the county, extensive study and characterization need for selecting the right clay raw materials. Characterization methods like XRF, XRD, and DSC-TG and sieve analysis give deep information about locally available clay raw materials.

**Day- 01: 17 Dec 2022, Time: 03:00 PM, Technical Session- 02, Parallel Session- 01**

Venue: PCR-309, Session Chairs: Prof. Dr. Md. Atiqur Rahaman Ahad, Prof. Dr. Sejuti Rahman

**PID: 9732** | **Mutual Information on Low-rank Matrix for Effective Intrusion Detection**

Hasin E Jannat, Md Mahbubur Rahman, Samrat Kumar Dey, and A F M Mohaimenul Islam

**Abstract** – With the popularity of the internet expanding, security is a top concern nowadays. Computer networks are becoming more and more prone to cyberattacks and other dangers due to the massive volume of data flow in various formats. Finding significant information to detect intrusions becomes more difficult as a result. In this data-driven world, dimensionality reduction is a crucial procedure for intrusion detection. For academics, an intriguing subject is choosing relevant traits from a big amount of irrelevant and associated data to accurately detect alerts/threats. One of the most popular statistical analysis-based methods for dimensionality reduction is principal component analysis (PCA), however, it has certain limitations. In this paper, we addressed this limitations of PCA and showed that mutual information of low-rank matrix is an effective subspace detection techniques as well as gives a better classification performance.

**PID: 1198** | **Anomaly Based Network Intrusion Detection Using Ensemble Classifiers**

Md. Showrov Hossen, Mohammad Jamal Hossain, Md. Abdul Masud, Md. Samsuzzaman, and Chinmay Bepery

**Abstract** – Network Intrusion Detection System is extensively utilized for protection and reducing the damages of information system. It protects threats and vulnerabilities in computer network. Due to the rapid growth of computer network communications, network intrusion is significantly increased and the intrusion detection is considered as a major issue in nowadays. For secure the communication, it is necessary to identify network attacks or malicious activities in network environment. To detect the intrusion in the network various methods have been proposed in past and effective analysis based on ensemble machine learning methods have been done to detect any types of anomalous events occurred in the flow of network traffic. In the learning process, ensemble methods are known to perform well. Investigating the best ensemble approach is crucial for creating an effective network intrusion detection system. In this paper, we used Bagged Naïve Bayes-Decision Tree (BNBDT) and Random Forest ensemble learning techniques and also used four base classification algorithms which are Naïve Bayes, KNN, Decision Tree and Logistic Regression on NSL-KDD network attack dataset for detecting the anomaly in network traffic and compared the performance of ensemble classifiers with the base classifiers. The proposed ensemble method provides better accuracy and relatively low false alarms rate than the other base classifiers.

**PID: 6131** | **Fraud Detection of Credit Card Using Data Mining Techniques**

Nishat Jahan Nishi, Farhana Akter Sunny, Sagor Chandro Bakchy

**Abstract** – A credit card is an essential and daily used component in our life. Credit card fraud is a crime in our society. It causes many problems in our daily online transactions. Various deficiency of the previous method has been researched in the introduction chapter. The establishment of avoiding credit card fraud security is a big issue for small financial institutions. The goal of this paper is to propose a model for detecting credit card fraud and making a false alarm. For this research purpose, we have used four data mining techniques i.e. Decision Tree (DT), Random Forest (RF), Artificial Neural Networks (ANN), and Logistic regression (LR). Our motivation was how to reduce the false alarm so that the cardholder gets into less trouble and also the card provider gets more time for accurate alarming checking. After collecting the data from the Kaggle repository we look into the structure of the large dataset to check the performance. Datasets are filtered by the feature selection algorithms called Pearson correlation and chi-squared. We have introduced this model to get fewer false alarms in credit card fraud. From the proposed system, we can obtain about 99% accuracy (LR) and it also gives fewer false alarms. For tracking credit card fraud in the era of industry 4.0, our research work will ascertain the advancement and effectiveness of sustainable technologies.

**PID: 3457** | **A Novel Approach to Reduce Air Pollution Through Machine Learning Based PM2.5 Prediction**

Tarik Monwar Monsaif, Omar Farhad Alif, Swakshar Das Amarth, Tahmid Asif Sadman and Jannatun Noor

**Abstract** – The industrial revolution is advancing development and also side by side creating an environmental crisis for us and the next generation. AI (Artificial Intelligence) is one of the most fascinating subjects for computer scientists in this century. It is a technology that helps a machine to do tasks by itself which needs human intelligence. Air pollution is one of the causes of the environmental crisis. So, our research proposes a novel approach for reducing air pollution by making people more aware of their day-to-day life by detecting the environmental air condition with the help of machine learning by using PM2.5 prediction. We find out accuracy tests for PM2.5 using various AI algorithms such as Linear Regression Analytics, Logistics Regression Analytics, Decision Tree, SVC Algorithm, and SGD algorithm and make a prediction based on it. Later, we introduce a framework that allows us to know about the PM2.5 values in the air and then counter it with the help of PM2.5 prediction which we calculate from the PM2.5 accuracy tests.



**PID: 3524** | **An Empirical Study of Pre-Trained CNN Models on COVID-19 CT Scan Images**  
Nawrin Tabassum, Monjure Mowla, Kazi Fuad Bin Akhter, Md. Tanvir Rouf Shawon, and Nibir Chandra Mandal

**Abstract** – As COVID-19 is highly infectious, the prevention of this disease is mandatory. The instant diagnosis of this disease is obligatory to stop the infection. The most commonly used procedure for COVID-19 detection is the RT-PCR test. But this process is very time-consuming and as a result, it allows the covid infected persons to spread the infection before they come to know the test result. So, in this paper, we used the method of detecting COVID-19 from CT scan images as a replacement for the conventional RT-PCR test. But this alternative method has its demerit too. To diagnose COVID-19 from these CT scan images, the analysis of a radiologist expert is required. So, we have used a deep-learning based method for automatic detection of covid infection from the CT scan images. We have used six pretrained models: ResNet50, Xception, DenseNet121, DenseNet201, MobileNet, MobileNetV2 and their accuracy are 97.38%, 92.35%, 95.56%, 93.55%, 93.95%, and 92.94% respectively.

**Day- 01: 17 Dec 2022, Time: 03:00 PM, Technical Session- 02, Parallel Session- 02**

Venue: PCR-309, Session Chairs: Prof. Dr. Mohammed Imamul Hassan Bhuiyan, Dr. Kafiul Islam

**PID: 5029** | **Revealing Climate Change from Moon Images with Dimensionality Reduction and Machine Learning**  
Peter Thejll, Monica Jane Emerson, D.M Saaduzzaman, Md. Hasan Maruf, and ASM Shihavuddin

**Abstract** – Earth's albedo is an important factor governing our planet's energy balance, and accurate measurements can help increase our understanding of the climate system as such, and specifically constrain global climate models. Terrestrial albedo is proportional to the intensity of earthshine, which is the solar radiation reflected off Earth onto the moon. Analyzing pictures of the moon can reveal the Earth's albedo at a lower cost and without the same systematic errors as the classical approach based on satellite images. Our proof-of-concept analysis is conducted in a model-world where realistic lunar images are generated by a geometric model of sunlight scattering between the Earth and the Moon. The analysis presented here is based on 1.2 million synthetically generated images of the Moon at the same phase and, as a consequence the dataset has a low variance suitable for our initial investigations. A random forest machine learning model was trained on the dimension-reduced dataset to predict the albedo and reached the target range of  $\leq 0.3\%$  relative error rate. Several machine learning models and feature extraction algorithms were explored to identify the best possible configuration for this aim and compared in this work.

**PID: 9168** | **Vowel Recognition for Isolated Digit Using Wavelet Transform at Decomposition Level 3**  
Shahriar Mahmud Kabir, Md. Shakib Ibne Ashrafi, Ratil H Ashique, ASM Shihavuddin

**Abstract** – The objective of this paper is to develop a vowel recognition system that can be efficiently used for digit recognition. In comparison to probabilistic approaches to vowel recognition, such as the Hidden Markov Model (HMM), the proposed method will be computationally less expensive. Experiments will be carried out on natural sounds using MATLAB to compute the recognition accuracy. In this paper, the experiment was performed on about 50 people of different ages to explore the feasibility of using wavelet sub-bands to recognize vowels under ideal and practical conditions. The experimental results reveal that the error rate utilizing the wavelet sub-band of diagonal decomposition level-3 (HL3) produces lower values in general than without wavelet and the other wavelet sub-bands vertical, and horizontal, indicating a close match with the original provided by the North-Texas Vowel Database.

**PID: 7274** | **Estimating Earth's Albedo from Moon Images using Random Forest will Enable Climate Change Monitoring**  
Peter Thejll, Monica Jane Emerson, D.M Saaduzzaman, Md. Hasan Maruf, and ASM Shihavuddin

**Abstract** – Climate change may well affect Earth's albedo. Albedo can be estimated using satellite observations. However, there is a less expensive and entirely independent alternative: the use of earthshine photometric observations of the Moon. This paper proposes the a machine learning approach for estimating Earth's albedo from the relative photometry of the bright and dark sides of the Moon. We trained a Random Forest model on hundreds of thousands of synthetic images of the Moon, and obtained an albedo error rate of 0.23%, in the modelimage world. The method we propose contributes directly to improving our understanding of the climate system. By increasing the quality of key observational data, namely the albedo, climate models can be calibrated against reality and thereby improve in accuracy.

**PID: 6326** | **A Time of Use Tariff Based Demand Side Management Algorithm for Residential Consumers**  
S. J. Hamim, Fakir Sharif Hossain, Md. Mehedi Hasan, Dip Sarkar, Mohammad Mainuddin

**Abstract** – The demand for electricity is burgeoning at a rapid rate as we move towards an advanced era of technology. However, the growth of new generation is lagging behind the demand due to the scarcity of fuels. As such, the necessity for load management is crucial to meet the upcoming energy crisis. The implementation of Demand Side Management (DSM) can be auspicious both for the utility and for the consumers. The consumers can be benefited by the reduced electricity bills and the utility can be benefitted through the reduction of peak electricity demand. In this paper, a methodology is proposed based on Time of Use (TOU) tariff to implement demand side management program for residential consumers. A revised electricity tariff is proposed to motivate the customers to shift their loads and to take part in the DSM program. The efficacy of the proposed algorithm is demonstrated and compared against the existing billing structure. It is found that the proposed method efficiently reduces the electricity bill of the consumers as well as lessens the burden on the existing power system by reducing the peak demand.

**PID: 6782** | **Internet of Things (IoT) for Water Quality Monitoring and Consumption Management**  
Mehedi Hasan Jewel and Abdullah Al Mamun

**Abstract** – This paper describes the design, development and implementation of an IoT-based water consumption metering and water quality monitoring System. Water is one of the natural resources found in nature and an essential part of life. Two of the major issues related to consumption of water, especially in Bangladesh are, huge amount of water waste due to lack of proper water management system and another one is poor quality of the drinking water. From the perspective of Bangladesh, the drinking water quality has been a huge issue but there are very few to no ways to monitor the quality of the water that is being consumed by the people. In this paper, we have proposed a solution to the problem by developing a mobile smart water metering system and integrated water quality monitoring where the quality of the tap water in households is constantly measured in real-time and can be monitored using a web/mobile application. In the meantime, the daily/monthly consumption of water is measured and recorded in the database for billing purposes. The daily consumption record is the key to decreasing water wastage. Our system will be able to reduce unnecessary water wastage by consumption metering and ensure the quality of water by quality monitoring. The metering, monitoring, bill payment, etc. are done remotely, and online using the Internet of things (IoT). The proposed solution integrates the IoT, hardware and software which results in healthy/safe drinking water and reduces water wastage which contributes to the sustainability of environment.



**Day- 01: 17 Dec 2022, Time: 03:00 PM, Technical Session- 02, Parallel Session- 03**

Venue: PCR-307, Session Chairs: Prof. Dr. M Shamim Kaiser, Prof. Dr. Muhammad Golam Kibria

**PID: 2070** | **Risk Analysis and Support System for Autistic Children using IoT**  
Shartaz Yeaser Feeham, Tahiya Akter, Susmita Debnath and Md. Solaiman Mia

**Abstract** – Autistic children face difficulties with communication, social interactions, obsessive interests and repetitive behaviors; as a result, they face a high risk of getting into critical situations if they are left free and alone in the outside world. But they should not be caged for this reason. So, there is a need for a way that can help and protect them. This paper brings an IoT (Internet of Things)-based support system for children with ASD (Autism Spectrum Disorder). The proposed system uses several IoT devices such as Accelerometer sensor, Gas sensor, Temperature sensor, Heart rate sensor, etc. which are linked up with a modern microcontroller called Arduino Uno for monitoring and helping the children with ASD to learn and improve their quality of life. The proposed system uses the sensors to read the surrounding environment of the child and then analyze if there is any risky situation going around. Finally, based on the results, it notifies the parents or supervisor of the autistic children. Additionally, a GSM (Global System for Mobile communication) module is used to communicate with their parents. The system keeps tracking all real-time surrounding environment data. It analyzes sensors' readings against different threshold values collected from the experiments in different scenarios to determine whether any risk has occurred or not.

**PID: 2740** | **Trade-off Between Latency and Energy for Offloading Tasks in Maritime Internet of Things**  
Sudip Chandra Ghoshal, Md Maruf Hossain, Bishozit Chandra Das, Palash Roy, Md. Abdur Razzaque

**Abstract** – With the advancement of maritime activities, the number of Maritime Internet-of-Things (M-IoT) devices is growing exponentially. However, due to the limited computational capacity of the M-IoT devices and the complex maritime network environment, the edge and central cloud computing scenarios can be adopted. Existing works have neither considered interference between the communication of ships nor the trade-off scenario between latency and energy consumption. In this paper, we have provided an optimization framework, namely VESBELT, which enable a trade-off between the minimization of service latency and energy consumption for offloading tasks on the edge or central cloud servers. Our experimental results depict that the developed system VESBELT is superior to contemporary works in terms of service latency and energy usage.

**PID: 4915** | **Cost-effective IoT-Based Smart Stick for Visually Impaired Person**  
Sheikh Abdullah, Eti Akter, Mohammed Shariful Islam, Jargis Ahmed

**Abstract** – Visually impaired persons are also a big part of our society. It is quite difficult and dangerous for blind people to move outside and carry on their daily basis work. Hence, they require some assistance that can help them to perform their necessary work safely and effectively outside of their home. In this paper, we proposed a low-cost IoT-based smart stick for the visually impaired person to assist them to move outside environment. The smart stick is consist of a few ultrasonic sensors to detect large and small obstacles along with manhole detection. Also, there is a water sensor to detect the presence of water on the road. In any case, if a blind person faces uncertain hazards, he/she can press an emergency button. Thus the location will be sent by the IoT devices to the responsible family person and they can be rescued. For alerting the blind person we have designed different beep and vibration patterns using a buzzer and vibrator. The accuracy of experimental and practical results is quite close, which indicates the effectiveness of the smart stick.

**PID: 9805** | **An SDN-based Secure Model for IoT Network in Smart Building**  
Md. Faisal, Hafsa Siddiqua, Md. Jahidul Islam, and Anichur Rahman

**Abstract** – Smart Building (SB) is an Internet of Things (IoT) application that aims to manage buildings without human intervention. SB interconnects almost all IoT-enabled devices in the home, such as lights, car parking, temperature sensors, AC, and so on. Another important component of SB is that can provide real-time information. On the other hand, Software Defined Networking (SDN) is a networking technology that can easily transfer and modify information from the data layer to the control layer through the SDN protocol. Currently, intelligent cities, offices, and large organizations are being developed based on SDN and IoT. Among them, many researchers have completed their work on this technology and they have faced various problems. Based on the above discussion, we propose an SB secure architecture model where multiple controllers are used to protecting the building from problems like a single point of failure. Moreover, the southbound protocol is used between the data layer and the controller layer to protect the security and privacy of the building, and through the northbound protocol, customer data is stored in cloud storage. Finally, the author evaluates the performance of the proposed model with various network metrics (Throughput, Round Trip Time) and CPU, Memory and Bandwidth Utilization rate.

**PID: 6822** | **Low-cost Task Offloading Scheme for Mobile Edge Cloud and Internet Cloud Using Genetic Algorithm**  
Sonia Chowdhury Sinthiya, Nafees Imtiaz Shuvo, Roki Reza Mahmud, Jargis Ahmed

**Abstract** – Offloading a task for a user is required when it can not perform the computation locally. Hence, Mobile Edge Cloud (MEC) can reduce the burden of edge users, as it brought computational capacity near to the edge users. Although MEC has resource constraints hence few users may have to offload to the cloud server also. Thus, choosing MEC or cloud for offloading is crucial as users have latency and energy constraints. We address the challenges of offloading and formulated our optimization problem. Due to the NP-Hardness of the problem, we proposed a meta-heuristic Genetic algorithm called Cost Effective Genetic Algorithm for Tasks Offloading (CEGA). In this approach, MEC will analyze the user's delay and energy state and it will divide users who should offload to MEC or the cloud. Based on the proposed (CEGA) method we evaluate the performance and observed significant improvement in user delay and energy reduction and overall cost for offloading compared to existing state-of-the-art works.

**Day- 01: 17 Dec 2022, Time: 03:00 PM, Technical Session- 02, Parallel Session- 04**

Venue: PCR-306, Session Chairs: Dr. Muhammad Nazrul Islam, Dr. Habibur Rahman

**PID: 1342** | **Identification of Influential Genes for Colorectal Cancer Using Machine Learning Approaches**  
Bithy Roy, Sabikun Nahar, Md. Imam Hasan, Humayan Kabir Rana, Nitun Kumar Podder, and Shudeb Babu Sen Omit

**Abstract** – The most malignant tumor of the large intestine is colorectal cancer (CRC), initially, some polyps grow inside the intestine and become CRC with the flow of time. In the case of treatment for cancer, influential genes (IFGs) identification is necessary. However, it is still insufficient, and more research is needed in this regard. Thus, to further contributions, we have taken the Cancer Genome Atlas (TCGA) data-set to detect the IFGs of CRC using Kruskal-Wallis H test and Bonferroni correction methods. Then we have successfully identified 14 IFGs from 17518 genes and using the fold change (FC) values and heat-map plot, we separated the up and down regulated genes. Finally, we have used some classifiers such as Random Forest (RF), K-Nearest Neighbors (KNN), and Support Vector Machine (SVM) to predict the accuracy of our proposed technique. We have found the accuracy of 98.59%, 75.38%, and 69.23% for RF, KNN, and SVM respectively. Our identified 14 influential genes may be used in further lab-based analysis and to develop the therapeutic treatment strategies for CRC.



**PID: 4655** | **An Improved Model for Nutrient Deficiency Diagnosis of Rice Plant by Ensemble Learning**  
Md. Simul Hasan Talukder, Ajay Krishno Sarkar, and Md. Nuhi-Alamin

**Abstract** – Rice is the most popular staple food all over the world, especially in China, India, and Bangladesh. It is the primary food of Bangladesh. But its production is hampered by the nutrient imbalance in soil that results in failing to meet the required amount of rich needed for this country. Early detection of nutrient deficiency can improve rice production. Machine learning (ML) is one of the best solutions for early detection of nutrient shortfall by leaf image processing since the leaves change their physical appearance due to the nutrient scarcity of soil. In our work, we have focused on how ML performs better on the small dataset of Kaggle with 1156 images. Three pretrained CNN models, MobileNet, DenseNet121, and DenseNet169, with an added pooling layer and dropout layer at the bottom, were carried out on an augmented dataset. The average ensemble of them outperforms and enhances testing accuracy from 92% to 96.67%. It yields a roc\_auc score of 99.62%. The analysis in this work revealed that data augmentation with parameter tuning, transfer learning architecture, and ensemble learning play the key roles in improving accuracy.

**PID: 7546** | **An Automatic Detection of Pneumonia from Chest Ionizing Radiation Images Using Machine Learning Algorithm**  
Mohamed Saifuddin Munna, Dr. Quazi Delwar Hossain

**Abstract** – As a result of absence of adequate healthcare facilities in developing countries, pneumonia is the most common cause of death now a days. In 2019, pneumonia was responsible for the deaths of as many as 740180 children less than 5 years old. Rapid death occurs in pneumonia patients due to fluid leaks in the lungs. Therefore, early identification and treatment with appropriate medication are crucial for preventing the spread of the disease. Chest x-ray is the mainly used & standard method of diagnosing pneumonia. Different lung illnesses, like volume loss, hemorrhage, fluid overload, lung cancer, or post-radiation or surgical modifications, make it extremely difficult to diagnose pneumonia in chest x-rays. Hospitals often struggle to detect pneumonia due to a lack of qualified radiologists. Therefore, computer-assisted diagnosis techniques are urgently needed to aid doctors in making more informed decisions. This research proposes a YOLO-based model and evaluates it on the CXR-14 subset of the Chest XRay dataset. Through the use of a dataset of about 29860 images, we were able to train a computer to distinguish between three distinct pneumonia stages. The model's mAP@0.5 on train data was 97.65%. This study proposed a low weight object detection algorithm for medical image processing.

**PID: 7786** | **Heart Diseases Prediction Using Multiple Machine Learning Techniques**  
Tamanna Afrose, Murad Hossen, Md. Imdadul Islam

**Abstract** – In this paper we focused on identifying heart disease of a patient, based on ten parameters found from benchmark database of pathological reports. Here we use six machine learning techniques: K-means, Fuzzy C-means (FCM), Support Vector Machine(SVM), Fuzzy inference (FIS) clustering, Logistic Regression (LR) and Multiple Linear Regression (MLR) along with Neural Network(NN) as the binary data classification to detect the heart disease. Finally, we combined the methods under different combinations to enhance accuracy of detection of diseases, and the corresponding result is found above 94% for combination of FCM, K-mean, SVM, MLR, FIS and NN.

**PID: 6229** | **Curvelet Transformed NIG Image-based Breast Tumor Classification Using Deep Learning**  
Shahriar Mahmud Kabir, Mohammed Imamul Hassan Bhuiyan, Rakibul Hassan Tusar, Mitu Mridha, Md. Sabbir Hossain Shuvo, ASM Shihavuddin

**Abstract** – Notwithstanding ultrasound (US) B-Mode images, automatic diagnosis of benign and malignant breast cancers is still an unexplored area of study. In this study, a deep convolutional neural network architecture based on parametric imaging is proposed to categorize and identify breast tumors from breast ultrasound images. Here, an appropriate model for explaining the ultrasound image statistics within the Curvelet Transform domain is the Normal Inverse Gaussian (NIG) distribution. To categorize parametric images produced by locally calculated parameter values of the NIG distributions in various Curvelet sub-bands, the proposed convolutional neural network is used. 100 benign fibroadenomas and 100 malignant cases from a publicly accessible dataset of 780 breast US images are undertaken. The proposed technique yields 95.5%, 96.91%, 94.17%, 94%, and 97% accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), respectively. Additionally, it is demonstrated that the accuracy attained by the Proposed Method is greater than several recently released findings.

**Day- 01: 17 Dec 2022, Time: 03:00 PM, Technical Session- 02, Parallel Session- 05**

Venue: PCR-404, Session Chairs: Dr. Nahid Al Masood, Dr. Ahsanul Alam

**PID: 3513** | **Eye Controlled Wheelchair for Physically Disabled Persons using Viola Jones Algorithm and Hough Transform**  
Md. Nazmul Hossain, Md. Ahshanur Rahman, Md. Rakib Hossain, and Rakib Ahshan Fahim

**Abstract** – Tetraplegia or normally known as quadriplegia is a kind of immobility activated by an ailment or cervical damage bringing about the total or halfway hindrance of the appendages and torso function. Every year many people are suffering from this illness. This paper attempts to implement a way to resolve this problem by making the disabled persons move on their own. The motivation behind this paper is to exhibit ease and low-cost method for empowering differently-abled individuals to explore their wheelchair freely through the movement of eyes. In this paper, we proposed a system where the camera will be put in front of the wheelchair. The camera will detect the face using the Viola-Jones algorithm and will detect eyeball using the Hough transform using the MATLAB environment. MATLAB interacts with Arduino microcontroller utilizing serial correspondence. Arduino transfers the control signal to L298N stepper motor driver, which gives the commanded signal to the motors of the wheelchair. In our proposed method, comparison and observation were made between other eye controlling methods and our method. The framework is reasonable and henceforth can be utilized by patients spread over a vast economy run.

**PID: 7150** | **High Altitude Airborne Hybrid Power Generation System Design in Saint Martin's Island**  
Mazbah Kabir Mridul, Anirban Barua, Md. Abdullah Bin Murad, and Abdullah Al Mahbub

**Abstract** – Being an overpopulated country, the power crisis in Bangladesh is increasing gradually. It relies on nonrenewable energy sources to generate electricity. The cost of such resources is high and harmful to the environment. However, there are plenty of ways to get clean energy from renewable sources like solar, wind, and hydro. This paper presents the possibility and design of high-altitude airborne hybrid (solar and wind) power generation systems in rural and off-grid areas such as St. Martin Island. Due to its isolation from the mainland, residents of the island of St. Martin partially meet their energy needs using diesel generators, which are expensive and environmentally harmful. Besides, this model consumes less land area than typical wind or solar systems for the same power generation, less manpower is required, adds the extra attractive view for the tourist, portable model, and easy transportation from one part of the island to another. Therefore, this study hopes to efficiently operate an airborne hybrid power generating system and provide a solution using solar and wind resources to mitigate electricity demand average 1.5MW daily and environmental pollution.



**PID: 9184** | **Design of A Microcontroller Based System for Harvesting Electricity from Exercise Bike**  
Niloy Barua Avra, Pulak Majumder, Jannatul Ferdous, Umme Fariha, M M Naushad Ali and Khalid Imtiaz Saad

**Abstract** – Regular exercising is one of the key factors to stay healthy. On the other hand, harvesting electricity from clean renewable sources is crucial for the environment. In this paper, we combine these two important aspects of our lives. An electricity generating device coupled with a stationary exercise bike is presented in this paper. A lead-acid battery was charged with the help of our developed prototype. Regular usage of this device can not only help a person stay healthy, but also can reduce the pressure on fossil fuel based generation of electricity. Our developed prototype will be able to recharge the batteries of UPS, which can be used in case of emergency power outage. Several tests were conducted using our developed prototype, where the battery accumulated 16.7% charge in a little over 2 hours.

**PID: 8185** | **A Novel Asymmetric Nine Level Inverter with Reduced Device Count Suitable for Renewable Energy Applications**  
Ahshan Habib, Md. Ahsanul Alam, Md. Tariqul Islam, Md. Fayzur Rahman, Afsana Mimi Raka, and Md. Razibul Awal

**Abstract** – Multilevel inverters are widely used for renewable energy integration and many other industrial applications. Power quality, efficiency, and economy of the inverters are the prime importance common to all such applications. In this paper, a reduced component count asymmetric multilevel inverter is proposed. Compared to similar existing topologies, it uses a smaller number of active switches, diodes, and voltage sources. Its absence of dc-link capacitor ensures zero voltage unbalance problem. Selective harmonic elimination (SHE) PWM method is applied to reduce power loss, and total harmonic distortion (THD), thereby enhancing efficiency and power quality. The superiority of the proposed topology over the recently proposed similar topologies has been compared and verified. To validate the theoretical proposition, a nine-level asymmetric inverter is simulated in MATLAB/ SIMULINK environment. With a small LCL filter, the THD performance of the inverter is 0.81% which satisfies IEEE standards. Excellent dynamic load performance shows the suitability of the inverter for industrial applications.

**Day- 01: 17 Dec 2022, Time: 03:00 PM, Technical Session- 02, Parallel Session- 06**

Venue: PCR-506, Session Chairs: Prof. Dr. Ziaur Rahman Khan, Dr. Ratil H Ashique

**PID: 2061** | **Deep Learning Enabled State of Charge Estimation for Electric Vehicle Batteries Under Noise Effects**  
Molla Shahadat Hossain Lipu, Md. Sazal Miah, Shaheer Ansari, Sheikh T. Meraj, Kamrul Hasan

**Abstract** – State of charge (SOC) is a vital parameter utilized to examine the performance of battery storage systems in electric vehicle (EV) applications. The lithium-ion batteries have been broadly utilized in the EV application for SOC estimation because of their high voltage, energy, capacity, and long life cycles. Nonetheless, there has been a concern in determining SOC for lithium-ion battery storage due to battery aging, chemical reaction, material degradation as well as noise and temperature impacts. Deep learning has demonstrated very effective in SOC estimation under variable environmental settings and dynamic load conditions. Thus, this work introduces long short-term memory (LSTM) network for SOC estimation due to its improved generalization performance and strong computational capability in highly battery nonlinear conditions. The accuracy and robustness of LSTM are verified by including random noises and bias to the measured dataset achieved through the battery experiments tests at ambient temperatures and publicly available EV drive cycles at different temperatures. In addition, the proposed LSTM is dominant to state-of-the-art machine learning (ML) techniques in terms of obtaining low root means square error (RMSE) and SOC error. The results indicate that the LSTM archives SOC error below 5% in all battery experimental tests and EV drive cycles.

**PID: 2970** | **Prospect of Electric Boat in Dhaka: An Alternate Way of Transportation**  
Md Ashraful Islam, M M Naushad Ali, Ahmed Jaudat Nahian, Md Hasan Maruf, Molla Shahadat Hossain Lipu and ASM Shihavuddin

**Abstract** – This paper proposes an alternate transport system using renewable energy powered electric boats, in Dhaka, to reduce traffic congestion and pollution. Solar powered charging station has also been proposed to meet the energy demand for charging the boats. Suitable boat selection was done by taking into account the limitation of the proposed Gabtoli to Sardaghat water route. Economic and environmental analysis was also performed to check the feasibility of the proposed system. The analysis demonstrated that, with only 12 boats, the levelized cost of energy is 7.63 Taka/kWh, with an estimated emissions reduction of 288 Tons. The electric boat can be a suitable alternative mode of transportation since it is cost-effective and reduces tailpipe emissions caused by conventional fossil fuel powered vehicles.

**PID: 3930** | **Management and Control Strategies of Battery Switching in a Hybrid Energy Storage System**  
Mohammad Ashifur Rahman, A.K.M. Baki and Shafquat Yasar Aurko

**Abstract** – Placement, sizing and cost of power electronic switches and converters in battery energy systems (BESS) are critical parameters for consideration to implement in real applications. Present battery systems incorporate highly accurate measurement systems and controllers for efficient management. However, lower energy efficiency and flexibility cause to limit the performance of large-scale battery systems. In this paper, with the view to increase the performance (in terms of flexibility, lifetime, efficiency, safety and reliability) of battery packs, a new design of battery and switches, also known as reconfigurable battery is developed and control strategies have been presented. To show and compare the performance, a hybrid energy storage system (HESS) is developed, which consists of reconfigurable battery, super capacitor and power electronic interfaces. The proposed system is modeled in the time domain simulation of MATLAB/SIMULINK®. Results demonstrate that proper control strategy in the drive-train can improve the deliverable energy efficiency and flexibility, without compromising the health of the battery cells.

**PID: 4486** | **Hydrogen Fuel Cell Based Low Power DC Motor Driven Energy Efficient Electric Vehicle: A Comparative Analysis**  
Israt Jahan, Md. Ariful Islam, and Omar Farrok

**Abstract** – Production of electric vehicles is increasing day by day because of the rising price of non-renewable energy resources and pollution created by utilizing it. Hydrogen fuel cells are the outcome of relatively recent technological development as a power source for electric vehicles. This paper presents various parametric analyses of a proton exchange membrane fuel cell (PEMFC) based electric vehicle which is driven by a relatively low power electrical dc motor. A lightweight electric vehicle is considered where the maximum power rating of the PEMFC is 12 kW and its voltage rating is 50 V. Output voltage of the fuel cell stack is too low to power the motor of the electric vehicle directly. Therefore, a dc-dc boost converter is connected to the PEMFC to increase its output voltage so that it can drive the dc motor. In the vehicle, two separately excited dc motors with different properties are analyzed. The motor is powered by two different dc-dc boost converters. One is for field excitation and the other is for armature. The fuel cell, converters, and electric motor are simulated by using MATLAB-Simulink software. Various parameters of the fuel cell, converters, and electric motor are presented and compared. It is found that selection of proper parameters of the motor can improve the overall performance of the electric vehicle and utilization of fuel cell is increased to a great extent.



**PID: 8217****Designing SWET Based Hybrid Charging Stations for Electric Vehicles at Dhaka-Mawa Expressway in Bangladesh**

Anirban Barua, Abdullah Al Mahbub, Mazbah Kabir Mridul, Sazzad Ahmad, Md Harunur Rashid and Partha Mandal

**Abstract** – This paper proposes a new power generation model perspective for Bangladesh. A detailed hybrid model is designed, and estimated output power (13.383 GW per day) is presented. In addition, the Simulink model is to analyze and develops the virtual environment. The presented system is based on SWET (Solid State Wind Energy Transformation), which can generate electrical power by using the highway transport wind speed. Most of the power generation stations in Bangladesh depend on non-renewable energy sources. However, non-renewable energy sources such as natural gas, petrol, diesel, and octane are limited, and the increasing demand & cost of the fuel is forcing us to find an alternate way. Similarly, electric vehicles are a burden on the grid. There is ample evidence that in the next couple of decades, a bulk number of vehicles will turn into electric vehicles in Bangladesh. Therefore, solar and SWET technologies are chosen to generate power and supply (16 MW per day) it to the charging station. After meeting the demand in the charging station, it can supply additional power (13.367 GW per day) to the national grid. Thus, this application will play a vital role in solving the power crisis in Bangladesh. After all, Electric vehicles will reduce transportation costs and carbon emissions by a great margin. Therefore, it will be possible to produce clean energy and fight against the greenhouse effect.

**Day- 01: 17 Dec 2022, Time: 03:00 PM, Technical Session- 02, Parallel Session- 07**

Venue: PCR-601, Session Chairs: Prof. Dr. Md. Mijanur Rahman, Dr. Muhammad Abul Hasan

**PID: 7434****An Approach to Identify Diseases in Betel Leaf Using Deep Learning Techniques**

MD Abdul Malek, Sarnali Basak, Sanjida Sultana Reya

**Abstract** – Despite its many benefits, such as vitamin C, thiamine, niacin, riboflavin, and carotene, we fail to preserve betel vine leaves against bacteria, resulting in a substantial crop loss worldwide. Because of the high level of damage, identifying leaf diseases are essential. To classify betel leaf diseases, several deep learning methods such as VGG16, VGG19, Resnet50, AlexNet, and InceptionV3 were applied using transfer learning, as well as some traditional machine learning approaches such as SVM and Logistic Regression. The dataset contains 5800 individual images of betel leave with two diseases (Stem Leaf and Bacterial Leaf Spot) that were captured using a mobile phone camera and preprocessed using Contrast limited adaptive histogram equalization (CLAHE) and Gaussian mixture model (GMM). Finally, the InceptionV3 reached the maximum accuracy of 94.83 % among the rest of the implemented algorithms, on an unseen test set with a total of 658 images.

**PID: 7188****Computer Vision Based Avalanche Monitoring and Warning System**

Md. Samiur Rahman, Ishtiak Al Mamoon, Tim Chen, John Chen, Tahmid Hussain Piash, Abul Lais M S Haque

**Abstract** – Avalanches due to excessive rainfall, typhoon and earthquakes are considered as major disasters in Taiwan. Avalanches cause severe threat to human life and property. Moreover, a large number of tourists attracted areas are under direct threat of avalanches which effects Taiwan tourism industry greatly. Therefore, developing an alert system for avalanches becomes inevitable. In this article, we have studied Taiwan's avalanche events and have developed a computer vision based alert system to reduce disaster risks. This epic computer vision process uses a basic multi-criterion guiding technique to illustrate angle data and various highlights. When examining the diversity of coordinating traits and elements, the breeding results show benefits. The avalanche detection and warning system developed in this research can provide data for disaster management and policymakers to strengthen offices and institutions in general and further develop disaster risk reduction methods.

**PID: 6781****Segmentation of Hemorrhagic Areas in Human Brain from CT Scan Images**

Abu Noman Md Sakib, Nipa Anjum, and Sk. Md. Masudul Ahsan

**Abstract** – Brain hemorrhage is potentially a fatal condition that results from internal bleeding in the human brain. In this study, Computed Tomography (CT) scan images have been used for segmentation tasks to pinpoint the area of hemorrhage. Unique data augmentation techniques using non-linear transformations like, Twirl and Spherical have been used along with traditional data augmentation techniques to increase variation in the dataset. The hemorrhagic portion of the brain in images that are easy to distinguish have been annotated to perform the segmentation task. The segmentation task was applied using U-Net and U-Net++ architecture. U-Net architecture has shown 84.33% Intersection over Union (IoU) and 91.34% dice coefficient score whereas U-Net++ has achieved 17.06% IoU and 28.27% dice coefficient score after applying some non-linear transformations on the dataset.

**PID: 9054****A Deep Feature Ensemble-Based Hybrid Model for MRI Brain Tumor Multi-Classification**

Hafiza Akter Munira, Md. Saiful Islam

**Abstract** – Even today, the diagnosis and classification of brain tumors still rely on the histopathological examination of clinical samples. The current method is invasive, cumbersome, and prone to human error. These shortcomings highlight the importance of implementing a fully automated deep learning based method for classifying brain tumors. The purpose of this research is to use a deep feature ensemble-based hybrid model to multi-classify brain tumors using convolutional neural network (CNN) and Machine Learning (ML) classifiers. Three CNN-based architectures namely 'HeuniNet', 'GlorotNet', and 'HenorNet' is proposed in this study and the top two features are chosen based on how well the proposed CNN model performs. Then, the top two features are concatenated to form a deep feature ensemble model, which is then used as input by three ML classifiers to predict the outcome. Random Forest (RF), Support Vector Machine (SVM), and K-Nearest Neighbors (KNN) are the three ML classifiers used in this study. The SVM outperforms other classifiers, achieving 94.95% accuracy with features extracted from the deep feature ensemble model. The experimental findings demonstrate that the proposed ensemble-based hybrid model can help improve the accuracy of the multi-class (glioma, meningioma, normal, and pituitary) dataset containing 3264 brain images.

**PID: 4729****Sign Language Recognition for Bangla Alphabets Using Deep Learning Methods**

Md. Saiful Islam, Dhruvajyoti Das, Saurav Das, and Md. Nahid Ullah

**Abstract** – Language is an essential aspect of communication. We can understand and communicate each other's feelings through language. However, certain members of our society cannot talk or usually listen, leaving them with only sign language as a means of communication. Although researchers put a lot of time and effort into deciphering sign languages, most of their efforts have been focused on sign digits, and some are limited to simple samples. To address these prevalent concerns in earlier research, we created a new dataset of Bangla alphabets consisting of 2340 samples with different backgrounds. We also proposed a custom CNN architecture and compared its performance with other state-of-the-art models like ResNet, EfficientNet InceptionV3, and VGG19. All state-of-the-art models were trained and evaluated with custom dataset weights and ImageNet weights, and the best results were compared to our custom CNN. Our custom CNN did better than all the state-of-the-art models on our dataset with 92% accuracy.



**Day- 02: 18 Dec 2022, Time: 11:30 AM, Technical Session- 03, Parallel Session- 01**

Venue: PCR-306, Session Chairs: Prof. Dr. Abdul Hasib Chowdhury, Dr. Ahmed Al Mansur

**PID: 1109** | **Effects of Aging Factors on PV Modules Output Power: An Experimental Investigation**  
Tuhibur Rahman, Ahmed Al Mansur, Shyful Islam, Md. Imamul Islam, Md. Sahin, Md. Razibul Awal, ASM Shihavuddin, Mohammad Asif Ul Haq

**Abstract** – The importance of renewable energy is enormous in which solar energy plays a significant role. The power degradation rate of solar panels increases with time due to aging factors. The degradation rate of solar panels is mostly triggered by aging factors like dust, discoloration, delamination, and cracks. In this paper, an experimental investigation has been done for 8 years aged 30W and 10 years aged 40W PV modules considering dust, discoloration, delamination and crack. A comparative analysis of the performance parameters of the aged modules is performed with pre-clean and post-clean conditions. The results indicate that the output power of the aged modules becomes double after cleaning. In addition, the effect of different amounts of dust deposition on the PV outputs is analyzed by considering the output power, voltage, and current. Experimental results show that the PV output power degradation rate gradually increases with dust density.

**PID: 1577** | **A LED-based Functional Light Source for the Characterization of Thin Film Solar Cells**  
Md. Saidul Islam, Syed Farid Uddin Farhad, Md. Saidul Islam, Nazmul Islam Tanvir, and Suravi Islam

**Abstract** – A light source of selective functionalities of wavelengths, illumination periods, and intensities is desirable for investigating performance parameters as well as the quality of different layers and interfaces of solar cells. Conventional light sources used for these types of research are expensive, space-consuming, cumbersome to work with, and have limited functionalities. We have developed a light source with variable wavelength, intensity, and illumination period to address these issues using an illumination period control unit, voltage regulator, neutral density filter, alterable light emitting diodes, etc. As a proof-of-concept, we employed our constructed light source to investigate the intensity, wavelength, illumination period modulated photovoltaic, and impedance properties of inorganic thin film solar cells such as cadmium telluride (CdTe) and copper zinc tin sulfide (CZTS) using lights of wavelength 410, 520, and 635 nm. We hope to use this light source for photophysical and photochemical studies of metal oxide materials used for renewable energy research.

**PID: 5528** | **Soil Impact on Photovoltaic Performance: A Laboratory-based Investigation**  
Jubayed Hossain Turag, Mohammad Amdadull Kabir, Md. Naim Al Hasan, Ahmed Al Mansur, Md. Imamul Islam, Mohammad Asif Ul Haq, Ratil H. Ashique, ASM Shihavuddin

**Abstract** – The reduction in power production due to dust deposition on the solar module surface is a significant issue that deserves much greater attention in the academic literature. The purpose of this study was to assess the performance loss of crystalline photovoltaic modules caused by natural and artificial dust deposition. Dust is made up of powdered sand grains and particles of various substances. Dust comes from a variety of sources. Dust in the atmosphere is an aerosol, and it can affect climate change in large amounts. Accumulation of airborne particles on photovoltaic cells may reduce the transparency of solar cell glazing, resulting in a considerable reduction in photovoltaic module solar conversion efficiency. Dust deposition is influenced by the module's tilt angle, exposure time, site climatic factors, wind movement, and dust characteristics. This study provides a brief overview of the power yield losses induced by soil accumulation on solar modules, as well as the findings of laboratory experiments. Soil samples were gathered from both natural and artificial dust depositions.

**PID: 8346** | **Forecasting of Solar Photovoltaic Output Energy using LSTM Machine Learning Algorithm**  
Md. Badrul Ahsan Tamal, Md. Ahsanul Alam, Md. Nayem Sharker, Mohibul Islam Sazib

**Abstract** – Due to its appealing qualities, solar photovoltaic (PV) energy generation has received much attention worldwide by the researchers and practitioners. However, the biggest challenge in producing solar energy is the unpredictable intermittent power output of PV systems, which is mostly caused by weather conditions. This variation in power generation usually causes significant economic loss. Accurate forecasting of output power a day ahead or hourly ahead is the efficient way for the management of the power production. This paper proposes a dependable short-term, hourly-ahead forecasting method of PV power generation for the delivery and storage mostly for the grid optimization. A long short-term memory (LSTM)-based deep learning method is used for its dependability for the long data along with feature of time series data. The historical dataset from 1990-2013 in Australian locations were used. By appropriately functioning dependent features with the independent features a correlation between them is developed. This resulted in excellent power output forecast of RMSE 0.27%. The accuracy of this simple system is much better than the recently proposed more complex hybrid system like LSTM+CNN, LSTM+SVM+RNN.

**PID: 9607** | **Solar Battery Charging Station for Electric Vehicles: Part I- Screening, Modeling, and Feasibility Analysis**  
Md. Sazal Miah, Nazmul Akter Shahin, Md. Shakib Ibne Ashrafi, Md. Hasan Maruf, Molla Shahadat Hossain Lipu, Ratil Hasnat Ashique, D.M Saaduzzaman and ASM Shihavuddin

**Abstract** – This is the first of a set of papers dealing with the screening, modeling, and feasibility analysis of solar battery charging stations in Bangladesh. Increased use of renewable energy will reduce the price and demand for fossil fuels. Photovoltaic solar energy is mainly used for various purposes such as heating, cooking, and power generation. Recent discoveries have helped in the development of solar-powered vehicles. To provide adequate charging rates, the increasing use of electric cars and hybrid electric vehicles necessitates the development of efficient charging stations. This will overload traditional networks, increasing charging costs. As a result, the use of onsite renewable sources such as photovoltaic electricity in addition to conventional grids can improve charging station performance. On the other hand, PV is known for its discontinuous nature, which is highly dependent on geographical and meteorological conditions. To account for PV's intermittent nature, the battery storage system is integrated with PV in a grid-connected system to assure the PV-based hybrid charging station's reliable functioning. In general, hybrid-powered charging stations should be cost-effective, have higher efficiency, and have better reliability to meet the fluctuating demand for electric vehicle loads under various circumstances. This paper will demonstrate the system design and performance analysis of solar electric vehicle systems, as well as propose a design of solar charging stations for EVs to address the ever-increasing energy demand for electric vehicles in the near future and to reduce the problems encountered in the process of utilizing renewable energy.

**Day- 02: 18 Dec 2022, Time: 11:30 AM, Technical Session- 03, Parallel Session- 02**

Venue: PCR-307, Session Chairs: Dr. Monirujjaman Khan, Dr. Nazmus Shakib

**PID: 1721** | **Design and Development of an IoT-based Smart System to Monitor and Control Environment of a Laboratory**  
Md. Motinur Rahman, Subrata Saha, Md. Ziaul Hasan Majumder, Fahmida Akter, Mohammad Abu Sayid Haque and Md. Anzan-Uz-Zaman

**Abstract** – This work represents a microcontroller-based automated system employed to monitor and control the laboratory environment from the cloud. A standard LDR (Light Dependent Resistor) based light sensor was developed and a DHT (Digital Humidity and Temperature) sensor is used to acquire surrounding humidity, temperature and light intensity data. The performance in measuring light level by the developed LDR system deviates about 10 % from the light level measured by the digital light sensor GY30. These data are displayed



on a Liquid Crystal Display (LCD) and can be accessed from the cloud as well as stored in the memory of the device. The system also allows a user to set humidity and temperature values directly or from the cloud and the system maintained the specified set values automatically. A separate module has been used for making communication with the cloud to facilitate monitor and controlling the laboratory environment using the mobile application. We are anticipating that the automated system may be expedient for optimization of the laboratory environment for different sophisticated instruments and thus may explore the novel applicability of IoT (Internet of Things) in different areas such as Intensive Care Units (ICU) of hospitals, production facilities of industry and research laboratories.

**PID: 5091** | **IOT Based Transformer Load Sharing & Health Monitoring System**  
Umma Syda Akther, Nazmush Sakib, Ratil H Ashique, and Rukhshana Parvin

**Abstract** – A transformer is basically a static device that transmits electrical power with the desired change in voltage and current at a steady frequency from one circuit to another circuit. It is the only device that performs at its optimum level of efficiency under full load conditions. However, overloading can cause abnormal conditions which may result in serious problems in the future. To avoid this situation, a separate standby transformer is used to supply the load during overload of the main transformer unit, which is automatically turned on by the Arduino microcontroller. As a result, both transformers will be efficiently loaded. Additionally, both transformers can be turned on to provide the load alternately when the load is normal. Sensors such as temperature and humidity sensors, flame sensors, and ultrasonic sensors for oil level indication are added to the NodeMCU providing a real-time monitoring system, so all sensor data can be monitored in real-time from anywhere on the Blynk IoT platform. Additionally, this arrangement provides a convenient maintenance facility for both transformers and load protection. With all these advantages, this system will be incredibly effective and reliable.

**PID: 7678** | **Cloud-Based Solar-Powered Remote Sensing and Monitoring for Severely I11 Patients Vitals to Ensure Appropriate Treatment and Medical Team Safety**  
Mohammad Rejwan Uddin, Palash Das, Mahabub Hasan Rafi, Marium Ahsan, and Mahady Hasan

**Abstract** – Currently, a big issue is people's inability to gain entry to health monitoring systems. Internet of Things (IoT) based solutions to remotely track a patient's vitals are abundant in the fight against this issue. In this article, an IoT based health monitoring system that can track the patient's core body temperature and heart rate remotely for remote or fatally infected areas, has been developed. With this device, doctors may get accurate readings on the patient's vitals every 10 seconds. This system will collect that data from the patient's body and transmit it to an IoT cloud platform. This will make the information accessible from anywhere with an internet connection. The patient's condition can be tracked in real time, where it can be accessed by the treating physician or other authorized personnel. For remote camping, power efficient solar-battery system also initialized to empower low power medical equipment with vaccine storage to ensure remote health facilities. The system performance was evaluated and presented with field implementation.

**PID: 6904** | **Machine Learning for Load Forecasting in a Green Data Center**  
Md. Shakil Ahmed, Swapnil Biswas, Md. Jobayer Rahman, Md. Habibur Rahaman Alhadi, Rifat Ara Moon, and Md. Motaharul Islam

**Abstract** – Since green cloud computing became a significant advancement in the world of computing in the past few years, its user base has been consistently expanding. Companies are adding more hosts and servers to their data centers to keep up with the ever-growing demand for cloud services. So, these huge servers use a lot of energy, raise costs, and put out a significant amount of greenhouse gasses. Also, even devices that are not being used use a lot of energy. Also, when CPU use reaches its peak, it is hard to keep node clusters running and use less energy. In this paper, we propose machine learning models to determine the minimum execution time. These models reduce the work done by machines and make sure that requests are managed correctly in data centers. Therefore, the purpose of this study is to present an effective strategy for the management of energy with a focus on the sustainability of green cloud data centers.

**Day- 02: 18 Dec 2022, Time: 11:30 AM, Technical Session- 03, Parallel Session- 03**

Venue: PCR-309, Session Chairs: Prof. Dr. Syed Akhter Hossain, Prof. Dr. Ahsan Habib Tareque

**PID: 2309** | **Identification of Influential Genes for Lung Cancer Using Machine Learning Approaches**  
Md. Imam Hasan, Sabikun Nahar, Bithy Roy, Humayan Kabir Rana, Nitun Kumar Podder, and Shudeb Babu Sen Omit

**Abstract** – Lung cancer (LC) is a kind of cancer that develops in lung tissues, most often in the cells that line the airways. It is the second most severe disease in the world, and making predictions about it is the hardest thing to do right now. As most of the cancer cells overlap with each other, it is difficult to detect the cells. However, it is very important to find cancer cells in their early stages. Understanding the molecular pathways behind how LC starts and spreads can help with early diagnosis, treatment, and figuring out how likely it is to get better. However, it is still insufficient, and more research is needed in this regard. In the case of treatment for LC, the identification of influential genes (IFGs) is very important. Thus, to further contributions, we have taken the Cancer Genome Atlas (TCGA) data-set to detect the IFGs of CRC using Kruskal-Wallis H test and Bonferroni correction methods. Then we have successfully identified 14 IFGs from 17518 genes and using the fold change values and heat-map plot, we separated the up and down regulated genes. Apart from this, the accuracy of our suggested method was predicted using a classifier algorithm known as the Support Vector Machine (SVM), and we discovered an accuracy of 84.54% which is satisfactory. Furthermore, the identified 14 significant genes may be employed in additional lab-based analysis and to create therapeutic treatment options, perhaps leading to a new understanding of the progression of LC.

**PID: 2681** | **Bangla E-Commerce Sentiment Analysis Using Machine Learning Approach**  
Sunjare Zulfiker, Ankur Chowdhury, Dip Roy, Shukdev Datta and Sifat Momen

**Abstract** – In this paper, a machine learning approach is used to predict user sentiments from Bangla texts about products available on e-commerce sites. In order to accomplish the task, we have constructed a Bengali corpus of the public views about products and services of multiple Bangladeshi E-commerce organizations. Besides, we have applied six different machine learning algorithms (Multinomial Naive Bayes (MNB), Logistic Regression (LR), Support Vector Machine (SVM), Decision Tree (DT), Random Forest (RF), and Stochastic Gradient Descent(SGD)) to predict and analyze the polarity of public sentiments. Term Frequency–Inverse Document Frequency (TF-IDF) technique has been applied by using Trigram features. Finally, after optimizing the hyperparameters using the RandomizedSearchCV algorithm, SVM classifier has been found to demonstrate the highest accuracy of 90.68% for predicting public sentiments.

**PID: 5490** | **Performance Analysis Rice Yield Model based on Historical Weather Dataset in Bangladesh**  
Ahmed Abdullah, Mehzabul Hoque Nahid

**Abstract** – This article intends to develop a method for evaluating the performance of the Rice Production Model in Bangladesh based on Historical Weather Dataset. In order to extract highlevel information from enormous meteorological datasets, machine learning models are increasingly widely used for rice yield production projections. Throughout the course of this research, a number of different machine learning models, such as Radial basis function, Multiple Linear Regression, Support Vector Regression and Multilayer Perceptron were constructed in order to make predictions about the production of rice. Mean Square-Error, Mean Absolute-Error, Root Mean SquareErrorA and the correlation coefficient  $r$  were calculated to evaluate the performance of these models. Maximum and Minimum temperature, rainfall, and humidity are the climatic factors considered to develop and evaluate the frameworks. The model was developed using climatic and rice yield data from Bangladesh's fifteen regions between 2006 and 2016. The result indicate that the Support Vector Machine Regression (SVR) exceeds other existing frameworks for reliably predicting future rice yields in Bangladesh leveraging the developed framework, as shown by the findings.



**PID: 4943****Contourlet Transformed Nakagami Image-based Breast Tumor Classification Using Deep CNN**

Shahriar Mahmud Kabir, Mohammed Imamul Hassan Bhuiyan, Md. Alfew Rahman, Md. Abdul Aziz Prodhon, Md Faysal Miah, ASM Shihavuddin

**Abstract** – It is still unexplored territory to automate the distinction of breast tumors using breast ultrasound (US) images. The parametric image-based approach described in this research employs convolutional neural network architecture using breast ultrasound images, to categorize and determine which breast tumors are benign and which are malignant. In this case, the contourlet transform is used to summarize the statistics of ultrasound imaging data using the Nakagami distribution as a helpful model. The proposed convolutional neural network is applied to classify breast tumors by parametric imaging produced by values of the Nakagami distribution's dispersion parameters which were calculated locally in various contourlet sub-bands. In this experiment, 100 benign fibroadenomas and 100 malignant fibroadenomas were considered from a publicly accessible dataset of 780 breast US images. The proposed technique has a 96% accuracy, 96.94% sensitivity, 95.1% specificity, 95% PPV, and 97% NPV, respectively. Furthermore, the Proposed Method's precision is superior to few recently reported findings.

**PID: 9315****Sedimentation Analysis on Padma River Using Machine Learning Techniques**

Md. Ruhen Hossain Bhuiyan, Niloy Saha Roy, Monoshi Kumar Roy, Md. Sultanul Islam Ovi, Faiz Al Faisal, and Muhammad Aminur Rahaman

**Abstract** – This research aims to predict the sedimentation rate in Padma River and to illustrate the rate of accuracy for water and land classification based on various machine learning algorithms. Increased sedimentation can cause utter problems for the organisms living there. Moreover, the water flow could be changed; the depth of the water can be lessened because of river sediment deposition, making boating and recreational use extra tough. This study comprises sedimentation for the last five years and how it will influence the surrounding environment, ecology, and socio-economy in the upcoming years, predict future areas that are subject to deposition, and show the accuracy of different machine learning algorithms for water and land classification. To conduct this research, we used a dataset consisting of images of Padma River (close to Naria in Shariatpur district of Bangladesh), collected from satellite, and run image processing techniques on it. We have obtained an accuracy of 97.5% for the image of 2018 and 99.17% for the image of 2019 using K-means. On the other hand, we obtained accuracy of 91.67% for images of 2018 and 95% for the image of 2019 using a self-organizing map (SOM). However, random forest (RF) shows the best results, having an accuracy of 97.5% for the image of 2018 and 100% for the image of 2019.

**Day- 02: 18 Dec 2022, Time: 11:30 AM, Technical Session- 03, Parallel Session- 04**

Venue: PCR-404, Session Chairs: Dr. Sajid Mohaimin Chowdhury, Dr. A. A. Monzur Ul Akhbar

**PID: 2393****Spherical and Rod-shaped Gold Nanoparticles for Surface Enhanced Raman Spectroscopy**

Md. Shaha Alam, Syed Farid Uddin Farhad, Nazmul Islam Tanvir, Md. Nur Amin Bitu, Mohammad Moniruzzaman, Mahmuda Hakim, and Md. Aftab Ali Shaikh

**Abstract** – Raman Spectroscopy offers an in-situ, rapid, and non-destructive characterization tool for the chemical analysis of diverse samples with minimal or no preparation. However, due to the inherent weak signal of conventional Raman spectroscopy, surface plasmon resonance features of diverse nanostructures have been utilized to conduct Surface Enhanced Raman Spectroscopy (SERS) in detecting trace label contaminants in foods and foodstuffs. In this effort, we synthesized gold nanoparticles (AuNPs) by reducing chloroauric acid (HAuCl<sub>4</sub>) using sodium citrate dihydrate. We prepared different sizes of AuNPs at a fixed temperature (100 °C) but with two different pHs, 4 and 8. UV-Vis spectroscopy, Dynamic Light Scattering (DLS), and Field Emission Scanning Electron Microscopy (FE-SEM) were used to analyze the synthesized AuNPs. FE-SEM micrographs revealed spherical AuNPs with an average diameter of  $\sim 55 \pm 13$  nm and

rod-shaped AuNPs with an average length of  $\sim 170 \pm 36$  nm for samples synthesized at pH 8 and 4, respectively. The effectiveness of the as-prepared AuNPs for SERS is tested by detecting Rhodamine 6G (R6G) diluted at a trace level. This study suggests that plasmonic nanoparticles coupled with SERS have great potential for wide applications in detecting other trace amounts of hazardous elements in foods and foodstuffs.

**PID: 5156****A 7nm Gate-All-Around Nanowire n-FET for DNA Sequencing**

Mohammad A. Islam, Azmin Islam, Palash K. Datta, Harley R. Myler

**Abstract** – DNA sequencing is one of the most important technologies of modern times, yet rapid, accurate, and cost-efficient techniques have been slow to be developed. One of the more recent advances takes advantage of semiconductor sensors in the determination of the sequence of base-pairs in targeted DNA molecules. Here we present a novel design and TCAD simulation-based study for a 7nm Gate-All-Around (GAA) nanowire MOSFET that detects charge variations of component nucleotides in a DNA structure.

**PID: 8996****A DFT Investigation on Structural, Electric, and Thermodynamic Properties of Transition Metal (Cr, Mo, and W) Doped in Small Arsenic Cluster (As<sub>15</sub>)**

Aoly Ur Rahman, Dewan Mohammad Saaduzzaman, Syed Mahedi Hasan, and Md. Kabir Uddin Sikder

**Abstract** – Finding suitable doping locations on a nanocluster for a particular dopant is one of the major considerations that need to be completed before efficient doping can take place. The electric, thermodynamic and structural properties of the pure As<sub>15</sub> nanocluster along with the TMdoped variants in two distinct positions are investigated. The investigation confirms that side-position doping is more suitable than front-position doping. Also, doping of transition metals (Cr, Mo, and W) causes structural, thermodynamic, and electric stability to the arsenic nanocluster. Among all the doped nanoclusters, As<sub>14</sub>-Cr-S comprises the lowest average bond length of 2.65 Å and optimum average binding energy of -3.72 eV. Also, its other electric and thermodynamic properties certify its structural stability and potential reactivity. So, As<sub>14</sub>-Cr-S may be a suitable option for further research and technological applications.

**PID: 9176****Mathematical Models for Tumor Cell Growth Estimation: An Analytical Review**

Uparna Singha, Aoly Ur Rahman, and Md. Kabir Uddin Sikder

**Abstract** – The augmentation of the volume of the tumors over time is quantitatively described by the tumor growth models, which have been explored in this work. These models expose a range of features of tumor cell growth from straightforward exponential growth depending on one parameter to more complex growth relevant to a large number of factors. Typically, differential equations are used to connect tumor growth rate to metastatic status and serve as the underlying formalism for these concepts. Models frequently serve as a theoretical foundation for understanding the complexity of tumor growth, its expansion, and different critical conditions in the affected subjects. This crucial understanding depends on the underlying assumptions of the models. Comparison between the models has helped to predict how tumors grow over time. The graphical representation of experimental data shows that the Gompertzian model explains the tumor growth over time more appropriately and suits best for Gompertzian parameter  $\alpha = 0.1$  and carrying capacity  $\theta = 8$ . Also, some other suitable combinations of  $\alpha$  and  $\theta$  may be a potential modification for explaining different stages of tumor growth. Despite significant advancements and achievements over the last several decades, further works and new modifications on models of tumor growth are essential to comprehend its complexities more clearly.



**Day- 02: 18 Dec 2022, Time: 11:30 AM, Technical Session- 03, Parallel Session- 05**

Venue: PCR-602, Session Chairs: Prof. Dr. Rezwan Khan, Dr. Nazmus Shakib

**PID: 4640 | Study on Plausible Application of Bangabandhu Satellite -2 as a Search and Rescue Satellite Under Cospas-Sarsat Programme**  
A. A. M. Shah Sadman

**Abstract** – To conduct the search and rescue operation rapidly, a satellite aided system, named Cospas-Sarsat, is providing excellent support by monitoring distress signals anywhere in the world and providing distress location to the concerned authority. A range of satellites with SAR transponders are being utilized for the purpose of relaying the signal to the ground segment. Bangladesh is conceptualizing the operation and application of its second satellite as a hybrid satellite, emphasizing on weather monitoring, disaster support etc. which can also be utilized in SAR activities. This paper discusses about the possibilities of exploiting BS-2 as a SAR satellite under the guidance of Cospas-Sarsat. The transponder and the distress beacon design have been described with the signal transmission technique between satellite and ground segments. Additionally, a coding and modulation method, 4D-8PSK-TCM has been discussed which can be implemented to achieve higher power efficiency followed by antenna specification for SAR system. To establish communication with BS-2 to other SAR satellites, the Inter Satellite Optical Wireless Communication (Is-OWC) technique has been also reviewed.

**PID: 4936 | Design and Analysis of a Dual-Band Miniaturized Rectangular Patch Antenna for Millimeter-Wave Applications**  
Md. Omar Faruk Noman, Arif Istiaque and Md. Azad Hossain

**Abstract** – In this work, a miniaturized, dual-band rectangular patch antenna for 5G millimeter-wave applications is introduced. It employs a slotted patch structure mounted on a FR-4 substrate with thickness of 0.8mm to achieve dual frequency characteristics. The antenna has a simple architecture and an overall dimension of  $8 \times 8 \times 0.87$  mm<sup>3</sup> which is significantly smaller compared to other traditional patch antennas. The operating frequencies of antenna are 30.65 GHz and 38.75 GHz respectively which falls inside the range used by the 5G network. The antenna has been modelled and simulated in CST microwave studio. Proposed structure shows excellent results with S11-parameters of -37.0 dB and -56.84 dB and bandwidths of 2.32 GHz and 3.5 GHz at the operating frequencies respectively. The antenna exhibits a highly directional far-field pattern with directivity of 5.33 dBi and 7.62 dBi at 30.65 GHz and 38.75 GHz. Proposed antenna is able to achieve excellent performance while maintaining a compact form factor, thus making it more efficient to utilize in 5G wireless and cellular systems to meet the requirements of 5G.

**PID: 5755 | Design and Performance Analysis of a Novel 3.5 GHz Q-Slot Antenna for Body-Centric Communications**  
Md. Aminur Rahman Talukder, H. M Arifur Rahman, Mohammad Monirujjaman Khan, and Ratil H. Ashique

**Abstract** – Antennas are highly essential elements in Body Centric Communication for creating linkages between bodymounted devices and off-body components. The performance of the antenna changes to that of free space operation when it is attached to the body. It is very important to investigate the proper antenna design for the body area network. This research proposes a Q-slot small 3.5 GHz antenna for Body Centric Communications (BCC). The antenna achieves a return loss of 32.94 dB and a highest free space gain of 2.87 dBi, with a radiation efficiency of 53.58 percent. The antenna has a physical dimension of 40 mm x 30 mm x 1.67 mm. Because of its compact size, FR4 substrate, and excellent results, the antenna performs quite well in terms of efficiency, bandwidth, radiation patterns, and realized gain. An artificial 3D torso phantom was used to replicate the human body with all its essential electromagnetic properties, which was used for the on-body simulation. Moreover, the antenna's on-body performance was likewise quite balanced, except for a small amount of return loss and gain value reduction.

**PID: 3253 | Design of a Slotted Patch Circular Antenna Array for Breast Tumor Identification**  
Ishrat Jahan, Md. Omar Faruk Noman and Md Ahasan Kabir

**Abstract** – Breast cancer has been one of the main causes of death in women in the last few decades, highlighting the need for more accurate methods of early detection that can facilitate more rapid and efficient treatment. X-ray mammography, magnetic resonance imaging (MRI), and ultrasound are all diagnostic tools for the early diagnosis of breast cancer. But they are constrained in some ways. For example, X-ray mammography, the most popular breast screening procedure, can miss cancer detection due to low tissue contrast and radiation exposure. In comparison to X-ray mammography, microwave imaging is safer for patients and offers higher detection rates. MBI utilizes differences in the electrical characteristics of fatty breast tissues and abnormal ones to diagnose breast cancer. This paper compares and contrasts four different microstrip patch antennas operating at 2.45 GHz for use in microwave breast imaging in the ISM frequency band. These antennas can identify tumors by analyzing and comparing their s-parameter, E-field, H-field, radiation pattern, and specific absorption rate (SAR). By placing each antenna separately on the breast skin and analyzing the field values and surface current density differences between the healthy and malignant tissue of the breast phantom designed and simulated in CST STUDIO SUITE, a single antenna is selected for the six-element antenna array to increase tumor detection sensitivity.

**PID: 7119 | TT-Mote: An Architecture towards Perpetual Wireless Sensor Networks**  
Ram Kaji Budhathoki and Deepesh Prakash Guragain

**Abstract** – Most sensor nodes are battery-powered, and often need periodic replacement, limiting their usage in remote places. Various energy harvesting sensor nodes and different power optimization algorithms, like deep sleep methods, are in practice to address this problem. Even in deep sleep mode, most sensor nodes consume significant power as this sleep duration is usually longer than the standard operating time. This paper presents a novel method that harvests solar energy, uses BQ25570 for energy management, a supercapacitor to store energy, and uses LoRa for communication. The proposed architecture employs programmable timers to shut down the sensor node, reducing power consumption and eliminating energy in deep sleep mode. The timer-triggered sensor node's activity was monitored for 15 days, transmitting data every 10 minutes. It is observed that even in low-light conditions, the sensor node may operate for more than seven days. Considering a periodic wake-up at every 10 seconds and sleep duration of 3 seconds, it was found through experimentation that a timer-triggered sensor node conserves 595 milliwatts of energy every day compared to a sensor operating in a deep sleep mode.

**Day- 02: 18 Dec 2022, Time: 11:30 AM, Technical Session- 03, Parallel Session- 06**

Venue: PCR-506, Session Chairs: Prof. Dr. Lal Mohan Baral, Dr. Jagannath Biswas

**PID: 5124 | Investigation of the Performance of Hemp-Containing Recycled Fabrics with Digital Design**  
Ayşe ŞEVKAN MACİT, Fatih AYTEKİN, Seher KAYA and Eren ÖNER

**Abstract** – Within the scope of this study, it is aimed to determine the performance of knitted fabrics produced from yarns containing hemp and recycled cotton in different proportions with the fabric kit system and to examine them in digital environment with the Vizoo 3D system. For this purpose, the knitted fabrics were systematically produced from the yarns containing different proportions of hemp, recycled cotton and polyester fibers. The properties such as bending, elongation, thickness, and mass per unit area of the obtained knitted fabrics were measured with the fabric kit system, and transferred to the digital environment via the Vizoo system. Many different variants could be obtained without producing in digital environment and the fabrics were examined in digital platform. According to the fabric kit results, it was observed that the mass per unit area, thickness, stretch (wale direction) and bending values are decreased with the use of finer yarn count. It has been observed that the increase in the hemp ratio in the blend reduces the stretch values of the fabrics. With the help of the Vizoo, fabric kit and Clo3d processes, it has also been demonstrated that different final versions referred to digital fabric twin can be seen easily by examining the same fabric by making use of digitalization.



**PID: 6580** | **Ultra-sensitive detection of nitrate ions by Cu-electrodeposited gold electrode**  
Abrar Yasir Abir, Ishmam Ibnul Arabi, Mohammad Shariful Alam, Jannatul Ferdousi Moon and Mohammad A. Hasnat

**Abstract** – The electro-catalytic reduction of nitrate ions in a neutral medium was performed at the Cu-immobilized Au surface. The cyclic voltammetric investigations showed that the Cu/Au electrode has an enhanced electro-catalytic effect on the reduction of the nitrate ion to nitrite ion followed by two electrons transfer process. This Cu/Au electrode displayed an excellent sensitivity ( $3.2518 \mu\text{A}\mu\text{M}^{-1}\text{cm}^{-2}$ ), a very wide linear detection range (0.1 to 111.4  $\mu\text{M}$ ), an ultra-low limit of detection ( $3.5 \pm 0.1 \text{ nM}$ ) and exhibited excellent performance in real sample analysis. Thus, Cu/Au-based electrode is proposed as an electrochemical sensor for nitrate determination in an aqueous medium.

**PID: 7454** | **Effect of Elastane on Physical Properties of Double Jersey Knit Fabric for Active Wear**  
Md. Kaikobad, Md. Omar Faruque, Mehnaz Jebin, Suraiya Ireen and Md. Mahbubur Rahman

**Abstract** – The dimensional and physical properties of double jersey fabrics (rib and interlock) vary due to different elastane (Lycra) consumption rates, which have a significant impact on its end-use. The goal of this research is to investigate how it varies when fabrics are produced from the same yarn type, count, stitch length, but a different elastane consumption rate, and knitting machines with the same gauge and diameter. In addition, the dimensional and physical qualities of rib and interlock fabrics are compared in this study. Physical properties such as fabric density, stitch density, GSM, shrinkage percentage, bursting strength, pilling, extension and recovery percentage were analyzed for five 1x1 rib fabrics and five 1x1 interlock fabrics made with varying elastane consumption rates by adjusting elastane feeding tension. Finally, it was found that while increasing elastane consumption rate by lowering elastane feeding tension, fabric bursting strength, and residual extension percentage increased, but fabric WPI, CPI, stitch density, GSM, recovery percentage declined. When compared to 1x1 rib fabric, 1x1 interlock fabric exhibited higher stitch density, GSM, bursting strength, pilling grade, residual extension percentage and better shrinkage property, making it more suitable for active wear. This study would assist commercial knit fabric manufacturers in comprehending the effect of elastane on fabric qualities.

**PID: 7975** | **Performance Analysis of Effective Sensors for Determining Reliable Flare Altitude of Fixed Wing UAV**  
Muhammad Mahfuzur Rahman and Md Hossam-E-Haider

**Abstract** – Landing phase is the most critical and challenging phase of flying for any fixed wing unmanned aerial vehicle (UAV). GPS has been widely used as the primary navigation sensor for UAVs but the accuracy of GPS, without any form of augmentation, is not enough for autonomous landing where precise height estimation is mandatory for safe landing. Although, most of the fixed wing UAVs are equipped with autonomous landing system, still it is recommended to put a human pilot in the loop for a safer landing. In addition to GNSS and INS, state of the art fixed wing military UAVs are aided by ground-based landing radars for safe autonomous landing. Ground based landing radars are expensive as well as restrict operation of UAVs to specific runways equipped with radars. Now a days, RTK GPS receivers are getting cheaper and more accurate. Cheaper laser distance measuring sensor like LIDAR can also be used for precise altitude measurement. In this paper, altitude estimating performances of GPS, RTK GPS and LIDAR have been compared using Software in The Loop (SITL) simulation to find out which sensor works best as reliable flare altitude estimating sensor for fixed wing UAV.

**Day- 02: 18 Dec 2022, Time: 11:30 AM, Technical Session- 03, Parallel Session- 07**

Venue: PCR-601, Session Chairs: Prof. Dr. Hasanul Kabir, Prof. Dr. Mohammad Abu Yousuf

**PID: 365** | **Bangladeshi Local Vehicle Recognition with A Comprehensive Dataset using Transfer Learning Techniques**

Md Sazedur Rahman, Md Zahim Hassan, Syed Nahin Hossain, Noor Masrur and Jakaria Rabbi

**Abstract** – Vehicle detection, localisation, and classification are essential for developing an Intelligent Transport System (ITS). Bangladesh is a developing nation, and the number of vehicles here is increasing significantly each year. Therefore, the development of an intelligent transportation system has become crucial. In order to assess the models' performance and the dataset's suitability for the task, we developed a demanding dataset of Bangladeshi vehicles and trained a variety of pretrained models using it. The dataset contains 12,413 images of 9 most common local vehicle types of Bangladesh. We carefully examined the performance of the model on the image database. We proposed a model that provides the most accurate results for the localization, and categorization tasks of Bangladeshi vehicles. The study also indicates that the newly introduced dataset is more challenging and offers more similar scenarios that resembles real life situations than pre-existing datasets.

**PID: 4937** | **SkinNet: An Improved Skin Cancer Classification System Using Convolutional Neural Network**

Diponkor Bala, Md. Ibrahim Abdullah, Mohammad Alamgir Hossain, Mohammad Anwarul Islam, Md. Atiqur Rahman and Md. Shamim Hossain

**Abstract** – According to current research, skin cancer is now considered to be among the most potentially lethal types of cancer that may occur in humans. Early detection of skin cancer, especially malignant type, can be tremendously advantageous as it may increase the survival rate of patients. Computers can help in the medical field by assisting with diagnosis. A convolutional neural network and image processing technology-based automated system were utilized in this study to recognise skin cancer. The system receives images of skin lesions, which are examined to determine the presence of skin cancer. The most prominent result of our computer based investigation is that it provides accurate results comparable with human analysis. In this research, we used the power of CNNs to bear on skin cancer recognition. We built a robust CNN model named SkinNet from scratch and trained it on the popular HAM10000 dataset. We then increased its performance using common techniques, such as the data balancing technique namely SMOTE, to address the issue of class imbalanced of data. We obtained very good results, and we believe that in near future, CNNs will be able to outperform traditional diagnosis and probably replace expert dermatologists. Our proposed CNN architecture is capable of providing 98.60% of recognition accuracy on the data that has never been seen before. In fact, it will be enough to get significant results that could be used to enhance the survival rate of humans.

**PID: 7989** | **SERNet: A Novel Speech Emotion Recognition System Using Ensemble Deep Learning Approach**

Diponkor Bala, Mohammad Alamgir Hossain, Mohammad Anwarul Islam, Md. Atiqur Rahman, Md. Shamim Hossain and Md. Ibrahim Abdullah

**Abstract** – Speech is among the most natural methods for us as human beings to express ourselves. Due to the relevance of emotions in today's digital world of distant communication, their detection and analysis are crucial. Emotion recognition is extremely difficult since emotions are different for everyone. Speech emotion recognition is one area of application in which deep neural networks have excelled. Single learners have been used in the majority of the work done in this subject. We have developed a Speech Emotion Recognition (SER) system named SERNet that processes and classifies speech inputs to recognize emotions. As part of our research, we tried to explore emotional feelings in audio talks by looking at the acoustic characteristics of such recordings. This study proposes a novel approach using an ensemble of binary classifiers to simplify the



multiclass classification problem into a binary classification problem, aiming to improve overall model performance. The binary classifiers are ensembled using a multilayer perceptron to obtain their final predictions on the multiclass classification problem. Utilizing a benchmark dataset designed specifically for the purpose of speech emotion recognition, the efficacy of this strategy has been proven. On the basis of the findings of the experiments, with an accuracy of 98.81%, this technique exceeds the most advanced models currently available.

**PID: 7182** | **Implementation of Encoder-Decoder based Long Short-Term Memory Network for Short-Term Electrical Load Forecasting**  
Amit Deb Roy and Ashfaq Yeafi

**Abstract** – Electrical load forecasting has extensive importance in power system designing and optimization. Keeping pace with the growing economy and moving towards a digitalized network, Bangladesh Power System (BPS) has to be renovated in terms of efficient load forecasting strategies. To meet the issue, this research proposes an effective short-term load forecasting (STLF) technique based on a unique form of recurrent neural network (RNN) known as the Long Short-Term Memory (LSTM) network. A new dataset gathered from a public owned power company of Bangladesh, is applied into the model which will help to get a better and recent understanding of BPS load. Employing this viable method, one hour ahead electrical load of BPS can be forecasted easily with a minimized error rate (MAPE 2.29%). In addition, Random Forest (RF) regression model is used to compare with the forecasting results of proposed LSTM. Again, the proposed LSTM model is used to get predictions for the different months of a given year to visualize how much load fluctuation of BPS load takes place in different seasons. In case of STLF, the prediction outcomes on the Bangladesh's electricity load demand, indicate that the proposed model can work flawlessly in grid optimization with greater precision.

**PID: 9269** | **Martian Craters Detection Using Neural Network Approach from Grayscale Satellite Imageries**  
Nilay Chandra Barman, Nazmun Nessa Moon, Mohammad Monirul Islam, Refath Ara Hossain and Samia Nawshin

**Abstract** – Several remote sensing methods are used to conduct research on the solar system and numerous planets. Crater analysis may provide vital information about planets, such as their relative age. A model for crater detection will benefit data administration, data processing, and scientific investigation. Additionally, it will assist the development of enhanced landing systems. Even now, enhanced computer capacity enables us to do deep learning operations. Multiple computer vision challenges demonstrate the effectiveness of neural network-based designs. In crater detection, however, neural network-based designs are not widely used. We utilize grayscale satellite images of Mars to train YOLOv4, YOLOv4-tiny, and SSD MobileNetV2 FPNLite to locate craters. Despite being trained for fewer steps, the YOLOv4-tiny model achieved an assessment mAP of 0.8835% (0.50). In contrast to SSD MobileNetV2 FPNLite, which took 6000 training steps to get the same 78.58% mAP (0.50) score, the YOLOv4 model only required 2900 training steps to achieve the same result.

**Day- 02: 18 Dec 2022, Time: 03:00 PM, Technical Session- 04, Parallel Session- 01**

Venue: PCR-309, Session Chairs: Prof. Dr. Md. Mustafizur Rahman, Prof. Dr. Md. Motaharul Islam

**PID: 708** | **A New Perspective of Improving Initialization for Particle Swarm Optimization**  
Kamrul Hasan, Juhair Islam and Mohammad Ehsan Shahmi Chowdhury

**Abstract** – Particle Swarm Optimization (PSO) is a pretty efficient algorithm to optimize functions. PSO can be used when traditional optimization algorithms, like Gradient Descent, fail. However, initializing the initial population of the PSO algorithm with random initialization does not yield good results. The primary target of this research is to find a unique way of initializing the initial population, so that PSO performs better than the traditional PSO algorithm. This proposal implemented techniques from Genetic Algorithms and used a novel approach to solve the issue of initialization. Researchers have introduced various initialization techniques in

recent years to improve the performance of PSO. Low discrepant sequences like Sobol Sequence, Halton Sequence and Faure sequences have been used to initialize the initial population. But limitation with those initialization technique is that their performance degrades as the search space gets larger. In this research we were able to find better initialization methods, as well as a novel approach. Result comparisons on various scales proves the superiority of the proposed initialization method.

**PID: 5809** | **Blockchain in Human Resource Management to Hire the Right Candidate**  
Md. Mijanur Rahman, Md. Fahad Mollik, Mahmudul Hasan and Moriom Akter

**Abstract** – Nowadays, blockchain technology is a great and immersive technology like artificial intelligence, machine learning, and the internet of things. Blockchain is a complex and secure distributed ledger system that stores data with other information such as timestamp, and hash value in a block, and each block is connected with the other. With the help of blockchain technology, many problems can be solved. After conceptualizing blockchain technology, it has changed many sectors, such as health, education, and business, as well as human resource management (HRM). However, still, there are some gaps in this area. So in this paper, we are going to investigate and solve those. Hiring employees is a vital role of the human resource (HR) but it is not so easy to hire the right candidate. To hire the right candidate, checking the performance appraisals of his previous organization is a great method to know about him. HR often needs to know the candidate's performance appraisals from his previous organization as feedback, which is not as easy and trustworthy as the traditional way. A performance appraisal is a systematic way to review or evaluate an employee's organizational performance. This could be an incredible, reliable system for an organization's HR. In this paper, a blockchain-based performance appraisal system will be used to check the performance of an employee of a previous organization. This system will be trustworthy, secure, and anonymous.

**PID: 4298** | **A Hybrid Method for Analyzing the Situation Based on Cumulative Fully Vaccinated and Confirmed Cases of Covid-19 in Malaysia**  
Marzia Ahmed, Mohd Herwan Sulaiman, Ahmad Johari Mohamad and Mostafijur Rahman

**Abstract** – SARS-CoV-2 is an infection that affects several organs and has a wide range of symptoms in addition to producing severe acute respiratory syndrome. Millions of individuals were infected when it first started because of how quickly it travelled from its starting location to nearby countries. Anticipating positive Covid-19 incidences is required in order to better understand future risk and take the proper preventative and precautionary measures. As a result, it is critical to create mathematical models that are durable and have as few prediction errors as possible. This study suggests a unique hybrid strategy for examining the status of Covid-19 confirmed patients in conjunction with complete vaccination. First, the selective opposition technique is initially included into the Grey Wolf Optimizer (GWO) in this study to improve the exploration and exploitation capacity for the given challenge. Second, to execute the prediction task with the optimized hyper-parameter values, the Least Squares Support Vector Machines (LSSVM) method is integrated with Selective Opposition based GWO as an objective function. The data source includes daily occurrences of confirmed cases in Malaysia from February 24, 2021 to July 27, 2022. Based on the experimental results, this paper shows that SOGWO-LSSVM outperforms a few other hybrid techniques with ideally adjusted parameters.

**PID: 3650** | **An Article Recommendation Technique from a Multi-Layer Reference Article Graph for Facilitating Chronological Learning**  
Sharukh Rahman, Kazi Hasnayeem Emad, Saiful Azad, Mufti Mahmud, and M. Shamim Kaiser

**Abstract** – With the rapid growth of scientific publications, researchers often find difficulty in discovering appropriate articles that can mitigate the knowledge gaps to understand a target article (a.k.a., base article in his paper). In this case, reference articles can play an important role. It may happen that a researcher may have to read several levels of references, which is challenging since it increases exponentially over levels. This kind of learning method could be considered as the chronological learning. In this paper, a chronological learning supported recommender system is proposed, which utilizes the reference articles of multiple levels



for generating a multi-level weighted graph. The weights of the various nodes in this graph are calculated considering three scores, namely lexical similarity, time-aware influence, and node centrality. Among them, the equation for calculating the time-aware influence score is improved by taking citation counts into consideration so that the articles with the higher citation counts receive higher influence scores, which is more practical. From this graph, a chronological path is selected considering a weight-based selection process envisioning mitigating the knowledge gaps to understand a base article. Since the keyphrase extraction plays an important role in this system, various unsupervised keyphrase extraction techniques are evaluated to discover the most suitable relevant technique for the proposed system.

**PID: 1681** | **An Energy Efficient Model of Software Development Life Cycle for Mobile Application**  
Muhammad Aminur Rahaman, Md. Solaiman Mia, Mahbubur Rahman and Md. Maskawath Latif

**Abstract** – Software industries are rising rapidly and usage of IT devices are increasing exponentially. Energy has become a global concern amongst all software industries. Existing SDLC (Software Development Life Cycle) model cannot meet the energy related issues associated with the devices, particularly smartphones that have limited battery life. In this paper, we have proposed a modified SDLC model that contains total seven steps which includes requirement analysis, design, coding, EE (Energy Efficiency) analysis, unit testing, integration testing and deployment. Among them, our main contribution is on EE analysis which checks a code based on three parameters named Memory Usage, Execution Cycle (CPU Usage) and Energy Usage. The process starts from the coding phase which is the third phase of our proposed model. A loop starts in coding phase and continues up to unit testing phase including the EE analysis. This loop checks a code either it is efficient or not based on some criteria. Efficient data access pattern, data representation, data organization, data precision choice, I/O configuration, dead code elimination, code transformation & increase of concurrency can produce different impact in software execution. We have achieved significant change in energy usage and memory usage by applying the above mentioned techniques. Calculated energy usage and memory usage of a software developed by traditional agile method is 0.1259mW & 39.40%, respectively whereas our proposed model achieved 0.0119mW & 27.33%, respectively. Our proposed SDLC model mainly focus on coding phase and it can reduce energy consumption rate of a software.

**Day- 02: 18 Dec 2022, Time: 03:00 PM, Technical Session- 04, Parallel Session- 02**

Venue: PCR-307, Session Chairs: Prof. Dr. Moshikul Haque, Prof. Dr. Md. Golam Rabiul Alam

**PID: 3896** | **A Benchmark of Machine Learning and Deep Learning Algorithms for Detecting Fake News in Bangla Language**  
Nirjas Mohammad Jakilim, SM Mahamudul Hasan and Enamul Hassan

**Abstract** – Due to the ease with which information may be obtained and the exponential growth in the amount of information available on the internet, it has become more challenging to differentiate between false and genuine information. Any of these fake news websites may easily infect people due to their fabricated claims. This situation has a significant impact on the offline community in general. As a result, interest in this subject has grown. A critical study has been conducted on identifying fake news in English and other languages, save for a few in Bangla. Our research shows an experimental benchmark investigation into identifying false news on a Bengali news website since there is less work in this domain. This research analyses 11434 fake news and true news in the Bengali language and evaluates the performance of machine learning and deep learning algorithms to create a benchmark for detecting Bangla fake news. This research compares the model's performance to a variety of linguistic characteristics and word vectorizers. The best accuracy obtained for lemmatized text is 95.45% for TF-IDF with the SGD classifier and 95.10% for the count vectorizer with the MLP classifier. For stemmed text, we received the best accuracy of 94.9% for the Count Vectorizer with MLP classifier and 94.83% for TF-IDF with MLP classifier. Among deep learning models, RNN gave the best performance with 96.55% accuracy where the f1 score is 0.96. The pre-trained Bangla BERT model gave an F1-Score of 0.96 and showed an accuracy of 93.35%.

**PID: 6716** | **A Multiclass Approach to Identify Misogynistic Bangla Text from Social Media**  
S.S. Saruar Jahan, Peom Dutta, H.M. Mahdi Hassan Khan, Md. Shahariar Karim Badhon and Raqeebir Rab

**Abstract** – Misogyny is defined as hostility, dominance, harassment, intimidation, and violence against women. Social media networks are rapidly developing. As a result, misogyny is becoming increasingly fashionable. This paper presents a solution to the problem of automatically classifying misogynistic Bengali messages on social media platforms. Several procedures have been taken to preprocess the data. Tf-Idf and Word Embedding with BERT are implemented so that computers can read text. Several machine learning-based models including Random Forest, SVM Polynomial kernel, SVM Signal kernel, and Adaptive Boosting have been tested to build a multi-class analyzer that identifies Misogynistic text in Bengali on social media. The models have been evaluated with the performance measures such as accuracy, precision, recall, and F1 scores. With 62.61 percent accuracy, the SVM sigmoid kernel outperforms all other models. As per our knowledge, no earlier research has been conducted on the classification of Bengali misogynistic text; consequently, the current research is the most comprehensive to date.

**PID: 7338** | **A Robust Approach to Identify Banglish Words using Bangla Scripts**  
Borhan Uddin, Md. Shoab Hasan, Md. Sobuj Mia, Muhammad Aminur Rahaman, Md. Parvez Hossain, and Faiz Al Faisal

**Abstract** – English word written in Bangla in the Bangla script is mentioned as "Banglish" word. Frequently use of Banglish words is degrading the standard of Bangla writing. There are many types of researches have been done on Bangla Natural Language Processing but detection of Banglish words from Bangla script still no remarkable works have been done. In this research paper, we have proposed a robust system and presented how to resolve the issue of identifying Banglish words. Moreover, our designed system could also be used to change these Banglish words into standard Bangla words using NER-BERT model. After cleaning the raw input data, the system parses it into individual sentences with unique ID then the sentences are split into several words. After getting each word, the system adds tags EN for English words, BN for Bangla words and UN for others. For training the system, two corpora are used. One corpus is used for word label tagging and another is used for dictionary. After identifying the Banglish words, the system changes automatically these into standard Bangla words based on the trained dictionary. The Dataset contains 700 sentences with various Banglish words. Our proposed system achieves overall accuracy of 80% for Banglish words identification and transformation into Standard Bangla words.

**PID: 7918** | **SPOT (Sales Production based On Time-Series): A Comprehensive Approach to Sales Forecasting using Contextually-tailored Time Series Analysis**  
Mohammed Zama, Aditya Jotawar, Jiakai Du, Fahim Islam Anik, Nafisa Anjum, Bilash Saha, Nazmus Sakib and Hossain Shahriar

**Abstract** – Unit sales in retail chain stores exhibit a significant degree of variance, affected by seasonality and special events. Individual products and categories also display a considerable difference in sales based on the geography of individual stores. In various businesses, a myriad of products is moved each day, and accurately predicted knowledge of sales facilitates the planning of logistics, warehousing, and procurement, besides other executive decision-making processes. Software developed for this purpose are undergoing continuous improvements. SPOT (Sales Production based On Time-Series) is an application to produce sales forecasts for customized input parameters – such as an individual store, state in which store is located, a particular product, category/sub-category of products, which will prove to be immensely useful for decision-making processes across a variety of concerned business units. SPOT delivers the results in the form of graphical summarization of selected data, along with its timeseries forecasts. More incisive sales predictions can be exported as a tabular numeric file. For the purpose of demonstrating the entire process, data from Walmart was considered; however, this can be extended to any related application fields as well.



**Day- 02: 18 Dec 2022, Time: 03:00 PM, Technical Session- 04, Parallel Session- 03**

Venue: PCR-306, Session Chairs: Prof. Dr. Md. Zahidul Islam, Dr. AFM Shahab Uddin

**PID: 7344 | An Effective Approach for Bengali Handwritten Punctuation Recognition by Using a Low-cost Convolutional Neural Network**

Azmain Yakin Srizon, Md. Ali Hossain, Abu Sayeed and Md. Mehedi Hasan

**Abstract** – Bengali handwritten character recognition is considered difficult due to the complex curvatures and diverse variations of Bengali characters. Being the seventh most-spoken language of the world, Bengali has received some worth-mentioning contributions in this domain with the creation of different datasets such as NumtaDB, BanglaLekha, CMATERdb, and so on. However, none of the previous studies solely focused on recognizing punctuation marks in Bengali literature. Punctuations are important in Bengali language as without them the meaning of the whole sentence can be changed drastically. Another challenge in handwritten character recognition is the lack of low-cost convolutional neural networks (CNN). Recent studies suggested remarkable performance utilizing transfer learning approaches. However, due to the high computation of such methods, they are not suitable for recognizing in real-time via mobile devices. To solve this dilemma, in this study, we have proposed a low-cost CNN for the recognition of handwritten punctuations. Experimental results showed that our proposed architecture achieved an overall accuracy of 96.25% and outperformed popular transfer learning approaches such as DenseNet-201, InceptionV3, Xception, and EfficientNet-B6 by a significant margin with the least recognition time and the least number of parameters. Moreover, to solve the lack of dataset problem in this domain, we have collected 50 handwritten samples for each of the 28 Bengali punctuation marks in this study and formed a new dataset called 'BiramDB' (In Bengali, 'Biram' signs means punctuations). This research will be beneficial for diverse applications such as converting handwritten poems, stories, historical documents, and other writings into machine-encoded texts.

**PID: 9489 | Object Detection and Tracking: Deep Learning based Novel Tools to Generate Robust Human and Machine-Annotated Ground Truth Data for Training AI Models**

Md Jobair Hossain Faruk, Hossain Shahriar and Muhammad Asadur Rahman

**Abstract** – Object detection and tracking is one of the most emerging fields of computer vision that facilitates various fields including robotics, healthcare, security, autonomous vehicle systems, machine inspection, surveillance, and logistics. In object detection, many factors need to be considered including intrinsic and extrinsic factors, camera motion, deformation, occlusion, and motion blur. Machine learning (ML) and deep learning (DL) approaches are being adopted in object detection and tracking, and training these models is the key challenge achieving robust accuracy in the automated detection and tracking of objects. Data annotation paves the way to training ML and DL models; however, training models with inaccurate data jeopardizes the robustness of actual object detection and tracking. Towards generating 100% accurate datasets, human intervention is crucial for assigning identities to the correspondent objects throughout frames. In this paper, we utilize the OpenCV-based deep learning technique and introduce a framework that allows users to assign identities to detected objects towards generating flawless humanannotated ground truth data. The proposed framework allows the users to assign correspondence ids for bounding boxes on Tkinter GUI to help organizations prepare robust annotated datasets to train large-scale object-tracking models for object detection. In an extension of our study, we introduce a novel tool that will learn from human-annotated datasets and generate identities for the detected objects accurately. We evaluate our models on roughly 100 and 1000 human-annotated ground-truth datasets and later 5000 machine-generated ground-truth datasets. According to our demonstration, we achieved an accuracy of 97.55% and 96.68% respectively for human-annotated ground truth datasets. We also achieved an accuracy of 96.33% using a machine-automated ground truth dataset which indicates the robustness of our model. In future studies, we will extend our research to optimize proposed models to achieve an ultimate accuracy of 100%.

**PID: 8347 | Real-Time Computer Vision Based Autonomous Navigation System for Assisting Visually Impaired People using Machine Learning**

Md. Zahidul Hasan, Shovon Sikder and Muhammad Aminur Rahaman

**Abstract** – Visual impairment is a global problem and people without vision suffer more than other impaired people. A companion is always needed for the movement of blind people and there may not be anyone by their side in case of emergency. Walking alone on the street, detecting the person closest to him and avoiding obstacles are always problems. Researchers have been working for visually impaired people using sensor based distance measurement systems for years. This paper proposes a Computer Vision based system to navigate visually impaired people by using Artificial Intelligence, and also a novel distance measuring approach. The system will capture real time images through a camera placed inside a sun-glass then process the video frames by trained YOLO V3 model. After processing, the program will identify a total of 80 pre-trained objects and additional 7 objects including person, car, bicycle, and broken roads and then will produce a navigation command through headphones. A comparative evaluation with other similar works is performed, and the result represents the primary accomplishments of this article. Several testing and validation procedures were carried out in order to achieve optimal performance and accurate distance measurement. The proposed system outperforms the state-of-the-art in terms of object detection, distance measurement, computational costs calculation, and accessibility for the visually impaired, according to the results, which were validated using mathematical calculations and the necessary measuring devices. Since Industry 4.0 demands smart automation, this system has a significant impact not just on disabled persons but also on the development of a smart city.

**PID: 8753 | Automatic 3D Animated Bangla Sign Language Gestures Generation from Bangla Text and Voice**

Md. Ariful Islam, Md. Ariful Islam, Ahsanul Karim, Muhammad Aminur Rahaman, Mahmuda Rahman, Md. Parvez Hossain, and Syed Ahsanul Kabir

**Abstract** – Every human being has a fundamental need for communication since it allows them to learn, express their emotions, and share ideas. However, sign language users are unable to hear or speak. They learn a variety of hand signals known as Sign Language (SL), which they use to communicate with themselves and others. Non-sign language users, on the other hand, have a difficult time understanding sign language. We have proposed a real-time bidirectional 3D Bangla Sign Language (BdSL) translator that is more dynamic and real-time than the traditional system for the simplest way to communicate. To facilitate effective communication between Sign and Unsign people, we have introduced an Automatic Animated BdSL Gesture Generation from Bangla Text and Voice. The recommended system takes input as Bangla Voice or Bangla Text and parses the output texts of corresponding inputs based on Signing Gesture Markup Language (SigML). Creating a bridge between Sign People and Normal People is the main purpose of this paper. A 3D animated Bangla sign gesture is generated dynamically based on the trained SigML. In this paper, the model is trained only for 13 Bangla Numeral gestures (0-9, Thousand, Lakh, and Crore) but the system can generate any 3D Animated Bangla Numeral gestures dynamically. 100 different lengths of Bangla Composite Numbers are being tested for the evaluation of the system. The system achieves an average interpretation accuracy of 97.80% for voice and 100% for Bangla Text input of Bangla Composite Numerals with a computation cost of 6.5 milliseconds per gesture.



**Day- 02: 18 Dec 2022, Time: 03:00 PM, Technical Session- 04, Parallel Session- 04**

Venue: PCR-602, Session Chairs: Prof. Dr. Anupam Kumar Bairagi, Prof. Dr. Tushar Kanti Saha

**PID: 2461 | High Performance Computing in Decentralized Network**  
Md. Abdullah Antor, Tasmin Jannat Tahsin, Minhas Abedin Sohan and Syed Ahsanul Kabir

**Abstract** – With the vast growth of information technology, faster communication and better processing has become the most important concern for modern civilization. For decades we have been using centralized cloud systems for using the internet. Client-Server communication system has both advantages and disadvantages. Then came the Blockchain based networks which is growing more popular day by day. But it is not efficient enough to integrate with existing cloud systems. We know that faster data transmission and better processing is currently a great necessity for Sustainable Technology and Industry 4.0. In this paper we are going to show a new system to achieve High Performance Computing with the help of decentralized networking infrastructure using Fog server, Content Delivery Network (CDN) and Peer to Peer communication. Content retrieval is the primary usage of the internet. This research is going to uncover how efficient decentralized network is for both providing content and gaining High Performance Computing. To solve content availability and download/browsing time issues, CDN is used as virtual overlay networks. It makes the content distributed and closer to the users. The content can be made even closer using dedicated Fog servers. We are proposing a system where each end device would be able to communicate with other nearby devices and whenever a certain content would not exist on nearby devices, the request would be thrown to the Fog server, then to the CDN. Besides content retrieval, the end devices would also act as hosting servers for providing cloud processing to get a complicated task done in a very short time.

**PID: 6978 | Fault Tolerance and Cost Effectiveness Analysis of Low-Powered 3D-TESH Network**  
Faiz Al Faisal, M.M. Hafizur Rahman and Yasushi Inoguchi

**Abstract** – Exa-scale supercomputing is the prime target for the supercomputers. To reach at that point, supercomputers require redesigning the interconnection networks to support high network scalability, suitable network performance, low cost-performance ratio, low power usage, high fault-tolerance, low network congestion and high throughput with low latency. Among the thousand of interconnection networks, one of the most capable one is 3D-TESH, is a hierarchical interconnection network (HIN) interconnected with multiple basic modules (basic modules are basically treated as single on-chip network), where each on-chip network is similar to a 3Dmesh network and offchip network are built using the 2Dtorus connections. Some static network parameters as well as dynamic communication performance (on-chip level) had been studied earlier for 3DTESH, which ensured the high significance of this network in comparing with others. Moreover, in case of power consumption, it requires about 41% less router power than 5Dtorus at the onchip level. In this paper, we like to evaluate some other important static parameters like- packing density, fault tolerance, wiring complexity, cost effectiveness factor and etc. Here, we found that 3D-TESH yields much better results than network like - 3Dmesh, 2Dmesh, 2Dtorus, TESH and even the 3Dtorus.

**PID: 3850 | Privacy, Security and Usability Comparison of Online Learning Platforms in Developing Countries: A Study on Bangladeshi Universities**  
Muhammad Al Amin Rifat, Kazi Md. Towhidul Alam, and Md. Mehedi Hassan Onik

**Abstract** – As the number of MS Teams, Zoom, and Google Meet users increases with online education, so do the privacy and security vulnerabilities. This study aims to investigate the privacy, security, and usability aspects of few tools that are frequently used for educational purposes by Bangladeshi universities. Consumer security, privacy, and usability are also concerns when it comes to online-based software. This study assesses the most commonly used tools that are used for online education based on three important factors: privacy, security, and usability. Assessment factors concerning the privacy, security, and usability aspects are

initially identified. Afterwards, each of the applications was assessed and ranked by comparing their characteristics, functionalities, and terms and conditions (T&C) in contradiction of those factors. In addition, for the purpose of additional validation, a survey was carried out with 57 university students who were enrolled at one of several private universities in Bangladesh. Microsoft Teams, Zoom, and Google Meet have been ranked based on an evaluation of their security, privacy, and usability features, which was accomplished through the use of a knowledge base and a user survey.

**PID: 5068 | Multiple Circular Ring-canals on the Starfish Routing Backbone in Wireless Sensor Networks**  
Md. Daiyan Uddin Mozumder, Riaj Hosen, Md. Mamun Hossain, Md. Ahsan Habib, Palash Roy and Md. Abdur Razzaque

**Abstract** – To capture real-time data from Wireless Sensor Network Applications, utilizing unmanned aerial vehicles (UAVs) is becoming popular for minimizing end-to-end latency and reducing packet loss issues with extended network lifetime. Existing works in the literature are either limited by using a static sink or ground vehicle-supported mobile sink. In this paper, we introduce Unmanned Aerial Vehicles (UAVs) as mobile sinks moving around multiple circular ring canals on the basic starfish routing backbone (bSFR). We also develop generalized mathematical equations for determining an optimal number of ring canals required for a terrain with certain width and length along with their radii. The results of experiments carried out in Network Simulator version 2 (NS2) depict that the proposed routing model significantly improves the performances in terms of end-to-end latency and network lifetime.

**PID: 5434 | Analysis of Data Transfer Mechanism among Wireless Devices in AsthaNet Healthcare Network**  
Ahmed Jaudat Nahian, K. Habibul Kabir and M M Naushad Ali

**Abstract** – AsthaNet Healthcare-as-a-Service (HaaS) was proposed to connect the disconnected communities with basic healthcare services. A portable digital health clinic, combined with wireless connectivity, a collection of network technologies and a smart application packages, can provide an autonomous solution to serve basic healthcare demands to the disconnected rural communities. In this paper, we analyze the data transfer mechanism within the Software Model of AsthaNet HaaS using several data transfer parameters. This ensures the outcomes of stability, survivability and errorless data transfer within the network model, thus ensuring sustainable healthcare solutions in the age of Industry 4.0.

**Day- 02: 18 Dec 2022, Time: 03:00 PM, Technical Session- 04, Parallel Session- 05**

Venue: PCR-601, Session Chairs: Dr. Abdul Rauf Bhatti, Dr. Ratil H Ashique

**PID: 6547 | Designing and Performance-Analysis of a 3 DOF Robotic Manipulator Arm and its Higher Order Integration for 7 DOF Robotic Arm**  
Ahsan Kabir Nuhel, Mir Mohibullah Sazid, Md. Nafim Mahmud Bhuiyan and Ariful Islam Arif

**Abstract** – Technology leads to flexible manufacturing and effective industrial automation. In this study, a robotic arm is designed named as bazu to do heavy work and shift material in a precise location. The primary objective of this paper is to develop 3 Degree of freedom (DOF) robotic manipulator arm which will be efficient for industrial application; Then to design and implement the ideas in a simulation to integrate the functionalities into 7 DOF robotic arm. A custom-made controller is designed and evaluated by task execution. Finally, by analyzing different user defined work output parameters are analyzed. In addition to that, Dynamic model identification, as well as retrieved feasible parameters, is used for designing the robotic arm.



**PID: 2689** | **Performance Evaluation of 2.4 kW Alkaline Fuel Cell Stack for Emergency Applications**  
Ripel Chakma, Ashish Kumar Karmaker and Naruttam Kumar Roy

**Abstract** – The rapid declination of fossil fuel reserves and the adverse impact on the environment inspires renewable energy resource integration. To increase renewable integration, Alkaline Fuel Cell (AFC) is one of the important renewable sources. The alkaline fuel cell contributes to compensating the energy demand with almost zero-emission instead of fossil fuels. In this paper, the dynamic performance of the 2.4 kW AFC stack using MATLAB/SIMULINK is analyzed by changing the fuel flow rate in order to get maximum output power, which can be used for power supply in remote areas and emergency periods when utility grid power is inaccessible. In addition, different parameters i.e., stack voltage, stack current, stack exchange current, stack power, stack efficiency, utilization, fuel flow rate, and DC load current are investigated in this paper. The results show that the voltage of the fuel cell is improved to 70 Vdc to use in residential loads and emergency loads, utilizing DC/DC boost converter.

**PID: 9643** | **An IoT based Smart Robot that Aids in the Prevention of COVID19 Spread**  
Shamim Ahmed, Robiul Alam, Md. Rasel Hossain, Md. Mominul Islam, Md. Imran Hossain, and Tamim Tabassum

**Abstract** – The Internet of Things revolution is transforming current healthcare practices by combining technological, economic, and social aspects. Since December 2019, the global spread of COVID19 has influenced the global economy. The COVID19 epidemic has forced governments all around the world to implement lockdowns to prevent viral infections. Wearing a face mask in a public location, according to survey results, greatly minimizes the risk of infection. The suggested robotics design includes an IoT solution for facemask detection, body temperature detection, an automatic dispenser for hand sanitizing, and a social distance monitoring system that can be used in any public space as a single IoT solution. Our goal was to use IoT-enabled technology to help prevent the spread of COVID19, with encouraging results and a future Smart Robot that Aids in COVID19 Prevention. Arduino NANO, MCU unit, ultrasonic sensor, IR sensor, temperature sensor, and buzzer are all part of our suggested implementation system. Our system's processing components, the Arduino UNO and MCU modules are all employed to process and output data. Countries with large populations, such as India and Bangladesh, as well as any other developing country, will benefit from using our cost-effective, trustworthy, and portable smart robots to effectively reduce COVID-19 viral transmission.

**PID: 9304** | **An Efficient Lead-free SnBr<sub>3</sub> based Perovskite SolarCell: Design and Optimization using SCAPS-1D**  
Omi Akter and Md. Shah Alam

**Abstract** – Recently perovskite materials have demonstrated significant potential as solar absorber materials. Long-term stability is a prerequisite for perovskite solar cells (PSCs) to be economically viable. Numerous attempts are being taken to develop non-toxic, cost-efficient lead-free perovskite solar cells with high efficiency. In order to accomplish this, leadfree CH<sub>3</sub>NH<sub>3</sub>SnBr<sub>3</sub> is seen as a competitive alternative to lead halide perovskites. In this paper, we design and simulate a pin heterostructure perovskite Cu<sub>2</sub>O/CH<sub>3</sub>NH<sub>3</sub>SnBr<sub>3</sub>/TiO<sub>2</sub> solar cell where tin halide perovskite is utilized to overcome the stability and toxicity problem of lead halide. The solar cell's performance has been evaluated by one dimensional simulation software SCAPS (version 3.3.10). We have investigated the effects of temperature, series resistance, optimal thickness of absorber layer, defect density, properties of electron transport material (ETM) TiO<sub>2</sub>, hole transport material (HTM) Cu<sub>2</sub>O on efficiency. We obtained maximum efficiency of 25.52% with Voc of 0.93V, Jsc of 33.89mA and FF of 80.23%. These findings indicate that an ecologically friendly and high efficient perovskite solar cell can be developed using methyl ammonium tin bromide (CH<sub>3</sub>NH<sub>3</sub>SnBr<sub>3</sub>).

**PID: 5334** | **Design and Fabrication of an Automotive Electromagnetic Braking System**  
Avishek Chowdhury and S.M. Minhazul Islam

**Abstract** – One of the most important features of a vehicle is its braking system. The kinetic energy of a moving body is converted into heat by nearly all braking systems, which use friction forces to do so. Overusing friction-type brakes raises the temperature of the braking pads, which lowers the system's efficiency. This work is primarily concerned with the analysis and construction of a 3D electromagnetic braking model that can apply brakes with no friction loss and without wasting the energy supplied. Because of the size and poor power-to-weight ratio, the traditional braking system is sometimes cumbersome. This method incorporates electromechanical principles. The magnetic force used by an electromagnetic braking system is what applies the brake, however the power needed to stop is manually applied. The system has been fabricated using motor, belt-pulley as the driving unit and rotator, core-coil, brake shoe and the power source as the braking unit. It is expected to be an effective braking mechanism that reduces the proportion of accidents. Additionally, it minimizes brake system maintenance.

**Day- 02: 18 Dec 2022, Time: 03:00 PM, Technical Session- 04, Parallel Session- 06**

Venue: PCR-506, Session Chairs: Dr. Mahidur Sarker, Dr. Molla Shahadat Hossain Lipu

**PID: 3751** | **Economical Design of Hybrid Solar Charging Station for Electric Vehicles (EVs) on the Dhaka-Chattogram Highway**  
Nazmul Islam Tareq, Md. Shariful Alam Mozumder, and N. K. Das

**Abstract** – Electric Vehicles (EVs) have attracted a lot of attention in recent decades owing to the increased carbon emissions and other environmental consequences of fuel-based vehicles. For developing countries like Bangladesh, EVs are an environmentally sustainable and feasible option that has already been adopted in this country. As a result, the country would be burdened by the upcoming electric load. However, electric vehicles will help to secure the country's existing energy supplies. Hence, there is a need for an alternative way to meet future demandable energy. Located near the Geographical Tropic of Cancer, the country receives an abundance of solar radiation throughout the year. Introducing a solar charging station can be a viable solution since solar energy has zero emission characteristics. Nevertheless, allocating enormous space for a large-capacity project in such a highly populated country is quite challenging. A cost-effective model of hybrid solar charging station with a capacity of 1900kWp is designed for three individual locations on the Dhaka-Chattogram Highway at suitable distances to cover an EV completing a single trip, taking into account some key factors such as system parameters, charging power capacity, and shading characteristics. For this purpose, solar panels are placed not only on the highway road divider section but also inside the charging station area to generate additional energy. The annual system production, performance ratio, and economic evaluation are obtained by utilizing PVsyst Software, and the overall system model incorporating shading analysis is demonstrated through SketchUp.

**PID: 9090** | **Comparative Study of CZTS Solar Cell with Different Buffers and BSF Layer**  
Dilruba Alam, Sourave Deb and Fatema Faiza

**Abstract** – Solar cell based on kesterite structured compound semiconductor Copper-Zinc-Tin-Sulphide (CZTS) has been attracting the researchers due to its high possibility in the photovoltaic world. For performance enhancement of the baseline structure CZTS solar cell, the type of cells utilized in this work is Al:ZnO/CdS(In<sub>2</sub>S<sub>3</sub>/Zn(O,S))/CZTS/SnS/Mo. In this work, a comparison on the performance of CdS, In<sub>2</sub>S<sub>3</sub> and Zn(O,S) buffer layers is performed to find a suitable buffer layer along with insertion of a SnS back surface field (BSF) using Solar Cell Capacitance Simulator (SCAPS) 3.3.0.7. Here, the effect of absorber thickness variation, buffer thickness variation, absorber doping density and absorber defect density variation on cell performance have been analyzed. An efficiency of 16.61% has been achieved with only 1µm thickness of CZTS absorber layer. Among the three buffer layers, Zn(O,S), with an optimum efficiency of 16.60%, has proved to be more suitable than the others (with VOC = 829mV, JSC = 29.67 mA/cm<sup>2</sup> and fill factor = 67.50%) and In<sub>2</sub>S<sub>3</sub> shows drastic change in performance parameters.



PID: 7146

**Design and Analysis of a Hybrid Power Charging Station for Electric Vehicles at Patenga, Chittagong**

Khandakar Abdulla Al Mamun, Md. Mokarom Hossain Faisal, Thakeya Mojtari Fahim, Jahed Ahmed and Nurul Azam Ayan

**Abstract** – Currently, all countries are working together to reduce the amount of carbon dioxide emissions, the same is the case with Bangladesh. To reduce carbon dioxide emissions, the use of green energy for electric vehicles is getting a lot of attention in different countries. Bangladesh's government is thinking to introduce highcapacity electric vehicles in the car market. But in this case, Bangladesh will have to face two problems. One is that Bangladesh's electricity demand is still unfulfilled, and the country's electricity demand for electric vehicle charging will increase. Another problem is that electric vehicle charging facilities are very less in the country, compared to the number of fuel stations electric vehicle charging stations are only 5%. Sustainable energy resources can play important role in this regard. This paper analyzes the technical, economic and environmental feasibility of the proposed electric vehicle charging station using the Hybrid Optimization of Multiple Energy Renewables (HOMER) Pro software.

PID: 842

**A Hybrid Bipolar DC-Link Converter Based on SEPIC-Cuk Combination**

Md. Ziaul Haque, Md. Abdullah Al Hysam, Asfaqur Rahman, Md. Amimul Ihsan, Sabbir Ahmed and Nur Mohammad Molla

**Abstract** – Power converters of DC-DC nature are pivotal to supplying power in electronics, charging equipment, and renewable energy integration along with AC-DC converters. They are frequently used in most of the power supplies of electronic devices as well as dedicated high-energy functionalities including charging battery cells, electroplating, and welding. Furthermore, DC-DC switching regulators not only fulfill the challenging necessities of engineering systems but also satisfy the rigorous standards of vehicles. Having efficient and stable Switched Mode Power Supply (SMPS) converters under extreme duty cycles is not that easy. The Single Ended Primary Inductor Converter (SEPIC) and Cuk converter combination are used in this research to create a blended DCDC converter with a single Insulated Gate Bipolar Transistor (IGBT) switch, thanks to their almost identical circuit configuration. The key advantage of employing one IGBT switch is that synchronization between switches is not necessary, and it can handle remarkably high voltage and high power compared to MOSFET. Additionally, the gate driver design will be sophisticated due to switching between the control terminal and the ground. An experimental simulation was created, and its performance was assessed under higher duty cycles. Consequently, this converter achieves a simple control structure with a high voltage gain, high efficiency, and lowered total harmonic distortion (THD) with the inclusion of two switched inductor blocks to replace both the input inductors of the respective SEPIC and Cuk partitions of the device.

PID: 3824

**Optimizing LQG Controller for a Single-Phase Power Inverter in an AC Microgrid System**

Md. Hassanul Karim Roni, Yafes Emran Haque Emal, Saad Solyman, Surain Jannath Ritu, Md. Fazla Rabby, Md. Fatin Ishraque and Md. Sohel Rana

**Abstract** – This article presents an optimization-based Linear Quadratic Gaussian (LQG) control application for controlling a single-phase power inverter in an ac micro-grid system. Several optimization techniques (e.g., genetic algorithm, particle swarm optimization, grey wolf optimization, pattern search optimization, and whale optimization) have been applied with two different objective functions (i.e., ITAE and RMSE) to prove the effectiveness of different optimizers for enhancing control performance. A comparative analysis between the different optimizers has been presented based on their optimization performance and controller performances. From the comparison presented grey wolf optimization outperforms the other studied optimizers with only 2.89% & 2.04% overshoots and 0.07 & 0.30% steady-state error with ITAE and RMSE objective functions respectively. The simulations and optimizations are conducted in MATLAB/Simulink environment.

PID: 6934

**Design and Characterization of Photonic Crystal Fiber Based Surface Plasmon Resonance Refractive Index Sensor**

Sayda Fahmida Kayser and Md. Arif Uddin

**Abstract** – A spiral PCF based surface plasmon resonance sensor is proposed in this paper. Gold is used as the active plasmonic material. It is placed on the external surface of the PCF. For detection purpose, the unknown analyte flow is positioned at the outer surface of the PCF. By using the finite element method (FEM), sensing performance is analyzed. The proposed sensor shows maximum amplitude sensitivity of 997 RIU-1 and maximum wavelength sensitivity of 10,000 nm/RIU at refractive index 1.39. At the same refractive index the sensing resolution of the sensor is  $1 \times 10^{-5}$  RIU. This PCF based sensor can sense the refractive indices from 1.36 to 1.39. Furthermore, performance of the sensor is investigated by varying the value of parameters such as gold layer thickness, pitch and air-hole diameter. The proposed sensor can detect biological analytes for its high sensitivity, improved sensing resolution and suitable linearity.

**Day- 02: 18 Dec 2022, Time: 03:00 PM, Technical Session- 04, Parallel Session- 07**

Venue: PCR-404, Session Chairs: Prof. Dr. A H M Abdur Rahim, Dr. Ahmed Al Mansur

PID: 886

**A Proposed Hybrid Microgrid Model for 37no Haliashahar ward of Chattogram City Corporation, Bangladesh Using MATLAB Simulink**

Md. Minhaj Hossain, Minhazul Haque Chowdhury Tamim, Md. Aasim Ullah, Md. Mosaraf Hossain Khan, Mohammad Mainul Hassan, Shah Ashraf Jahan and Sheik Erfan Ahmed Himu

**Abstract** – Electricity has made our lives easier by drastically reducing the amount of work we have to do but there is a lot of cause for concern regarding the method that is used to generate it physically. Even today, conventional methods produce most of our electricity. These conventional technologies create power mostly from fossil fuels. These approaches are expensive and environmentally damaging. Electricity production requires the usage of fossil fuels, which raises the cost and releases harmful pollutants. The only other option is to develop a new approach that is both inexpensive and efficient while also being kind to the environment. This paper focuses on the proposed hybrid microgrid model for 37no Haliashahar area of Chattogram City, Bangladesh. The solar and wind energy systems are the main sources of energy, and the battery is used as a backup. The battery storage system stores extra power from the grid in day and keeps the load running when the PV power isn't available in night. A Fuzzy Logic Controller (FLC) based PV Maximum Power Point Tracking controller technique is used. The proposed hybrid system is modeled and simulated in MATLAB Simulink software.

PID: 6831

**Closed-Loop Switched Capacitor Cuk Converter Topology for Voltage Regulation and PFC Applications**

Md. Abdullah Al Hysam, Md. Amimul Ihsan, Asfaqur Rahman, Kazi Mohammad Mamun, Md. Rafayel Bishal and Zubaida Azad Shikha

**Abstract** – Converters of AC-DC nature are pivotal to supplying power in electronics, charging equipment, and renewable energy integration. A closed-loop Cuk converter with switched capacitor network and PID controller was proposed in this paper to mitigate the limitations of open circuit Cuk converter topology to ensure improved power factor from input along with low distortion in output, making it ideal for green energy and electric vehicle applications. Significant improvement in output voltage regulation and input power factor correction was found in the proposed closed-loop switched capacitor topology.



**PID: 8081****Modification of Dynamic Logic Circuit Design Technique for Minimizing Leakage Current and Propagation Delay**

Sheik Erfan Ahmed Himu, Sanjida Sultana, Mohammed Soaibul Chowdhury, Arafat Ibne Ikram, Hasan Rahman Saium and Md. Minhaj Hossain

**Abstract** – This paper is based on the OR logic operation's small discharging current and transmission time delay dynamic logic circuit configuration method. In terms of static logic circuits, it requires a larger number of transistors and consumes a massive amount of power. However, high-speed dynamic logic circuits consume less power due to their lower number of transistors. But, it has an issue with the evaluation phase where current gets leaked from the dynamic node due to sub-threshold leakage. In this paper, we have shown a new dynamic logic circuit design procedure for reducing leakage current from the dynamic node by using delay component, stacking effect, current mirror circuit with footed nmos, and a keeper circuit with the keeper device. The suggested system is analyzed in LTSpice with 45nm CMOS predictive technology model and compared with the previous research to demonstrate validity. The simulation study demonstrates power savings relative to traditional architecture and verifies the suggested strategy. This circuit could be used for designing low power consuming and delay systems for wide fan-in and can be useful for cascading several stages.

**PID: 6113****Environmental Impact of Land Use and Land Cover Change in Rampal, Bangladesh: A Google Earth Engine-Based Remote Sensing Approach**

Md Tanvir Miah and Maria Sultana

**Abstract** – Environmental change is a complex process and its impact on the habitat is a major challenge to understand. The purpose of this research is to investigate environmental changes that have occurred in Rampal Upazila in Bagerhat District during the previous 20 years. This research has also been conducted to understand the impact of different land uses on the ecosystem. To examine the relationship between field measurements and remotely sensed data various remote sensing indices are employed in this study to detect environmental changes. The Landet-7 & 8 (Enhanced thematic mapper) dataset was utilized to discover the alterations. The previous 20-year dataset was categorized into distinct land use/land cover groups using Google Earth Engine and Arc GIS. The findings indicated that from 2003 to 2022, the Bare land, agricultural land, and the amount of built-up area have decreased. But the amount of vegetation area and water bodies has increased in a small portion. In addition, according to the LST analysis it is seen, in these 20 years, the temperature of the Rampal area has slightly increased in 2022 as compared to 2003. It is expected that by getting a better understanding of the key mechanisms of environmental components and changes researchers, policymakers, and conservation practitioners will be able to take the opportunities to utilize these findings in relevant projects and experiments.

**Day- 02: 18 Dec 2022, Time: 03:00 PM, Technical Session- 04, Parallel Session- 08**

Venue: PCR-302, Session Chairs: Prof. Dr. Farhad Rabbi, Prof. Dr. Abul L. Haque

**PID: 8885****Event Detection from Cricket Videos Using Video-Based CNN Classification of Umpire Signals**

Shadman Sakib, Md. Afranul Haque Mridha, Nahid Hasan, Md. Toasin Habib and Dr. Md. Shahriar Mahbub

**Abstract** – Cricket is a long duration game. It can last for several hours or even days. Due to cricket's lengthy nature, it becomes indispensable for viewers to have the option of watching selected interesting events from a cricket match. As cricket videos are unscripted in nature, detecting key events from cricket videos is a big challenge. In this paper, we propose a method to detect 5 key events, namely FOUR, SIX, OUT, NO BALL and WIDE from cricket videos by recognizing the umpire's signal. Analysis of umpire signals is performed using a pretrained Convolutional Neural Network (CNN) architecture, namely I3D. A new dataset, containing 504 videos and 2000 images from cricket matches, is introduced in this work for the detection of key events in

cricket. For the tasks of umpire frame detection and umpire signal recognition, test accuracies of 97.76% and 86.14% are achieved respectively. Employing the proposed framework on official cricket match videos, we achieve precision, recall and F1 scores of 95.23%, 86.95% and 90.90% respectively. Furthermore, by evaluating performances of both proposed video-based approach and existing image-based approach on novel cricket videos, we can affirm that the proposed approach outperforms the image-based one.

**PID: 1204****Exploiting Deep Learning Based Classification Model for Detecting Fraudulent Schemes over Ethereum Blockchain**

Kowshik Sankar Roy, Md. Ebtidaul Karim and Pritom Biswas Udas

**Abstract** – The extensive usage of the Blockchain technology as one of the most popular forms of decentralized platform has been spread across a numerous field over the recent years. From financial sectors like banking industry to the supply chain management of multiple large corporate farms, blockchain technology has been proven its productivity across different communities. However, the reliability of the blockchain system has often been compromised with the introduction of various scams and fraudulent activity within the system. Due to the absence of a comprehensive and definitive dataset, the challenges of building an effective fraud detection model becomes even more severe in this particular field. Thus, in our work, we propose a deep learning based blockchain fraud detection model based on the Ethereum blockchain transaction data. With the association of a reliable dataset in this field, we build a deep learning-based detection model to classify the fraudulent activities within the system. The proposed classification model is comprised of a Long Short-Term Memory (LSTM) unit and a dense unit to detect the fraudulent transactions. For the sake of reducing down the complexity and avoiding the unnecessary transactional features, Information Gain has been utilized as the feature selection unit of the model. When compared to the corresponding values of different models on the same dataset, experimental results show a significant improved results in different aspects using the proposed approach.

**PID: 1118****Book Review Sentiment Classification in Bangla using Deep Learning and Transformer Model**

Gobinda Chandra Sarker, Kazi Md Sadat and Aditya Das

**Abstract** – Sentiment analysis is the approach detecting different underlying emotions from text data. E-commerce business is getting popular all over the world, including in Bangla-speaking regions. E-commerce websites provide different kinds of products and services. Following the growth of e-commerce businesses, there is a gap in research on consumer sentiment analysis. Our study focused on sentiment analysis of book reviews in Bangla. In this paper, we have developed our dataset of 5189 reviews by crawling data through the review sections of rokomari.com, a popular online platform for selling books in Bangladesh. The reviews were manually annotated into positive and negative sentiments by experts. We have investigated the performance of four different deep neural network models; LSTM, BiLSTM, CNN-LSTM, and CNN-BiLSTM, and three transformer models; m-BERT, Bangla-BERT and XLM-R. We have found that XLM-R outperforms the other DNN models as well as the other transformer models achieving the highest weighted f1 score (88.95%) on test data. The dataset is made publicly available at <https://github.com/gcsarker/Bangla-Book-Review-Dataset>.

**PID: 146****PestDetector: A Deep Convolutional Neural Network to Detect Jute Pests**

Dewan Ziaul Karim, Tasfia Anika Bushra and Muntasir Mahmud Saif

**Abstract** – Widely known as the "Golden Fiber", jute is regarded as one of the most important and profitable crops in many countries including Bangladesh. Jute and jute-based commodities can bring a lot of foreign income and eventually boosts the overall economy of the country. However, many a time, jute production gets hindered due to many harmful pests and insects. Even though farmers identify and take actions against these pests following a manual procedure, it is often tedious and time-consuming. That is why it may be very beneficial to have a machine learning-based approach towards pest detection. This paper proposes a deep CNN model named "PestDetector" that can correctly identify 4 major types of jute pests (Field Cricket, Jute



Stem Weevil, Spilosoma Obliqua, and Yellow Mite) with substantial accuracy. The work is done on a total of 2200 images separated into 3 categories: Training, Validation, and Testing. The model ultimately demonstrates 99.18% training accuracy and 99.00% validation accuracy. Additionally, the model's overall performance has been assessed using precision, recall, F1-score, and confusion matrix.

**PID: 3415 | Bengali Handwritten Digit Recognition using CNN with Explainable AI**  
Md Tanvir Rouf Shawon, Raihan Tanvir and Md. Golam Rabiul Alam

**Abstract** – Handwritten character recognition is a hot topic for research nowadays. If we can convert a handwritten piece of paper into a text-searchable document using the Optical Character Recognition (OCR) technique, we can easily understand the content and do not need to read the handwritten document. OCR in the English language is very common, but in the Bengali language, it is very hard to find a good quality OCR application. If we can merge machine learning and deep learning with OCR, it could be a huge contribution to this field. Various researchers have proposed a number of strategies for recognizing Bengali handwritten characters. A lot of ML algorithms and deep neural networks were used in their work, but the explanations of their models are not available. In our work, we have used various machine learning algorithms and CNN to recognize handwritten Bengali digits. We have got acceptable accuracy from some ML models, and CNN has given us great testing accuracy. Grad-CAM was used as an XAI method on our CNN model, which gave us insights about the model and helped us detect the origin of interest for recognizing a digit from an image.

**Industry 4.0 - Technological pillars**



**ABSTRACTS | Interactive Poster Session**

**Day- 02: 18 Dec 2021, Time: 04:45 PM, D2IPS**

Venue: PCR-309, Session Chairs: Dr. Ratil H. Ashik, Dr. Jagannath Biswas, Dr. Fernaz Narin Nur, Dr. Md. Abu Layek, Dr. Maheen Islam, Dr. Selina Sharmin, Dr. Nazma Tara, Dr. Sajeeb Saha

**PID: 4016 | Real-time Air Pollution Monitoring by Drones for Mobile Smart Sensing in Hard-to-Reach Areas**

Istiaq Ahammad Limon, Ali Daud Hossain, Ishraque Rahman, Md. Anamul Sakib Zim

**Abstract** – Due to the presence of hazardous gasses at high levels, some regions are physically very difficult for humans to approach. The idea seeks to simplify the task of monitoring the air quality in hard-to-reach areas. The NodeMcu microcontroller is used in the creation of the system. The real-time monitoring, analysis of the air quality, and data logging to a remote server, which allows for continuous data updating online, are all features of the air pollution monitoring system. The system's specified air quality readings were precise. The outcome could be accessed via any internet-connected smart device from the server.

**PID: 4313 | A Convenient Model to Detect Facial Expressions by Machine Learning**

Toyeer-E-Ferdoush, Habibur Rahman

**Abstract** – Emotion recognition from facial expressions is an enthralling field of research with applications in safety, security, personal information, and marketing. Researchers want to create techniques for interpreting and extracting facial expressions so that computers can make more accurate emotional predictions. In recent years, various architectures in machine learning have been used to improve facial expression performance. The sort of primary definitely goal mostly is to more accurately for the most part detect the face from a webcam or camera directly, as well as to essentially detect the particularly basic emotions that can kind of be displayed in the face using a combined approach in a subtle way. Deep Convolutional Neural Network (DCNN)-Support Vector Machines (SVM) with viola jones This paper proposes an algorithm to specifically improve the performance of detecting faces in color images taken from a camera, and then really basic pretty human facial expression detection essentially is proposed from that image, which mostly is quite significant. There basically are expression of happiness anger, disgust, neutrality, sadness and surprise, so deep Convolution Neural Network (DCNN)-Support Vector Machines (SVM) with viola jones This paper proposes an algorithm to basically improve the performance of detecting for the most part faces in color images taken from a camera, and then definitely basic for all intents and purposes human facial expression detection for the most part is proposed from that image, or so they definitely thought. Previously, particularly multiple methods for recognizing facial expressions specifically were used, but combining DCNN and SVM with the viola jones algorithm produced fairly better results for randomly taken webcam photos, which essentially is fairly significant. Several studies essentially have been conducted to essentially detect facial expressions using DCNN and SVM separately, but the combined approach with the viola jones algorithm essentially is the first to definitely recognize the disgusted expression in a subtle way. This one-of-a-kind proposed model features the expression disgusted, for all intents and purposes contrary to popular belief. The proposed model will for the most part detect basic really human 7 facial expressions faster and for all intents and purpose more accurately than other methods in a fairly big way. Using the adaptive algorithm adaboost with the viola jones, the system got the more efficiency as well as faster training capability. System can train the model with larger dataset. It also can be used as the global technology for facial expression detection system.



**PID: 5675** | **A New Technique to Classification of Bengali News Grounded on ML and DL Models**  
Antara Mondal, Fazle Rabbi, Santa Akter Jami, and Tamim Al Mahmud

**Abstract** – News or text categorization task using machine learning is in the domain of AI. We must the types of news we are reading in news articles. In our native Bengali language, for example, there are numerous classifications for news. The motivation for working in this domain is because of the limited research in Bengali text and the scarcity of resources. This study proposed a new technique for the categorization of the news based on a comparison among different ML and DL model results. First, we have collected more than 20K data. Afterwards, applied several ML and DL models to pre-processed and cleaned data. Then apply our proposed technique on evaluated results produced by the ML and DL models to make a final decision to identify the news category. In our proposed technique, we counted the predicted categories from three ML models and two DL models. Finally, we computed the maximum predicted class and assigned the category for the specific news.

**PID: 5904** | **A Texture Descriptor, Evaluation window based Adjacent Distance Local Ternary Pattern EAdLTP for Image Classification**  
Most Marria Akter Misty, Sajal Mondal, Tanzum Alam Zumu, Md Anwarul Islam Abir, Md Monirul Islam, and Md Zahidul Islam

**Abstract** – In this study, a novel local feature descriptor known as Evaluation window based Adjacent Distance Local Ternary Pattern (EADLTP) for Image Classification is created by combining Evaluation window EwLBP and the features from AdLTP. The goal of the EADLTP framework is to achieve robustness by encoding adjacent information. In order to more effectively minimize the noise of each neighbor's values, EwLBP produces an evaluation window for each Pth number of locations and applies the average concept to each pixel value of the evaluation window. The evaluation window's utilization also increases the scale of the "micro-structure" information. adjacent neighborhood window Local ternary Pattern AdLTP, the relations between the sequential neighbors with a specified distance. In the proposed method, surrounding sub image window and adjacent neighborhood window calculated the neighbor and extract the binary code which is constructed to modify traditional LBP thresholding schema, improve the adjacent neighbor information. Finally, the resultant EAdLTP pattern is divided into two distinct parts: Adjacent distance local ternary pattern upper (EAdLTUP) and Adjacent distance local ternary pattern lower (EAdLTPL), and the final feature descriptor vector is obtained by linear concatenation of both EAdLTUP and EAdLTPL histograms to generate our final EADLTP Feature descriptor. EAdLTP descriptor tested with KTH-TIPS KTH-TIPS2b datasets to the applicability of the proposed method. In comparison, the proposed EAdLTP approach is more robust against noise and consistently outperform all of the fundamental methods.

**PID: 7284** | **Comparison of Properties of Perovskite Solar Cell Material CsPbI3: A First Principal Study**  
Prianka Mondal, AKM Shahabuddin, D.M Saaduzzaman, Shamima Khanom and Farid Ahmed

**Abstract** – In this review, we have studied the different structural combinations of CsPbI<sub>3</sub> along with its comparison with a previous experimental study of Perovskite Solar Cell Material CsPbI<sub>3</sub>. Here we used DFT based study implementing CASTEP code. Previously, different exchange functional like GGA-PBE was used to calculate the band gap of this structure. Our goal was to analyze the structure using a more accurate functional (HSE06) to determine the band gap. In this work the atomic position of Cs and Pb atoms are interchanged to investigate the variation of parameters. The obtained value of the lattice parameter is 6.25 Å which is quite similar to the experimental value. On the other hand, the band gap value was different from previous study which is 2.4 eV. The obtained value indicates the structure as wide band semiconductor which can be used to make LEDs or LASERS as well as in radio applications.

**PID: 8636** | **Energy Efficient Resource Management for Multicore Processors**  
Ahmed Shabab Noor, Afsana Airin, Rezab Ud Dawla, Muhib Al Hasan, Ahmed Rafi Hasan, and Md. Motaharul Islam

**Abstract** – In today's world, machines must be as energy efficient as possible with an ever-growing demand for high computation tasks that cost a lot of energy. Moreover, we want parallel execution of high computation tasks which further demands from the processors. Parallel task execution in multiprocessing costs a lot of energy and relies on efficient schedulers for high performance. Work stealing schedulers are often used in multiprocessing but reducing its overall power consumption is a difficult task. It is even more challenging when using asymmetric models due to their nature. While dynamic voltage and frequency scaling (DVFS) is an answer to this problem, its intricacies must be appropriately addressed. Many works have been done on DVFS and work stealing runtimes that ensure energy efficiency. Energy Aware Scheduler (ERASE) is a task scheduler that works alongside work-stealing runtimes. It makes use of DVFS and proposes a modular architecture for scheduling tasks on multicore processors effectively. We take ERASE as a baseline and make changes to improve the tasks' energy consumption and overall execution time. We show that by tuning the scheduler and making method-level changes, we can improve its overall efficiency.

**PID: 9239** | **Damage detection of old structure with deep learning: An onsite survey**  
Rafiul Bari Angan, Md. Safaiat Hossain, and Sadman Sakib Nobel

**Abstract** – Numerous civil structures were built using a primitive seismic code that does not comply with modern safety requirements. So, buildings need to be monitored frequently due to corrosive agents, lateral loads, and additional variable loads which cause them to degrade. For building health monitoring, in Non-destructive tests (NDT), damage (Crack & Dampness) detection is the most important part. It is done by a team of 2-4 personnel which is costly and time-consuming. In the modern era, intelligent structural damage identification based on deep learning techniques has shown its reliability and efficiency. In addition to traditional structural health monitoring, computer vision-based structural health monitoring enables the development of a easily accessible, cost-effective, real-time damage (Crack & Dampness) detection system. Convolution neural networks (CNNs) is the most modern object detection algorithm which can extract information from videos and photographs in real-time. So that in this work the DNN (Deep Neural Network) and YOLOv4-tiny, which are based on CNN, were used to detect damages in the building.





## Mohammad Ali Moni

Senior Research Lecturer of AI & Data Science  
University of Queensland  
Australia



## Workshop on Basic Bioinformatics Tools & Techniques

### Abstract

Bioinformatics has emerged as one such promising discipline that proved its importance from genomics to proteomics and from detecting biomarkers to designing new drug molecules. Fundamentals of Bioinformatics are essential for professional excellence in this field. This workshop will cover hands-on training on basic bioinformatics tools and techniques to understand the broad utility of bioinformatics.

The workshop will cover the following topics:

- Introduction to Tools and Techniques
- Basic of Datasets (Microarray and RNA-Seq data)
- Microarray Data Processing
- RNA-Seq Data Processing
- Finding Differential Expressed genes
- Functional Enrichment analysis
  - Signaling Pathways
  - Ontological Pathways
- Protein-protein Interaction (PPI) Analysis
- Validation Testing

Introduction to Tools and Techniques:

1. Installing R
2. Installing RStudio
3. Available packages: Bioconductor Packages; CRAN Packages
4. Installing and loading Packages: `install.packages("package name"); library("package name") /* for loading packages*/`

```
Example: install.packages("ggplot2");  
library("ggplot2")
```

5. Installation Cytoscape and Cytoscape apps: Install Cytoscape; Cytoscape apps

Basic of Datasets:

1. NCBI GEO Datasets (gse5220)
2. Cambridge EBI Arrayexpress datasets
3. Cancer data TCGA

Microarray Data Processing:

1. Manual statistical analysis using Excel
2. Analysis using R packages: `library(Biobase)`, `library(GEOquery)`; `library(limma)`

RNA-Seq Data Processing:

1. Using online software. Example: GREIN
2. Using R packages. Example: a. DESeq; b. EdgeR; c. Limma

Functional Enrichment analysis:

Enrichr; David; ImageGP; Metascape

Protein-protein Interaction (PPI) Analysis:

STRING; NetworkAnalyst

Validation Testing:

Enrichr

### Biography

Dr Mohammad Ali Moni is Senior Research Lecturer of Artificial Intelligence & Data Science at the University of Queensland, Australia. He obtained a PhD degree in Artificial Intelligence and Digital Health Data Science in February 2015 from the University of Cambridge, UK. He continued to focus on the same teaching and research areas during the last 8 years and has led and managed significant research programs, such as using big health data to develop machine learning, deep learning and translational data science models, and software tools to aid diagnosis and prediction of disease outcomes, particularly for hard-to-manage complex and chronic diseases. His main research interest includes developing statistical models, machine learning and deep learning algorithms and software tools utilizing multimodal data, especially medical images, neuroimaging, EEG, ECG, Bioinformatics and secondary usage of routinely collected data for different conditions. He has published more than 200 top-tier journal articles and received 6900+ citations.



STI Expo 2022 is a flagship event of the 2022- 4th International Conference on Sustainable Technologies for Industry 4.0 (STI 2022). For the first time, STI Expo 2022 will create a common platform for researchers and industry practitioners to plan, discuss and achieve the goals of Industry 4.0. STI Expo 2022 is going to be organized with the purpose of amelioration of business relations, demonstration of industrial technologies and collaboration with industries for research projects. The event will also facilitate the exhibition of both new and upcoming technological products, presentation of the technological innovation targets for industrial revolution and an environment for the cooperation and development of new partnerships.

The Organizing Committee of STI Expo 2022 invites Software and App development companies, Telecommunication vendors, Aggregators, Power Distribution & Transmission companies, Heavy Machinery Industries, Manufacturing Industries, Sales and Service companies, Engineering Consultation & Management firms, Textile industries, Government bodies, and Technical Associations engaged and interested in Computer & Software engineering, Electrical power engineering, Renewable energy or Energy systems to sponsor the conference or, arrange an industrial trade exhibition booth. The Participating companies of STI Expo 2022 were Elite Hi-tech industries, Walton Hi tech industries, Moon International, Famantech corporation, Ashuganj Power station company Limited etc. In this year, STI Expo 2022 is very honored to have Daraz Bangladesh, Teletalk Bangladesh, Walton Hi tech industries, Elite Hi tech industries, Beximco Group and square pharmaceuticals etc. with us. In this year, STI Expo 2022 will be going to arrange three segments-

- (i) Industrial Panel Discussion session.
- (ii) Industrial Exhibition of Technological Products.
- (iii) Pioneers of Academic Projects.

### Industrial Panel discussion session:

A panel discussion is a way to engage industry thought leaders in dialogue regarding relevant topics in their industry while an audience listens. Each panelist will typically have their own differing opinions from the others on the subject matter presented, which makes for a thought-provoking and well-rounded discussion for the audience to learn from and be entertained by. In this year, we have set our industrial panel discussion topic as-



### Industrial Panel Discussion

" Pathways to Bridge the gap between academic research and R&D of any professional organization for Industry 4.0 revolution"



**Mohammad Razaul Karim Rizvi**  
Additional General Manager  
Planning & Implementation Department  
Teletalk Bangladesh Limited



**Md. Noor A Alam**  
Deputy Managing Director  
Elite Hitech Industries Ltd. &  
Noor Trade Electronics



**Dr. Hasan Mahmud**  
Director (Entrepreneurship)  
Bangladesh Energy and Power  
Research Council (BEPRC),  
Inaugural Bangabandhu Chair Researcher



**Syed Al Imran**  
Senior Deputy Executive Director  
Walton Hi tech Industries Limited

#### Industrial Exhibition of Technological Products:

Industrial exhibition is a platform where the leading industries of the country launch and promote technological and industrial products. It Creates an unparalleled platform for industry-academia collaboration · Creating strategies to bring industry problems to the academia for productive and innovative solutions for development. Participating in an industrial exhibition will enable industry to market their brands to a broader crowd and make them aware of their product and service.

In STI Expo 2022, we have arranged an industrial exhibition session and some growing and start up companies are going to participate in this session.

#### Pioneers of Academic Projects:

We believe that the young professionals and graduates have the potential to invent prototype projects which will open a new era for industry practitioners in future. Through this session, STI Expo 2022 is going to set a platform for young engineers and professional to showcase their academic projects.

## Previous STI Proceedings





# Previous Keynote Speakers

## STI 2019

 <b>Muhammad H. Rashid</b> IEEE Fellow Professor, Electrical Engineering Florida Polytechnic University, USA	 <b>Sajal K. Das</b> IEEE Fellow and Professor Missouri University of Science and Technology, USA	 <b>Deng Zhongmin</b> Professor and Director Wuhan Textile University China	 <b>Alamgir Hossain</b> Professor, Artificial Intelligence Teesside University UK	 <b>Fahim Kawsar</b> Director, Bell Laboratories New Jersey, USA
 <b>Oksam Chae</b> Professor, Computer Vision Kyung Hee University, South Korea	 <b>Rahamatullah Khondoker</b> Professor, Applied Sciences Darmstadt University, Germany	 <b>Md Atiqur Rahman Ahad</b> Senior Member, IEEE Osaka University, Japan	 <b>Prof. Dr. Celia Shahnaz</b> Chair, IEEE BDS Professor, BUET	

## STI 2020

 <b>Claudio A. Canizares</b> IEEE Fellow University of Waterloo Canada	 <b>Vincent Wong</b> IEEE Fellow University of British Columbia Canada	 <b>Rajkumar Buyya</b> IEEE Fellow University of Melbourne Australia	 <b>Hussein Abbass</b> IEEE Fellow University of New South Wales Australia	 <b>Sushmita Mitra</b> IEEE Fellow Indian Statistical Institute Kolkata	 <b>Manzoor Ahmed</b> Professor Emeritus BRAC University
 <b>M. Julius Hossain</b> Research Scientist EMBL, Heidelberg, Germany	 <b>Monirul Islam Sharif</b> Senior Member, IEEE United States of America	 <b>Md. Rabiul Islam</b> Senior Member, IEEE University of Wollongong, Australia	 <b>M. Tariqul Islam</b> Senior Member, IEEE Universiti Kebangsaan Malaysia (The National Univ of Malaysia)	 <b>Thorsten Henkel</b> Department Head Industrial Security Solutions Fraunhofer SIT, Germany	 <b>Asif Naimur Rashid</b> Chief Information Officer Robi Axiata Ltd, Bangladesh

## STI 2021

 <b>Prof. Tarek Abdelzaher</b> IEEE Fellow University of Illinois, Urbana Champaign	 <b>Amit K. GUPTA</b> PhD CEng Fellow (IEEE IET IES) Head of Rolls-Royce Electrical, Singapore	 <b>Prof. Giancarlo Fortino</b> IEEE Fellow University of Calabria, Italy	 <b>Prof. Ai-Chun Pang</b> IEEE Fellow National Taiwan University	 <b>Prof. M. Ashraf Alam</b> IEEE Fellow Purdue University, USA
 <b>Sajal K. Das</b> IEEE Fellow and Professor Missouri University of Science and Technology, USA	 <b>Tapan Saha</b> IEEE Fellow University of Queensland	 <b>Chanchol Roy</b> Professor University of Saskatchewan	 <b>Dr. Zhi Chen</b> Wuhan Textile University	 <b>Dr.-Ing. Moniruzzoza Ashir</b> Technical University of Dresden Germany

# PHOTO GALLERY





## PHOTO GALLERY



## PHOTO GALLERY





## PHOTO GALLERY



## 2023 5th International Conference on Sustainable Technologies for Industry 4.0 (STI)

Green University of Bangladesh, Permanent Campus, Purbachal American City, Rupgonj, Dhaka, Bangladesh  
 Date: 09-10 December 2023 ✉ [sti@green.edu.bd](mailto:sti@green.edu.bd) 🌐 [fse.green.edu.bd/sti-2023](http://fse.green.edu.bd/sti-2023)

### WHY STI?

- First conference in southeast Asia on Sustainable Technologies for Industry 4.0
- Only conference in Bangladesh, which is technically sponsored by the central IEEE Computer Society
- All the papers of our previous editions are included in the IEEE Xplore digital library within short period of times
- From the very first edition, all the accepted papers are included in the Scopus and other renowned databases
- With each subsequent edition, involvement of international participants is increasing, e.g., 2019: 20 countries, 2020: 22 countries, and 2021: 35 countries
- In our last edition (STI 2022), FOUR (4) IEEE fellows where one was IEEE Life Fellow have joined us as keynote speakers, and it is a common practice

### CALL FOR PAPER

STI conference provides a platform for facilitating and promoting innovative research on Industry 4.0 (or Industrial Revolution 4.0) by encompassing research areas related to smart industries, smart grids, intelligent transportation, real-time healthcare, and others that are bolstered by automation and cyber-physical systems. In addition, detailed studies and research are required to design and develop sustainable solutions for Industry 4.0 since they depend on the complex relations among humans, systems and objects, which is also covered in this conference.

STI 2023 welcomes researchers, industry professionals, and practitioners to display their scientific achievements and sustainable solutions for industrial developments in the fields of computer science & engineering, electrical & electronic engineering, textile engineering, robotics and cyber-physical systems related to Industry 4.0. It will be hosted at the permanent campus of Green University of Bangladesh, Purbachal American City, Dhaka, Bangladesh during 09-10 December 2023.

We are seeking original high-quality innovative research for submissions. All submissions to STI 2023 will go through a double-blind peer reviewing process. Accepted and presented papers will be submitted to the IEEE Xplore digital library. Papers presenting original research are being sought within following tracks, but not limited to:

01 Intelligent Computing, Networking and Security Systems	02 Energy, Robotics, Electronics, Sensors and Communications	03 Textiles and Other Industry 4.0 Applications
<ul style="list-style-type: none"> <li>• Augmented Reality, Virtual Reality, Bioinformatics</li> <li>• Computational Linguistic and Natural Language Processing</li> <li>• Computer Vision, Image Processing and Pattern Recognition</li> <li>• Artificial Intelligence in Autonomous Vehicles</li> <li>• AI and Machine Learning in Smart Grid Power System</li> <li>• Concurrence of 5G, Cloud, Fog and Edge Computing</li> <li>• AI in Robotics and Automation</li> <li>• Digital Twins</li> <li>• Data Mining Techniques for Business Intelligence</li> <li>• Transfer Learning in Industry Applications</li> <li>• Computer Network and Information Security</li> <li>• Big Data Analytics and Blockchain Technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Smart Grid &amp; Micro Grid, Renewable Energy &amp; Sustainability</li> <li>• Nuclear Physics and Biochemical Engineering</li> <li>• Industrial Automation, Robotic Design and Applications</li> <li>• Advanced Microcontrollers and Embedded Systems Design</li> <li>• Green Electrical Components, Circuits, Devices and Systems</li> <li>• Control System and Power Electronics</li> <li>• VLSI Design and Graph Theory</li> <li>• Remote Sensing and Smart Sensor Design</li> <li>• Sustainable Nanotechnology and Materials Science</li> <li>• Signal Processing, Telecommunications and RF engineering</li> </ul>	<ul style="list-style-type: none"> <li>• Smart Textiles and Clothes</li> <li>• Sustainable Machine Design</li> <li>• Automated Inspection and Maintenance</li> <li>• Green Manufacturing of Yarn &amp; Fabric and Fashion Design</li> <li>• Advanced Spinning, Dyeing, Printing and Finishing</li> <li>• Smart Home/ City/ Industries/ Health/ Agriculture</li> <li>• Autonomous and Unmanned Aerial Vehicles</li> <li>• Smart Education (Education 4.0)</li> <li>• Industrial Policies Aligning SDG</li> </ul>

### COMMITTEE

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### SPECIAL FEATURES

- Keynote and Invited Speeches
- Technical Paper Presentation
- Interactive Poster Session
- Industrial Talks
- Workshops and Tutorials
- Innovative Project Exhibition

### IMPORTANT DATES

Full Paper Submission.....	31 JUL 2023
Submission of Special Session, Tutorial and/or Workshop Proposal.....	16 SEP 2023
Proposal for Student Conference.....	16 SEP 2023
Acceptance Notification.....	30 SEP 2023
Final Camera-Ready Paper Submission.....	15 OCT 2023
Conference Date.....	09-10 DEC 2023

### SUBMISSION GUIDELINE

Prospective authors are invited to submit their manuscripts reporting original unpublished research and recent developments in the topics related to the conference. It is required that the manuscript follows the standard IEEE format (IEEE standard double column, 10-point font).

- Submitted paper should be in PDF format and should be maximum 6 pages
- Submissions must include title, abstract, keywords, body and references.
- Due to double-blind peer review requirements, paper must not contain author and affiliation information.
- The IEEE templates in Microsoft Word and LaTeX format can be found at: <https://fse.green.edu.bd/sti-2023/>
- Authors are advised to upload full papers through Easy Chair conference management system using this link: <https://easychair.org/conferences/?conf=sti20230>.

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# icpc

## International Collegiate Programming Contest

# 2022 ICPC Asia Dhaka Regional

### March 2023

### Green University of Bangladesh



### Preliminary Contest

Registration at: <https://icpc.green.edu.bd>  
 Registration Starts: January 01, 2023  
 Registration Deadline: January 25, 2023  
 Online Mock Contest: February 03, 2023  
 Online Preliminary Contest: February 04, 2023  
 Registration Fee: BDT 390

### Main Contest

Registration Starts: February 10, 2023  
 Registration Deadline: February 17, 2023  
 Mock Contest: March 10, 2023  
 Onsite Contest: March 11, 2023  
 Registration Fee: BDT 7500

<https://icpc.green.edu.bd>

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Scan QR Code



**Organized By:**  
**Green University of Bangladesh**  
 Purbachal American City, Kanchan, Rupganj  
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