14th IEEE International Conference on Open Source Systems & Technologies

ICOSST 2020

16th - 17th December, 2020

WHATS INSIDE!

WELCOME NOTE FROM **GOVERNOR OF PUNJAB**

Chaudhry Mohammad Sarwar
Governor Punjab

Dear Members,

I am sure that the future of open source is bright and by using open-source technology we can take Pakistan on a fast track towards development and prosperity. In this context, ICOSST 2020 provides a unique opportunity for researchers and industries to come together for low cost and innovative solutions. The Government can gain huge benefit in developing a cheaper solution for e-governance and social services to better manage the resources and provide quality living to the citizens. In the end, I would like to wish the very best of luck to the organizers and participants of ICOSST 2020.

Thank You.

WELCOME NOTE FROM **MINISTER HIGHER EDUCATION**

Raja Yasir Humayun

Minister for Higher Education
Government of Punjab

Dear Members,

I am very pleased to know that IEEE 14th International Conference on Open-Source Systems & Technologies 2020 has been organized by Al-Khawarizmi Institute of Computer Science (KICS) University of Engineering & Technology Lahore. Our students must learn about open-source systems & technologies and become part of this open-source system movement. I think that is the key especially for the third world country because the open-source system is playing a major role in the future of software growth and the role that KICS is playing by organizing conferences is commendable. The government is encouraging research in the field of software technologies as we want our students to learn new technologies. It will be an excellent opportunity for students, researchers, academia to know what is happening around the world in this area. In the end, I wish Al-Khawarizmi Institute the best of luck and I hope they keep doing good work as they are doing already.

Thank You.

WELCOME NOTE FROM **PARLIAMENTARY SECRETARY**

Dear Participants,

I would like to thanks KICS UET for inviting me to the 14th International Conference on Open Source Systems and Technologies. I think this is a great platform for the researchers, academics, and industrial experts to exchange their ideas on a wide range of topics related to Open Source Systems and Technologies, Software Applications, Artificial Intelligence, cloud Computing, especially AI applications for COVID-19 detection, diagnosis, treatment, prevention, evolution, control, and prediction, etc. All these technologies are considered to be the most demanding technologies of the current time and also of the future.

In the end, I would like to wish the best of luck to the organizers and participants of ICOSST 2020.

Thank You.

Ms.Nausheen Hamid

Parliamentary Secretary
Ministry of National Health Services, Regulation & Coordination

WELCOME NOTE FROM **CHAIRMAN PHEC**

Prof. Dr. Fazal Ahmad Khalid (SI)

Chairman PHEC
Punjab Higher Education Comission

Dear Participants,

I would like to congratulate the University of Engineering and Technology and Al-Khawarizmi Institute of Computer Science for organizing ICOSST 2020. I am sure that this will provide a big platform for all the researchers, technologists, engineers, and scientists to contribute to this platform which is now a recognized platform at the international level because this is a continuation of the series of conferences that were held in the previous years and this time it is going to be conducted online. let me congratulate the organizers Dr. Waqar Mahmood and his team for making all the arrangements and inviting the speakers to come to this platform and contribute in the best possible manner for the advancement of science, engineering, and technologies. This conference is very critical from the perspective of IT and the software technologies which have become very important and critical in modern times. In the last few months in Pakistan and all over the world we have witnessed that education technology has played a vital role in the continuation of our activities whether it is in academics, industry, or any organization. The new normal has become very important and this would not have been possible without the advancement in the field of Computer Science Engineering and the deceptive technologies from Artificial Intelligence, Data Science to Machine Learning, 3d printing, and many other software which have become very important and critical to providing us a platform to work, to engage and contribute in various organizations in various activities and programs. This conference will not only give opportunities to the faculty working in different institutions but also there are participation from international forums, universities, and organizations. I am sure that this will allow having the exchange of views and ideas to learn many new things in the field of Computer Science and Software Development. Punjab Higher Education Commission has also tried to bring some new developments like we are developing a portal for the province to facilitate our students and faculty members in terms of admissions, employment opportunities, scholarships, and all kinds of academic information that would be available at this portal. It has various levels of engagement from career counseling to management to various aspects of cooperation, employability, and job prospects that might be available in various institutions. So, the students can find this information with a click. Technology is the way forward and no country can make progress without focusing on science, technology, mathematics including social sciences, liberal arts so that we cannot only provide opportunities to the scientists and the graduates of the country but also see that the holistic education should be available coupled with the developments happening in the world and that knowledge and information is shared at the platform like ICOSST. Here I would say that the University of Engineering & Technology has taken a lead and has established ICOSST as an international platform with a serious kind of review that is carried out. As far as the publications are concerned, the research papers that are submitted and published to the conference with a good review. The credit goes to the organizers and the committee who has worked day & night to make this successful event and I wish all the best to the organizers.

Thank You.

WELCOME NOTE FROM **VICE CHANCELLOR UET**

Prof. Dr. Syed Mansoor Sarwar

Vice Chancellor UET

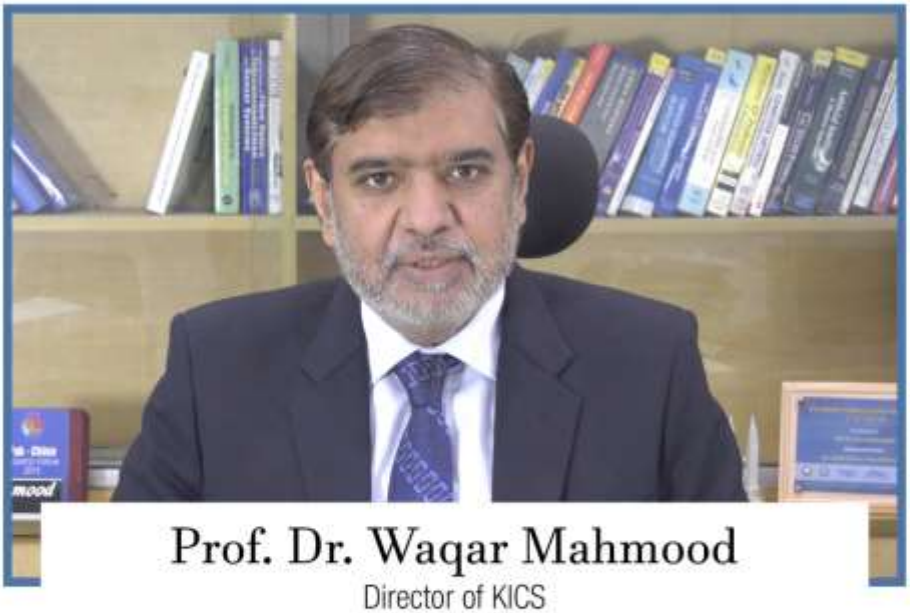
University of Engineering & Technology, Lahore

Dear Participants,

ICOSST has been a torchbearer for the last several years in several engineering disciplines specifically for the computer science community. It is gratifying to note that the agenda of this conference covers a wide range of topics related to recent advances in the field of Open Source Systems and Technologies, Software Applications, Databases, Networks, Information Security, OSS and Social Innovation, Embedded Computing, Cloud Computing, Virtualization, AI for Knowledge Discovery, Automation, AI Applications for COVID-19 Detection, Diagnosis, Treatment, Prevention, Evolution, Control, and Prediction, etc. ICOSST 2020 is a great opportunity for the professionals, private/public sector organizations, researchers, and students to discuss the needs of future applications and current challenges in developing and adopting open-source solutions. AI technologies are considered to be the most demanding technologies of this century. According to the trade market trends, countries like China, Germany, and the USA have released strategies to promote the use and development of AI. The industrialized countries and their governments are pushing their knowledge economy frameworks with investment in science and technology are playing a critical role in their strategies. There is a dire need for Pakistan to keep the due focus on the development and use of AI technologies since they have the potential to boost our economy in several areas and enhance our exports to several billion dollars. In recent times, several initiatives have been launched at the national level to take advantage of the current wave of AI. I feel truly honored and proud to share that UET Lahore has won funding under all these centers after a healthy competition amongst other universities across the country. Our four state of the art R&D labs under each of these centers are flourishing under the dynamic faculty of UET and contributing to the socio-economic benefits to the nation. Therefore, a platform is needed for researchers, engineers, academicians as well as industrial professionals from all over the world to present their research results and development activities in the latest computing technologies. In this regard, I thank the ICOSST organizing team for providing opportunities to the delegates to exchange their research findings and ideas with others. I would suggest the participants further strengthen the collaborative research and development relationships. In the end, I would like to wish the best of luck to the organizers and participants of ICOSST 2020.

Thank You.

WELCOME NOTE FROM **DIRECTOR KICS**



Prof. Dr. Waqar Mahmood

Director of KICS

Alkhawarizmi Institute of Computer Science - UET Lahore

Dear Participants,

It gives me great pleasure and it is my honor to welcome you all to ICOSST 2020 organized virtually this year by Al-Khawarizmi Institute of Computer Science (KICS), UET Lahore. The institute is known for its applied research and development activities in the area of Information and Communication Technologies in collaboration with local industries and international research & academic organizations. The institute is playing a key role in taking the country forward towards a knowledge-based economy and competitive industrialization. It provides the country with trained resources for state-of-the-art training and certification programs. Over the years it has established more than 25 research & training labs in various areas of ICT including Artificial Intelligence, Cloud Computing, IoT, and other technologies of the fourth industrial revolution. KICS has received recognition as a top IT research institute in Pakistan by the study conducted by Islamic Development Bank and Higher Education Commission. It has been organizing this annual conference for the last 13 years and it is the 14th conference this year in this series. This year we have received more international submissions than any of the previous years, showing increased confidence in the international research community at the conference. The international submissions came from the USA, Europe, Italy and Bulgaria, China, South Korea, Indonesia and the Philippines, Saudi Arabia, Lebanon, Africa, Nigeria, South Africa, Bangladesh, and India. The conference received 176 submissions and the technical committee of international experts selected 35 highest quality papers for publication which is less than 20% of the submitted lot making it a very highly selective conference. The open-source movement has picked up great momentum recently. 90% of all software developers today use some kind of open-source technology in their code. This conference has been acting as an intellectual interchange among researchers, scientists, engineers, and experts involved in open-source development. It is providing a perfect platform for researchers and practitioners to embrace AI, NLI technologies of the 4th industrial revolution by developing an understanding of its true potential for productivity enhancement in all sectors of the economy. This year COVID-19 was selected as a special topic of research for the ICT community to bring forward innovations and it would help in the prevention of this disease. The event is organized virtually including the technical sessions, invited talks, and panel discussions. The exposition is also arranged in a 3d live virtual mode. KICS research labs and other industries are showcasing their products and projects. The virtual exposition also has an option of live chat with the exhibitors. To conclude, I would say Pakistan is facing a large number of challenges including a lower human development index, education index, and ICT use index. On the other hand, it has a very large young population. If the young population is provided with the appropriate education and training, they can turn around the country's future. The open-source platform and the various technologies presented today and tomorrow during the event by KICS UET provide opportunities to exactly serving this purpose. We appreciate our collaborators especially Punjab Higher Education Commission and Federal HEC, exhibitors, and IEEE volunteers, without your support we were not have been able to meet this objective. I would like to thank the technical committee headed by Dr. Ghalib, the program committee headed by Dr. Amir, the virtual exhibition team headed by Rehan Tariq, the administrative group headed by Aqeel Babar, the coordination group headed by Kashif Bashir, and volunteers who work tirelessly over past few months to make this event a great success. Special thanks to IEEE volunteer Mr. Hamza for helping out with the arrangements of the virtual event. I hope you find the International Conference on Open-Source Systems and Technologies 2020 a rewarding experience.

Thank You.

14th IEEE International Conference on Open Source Systems & Technologies ICOSST 2020

Open-Source Software (OSS) is an established cross-disciplinary paradigm for distributed enterprise computing and e-Government. It is helping organizations both public and private to keep control on the cost of development and deployment. OSS has not only changed the way software applications are architected, deployed, and consumed but also, they are engineered to provide large distributed cross-platforms and frameworks. IEEE Computer & Communication Societies, Lahore Section, (R10) in Technical Co-sponsorship and joint collaboration with Al-Khawarizmi Institute of Computer Science, UET, Lahore, Pakistan organized a two-day first virtual conference of Pakistan (International Conference on Open Source Systems & Technologies) ICOSST 2020 to invite researchers and practitioners from across the world to share their ideas and experiences related to the state-of-the-art and the future of open source systems and technologies, software applications, databases, networks, information security, OSS and social innovation, embedded computing, cloud computing, virtualization, AI for knowledge discovery, automation, AI Applications for COVID-19 Detection, Diagnosis, Treatment, Prevention, Evolution, Control, and Prediction, etc. ICOSST created a scientific venue where participants shared ideas, strategies, and policies for tackling the development, research, and adaptation challenges related to open-source tools and open-source development environments for their customized requirements.

VIRTUAL / EXPOSITION

As the conference was held virtually, the Industrial Exposition was also held virtually this year. It was Pakistan's 1st virtual exposition in a complete 3D environment where products from different labs of KICS were displayed in such a manner that visitors could have a live demo experience in a virtual reality-based environment. The unique exposition organized using VR based technology not only attracted visitors but also set an example of organizing expositions in the pandemic. More than a dozen industries showcased their products in the exposition. Participating industries include ArhamSoft Pvt.Ltd, TechHive Solutions, Jolta Electric, Zoxcell, Desollnt. Pvt. Ltd, Silicon st, Grandeur Tech, Ebryx, Tower Technologies, Xeber, Repairwala.Pk, Tranchulas, ComSoft Solutions, ArbiSoft, Techverx, Global Technologies. than a dozen industries showcased their products in the exposition. Participating industries include ArhamSoft Pvt.Ltd, TechHive Solutions, Jolta Electric, Zoxcell, Desollnt. Pvt. Ltd, Silicon st, Grandeur Tech, Ebryx, Tower Technologies, Xeber, Repairwala.Pk, Tranchulas, ComSoft Solutions, ArbiSoft, Techverx, Global Technologies. The participants of the conference appreciated the unique idea of the virtual exposition.

To advance communications and networking technology for the betterment of humanity, right now, in more than 140 countries around the world, thousands of members are actively working as engineers, academics, practitioners, scientists, executives, and associates contributing new ideas and information to our collective knowledge, developing higher industry standards, and changing the way we all communicate, for the better. The IEEE Communications Society promotes technological innovation and fosters the creation and sharing of information among the global technical community. The Society provides services to members for their technical and professional advancement and forums for technical exchanges among professionals in academia, industry, and public institutions to bring the world together in harmony through communications and networking technology research, application, education, and incubation of new ideas.

The Chair of the IEEE COMSOC Lahore chapter is Mr. Kashif Bashir and Vice-Chair is Dr. Yasir Saleem.

The IEEE Computer Society is the premier source for information, inspiration, and collab¬oration in computer science and engineering. connecting members worldwide, the comput¬er society empowers the people with advanced technology by delivering tools for individuals at all stages of their professional careers.

Our trusted resources include international con¬ferences, peer-reviewed publications, a robust digital library, globally recognized standards, and continuous learning opportunities. The IEEE computer society traces its origins back to 1946. For more than 70 years, our members have played a central role in the rapid evolution of computer technologies, and we've grown from a small group of specialists to an international organization with more than 50,000 members who are dedicated to advancing all aspects of computer science and engineering.

The IEEE Computer Society offers an array of products and services to keep you and your organization at the top of technology: 200+ conferences, a Digital Library (CSDL) with 800k articles, peer-reviewed magazines and journals, online education, and a solutions center.

The Chair of the IEEE computer society Lahore section is Prof. Dr. Waqar Mahmood and Vice-Chair is Mr. Aftab Ur Rehman.

ICOSST/ ORGANIZERS

IEEE LAHORE SECTION

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- General Chair

Dr. Ghalib Asadullah
- Technical Chair

Mr. Kashif Bashir
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Noor ul Wara - *Member*

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WEBSITE COMMITTEE

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Muzammil Hassan - *Co-Chair*

INDUSTRIAL DEMOS COMMITTEE

Farhan Riaz - *Chair*

Dr. **Giorgio** Quer

IEEE Distinguished Lecturer

Affiliation: Scripps Research Institute in San Diego, California

Talk Title: Wearable Sensor Data to predict COVID-19

Prof. **Claudio** Gallicchio

International Speaker

Affiliation: Assistant Prof. Machine Learning at the Dept. of Computer Science in the University of Pisa, Italy

Talk Title: Advances in Deep Randomized Neural Networks

Dr. **Abdul** Waheed

International Speaker

Affiliation: Principal Member of Technical Staff, Monitoring Cloud at Salesforce, United States

Talk Title: Monitoring the cloud using open source component

Dr. **Moazzam** Khan

National Speaker

Affiliation: Software Engineer IBM Security Systems

Talk Title: Applying ML to Cyber Security Data: A case study of User Behavior Analysis

Prof. **Melanie** Rieback

International Speaker

Affiliation: CEO/Co-founder of Radically Open Security

Talk Title: Pentesting ChatOps

Prof. **Oliver** Hohlfeld

International Speaker

Affiliation: Professor and heads the Chair of Computer Networks at Brandenburg University of Technology (BTU), Germany

Talk Title: Internet User Behavior during Covid-19

Dr. **Junaid** Qadir

National Speaker

Affiliation: ITU/Academia

Talk Title: IThe Ethics of Artificial Intelligence

Mr. **Syler**

International Speaker

Affiliation: Expert at Huawei AI Global Strategies

Talk Title: Ascend to Pervasive Intelligence

Prof. **Ying** Liu

International Speaker

Affiliation: SCenter for Image and Information Processing, Ministry of Public Security, China.

Talk Title: Bridging the Gap between Lab-grade Technologies and Practical Challenges

INVITED/ TALKS

Dr. **Giorgio** Quer

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IEEE
Distinguished Lecturer

Affiliation: Scripps Research Institute in San Diego, California

Talk Title: Wearable Sensor Data to predict COVID-19

Dr. Giorgio Quer talked about atrial fibrillation (AF) that is an abnormal heart rhythm characterized by the rapid and irregular beating of atrial fibrillation. He talked about the cardiologist level AF detection and prediction of AF. He talked about the AI-enabled EEG algorithm for the identification. He talked about the mSToPS randomized clinical trial. On the effectiveness of deep representation learning: The Atrial Fibrillation case. He talked about the clinical approach and deep learning approach for the detection of AF. He talked about the Clinical and DL features and architecture such as Alex net, VGG, ResNet, Inception, and Mobile Net. He talked about the clinical use of the deep learning approach. He talked about the long data from the ECG, the history and interpretation of the ECG, and how we monitor the ECG. He talked about the smartwatch for AF and large scale assessment of a smartwatch to identify atrial fibrillation. He talked about the Sleep test, diagnostic tool, monitoring sleep, sleep stages, and identify the pattern. He discussed the longitudinal sleep analysis, objective vs. Subjective measure of sleep. He talked about Sleep variability, huge sleep variability, different behaviors, and individual clinical recommendations. He talked about the Resting Heart rate that the normal daily RHR can vary by as much as 70 bpm between individuals. Small but significant seasonal trends. Women had greater variability in RHR than men. Age sex and BMI are the main factors in RHR. He said that everybody resting heart rate is relatively unique to them. He talked about the FLU prediction. He talked about the COVID caused so many deaths and real-time tracking of self-reported symptoms to predict potentials COVID. He talked about the Asymptomatic, and prevalence of Asymptomatic. He talked about the wearable sensor data and self-reported symptoms for COVID-19 detection. He talked about the MYDataHelps app in which many people can share their COVID symptoms and data. He can report the symptoms and test results, resting hr. and sleep rate. In his conclusion, he discussed digital medicine, personal sensors, and passive monitoring. He talked about the automatic analysis of long data and the extraction of new information. He talked about personalized medicine and tight collaboration with clinical sensor engineers.

Prof. **Claudio** Gallicchio

International Speaker

Affiliation: Assistant Prof. Machine Learning at the Dept. of Computer Science in the University of Pisa, Italy

Talk Title: Advances in Deep Randomized Neural Networks

Prof. Gallicchio talked about the advances in deep randomized neural networks and Neural networks in several forms, including training algorithms, regularization techniques, etc. He discussed about the importance of randomization and elaborate the deep learning tremendous success over the last years. He also discussed the Complexity and accuracy tradeoff that the more complex algorithms have high accuracy. He talked about the concepts of perceptron that is a probabilistic model for information storage and organization in the brain. He discussed that the randomization is computational cheap then optimization. We can use a random expansion into a higher dimensional feature space. He talked about the Deep learning that developed multiple representation, artificial neural architecture, training algorithms and Initialization schemes. He talked about the structured data and introduce the concept of structure data that contain a structure in data. He talked about time series and graphs and recurrent neural networks. He discussed about the advantages of randomized neural networks such as faster learning, clean mathematical analysis and unconditional hardware implementations. He also talked about the Applications of randomized neural network such as Imminent intelligent, Human activity recognition, and Robot localization, early identification of earth quake and early identification of heart diseases. He concludes the talked by sharing the great tradeoff between accuracy and complexity, exploit intrinsic properties of the neural architectures and enables fast yet efficient learning in structure domains.

Dr. **Abdul** Waheed

International Speaker

Affiliation: Principal Member of Technical Staff, Monitoring Cloud at Salesforce, United States

Talk Title: Monitoring the cloud using open source component

Dr. Abdul Waheed talked about the background of cloud computing and importance of monitoring the cloud services. He talked about the large number of devices and the other end have large computational powers. He talked about the Computing pattern, distributed clients and data centers He talked about the Services, infrastructure and deployment of cloud. He discussed some Cloud services models, Software function, platform and Infrastructure. He talked about the monitoring for clouds and Levels of visibility in clouds. He talked about the OS visibility and OS providers for resource management, I/O operations, isolation and system API. He talked about the Public cloud usage models and Public cloud monitoring. He talked about the Public cloud usage models and Public cloud monitoring. He discussed some examples of public cloud such as Amazon cloud watch and use cases of Cloud monitoring. He talked about the limitations for native monitoring and requirements for a cloud monitoring solution. He talked about the Pipeline operation: collection, transport, archival, indexing, search and analytics. He discussed about the limitation for native monitoring that works well for smaller companies and creating problems with growing scale/size.

Dr. **Moazzam** Khan

National Speaker

Affiliation: Software Engineer IBM Security Systems

Talk Title: Applying ML to Cyber Security Data: A case study of User Behavior Analysis

Dr. Moazzam khan talked about the Qradar based application called Watson Advisor and insider treat such as intentional and unintentional treats that are caused by social media, poor security. He discussed about the percentage of total attacks that are divided into outsider's attack with 40% and insiders attack with 60%. These attacks cause 4$ million losses and more than 204 organizations are involved. He discussed about the traditional techniques of detecting anomalous user behaviors such as rule based and the ML base. In the rule based technique user will get allot of alert and very rigid and didn't learn from user behavior. ML techniques learn from data, they are divided into supervised learning and unsupervised learning. He talked about the Security Information and events manage

Information and events management system (SEIM) the main task of SEIM is to collect data from various sources on your network and notify when a security incident occurs. He talked about the different examples of SEIM such as Log sources, event processing: Web proxy, IPs and firewall. He talked about some challenges for ML models such as for example the events are out in one database, hundreds of columns, the rows are sparse ,500k + events per second ,43 B records ,1M devices and 1M users. These all the things are very difficult to handle. He talked about the constructing ML pipeline and time serious based models. He also talked about the peer group models and defined peer groups. He concluded the talk with the challenges and future work of cyber security.

Prof. **Melanie** Rieback

International Speaker

Affiliation: CEO/Co-founder of Radically Open Security

Talk Title: Pentesting ChatOps

Melanie Rieback talked about the pentesting the chatOps. She talked about the openness and transparency of customers. She talked about the building quotation of pin and then inviting the customer to chat box. She talked about the Security and optimization from malicious activities. She talked about their work with Google, Mozilla in term of security. She talked about the Red/blue pen testing in which they take teams from software development companies and divide red and black teams and then they compete each other by hacking and technical skills.

They also provide a training to them to hack their own applications and also do phishing test to their applications. She talked about the Scanning and exploitation and she discussed about the securing consultancy as a DevOps shop. She said that the Pen test also show the progress of you work as well. She talked about some security concern and give some suggestion such as Try and use individual Chatbot's. She discussed that the future of Chatbot's are AI based Chatbot's.

Prof. **Oliver** Hohlfeld

International Speaker

Affiliation: Professor and heads the Chair of Computer Networks at Brandenburg University of Technology (BTU), Germany

Talk Title: Internet User Behavior during Covid-19

Oliver Hohlfeld talked about the virtual conferences and shared his experience that the Virtual conference have more attendee's then on-site conferences. He talked about the Network performance and network security and issues of performance and how we can make it faster. He talked about How COVID change the internet. He talked about the Internet biggest success stories and talked about the corona warn app that help us to fight with the coronavirus. These app help tracing the start of the official COVID-19 exposure notification app for Germany. He talked about the Corona pandemic remark that is a very challenge for our society. He talked about the Warn app that released on 16 June, 2020. He talked about the corona warn app for Germany and how they are measuring the user behavior that download app used. He talked about the App and measuring usage approach. He talked about the Bluetooth scanning for and detection of infection and diagnosis keys. He talked about the geographic app interest that increase in lockdown and partial lock down. He talked about the user behaviors during the lockdown and internet behavior and the activities of users. He talked about the impact of the covid-19 pandemic, lots of data that needs Lots of data structure. He discussed about the 3 main data points one is located on iXP central Europe, IXP southern Europe and IXp US east coast. He talked about the Data that has been analyzed strictly premise and results are aggregated. He discussed about the traffic volumes before and after the lockdown. How the pandemic changing the pattern? He talked about the large increase in web and large increase in number of active ip addresses and volume, 200% increase in domain based VPN based traffic. He concludes that Changes in people's lives lead to new traffic patterns. Traffic increase 15 to 30 % within a few days. Networks did react quickly to the additional need for capacity. They can accommodate sudden changes in demand if they are planned with spare capacity and quick reaction times.

Dr. **Junaid** Qadir

National Speaker

Affiliation: ITU/Academia

Talk Title: IThe Ethics of Artificial Intelligence

He mainly talked about the success of ML and AI. He further discussed the problems that are being tackled by AI such as Object Recognition, Reinforcement learning, image classification, health informatics self-driving cars, and machine translation. He talked about the benefits and harms of AI technology. He talked about the ledger of harms such as systemic oppression, social relationships, physical and mental health. He talked about the King Midas problem and the value Alignment problem. He talked about the Bias, fairness, and justice, and ethics of AI /ML models. He talked about the interpretability, privacy, trustworthiness of AI models. He talked about the business of AI models with face detection algorithms and natural language processing. He discussed the AI learns to model gender stereotypes. He talked about the problems of fairness and ethical choices. He discussed the machine Bias that are used to predict future criminals that are biased against blacks and the curves of predictive accuracy vs. fairness. AI has the potential for huge benefits and massive harm.

Mr. **Syler**

International Speaker

Affiliation: Expert at Huawei AI Global Strategies

Talk Title: Ascend to Pervasive Intelligence

Mr. Syler discussed the intelligent devices have expanded to various industries and are currently driving pervasive computing. He talked about the shifting from general to heterogeneous computing and advancing Moor's. He talked about the breakthroughs in AI algorithms Unlock Boundless possibilities. He talked about the 5G empowers Ai and the internet of everything brings ubiquitous data. He talked about the transmission and latency requirements in typical scenarios, 5G capacity leap, peak rate, number of connection, and latency. He talked about the Verge of an innovation explosion, explosive data growth, pervasive computing, and pervasive intelligence. He talked about the barriers of AI lead to the high cost of intelligent transformation. He talked about the intelligent edge solution, data center solution. He talked about the AI will reshape industries and AI readiness empower industries. He talked about Huawei's solutions such as Da Vinci architecture, the bedrock of the ultimate AI computing power. AI computing power such as Atlas 3ool: the most powerful inference to tool. He talked about the best in class heat dissipation for optimal energy efficiency. He discussed the Device Edge Cloud collaboration enables the ultimate development and user experience and the openness at different layers that enable the industry AI applications. He talked about the Trustworthy AI platform from chips to systems and trusted chips and trusted systems. He talked about the Welink and VMall and how AI empowers the industries. He talked about Huawei's building a bountiful digital world. They provide open hardware, open-source software, and partner enablement. He talked about Huawei's industry experience with the strength of top ISVs. He talked about the Atlas 900 AI Cluster Expediters Astronomical exploration. He talked about the electric power that is an Industry-first Smart Grid check solution. He talked about the AI-powered Covid-19 diagnostics in Italy and transportation that is AI Smooth's highways with a 5x efficiency boost. He talked about the Supercomputing Atlas that helps PCL build Cloud-Brain Phase II.

Prof. **Ying** Liu

International Speaker

Affiliation: SCenter for Image and Information Processing, Ministry of Public Security, China.

Talk Title: Bridging the Gap between Lab-grade Technologies and Practical Challenges

She talked about the CSI Image Retrieval techniques. She discussed the challenges that are the quality of CSI images, specific content, and a small number of samples for learning. She talked about the CSI image enhancement and the problems are very low resolution and overexposure. She talked about the face recognition and challenges in this scenario are Face occlusion and Person re-identification. These are a very hot topic for research and practical data are more complex than our training data. She discussed another topic that is criminal identification by using body features. Then she discussed the video retrieval and challenges that are small objects, the same object under the different camera, and high precision in the event perdition she suggests the multi-model. She discussed the event prediction abnormal crowd behavior prediction and the challenges. She discussed the multimodal information processing for public opinion analysis challenges are data authority and fusion of multimodal data. She talked about the hyperspectral image analysis and challenges such as data collection and hardware cost. She talked about the surveillance video data compression and challenges in the information of the important clues that might be removed. How to introduce police experience in this domain-specific task? She talked about the CSIR image retrieval system that they developed to solve the police case systems. Their many products have been used in police cases.

PAPER/ PRESENTATION

1 Amna Altaf

Affiliation: COMSATS University Islamabad

Paper Title: Email Organization Through Deep Learning Algorithms

The author presented the existing issues for email overload for internet users. The papers main crux was to devise an intelligent taxonomy strategy that can segregate emails into distinct groups by incorporating different learning methods for different user types. The author elaborated that they used MLP (Multi-Layer Perceptron) based learning models that can intelligently categorize emails into three datasets of different sizes and purposes. Experimental results, algorithm used and results of the experiment was shared. The speaker also highlighted optimization tools, dropout ratio and batch normalization techniques used in the algorithm to achieve optimization. In the end the speaker discussed the main application areas of the proposed techniques for both industrial and educational purposes.

2 Romona M Haris

Affiliation: North Central University California, USA

Paper Title: Data Warehousing and Decision Support System Effectiveness Demonstrated in Service Recovery During COVID-19 Health Pandemic

The author highlighted the effectiveness of DW / DSS (data warehousing and decision support systems) during a health-related epidemic. The author proposed an approach to manage the business plan and implement certain types of effective service recovery that will allow to maintain a current customer base in times of epidemic. The collected data obtained from the techniques can help to identify some of the features of the current services provided to the customer, which can help in gaining business intelligence that can forecast important decisions. The author discussed the comprehensiveness of the data warehousing and decision support systems in developing a successful platform for devising a structurally strong business model.

3 Muhammad Usman

Affiliation: University of Engineering & Technology, Taxila, Pakistan

Paper Title: AI Detect: A Machine Learning Based Approach for Fault Identification in Gear Bearing System Using Low-Frequency Data

In this paper the author discussed a low-cost technology for fault identification of rotary machines specifically for gear bearing systems. Rotary machines are important components of any industrial operation. Fault in these machines and their components can cause a series of damage due to fatal failure of the system. The research uses Bagged Tree algorithm that tests and validates the readings of a monitoring rig that uses accelerometers to detect vibration profiles of various gears and bearings in the lower frequency range. The author also discussed the statistical features of the technique which are obtained by simulations on Matlab. Experimental results, algorithm used and results of the experiment was shared. Moroder the comparison to the SVM and KNN method is also displayed to highlight the effectiveness of the algorithm.

4 Muhammad Sohaib Ajmal

Affiliation: University of Engineering & Technology, Taxila, Pakistan

Paper Title: Flexible Genetic Algorithm Operators for Task Scheduling in Cloud Datacenters

In this paper the author discuses about the importance of data management for cloud computing. Cloud Computing is the backbone of the modern information technology industry, almost used in all internet usage including social media and mobile phones. To process large chunks of information some sort of data management is an essential tool for Cloud datacenters. The author discusses the existing issues of Genetic algorithms and the risks associated with inefficient data management. The author has presented a novel technique called as Flexible Genetic Algorithm Operators for Task Scheduling (FGAO). This algorithm operates on the crossover and mutation operators according to the required quality of the scheduling solution, without defined stopping standards. Experimental results, algorithm tools and results of the algorithm were shared. The author shared that the proposed algorithm optimizes data management and reduced the computational time by 40% and data repetitions by 33% as compared to the results of genetic algorithm.

5 Sumair Aziz

Affiliation: affiliation with University of Engineering and Technology, Taxila

Paper Title: Emotion Recognition System Featuring a Fusion of Electrocardiogram & Photoplethysmogram Features

This paper is based on the implementation of Artificial Intelligence with the particular use of Machine Learning and Deep Learning focused on the enhancement of Human Computer Interaction (HCI);
with the aid of Emotion recognition technology. The Classifiers used were as follows: 1) KNN and 2) ANN. Four classes of human emotions were addressed in the paper: Fear, Disgust, Happy, Sadness. Different emotions were judged with the help of Electrocardiogram (ECG) and Photoplethysmography (PCG).

6 Maneeha Rani

Affiliation: University of Engineering and Technology, Peshawar

Paper Title: Comparative Analysis and Enhancement of Sentiment Intensity Based Tools

In this paper the author discussed a low-cost technology for fault identification of rotary machines specifically for gear bearing systems. Rotary machines are important components of any industrial operation. Fault in these machines and their components can cause a series of damage due to fatal failure of the system. The research uses Bagged Tree algorithm that tests and validates the readings of a monitoring rig that uses accelerometers to detect vibration profiles of various gears and bearings in the lower frequency

range. The author also discussed the statistical features of the technique which are obtained by simulations on Matlab. Experimental results, algorithm used and results of the experiment was shared. Moroder the comparison to the SVM and KNN method is also displayed to highlight the effectiveness of the algorithm.

7 Bilal Tahir

Affiliation: University of Engineering & Technology, Lahore, Pakistan

Paper Title: News-EDS: News Based Epidemic Disease Surveillance Using Machine Learning

This paper, presents the News based Epidemic Disease Surveillance using machine learning (News-EDS) to perform surveillance by identifying the English news related diseases. First, we classify the news related to the predefined list of epidemic-prone diseases using machine learning classifiers. Next, the labelled dataset and pre-trained word embeddings are used to identify news related to diseases unknown to the classifier during the training process. In addition, we perform unsupervised clustering on news content of unknown diseases to identify the individual diseases discussed in the text of news. Our results show that the system can segregate news related to a predefined list of diseases with a maximum of 95% accuracy. While for unknown disease identification, 78% accuracy is achieved. Furthermore, the clustering algorithm shows the values of 0.884 and 0.887 for completeness and homogeneity values of clusters, respectively.

8 Syed Jahanzaib Hussain Pirzada

Affiliation: Beihang University, China & Information Security

Paper Title: Optimized Authentication Algorithm on FPGA for Space- Air-Ground Integrated Network

In this talk the author highlighted the rising trend of space-air-ground integrated network. The writer emphasized that it is imperative to extend coverage of communications into space, air and land by corresponding equipment integration of navigation and surveillance (CNS) services while maintaining data encryption. To compete against recent advancement of technology, the speed of communication has to be increased along with data protection for algorithms especially for those used in defense purposes. This can be achieved by a single authentication algorithm with high output implementations. In the proposed work, an authentication algorithm based on the Advanced Encryption Standard (AES) using a parallel structure is proposed. Various optimizations tools have been proposed for light optimization, catering radiation in space and high throughput implementation that provide further support to the algorithm. The proposed algorithm has been validated on an in-FPGA environment and provides enhanced results as compared to previous work done for the same cause.

9 Muhammad Sohaib Ajmal

Affiliation: University of Engineering & Technology, Taxila, Pakistan

Paper Title: Randomized Key Exchange Protocol Implementation for Internet of Things Application

The author highlighted the importance of the security of public-key algorithms. Moreover, the introduction of Perfect Forward Secrecy (PFS) is introduced to tackle various security threats. The security of the key exchange protocol is the crucial element for securing the public-key algorithm as it unlocks the information present in the algorithm. Furthermore, the information extraction of public-key cryptography demands a major conversion protocol. The author describes that conventionally, asynchronous and symmetrical key conversion protocols are used that consume a lot of hardware resources and execution time. Furthermore, these protocols require high message count to send required information that causes delays in key conversion and inefficient use of bandwidth. In order to cater the above-mentioned problems, the author has presented a novel key exchange protocol with advanced features for random start vector and PFS. In the end the author explained that the proposed algorithm is simpler and faster than the previous algorithms and a comparative analysis with One TimePad (OTP) algorithm was also presented.

10 Shakir Ullah

Affiliation: University of Engineering and technology, Peshawar, Pakistan

Paper Title: Design and Analysis of a Compact Dual-Band Patch Antenna for 5G mmW Application

The author has presented a novel patch antenna that can provide support for fifth generation (5G) network applications. The antenna is based on a slotted rectangular design with support for dual-band (28 / 42GHz) frequencies. The author describes the construction of the antenna, that has been designed on a simple microstrip patch of 8 × 8 × 0.8 mm3 size. The proposed antenna provides an impedance bandwidth of 2 / 9.2 GHz for the 28/42 GHz transmission frequency and provides a tangible solution for required compactness, improved efficiency and high gain. In order to improve the gain of the antenna a deflected ground structure (DGS) is shaped below the feed line of the microstrip patch antenna (MSA). The proposed design provides better VSWR, reduced return losses, improved gain, enhanced efficiency, and optimal current distribution to provide increased support for 5G applications in the millimeter-wave field.

11 Muhammad Tanveer

Affiliation: GIK Institute of Engineering Sciences & Technology, Paki-

Paper Title: LAS-6LE: A Lightweight Authentication Scheme for 6LoWPAN Environment

The author has highlighted the importance of IPv6 as an integral fragment for internet of Things. The LAS-6LE finds immense applications for low-power wireless personal area networks (6LoWPAN). The structure of the 6LoWPAN network, by using sensor nodes (SNs) was also discussed, that gathers critical information from the host environment, stores it and then transfers it to server. In order for a powerful and reliable communication over the 6LoWPAN network, a powerful verification scheme is required to validate the authenticity of the SN. The paper discusses a lightweight standardization strategy for the 6WWPAN environment (LAS-6LE). The structure of the LAS-6LE was also discussed that authenticates the validity of data sent by the SN and then establishes an encrypted key between the server and the SN to realize data privacy. Furthermore, the logical accuracy of LAS-6LE is than versified by BAN logic. The SN server set is the key for future encrypted communications. The experimental results define that LAS-6LE 6LoWPAN environment consumes less resources and more reliable data transmission.

12 Ali Akbar

Affiliation: Namal Institute, Pakistan

Paper Title: MAC Aware Random Network Coding for Wireless Unicast Flows

The author has proposed an effective encoding scheme for Random Linear Network Coding (RLNC) that provides a unicast flow in single-hop ad hoc networks and multi-hop wireless mesh networks (WMNs). The author discussed the conventional encoding methods known as the Unicast stream, also known as Intercast Network Coding (NC). Although the inter-flow NC technology reduces total number of transmissions, but practically scrutiny of Wireless Medium Access Control (MAC), shows that NC technology is highly affected by MAC overheads. The algorithm based on RLNC was validated by Telos motes testbed. The test results show that the proposed approach decreases transmission rates by up to 40% times as compared to the conventional methods.

13 Sidra Farhat

Affiliation: University of Engineering and technology, Taxila

Paper Title: High Gain Patch Antenna Array with Defected Ground Structure for 5G Applications

A novel, single layer patch antenna array based on 1 × 4 elements having a compact size, high gain and with low design complexity is presented. A single patch is designed and to enhance the performance, two different configurations of arrays are proposed and analyzed. To reduce the coupling between the antenna array elements

an I-shaped slot is inserted in the ground. Parasitic metallic strips are employed to enhance the peak gain. The proposed antenna array has a compact size of 3.6 × 3.6 cm2. Rogers RT5880 is used as a substrate with a thickness of 0.508 mm. The design achieves an operational bandwidth of 2.06 GHz with a peak gain of 15.07 dBi. The maximum radiation efficiency of 91.9% is achieved at 28.5 GHz. The proposed array-2 is then fabricated and measured. Various parameters such as reddiation efficiency, Voltage Standing Wave Ratio (VSWR), surface currents and radiation patterns for E and H-fields are investigated.

14 Syed **Najeeb** Ali Kazmi

Affiliation: University of Engineering and technology, Taxila

Paper Title: IoT based Energy Efficient Smart Street Lighting Technique with Air Quality Monitoring

This paper presents an Internet of Things (IoT) based smart street lighting system with real time online air quality monitoring. It generates free energy from solar panels and piezoelectric transducers for smartly switching the streetlights ON/OFF based on presence and absence of vehicles and sunlight. Firstly, the electricity generated from solar panels and piezoelectric sensors placed under the speed breakers and footpaths, is stored in rechargeable batteries, for powering up streetlights and its associated sensors. The frequency of vehicles, presence/absence of sunlight and air quality is sensed through different sensors while online monitoring is performed via ThingSpeak, which is an open source IoT platform with MATLAB analytics. Moreover, a detection system is used for detecting faulty streetlights with the help of voltage and current sensors. Depending upon number of vehicles passed during night, streetlights are operated at four different intensities i.e. between 50%-20% with the step size of 10% in the absence of vehicles. However, upon arrival of vehicle the lights start glowing at 100% intensity. With this proposed system, electricity consumption by streetlights is significantly reduced up to 84%, and also with real time air quality monitoring, authorities can take suitable action when air quality index reaches an undesired level.

15 **Muhammad** Asghar

Affiliation: University of Engineering and technology, Taxila

Paper Title: A Robust Technique for Detecting SARS-CoV-2 from X-Ray Image using 2D Convolutional Neural Network and Particle Swarm Optimization

The recent pandemic that has taken the world by storm, Corona Virus (COVID-19) sparking from Wuhan in China has to spread across the globe is spread through touch and breath, hence rapidly spreading. Strategies to cope with it initiate by diagnosing the affected people. A real-time Reverse-transcription-polymerase reaction is a very slow and unreliable means if diagnosing the disease thus a much quicker alternative is required. Initially, we would collect and arrange all our data through the methods of data synthesis. Another important factor is the testing and training of the proposed 2D Convolutional Neural Network (2D-CNN) model, dividing the data into three groups, and each group consists of different images for testing, training, and validation. The features are then selected using the Particle Swarm Optimization (PSO) method and smoothened using Principle Component Analysis (PCA). Data evaluation is done through classification using a support vector machine (SVM) and an array, which provides the results necessary to record and diagnose diseases based on a variety of data samples.

16 **Farhad** Hassan

Affiliation: Air University, Pakistan

Paper Title: Effect of Hyperparameter Optimization Technique to Extract the Nuclei from the Cell

This paper helps in extracting the nucleus from the cell by using image processing techniques and the power of deep learning architectures while it is based on the U-Net nuclei segmentation framework, but the standard model achieved 84.8% testing accuracy, achieved 83.5% training accuracy and also little bit variation in predictive resultant image as compared to binary image but with a hyperparameter optimization tech-

nique, the model achieved 97.6% testing accuracy and 97.5% training accuracy and the predictive resultant images of the hyperparameter optimization model are more accurate as compared to without a standard model and help research community of medical imagery analysis.

17 Amina Baseer

Affiliation: Quaid-Azam University Islamabad, Pakistan.

Paper Title: Deep Networks Based Classification of COVID-19 Chest X-Ray Images

The worldwide spread of COVID-19 (Corona virus) has been declared a global health crisis by WHO. In order to perform early diagnosis of COVID-19 infection a computer-aided diagnosis (CAD) system is of great importance. Chest X-ray radiographic imaging is a preferred diagnostic mean used by radiologists. Machine and deep learning algorithms have been found useful in many CAD equipped health care systems. In this paper, we present an approach to classify chest X-ray radiographic images into normal, COVID-19, and viral-pneumonia categories. The proposed approach performs feature extraction using pre-trained and finetuned deep networks using transfer learning. A support vector machine (SVM) is trained using the extracted features and used for classification. We collect a dataset comprised of publicly available chest X-ray images from normal, COVID-19 and viral-pneumonia patients. Experimental results demonstrate that the proposed approach achieves 99.29% classification accuracy in case of COVID-19 images and an overall classification accuracy of 97.36%, which is better than most of the existing approaches.

18 Emmen Farooq

Affiliation: University of Management and Technology Lahore, Pakistan

Paper Title: Privacy Policies' Readability Analysis of Contemporary Free Healthcare Apps

This paper presents a novel slotted rectangular dual-band (28/42GHz) patch antenna for fifth generation (5G) network applications. A simple microstrip patch antenna of the size 8×8×0.8 mm 3 has been proposed having impedance bandwidth of 2/9.2 GHz for 28/42 GHz transmission frequency, to resolve the issues of the required compactness, high gain and improved efficiency of the 5G wireless applications. Rogers RO4350 (lossy) is used as a substrate material having dielectric constant and thickness of r=3.66 and 0.8 mm respectively. For the resonant frequencies of 28.2 GHz and 42 GHz, the gain of 6.2 dB is achieved for the entire considered bandwidth and a directional radiation pattern is achieved for millimeter-wave transmission. A defected ground structure (DGS) is formed by placing a rectangular slot under the ground, underneath the feed line of a microstrip patch antenna (MSA) which results in improving of the gain. The comparison of the DGS, full ground, and the effect of the slot technique are shown in detail with simulation results in CST. The results for return loss, VSWR, gain, efficiency, directivity and current distributions shows that the proposed antenna is well suited for the 5G applications in the millimeter-wave region.

19 Nasir Beyg

Affiliation: National University of Sciences and Technology Islamabad, Pakistan.

Paper Title: Image Dehazing Using Dark and Bright Channel Priors and Multi-Scale Filters

The paper proposes bright and dark channel priors dependent single image based dehazing in two color spaces. The hazy RGB is first converted into YCbCr space. Transmission maps are estimated using dark channel priors (DCPs) and airlight of intensity (in YCbCr) and RGB components computed using three window sizes. Bright channel priors (BCPs) and threshold values are also computed for YCbCr and RGB color spaces. The transmission maps are adjusted using DCPs and BCPs and refined using multiscale guided filter to obtain a superior dehazed image. Comparison (both visually and qualitatively) on variety of images exhibits the significance of proposed technique over existing techniques.

20 Nauman **Zafar** Hashmi

Affiliation: UET Taxila, Pakistan

Paper Title: An Augmented Reality Based Virtual Dressing Room Using Haarcascades Classifier

Virtual dressing rooms are modern way of shopping where customers experience realistic dress fitting and order online. As trying different dresses at shopping centers is very time consuming and customers are not sure how the dress looks on them. Therefore, there is a need to identify efficient methods to improve virtual dressing rooms and increase e-commerce businesses. All the existing virtual dressing room methods required Kinect sensors for virtualdress fitting and Kinect sensors are expensive. Our motivation is to create such virtual dressing room that overcome the constraint of Kinect sensor input. We present a dynamic virtual dressing room based on web cam to acquire input video and allow user to experience virtual dress fitting. Our proposed model comprised of following steps including face, skin, lower body detection and dynamic distance estimation for precise virtual reality. We have evaluated our algorithm on 50 subjects using 10 dresses.

21 **Saad** Naeem

Affiliation: FAST NUCES Islamabad, Pakistan

Paper Title: Subspace Gaussian Mixture Model for Continuous Urdu Speech Recognition Using Kaldi

Automatic Speech Recognition Systems (ASR) have significantly improved in recent years, where deep learning is playing an important role in the development of end-to-end ASR's. ASR is the task of converting spoken language into computer readable text. ASRs are becoming ever more prevalent way to interact with technology, thereby significantly closing the gap in terms of how humans interact with computers, making it more natural. Urdu is an under resourced language, for which training such a system requires a huge amount of data that is not readily available. In this paper we present improvements to the architecture of a statistical automatic speech recognition system for which the components involved in a statistical ASR have been explored in great detail. We also present the results on various statistical models that are trained for Urdu language. We choose the Kaldi toolkit for training the Urdu ASR using approximately 100 hours of transcribed data. The refined Subspace Gaussian Model gives a word error rate of 9% on the test set.

22 **Roger** Achkar

Affiliation: American University of Science and Technology, Lebanon.

Paper Title: Fire and Smoke Detection Using Artificial Neural Networks

Fire is an abnormal event which can cause significant damage to live and property. In this paper, we propose a deep learning-based fire detection method which imitates the human fire detection process. This study aims to investigate the effectiveness of our three sensors that are the inputs of our system, Smoke Density, Temperature and Carbon Monoxide sensors. These sensors with the help of artificial neural network will help esti-mate the appearance of fire, smoke or none of the them. In the Artificial Neural Network, the forward pass, back-propagation and the further forward pass will be applied as methods to update weights and reach the minimal error by iterating through the epochs. This research has reached an accuracy of 98.3%.

23 **Inayat** Ullah

Affiliation: University of Engineering and Technology, Taxila, Pakistan

Paper Title: An Improved Comparative Model for Chronic Kidney Disease (CKD) Prediction

This paper exploit machine learning (ML) technique to find and diagnose chronic kidney disease (CKD) at mild damaged stage. Kidney disease are syndromes that cause the functions and Glomerular filtration rate

(GFR) of the kidney. Nephrologist caution that the ratio of patients affected by CKD is significantly increasing. More precise Data mining and ML methods are required to predict and diagnose CKD successfully. In this paper we apply different ML classification procedures on a data set obtained from UCI repository which comprise of 400 instances, 24 features and binary classification labels. The 10-fold cross-validation procedure is applied on dataset to evaluate the model. The most familiar ML classification algorithms are included in this paper are Random forest (RF), discriminant analysis (DA), Naive Bayes (NB), Support Vector Machine (SVM), and k-nearest neighbor (K-NN). All the experiments are performed in MATLAB tools. The statistical results of all algorithms proved that RF performed better then DA, NB, SVM, and K-NN with accuracies of 99.75%, 98.25%, 98%, 97%, and 92% respectively.

24 **Hafiz** Hamza
Affiliation: Lecturer, Pakistan

Paper Title: Digital Image Processing Based Detection of Rheumatoid Arthritis Using Pythagorean Theorem

Digital image processing has procured huge significance in analysis and diagnosis of diseases in this era of technology. Detection of rheumatoid arthritis is a challenge in the situation when experts are unavailable. Rheumatoid Arthritis (RA) is a disorder of the immune system, which attacks our own tissues and causes joint pain, swelling, and stiffness. To detect RA, rheumatologists recommend a blood test, named "Rheumatoid Factor". In laboratories, this test is performed manually by technicians, where the presence of experts is necessary, and chances of human errors and mistakes exist. We proposed a method that will identify the Rheumatoid Arthritis by applying digital image processing approaches. This proposed method is based on pre-processing and finding the region of interest.
To find the performance of proposed method the blood samples are taken in medical Laboratory and experimental results showed that the efficiency of this method is 98%

25 **Ali** Nawaz
Affiliation: CEME NUST, Pakistan

Paper Title: Agile Methods: Testing Challenges, Solutions & Tool Support

Agile development is conventional these days and with the passage of time software developers are rapidly moving from Waterfall to Agile development. Agile methods focus on delivering executable code quickly by increasing the responsiveness of software companies while decreasing development overhead and consider people as the strongest pillar of software development. As agile development overshadows Waterfall methodologies for software development, it comes up with some distinct challenges related to testing of such software. Our study is going to discuss the challenges this approach has stirred up. Some of the challenges are discussed in this paper with possible solutions and approaches used for resolving these challenges. Also, the tools in practice are mentioned to improve the efficiency of the process.

26 Muhammad **Usman** Awais
Affiliation: National University of Computer and Emerging Sciences, Pakistan.

Paper Title: DevOps in Pakistani Software Industry

Researchers have been working to make software processes smooth and efficient. DevOps is a software development framework that fits best in the context of ever-emerging cloud technologies. DevOps has made it possible to automate each stage of software development, this is why it is gaining popularity rapidly. For the Pakistani software industry, the acceptance of DevOps is hindered by many factors. The most important of them all is the ever-widening disparity between the industry and academia. To assess the knowledge and acceptance of DevOps in the Pakistani software industry, a survey was conducted. Apart from other results, one conclusion is clear from the survey; Pakistani software engineers are completely aware of the changes taking place in the international market and they are trying to coupe up with them, but the lack of theoretical knowledge is not allowing them to get to the pace they should have been. At the end of the article, some suggestions are presented to improve the situation.

27 Maham **Anwar** Beg

Affiliation: Lahore University of Management Sciences & Prince Sultan University, Pakistan.

Paper Title: A Comprehensive Clone Management Solution

Copying existing code for reuse is a common practice during software development and maintenance. This leads to duplication of code in software systems, also called code clones. Clones can be spotted using any available clone detection tool. A common activity followed by detection is to refactor and remove clones. However, for pragmatic reasons, it is not always possible to remove clones and hence clones should be managed effectively to avoid any negative impacts on software maintenance. We present CMT, an Eclipse IDE integrated tool that provides a compre hensive clone management mechanism including clone detection, clone tracking, clone analysis, clone visualization, metalevel clone unification, and controlled clone generation for code fragment level simple clones and higher-level structural clones

28 **Arooj** Arif

Affiliation: National University of Computer and Emerging Sciences

Paper Title: Refactoring of Code to Remove Technical Debt and Reduce Maintenance Effort

Software industry faces issues like Technical Debt in their software projects. Technical Debt (TD) is a debt, which arises when a person involved in engineering of software, intentionally or unintentionally makes wrong or non-optimal design decisions. This problem occurs due to non-systematic and undefined approach to manage the high level of uncertainty in requirements. These non-optimal design decisions and the non-systematic approach can result in introduction of code smells. Code smells are actually technical debt (also known as perceived debt), which may cause a project to fade out with time. Code of a software project with technical debt is considered as unclean code. Refactoring is an activity of modifying the code to remove technical debt from a software project and make the project code clean. The goal of this work is to study the impact of removing TD on the effort required to adding features and removing bugs in software. To this end, this work uses a stepwise approach; first code smells (considered as technical debt) are identified, and in the next step the smells are removed and impact of removing the code smells (on removing bug and adding new feature) is observed in terms of effort required during maintenance. Technical debt in five opensource software applications has been calculated and impact of removing the code smells has been observed on one of the applications named NopCommerce (an ecommerce-based system). Effort to add a new feature and remove a bug, before and after refactoring, has been calculated in terms of man-hours. The effort required to add new feature and remove a bug from the clean code has been 7% less as compared to the effort required to do the same in unclean code. Whether to perform refactoring or not is a decision made by software developers. The impact of refactoring in reducing effort required to maintain code will help a developer make a decision regarding refactoring.

29 Muhammad **Kashif** Nazir

Affiliation: Riphah International University Faisalabad, Pakistan.

Paper Title: Sentiment Analysis of User Reviews About Hotel in Roman Urdu

In recent years, sentiment analysis has significant role on various social media networks, electronic marketing websites, communication forums and blogging websites. There are many issues in sentiment mining, classification and analysis like huge lexicon, Natural language processing overhead, fake reviews etc. Out of these issues, one major issue is that the comments and reviews can be in different languages like French, Chines, English, Urdu, Arabic etc. To handle each language according to its syntax, semantic and structure is very difficult task. Many researcher's work on English, Urdu, Arabic sentiment analysis but very limited work has been done on resource constrain languages like Roman Urdu. In this paper, Python is used to execute different classification machine learning models for Roman Urdu text analysis. Total 3000 reviews dataset has been scrapped from different hotel websites. The results show that logistic regression and SVM outperformed in terms of accuracy, recall, precision and F-measure.

30 Shumaila Farhad

Affiliation: Abasyn University, Pakistan

Paper Title: An Adaptive and Lightweight Spreading Factor Assignment Scheme for LoRaWAN Networks

Presently, a long-range wide area network (LoRaWAN) uses an adaptive data rate (ADR) by aiming to provide consistent and energy-efficient communication to the Internet of Things devices. The ADR manages both the spreading factor (SF) and transmit power at the end device (ED) and network server (NS)-sides. However, the performance of ADR is severely affected by the variable channel conditions, resulting in massive packet loss. Therefore, we propose two schemes: the initial SF assignment scheme (I-SFA) during the deployment phase and a recovery method called adaptive SF assignment based on the interference (A-SFA). The I-SFA assigns the best SF to EDs based on the received power that a gateway would receive from ED. Whereas A-SFA is used as a recovery method when a collision between two packets of the same SF occur, the A-SFA changes the SF. Hence, it reduces the chances of future interference and thus improves the packet delivery ratio. Simulation results show that the proposed scheme performs better in terms of packet delivery ratio and energy consumption when compared to the existing methods.

31 Asad Ali

Affiliation: University of Salerno, Italy

Paper Title: Bio-Inspired Algorithms in Software Fault Prediction: A Systematic Literature Review

Bio-inspired (and meta-heuristic) algorithms are successfully employed in different domains and the research is going on to accommodate them in all the contexts where optimization is required. In software engineering, and especially Software Fault Prediction (SFP), they are investigated in various forms, e.g., to extract the most relevant features in a dataset or to select the most appropriate set of parameter values in the application of estimation techniques. In SFP, feature selection and optimization/tuning of estimation technique's parameters are an active research area, where recently various bio-inspired algorithms have been employed for both strategies. In this work, we present a Systematic Literature Review (SLR) about the use of bio-inspired algorithms for feature selection and parameter optimization aiming at increasing fault prediction accuracy of the models built with various estimation techniques. To the best of our knowledge, there is no SLR in SFP which covers the use of bio-inspired algorithms, both for feature selection and parameter optimization. Since, the use of bio-inspired algorithms in the area of SFP started to be investigated in the late 2000, we have considered studies published between 2007 and 2019. As result, we have selected about 19 studies related to parameter optimization and 15 dealing with feature selection (in total 34 studies), extracted from five well-known digital libraries (ACM digital library, IEEE explore, Springer, ScienceDirect, and Scopus). Genetic Algorithms (GA) and Particle Swarm Optimization (PSO) are the widely used bio-inspired algorithms, both for parameter optimization and feature selection. Among them, GA is the better performed algorithm when evaluating its performance against the baseline (i.e., estimation techniques without any algorithm for feature selection or parameter optimization and trained with their default values). The SLR results also suggests that bio-inspired algorithms seem to provide more accurate predictions for feature selection than for parameter optimization.

32 Shumaila Farhad

Affiliation: PIEAS, Islamabad Pakistan.

Paper Title: A Parallelized Data Processing Algorithm for Map Matching on Open-Source Routing Machine Server

This paper discusses the multiprocessing algorithm, used for improving the performance of code that processes data on Open-Source Routing Machine (OSRM) Server. OSRM is a routing engine that provides (shortest) routes between origins and destinations on Open Street Map (OSM) based road networks. The Nearest Service by OSRM may be used to map GPS data on OSM road networks. The latitudes and longitudes (coordinates) from Floating Car Data (FCD) are sent to the OSRM server using nearest API to find the pair of nodes for the specific coordinates. The performance of data preparation process depends on many

factors. For the OSRM server available online, it takes tremendous amount of time therefore a local setup of server is a preferable choice. Even on a local server, it takes a considerable time to prepare large scale data. It is important to optimize the data fetching algorithm so that huge records can be prepared easily using the Open-Source Routing Machine. A two-prong strategy has been discussed in this paper. Firstly, the performance can be improved by running processes in parallel and utilizing the maximum number of cores. The Second improvement is achieved by splitting files to avoid the memory swapping process. The parallelization process yields pronounced results which have been discussed in this paper.

33 **Hameed** *Ullah*
Affiliation: National University of Sciences and Technology, Pakistan.

Paper Title: Robust Nonlinear Output Feedback Tracking Control of Single-Link Flexible Joint Robotic Manipulator System

Single link flexible joint robotic manipulators are highly nonlinear systems is being widely used in many industries which are most of the time suffer from external disturbances and dynamical parametric uncertainties. In this paper, robust nonlinear output feedback tracking control is designed for single-link flexible joint robotic manipulator system. The designed controller is based on the feedback linearization control technique which is opted owing to its simplicity. A conventional high gain observer is used to estimate the states, but it is sensitive to external disturbances and parametric uncertainties. To handle the aforementioned drawbacks, an extended order high gain observer is used which has the capability to eliminate the effects of external disturbances and parametric uncertainties. A feedback linearizing control technique is used to track the desired output of the robotic manipulator and extended order high gain observer is used for state estimations. The proposed controller and observers are validated using MATLAB simulations. The results show that the extended order high gain observer along with globally bounded feedback linearizing control perfectly tracks the trajectory of the system's output in the presence of external disturbances and parametric uncertainties. This robustness of the extended order high gain observer against external disturbances and parametric uncertainties makes it appropriate for practical implementation to the flexible joint ***n***-link manipulators.

PANEL / DISCUSSION

The session chair Dr. Amir Mehmood led the panel discussion. He discussed about the problems we faced during COVID-19 pandemic. He stated that, "the goal of the panel discussion is how can we fight this COVID-19 pandemic with innovation from industry and academia". All the panelist introduced their selves and shared their opinion on the topic.

Dr. Hammad Naveed, Dr Zartash, Dr Adnan Jabbar and Omer J. Ghani were the panelist who gave a brief introduction of their background and work. The questions Dr. Amir Mehmood asked were:

1. Considering the second wave of COVID-19, what is the need of hour, what is required and how industry help in tackling problems in the second wave?
2. What kind of response you had seen from Academia? Were the technologies market ready and robust enough to meet demand at scale?
3. Is there any innovative solution in particular you would like to mention? Like AI based diagnosis, cheap and quick infection detection, predicting hotspots and trends etc.

Dr. Hammad Naveed

Associate Professor Dr. Hammad Naveed from FAST, Islamabad said for innovation the professionals of all fields such as medical, engineering and technology must collaborate. He further said that there is not enough support and funding available for industry in Pakistan for research. The viruses evolve overtime and they need to be studied constanly to make better vaccines. We haven't even identified the genetic mutation of COVID-19 virus. We must focus on doing more and more research to compete with the national needs.

Dr. Zartash

Dr. Zartash from LUMS continued the discussion by sharing his opinions. He said during the first wave everyone was taking precautions for COVID-19 and were being careful ascompared to the second wave. Typically, the second waves are much higher as it can be observed on some countries. People should be careful and take precautionary measures to protect themselves from this deadly virus. The awareness campaigns should continue operating as usual. He further said the e-commerce has expanded during the pandemic, which shows the technology industry have played a good role and stayed updated according to the requirements of society. He gave examples of efforts made to create applications and equipment for COVID-19.

Dr. Adnan Jabbar

Dr. Adnan Jabbar is an emergency physician and health care technology consultant. He started by supporting the opinion of Dr. Hammad. He also added that the organizations lack funding and resources for research and development. He said, he believed that literacy rate must be improved greatly. Lower literacy rate and disinformation are the factors that have made it difficult to fight the pandemic.

Omer J. Ghani

Omer J. Ghani from HEC discussed about all the funds launched for research and development in educational sector. In addition, he said we need to use a combined approach to handlea situation such as COVID-19 pandemic.The behavior change is the first requirement, another requirement is that the policy makers, the government and private sectors must work together to cope with the situation.He further added, the research organizations should also focus towards commercializing the research and projects rather than just publications. There is also a lack of multidisciplinary research, hence we all must come together and work together.

Finally, Dr. Amir Mehmood concluded the discussion by saying, "Dr Zartash emphasized that serious precautions must be taken against COVID-19, Dr Adnan mentioned literacy rate should be increased and industry should scale up to tackle the pandemic. Omer pointed out that they will be making some policies that the universities can define their own research priorities. Dr. Hammad suggested reverse-engineering to create solutions for ongoing issues."

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