



AICTE & MRSPTU sponsored six days online Faculty Development Program

IoT & Artificial Intelligence in Industry 4.0

Six days online faculty development program sponsored by AICTE & MRSPTU on “**IoT & Artificial Intelligence in Industry 4.0**” organized by Department of Electrical Engineering, Baba Farid College of Engineering & Technology, Bathinda from 17th-22nd January. More than 300 registrations were received across 24 States of India. The program was described important transformation is necessary to accompany the volumes of data produced by the Internet of things and need of network identification because in modern ADN there is rapid growth in demand side technologies and distributed energy resources. Main topics discussed in the program was related to Applications of Machine learning, Network Identification in Modern PS through AI, AI Based adaptive control technique for grid integrated, AI based adaptive control technique for solar power Electric vehicle, Emerging trends in AI & IoT, Introduction to Internet of Robotic things (IORT), AI & Robotics in Industry 4.0, Solar MPPT Tracking using Artificial Intelligent Technique, IOT and Cyber Security, Future of IOT (Predictive Analytics), Efficient Intelligent Control for Electrical Management System, National Educational Policy (An Overview), Explore various research opportunities and challenges in the field of IOT, AI and its applications, Free and Open-Source Frameworks for IoT and Industry 4.0, AI/IOT Application in Power System, Real Time Streaming Libraries for IoT and Industrial Applications.

Day 1: Monday, January 17th, 2022

Resource Person –

1. Prof Dr. Buta Singh Sidhu, Vice Chancellor, MRSPTU, Bathinda.
2. Col. B. Venket, Director, Faculty Development Cell, AICTE, New Delhi.
3. Dr. Suhas M. Kakade, COE, Pune
4. Dr. Priyank Shah, University of Warwick, UK

1st Session: - The program was inaugurated by the Chief Guest Prof Dr. Buta Singh Sidhu, Honorable Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University, Bathinda. He addressed the audience with great enthusiasm and discuss emerging AI & IoT trends in different sectors alongwith related research in these sectors. The Guest of Honour Col. B. Venket, Director, Faculty Development Cell, AICTE, New Delhi graced the occasion and



congratulated BFCET for organizing FDP on IoT & Artificial Intelligence in Industry 4.0. Er. Harsimran Singh (Convenor FDP) briefed the importance of faculty development program to all participants. Dr. Tejinder Pal Singh Sarao (Dean R&D, BFCET) delivered welcome speech to all the faculty members as well as delegates.

Session 2: - Dr. Suhas M. Kakade, COE, Pune : The topic for the second session was Applications of Machine learning. He started the talk by explaining basics of Machine learning by taking few daily life examples. He explained the supervised, unsupervised learning of machine learning. As the session proceeded, he explained the classification of advanced machine learning- Neural network (NN), Convolutional neural networks (CNN), Recurrent neural networks (RNN), Deep Neural Network (deep learning), Generative Adversarial Networks (GAN). He also discussed the applications of Advanced machine learning-

Furthermore, he explained the other interesting applications – Text to Image, Text to Video, Scene synthesis from unseen direction, zero shot learning/one shot learning/ few shot learning. He added his collaborations sponsored through IDMRP Grant which is to investigate how well the selected machine learning and deep learning algorithms perform to predict the solar. The explanation of the algorithms and work done used in above project was explained by one of his M. tech students.

Lastly, he also cleared the doubts of participants effectively.

Session 3: Priyank Shah [Postdoctoral Research Fellow, University of Warwick, UK]The topic for the second session was ‘Network Identification in Modern PS through AI’. He started this session that about 2020, an important transformation is necessary to accompany the volumes of data produced by the Internet of Things. After that he talked about the need of network identification because in modern ADN there is rapid growth in demand side technologies and distributed energy resources. After that he talked about the problems related to ADNs i.e. aging of assets, lack of network visibility and controllability because these problems effect various estimation and control operations of modern DMS. Dr. Shah also discussed about why the knowledge of accurate And model is important to be estimated. He further discussed about the objectives of network identification and also its applications. He discussed about the device used in this is phasor measurement unit (PMU) and smart meter. Dr. shah further discussed about the type of input data i.e. in PMU the data is in the form of voltage phasor and current phasor and in smart meter the input data is in the form of voltage and current magnitude, active and reactive power, power factor. Then he discussed about the



frequency of data update intervals for electricity smart meter. Further he discussed about the network identification with PMU dataset and its problem formulation. Then he explained the detailed process of voltage and current measurements.

At the end of session, he concluded this session that the proposed framework estimates the system architecture of the active disturbance network using synchronous and non- synchronous measurements and the proposed framework accurately estimates the branch parameters and variation in branch parameters for irrespective of the balanced and unbalanced lattice of benchmarked distribution network. The proposed framework accomplishes the identification objectives even with the presence of the noise in D-PMU measurements.

Lastly, he also cleared the doubts of participants effectively.

Day 2: Tuesday, January 18th, 2022

Resource Person –

1. Dr. Nishant Kumar, IIT, Jodhpur
2. Dr. Nishant Kumar, IIT, Jodhpur
3. Dr. Mala Kalra, NITTTR, Chandigarh

Session 1: Dr. Nishant Kumar, IIT Jodhpur The topic for the first session was “AI Based adaptive control technique for grid integrated”. He started the talk by classification of solar energy conversion system. He added content related to sandstone and grid interface for single phase and three phase system. Dr Nishant discussed about the inverter arrangement in control strategy of solar energy in term of load interface with DC-DC converter in DC micro grid and DC-AC converter for AC loads. As the session proceeded, he explained development of neural network theory-based control technique for solar PV array integrated grid system. In classification of control techniques sir covered d-q control, SDGI based control, LMS/LMF based Control, Kalman Filter based Control, Space vector filter-based control, moving average filter-based control and orthogonal component-based control. He also discussed ANOVA kernel stochastic gradient descent algorithm to use the improve the estimation accuracy. He said Kernal tick is used for mapping in high dimensional space, which realizes a linear relationship n between the input signals during mapping into the HDS.



Lastly, he also cleared the doubts of participants effectively.

Session 2: Dr. Nishant Kumar, IIT Jodhpur The topic for the second session was “AI based adaptive control technique for solar power Electric vehicle” First of all she discussed about new technologies and their concerns. After that he talked about e design of an electric driven vehicle that can regenerate power using solar energy technology. If this type of vehicle became a standard commercial vehicle, the demand for fuel would decrease substantially. He said designing this vehicle for practicality is the primary difficulty. The vehicle must be lightweight to minimize the size of the motor required to withstand urban transport needs. After that he talked about the long-term objective of this project is to design, fabricate and assemble a fully functioning vehicle powered by solar energy, which in the future can be used to compete in the Shell Eco Marathon. He said about the frame design, powertrain, battery research selection and purchase, starting and suspension. He further discussed environmental impact of feasible alternative energy vehicles will have a positive impact on the environment. Since combustion engines never achieve complete combustion, resulting extraneous gases add to the problem of global warming. Electric motors produce zero emissions; therefore, the application of urban electric driven vehicle will dramatically decrease the amount carbon dioxide (CO₂) contributing to global warming. As the session proceeded, he explained the control of solar power and characteristics of PV Arrays.

At the end of session, he talked about solar PV system of MPPT testing and deterministic optimization algorithm. In which he covers Hill climbing, incremental conductance method, fractional open-circuit voltage, fractional short circuit current, ripple correlation control, discrete-time ripple correlation control, current sweep, DC-Link capacitor droop control and MPPT techniques fuzzy logic based MPPT control. Lastly, he also gives the answers queries raised by the listeners.

Session 3: - Dr. Mala Kalra, NITTTR, Chandigarh: The topic for the third session was Emerging trends in AI & IoT. She started session that how the convergence of AI & IoT can redefine the way industries function. So, emerging AI & IoT trends in three sectors along with related research in these sectors. She further explained that IoT is all about embedding sensors into machines, vehicles that continuously generate data streams through internet connectivity. She explained that IoT applications follow five basic steps create, communicate, aggregate, analyze and act. Dr. Kalra explained about cloud computing that cloud services facilitates instantaneous databases, storage and the benefits of cloud



computing is scalability and data mobility. It also does not involve huge initial investments but if you work with real time application then cloud will be challenging such as health monitoring because it creates delay for result which was not acceptable. Then she moves to fog/edge computing which is providing data processing capabilities & storage facilities. Fog computing is a distributed computing paradigm that acts as an intermediate layer between cloud data centers & IoT devices whereas edge computing enables data processing at the end devices.

She further explained that the impact of blending AI & IoT on three major sectors i.e. agriculture, healthcare and industrial automation. AI & IoT in agriculture will increase the quantity and quality of production. With the help of AI we can make agricultural robots that reduce human efforts and save time by performing multiple tasks at one time, monitor and harvest crops more effectively.

Dr. Kalra further explained that the most useful application of AI in healthcare is that the remote patient monitoring (RPM) systems use wearable's to monitor the condition of monitors, useful for monitoring the corona patient and many more. At last, she said that in manufacturing industry AI automate complex tasks, prediction of machine failure and for quality checks and then she described about digital twin which is a digital representation of a physical object in operation.

Day 3: Wednesday, January 19th, 2022

Resource Person –

1. Dr. KS Nagla, NIT, Jalandhar.
2. Dr. Amandeep Kaur, CUP, Bathinda
3. Dr. Shimi S.L, NITTTR, Chandigarh

Session 1: - Dr. KS Nagla: The topic for the session was Introduction to Internet of Robotic things (IoRT) . He started the talk by explaining importance of Robotics by taking few daily life examples- swimming robots, Flying Robots, Robotic Balls, Swarm robots, Snake robots, Micro robots, Nano robots, crawler robots, Hybrid Robots, etc. He further explained the classification of robots in terms of applications- Space Robots, Military Robots, medical robots, industrial robots, service robots, etc. As the session proceeded, he discussed the world



robot report 2021, according to this report, the use of industrial robots in factories around the world is accelerating at a high rate: 126 robots per 10,000 employees is the new average of global robot density in the manufacturing industries – nearly double the number five years ago (2015: 66 units).

Furthermore, he explained the other interesting biological background based on AI .IoRT supports artificial intelligence (AI) in robotics, machine learning, perception, sensor fusion and swarm technologies, SLAM, Localization, mapping etc. will provide the next phase of development of IoT applications. While artificial intelligence and machine learning allow/empower these machines to function using decision making and learning algorithms instead of programming. Then he talked about the experiment - IoRT: sensor Fusion. Mapping is done in 2D ad 3D.

Lastly, he also cleared the doubts of participants effectively.

Session 2: Dr. Amandeep Kaur Central University of Punjab, Bathinda, the topic for the second session was “Artificial Intelligence & Robotics in Industry 4.0” First of all she discussed about Industrial revolution in which she covers the industrial revolution of manufacturing with steam and waterpower and mass production assembly lines using electric power in 1st and 2nd revolution. In 3rd and 4th revolution she covered automated production using electronics, plc IT system and robotics and autonomous decision making of cyber physical system using machine learning through cloud technology. After that she talked Artificial intelligence in the fourth industrial revolution is beginning to live up to its promises of delivering real value necessitated by the availability of relevant data, computational ability, and algorithm. Therefore, this study sought to investigate the influence of artificial intelligence on the attainment of sustainable Development Goals with a direct focus on poverty reduction, goal one, industry, innovation, and infrastructure development goal 9, in emerging economies. She said Industry 4.0 or the fourth industrial revolution (4IR) is gaining a lot of attention particularly on its potential impact on humanity Schwab argued that 4IR will change how human beings live, work and how the economies work as well as how we are governed.

At the end of session, she talked industry 4.0 introduces the self-automation method, self-configuration method, self-diagnosing and intelligence decision making. She explained the use of ICT, sensor technology and robotic technology make it possible to record the



production process of each element (instead of sampling and control) and detecting errors that occur during the process.

Lastly, she also give the answers queries raised by the listeners.

Session 3: - Dr. Shimi S.L: The topic for the session was Solar MPPT tracking using artificial intelligent technique. She started her session that there are two basic approaches in maximizing the power extraction using automatic sun tracker and searching for the MPP conditions. For the maximum power she said firstly take the height of projectile that is fired straight up is given by the motion equations. She explained that by the calculus technique we can find out the maximum peak. Then she further explained about partial shading of solar panels. Dr. Shimi explained the I-V & P-V characteristics of photovoltaic cell. Then she explained the mathematical modeling by taking three equations by taking solve is equal to zero, positive and negative. She described the MPPT model of PV system. Then she explained buck converter and list of parameters of buck converter. Then she compared the results with experimental results inside the laboratory with like vikram solar.

Dr. shimi explained about the simulation model of MPPT solar and efficiency of MPPT solar. She did this experiment with different algorithms and compared these results and take that results which gave maximum efficiency. She further played video of her laboratory work that how the system works and also explained the simulation model. Then she further explained the artificial intelligence fuzzy logic toolbox by showing some experiments and explained about adaptive neuro fuzzy inference system (ANFIS).

Lastly, she also cleared the doubts of participants effectively.

Day 3: Thursday, January 20th, 2022

Resource Person –

1. Dr. Parwinder Singh, CUP, Bathinda



2. Dr. Rajinder Kumar, NIT, Kurukshetra

3. Dr. Abdul Saleem, IIT, Roorkee

Session 2: Dr. Rajinder Kumar NIT, Kurukshetra The topic for the second session was “Future of IOT (Predictive Analytics)” First of all she discussed about new technologies and their concerns. After that he talked Enterprises and service providers have been looking at IoT as a key enabler to drive digital transformation and to unlock the operational efficiencies. Advances in Artificial Intelligence coupled with ubiquitous connectivity, and real-time communications are enabling exponential growth in efficiencies generated by IoT. As machines and products

have started communicating with each other without any human intervention, the real value of data is getting generated through better and faster decision-making, He said Emerging technologies such as Internet of Things (IoT) are shaping our lives and disrupting the traditional businesses at a rate of change never seen before in the history. Enabled by exponential increase in computing power and availability of large amount of data, machines are fast learning to replace humans in several areas. This “intelligence” is moving away from central server farms into devices and things that will soon become a part of our everyday lives. These devices will potentially negotiate their own way in our world via “smart contracts” and without any significant human intervention

At the end of session, he talked about Generative Adversarial Networks based on strategy where two different networks are pitted against one another and two networks in in learning battle. In goal of GAN he said one of two networks creates new samples that are so close to training data that other network. Lastly, he also gives the answers queries raised by the listeners.

Day 5: Friday, January 21st,

2022 Resource Person –

1. Dr. Amit Kauts, GNDU, Amritsar
2. Dr. Gaurav Kumar, Director, MRCS

Session 1: - Dr. Amit Kauts: Session 1: - The topic for the session was ‘National Education Policy 2020 (An Overview)’. He started the talk by asking questions



related to national education policy as what participants know before about it , what kind of knowledge they have related to it. After that he talked about new school education structure:- Foundational stage (age 3-8), preparatory stage (8-11), middle stage (11-14) and secondary stage (14-18). He further explained the classification of National coordinators- UGC (Non technology post graduation degree programme), NPTEL, IIT Madras (technical/ engineering UG & PG degree programme), CEC (Non technology under graduation degree programme), IGNOU (diploma and certificates programme), NCERT (School education, program from 9th to 12th), NIOS (out of school children educational programmes), IIM banglore (Management programme), NITTTR(Teacher training programme).

Furthermore, he explained the other interesting subjects which are now taught in India as a priority basis which are Artificial intelligence, design thinking, holistic health, organic living, environment education, global citizenship education, mathematics. Then he talked about the institutional restructuring and consolidation.

Lastly, he also cleared the doubts of participants effectively.

Session 2: - Dr. Gaurav Kumar: Dr Gaurav Kumar, Founder Director and First Promoter of Magma Research and Consultancy Services, India. His Qualifications integrate MCA, M.Phil. (Computer Science), M.Tech. (I.T.), Ph.D. (Computer Science), LL.B. and IBM Certified Associate Developer. He obtained the International Certifications in Data Science, Python, Blockchain Programming, Machine Learning, Software Testing and related technologies from corporate giants including IBM, Google, Accenture and many others. Dr Kumar possesses more than 18 years experience in Teaching, Industry and Research. He delivers the Practical Hands-On Sessions on recent technologies in Workshops, Faculty Development Programmes (FDPs), Short Term Courses (STCs) and Technical Events as Resource Person in various states of India.

Day 6: Saturday, January 22st,

2022 Resource Person –

1. Dr. Vedantham Lakshmi, Srinivas, IIT Dhanbad
2. Dr. Gaurav Kumar, Director, MRCS



3. Valedictory

Session 1: Dr. V. Lakshmi Srinivas, IIT Dhanbad. The topic for the session was, 'AI/Iots applications in Power system'. He started the talk by explaining the advances in power systems and power system- intelligent control of grid interfaced and off-grid DG/PV systems. After that he explained the typical configuration of power system-explaining the terms state estimation, visualization, energy management functions, communication input/output controllers transfer data to computers, data collected at remote terminal units. Furthermore, Dr. talked about traditional power systems and why power systems is shifted to smart grids. He said there are challenges of today's evolving electricity grid which are integration of renewable energy sources into main grid, renewable energy sources are located far away from load centres, conventional energy sources are getting retired, introduction of power electronics converters in the grid and increase in global demand of electricity.

As the session proceeded, he talked about the control center of power system and its functions- state estimation, economic dispatch, optimal power flow, unit commitment, load forecasting and security assessment. After that he mainly focused on system monitoring of the power system and its key feature of a smart grid, GPS-synchronized phasor measurement units and communication technologies enable advancements in system monitoring.

Lastly, he also cleared the doubts of participants effectively.

Session 2: - Dr. Gaurav Kumar: Dr Gaurav Kumar, Founder Director and First Promoter of Magma Research and Consultancy Services, India. His Qualifications integrate MCA, M.Phil. (Computer Science), M.Tech. (I.T.), Ph.D. (Computer Science), LL.B. and IBM Certified Associate Developer. He obtained the International Certifications in Data Science, Python, Blockchain Programming, Machine Learning, Software Testing and related technologies from corporate giants including IBM, Google, Accenture and many others. Dr Kumar possesses more than 18 years experience in Teaching, Industry and Research. He delivers the Practical Hands-On Sessions on recent technologies in Workshops, Faculty Development Programmes (FDPs), Short Term Courses (STCs) and Technical Events as Resource

Person in various states of India.

Session 3: Valedictory : In the last session of the program, quiz took place from 1:00 p.m. to 1:30p.m. Firstly Er. Harsimran Singh FDP Coordinator and HOD of electrical department insighted about the program. After that the guest of honor, Dr. Balwinder singh sidhu coordinator AICTE and MRSPTU MOU talked about the FDP program and upcoming programs for non teaching staff also. At last Dr. Hardeep Singh from BFCET thanked everyone who have participated in the FDP and he also added that the objective of this programme to bring different experts, their reseaches of AI and Iots is fulfilled. Furthermore, he thanked every expert who had delivered their best to succeed the FDP. He is also requested participants to share their valuable experience and must share this knowledgeto their students so that students will get maximum benefit. Meanwhile, He also congratulated and thanked to AICTE & MRSPTU, Er. Harsimran Singh FDP Coordinator, convenor, co-convenor, every member of organizing team of BFCET and all other participants who have made this event successful



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Department of Electrical Engineering
Organizes
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on
"IoT & ARTIFICIAL INTELLIGENCE IN INDUSTRY 4.0"
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Keynote Speakers
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Brochure of the Faculty Development Programme on IOT & Artificial Intelligence in Industry 4.0

