2023 IEEE CIS Summer School on

Artificial Intelligence and Machine Learning for Engineering and Social Science Research

September 04-08, 2023

Department of Computer Science Engineering
&
Department of Electrical Engineering

Malaviya National Institute of Technology Jaipur
Rajasthan, India

Objectives

This IEEE CIS Summer School aims to develop understanding of fundamentals of advanced Artificial Intelligence(AI) and Machine Learning(ML) for participants through exercises, project based learning and industry specific problem solving. It presents an opportunity to young scholars to think, innovate, design and create new solutions to **Engineering and Social Science problems**. It assists them in comprehending the real-world applications of these technologies (AI & ML), which can be used to address issues including climate change, insufficient healthcare, and poverty, education among others.

AI is playing a major role in the fourth industrial revolution and a lot of evolution in various ML methodologies have been observed. AI techniques are widely used by the practicing engineers to solve a whole range of hitherto intractable problems. Advanced AI, particularly large language models (LLMs), are substantially affecting social science research. These ML models pertaining to vast amounts of text data are increasingly capable of simulating human-like responses and behaviors, offering opportunities to test theories and hypotheses about human behavior at great scale and speed.

This school featured Keynote and Invited Speakers (Including Women in Engineering) from Academia and Industry both. A panel discussion with experts to solve the doubts and throw the lights on the current issues related to AI/ML research will be held. Hands on laboratory is also spread over one day.

An add on event "Hackathon" with the Industries provided opportunity to participants to develop a solution on their own. The Hackathon is conceived to challenge India's innovative minds to conceptualize ideas and framework using AI, Deep Learning, ML, etc.(This event was conducted in physical mode in two phases viz. Initial Phase/Idea screening round and Grand Finale round. In the Initial round, the submitted ideas were thoroughly screened and scrutinized and the selected ones will be moved to the Grand Finale, which was held physically at MNIT Jaipur on 7th September 2023. Best ideas were declared winners.)

Venue and Dates

Venue: NKN-1, Prabha Bhawan for IEEE CIS and Lecture halls for Hackathon, MNIT Jaipur

Note: The summer school was organized in Hybrid mode (Physical as well as Virtual)

Dates: September 04-08, 2023

Duration: 5 Days

Organizers: Department of Computer Science and Engineering & Department of Electrical Engineering Malaviya National Institute of Technology, Jaipur

Collaborators: Namibia University of Science and Technology and UNESCO Chair on Secure High-Performance Computing for Higher Education and Research

Sponsors: IEEE Computational Intelligence Society

Lectures Details:

The IEEE CIS Summer School focused on the core principles and advanced concepts in Artificial Intelligence (AI) and Machine Learning (ML) and their applications to solve complex problems. It aimed to develop an understanding of the fundamentals of advanced Artificial Intelligence (AI) and Machine Learning (ML) for participants through exercises, project based learning and industry specific problem-solving. The Summer School observed total 72 participation including 6 overseas participation. It presented an opportunity to young scholars to think, innovate, design and create new solutions to Engineering and Social Science problems. It assisted them in comprehending the real-world applications of these technologies (AI & ML), which can be used to address issues including climate change, insufficient healthcare, poverty, lack of education, among others.

It is to be noted that AI is playing a major role in the fourth industrial revolution and a lot of evolution in various ML methodologies have been observed. AI techniques are widely used by the practicing engineers to solve a whole range of hitherto intractable problems. Advanced AI, particularly large language models (LLMs), are substantially affecting social science research. These ML models pertained on vast amounts of text data are increasingly capable of simulating human-like responses and behaviours, offering opportunities to test theories and hypotheses about human behaviour at great scale and speed.

The Summer School featured Keynote and Invited Speakers (Including Women in Engineering) from Academia and Industry both. A panel discussion with experts to resolve doubts and throw light on the current issues related to AI/ML research was also organised during the Summer School. Hands on laboratory was also spread over one day to enable the participants to have a practical experience of the theoretical insights shared during the Summer School.

The Summer School comprised of five Academic Sessions of 1.5 hours each, three Industry Sessions of 1.5 hours each, three Women Engineers Sessions of an hour each, four Hands-On/Demo Sessions of 1.5 hours each, and a Panel Discussion of 1.5 hours. Detail of the Experts is given below.

Academic Experts

Lecture 1	**:**	**Dr. M. Tanveer**
Affiliation		Department of Mathematics, Indian Institute of Technology, Indore
Topic		Large scale SVM algorithms and applications to healthcare
Lecture 2	**:**	**Dr. Bruhdehswar Bejwara**
Affiliation		Department of Computer Science (Cybersecurity),Southern Arkansas University, USA
Topic		AI in Cybersecurity
Lecture 3	**:**	**Dr. Siddharth Pancholi**

Affiliation		Harvard Medical School, USA
Topic		AI in Neurotechnology
Lecture 4	**:**	**Prof. Mufti Mahmud**
Affiliation		Department of Computer Science of Nottingham Trent University, UK
Topic		Towards an Inclusive Society: Artificial Intelligence in Provisioning Personalized Learning for Education 5.0

Industry Experts

Lecture 1	**:**	**Dr Harish Sahu**
Affiliation		DRDO, Delhi
Topic:		Quantum Computing's Threat to Cyber Security & countermeasures
Lecture 2	**:**	**Mr. Binod Suman**
Affiliation		IT Professional
Topic		Evolution of generative AI and industry implications
Lecture 3	**:**	**Mr. Vishal Bachani**
Affiliation:		New Benefits, Dallas, USA
Topic		AI in blockchain: Leveraging the power of AI to improve the scalability of blockchain
Lecture 4	**:**	**Dr. Mahesh Bhargva**
Affiliation		CDAC Pune
Topic		Unleashing the Power of AI by Navigating NLP, Large Models and Speech Technology

Women Engineers Experts

Lecture 1	**:**	**Dr. Charu Sharma**
Affiliation		IIIT Hyderabad
Topic		Geometric Deep Learning for Graphs and Point Clouds
Lecture 2	**:**	**Dr Hajar Homayouni**
Affiliation		San Diego State University, USA
Topic		Generative models for synthetic data generation
Lecture 3	**:**	**Dr Grace Eden**

Affiliation	University of York, England
Topic	Human-Centered Artificial Intelligence

Hands-on sessions

Session 1	**:**	**Dr. Tanu Wadhva**
Affiliation		Indian Institute of Information Technology Una
Topic		Climate Analytics through AI: Unlocking Patterns and Detecting Extremes
Session 2	**:**	**Ms Anuradha Adiga , Ms Supriya Aras and Ms Keerthi Reddy**
Affiliation		Infosys
Topic		Fine Tuning of Large Language Models, Semantic Search using Large Language Models

Panel discussion by Academicians:

A Panel Discussion of an hour and a half duration was organized on Sept. 8, 2023 to explore the key topics of the IEEE Summer School collectively. The primary objective of the expert panel discussion was to dispel uncertainties and shed light on contemporary issues within the realm of AI/ML research.

Topic	The profound significance of AI and ML, emphasizing their multifaceted impact on various facets of society and the economy
Academician 1	**Dr. Pradeep Kumar**
Affiliation:	Assistant Professor, IIM Shillong
Academician 2	**Dr. Badri N. Subudhi**
Affiliation:	Assistant Professor, Department of Electrical Engineering, IIT Jammu
Industry Expert	**Mr. Dheera Bhatia**
Affiliation	Chief Information Security Officer (CISO)

Hackathon:

Hackathon 2023, a part of the IEEE Computational Intelligence Society (CIS) Sponsored Summer School on "Artificial Intelligence and Machine Learning for Engineering and Social Science Research", was hosted on Sept. 7, 2023 by MNIT Jaipur in collaboration with Namibia University of Science and Technology and UNESCO Chair on Secure High-Performance Computing for

Higher Education and Research, was conceived to challenge India's innovative minds to conceptualize ideas and frameworks using Artificial Intelligence, Deep Learning, Machine Learning, and Generative AI.

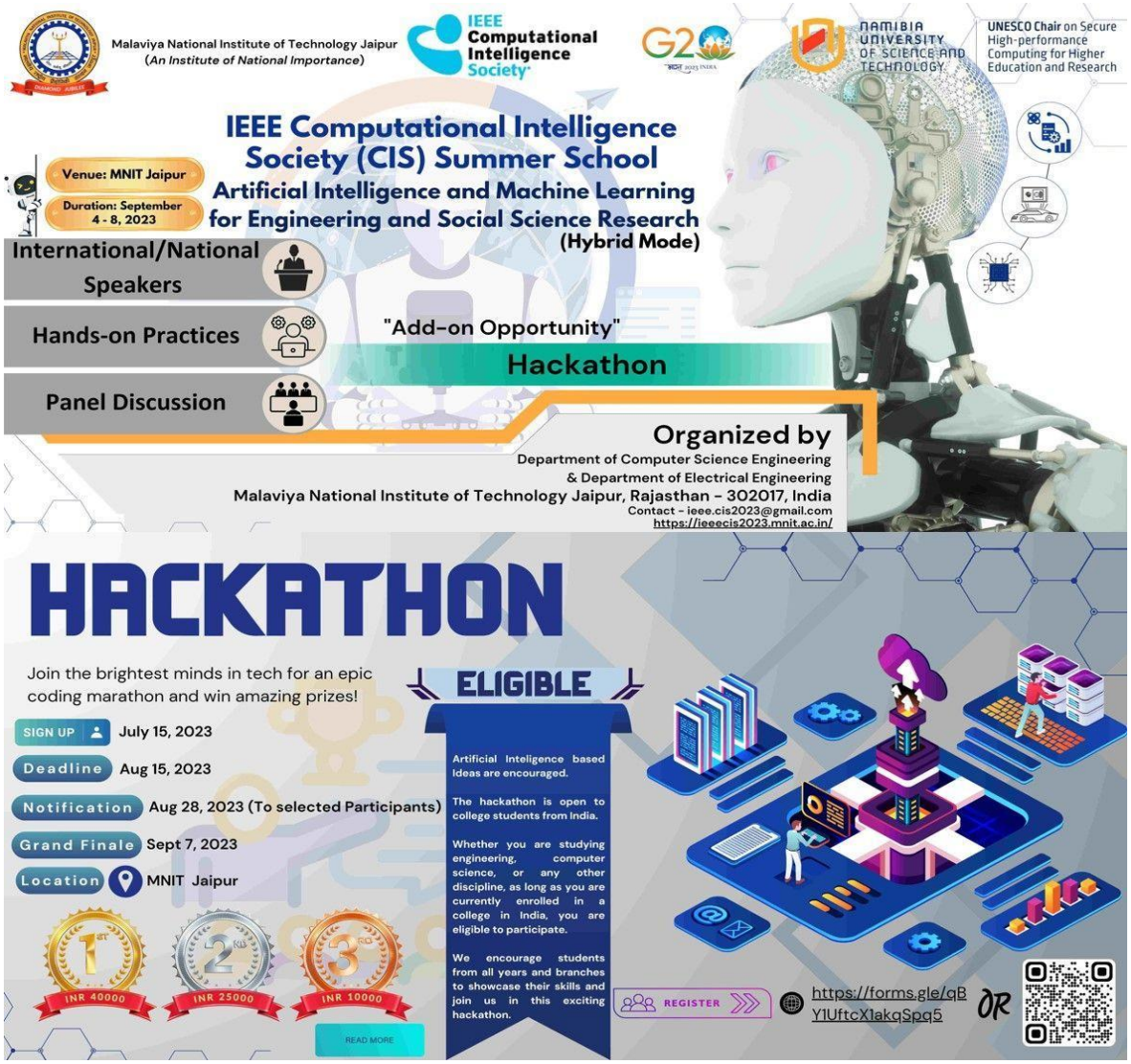
The Hackathon was a unique opportunity for students in India to submit their innovative ideas/concepts under the different problem statements. The event was conducted in physical mode in two phases: a screening round and a grand finale round of 24 hours. The timeline and the steps to participate in the Hackathon were clearly defined. The Registration for the Hackathon began on August 15, 2023, and continued until August 20, 2023. The Idea/Prototype submission to submit the student teams' initial approach to solve any problem was permitted from August 15 to August 25, 2023. The Evaluation Phase wherein submitted projects were evaluated by a group of Experts continued from August 26 to August 28, 2023. The announcement of selected teams wherein selected teams were to be called on campus was scheduled on August 28, 2023. The Grand Finale when the selected teams were required to start building their project was scheduled on September 7, 2023. The teams were expected to apply their ideas, get guidance from the team of AI and ML Experts and come up with a solution and submit their final project also on September 7, 2023. The announcement of winners during the Closing Ceremony was scheduled on the concluding day of the Summer School, i.e. in the evening of Sept 8, 2023.

Only the innovative ideas which were selected, were moved to the Grand Finale round. During the Grand Finale, selected participants were expected to build a solution to demonstrate their concepts and prove to the juries that their ideas are technically feasible, and more importantly, implementable. The best ideas were to be declared winners. The major attractions of the Hackathon were: mentorship by Industry Experts, Consolation Prizes for all the participants, Participation Certificate to all and arrangements for accommodation and meals free of cost for the participants during the Grand Finale round from 7th to 8th September 2023 at MNIT Jaipur campus.

Around 170 teams have registered for the event and after scrutiny around 65 teams with approximately two hundred students from different colleges and universities across India participated in the Hackathon. The participants stayed for 24 hours in the designated theatres of the Vivekananda Lecture Theatre Complex at the MNIT campus and worked in teams to design solutions to the problem statements selected by them. Participants worked on real-life situations such as developing an alarm system when a fire breaks out in the forest, designing a social media platform with block chain, making a robot which helps older people, and developing an app to make a video call for disabled people, etc. The participants were provided an opportunity to present their results to the Panel of Judges and respond to questions posed by the Panel during which their projects were examined and evaluated. Winners of the Hackathon is listed as below,

1st Prize	**Aman O. Kushwaha, Varun Pandiya, Sumit Dhattarwal**
Affiliation	NIT Goa
2nd Prize	**Harshit Borana, Parth Sharma and Charvi Bapna**
Affiliation	Geetanjali Institute of Technical Studies, Udaipur
3rd Prize	**Ankit Kumar and Ankit Gupta**
Affiliation	Manipal University Jaipur.

Poster of the Event:



Program Schedule for IEEE CIS Summer School:

MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY JAIPUR

IEEE CIS Summer School on

"Artificial Intelligence and Machine Learning for Engineering and Social Science Research"

(September 04-08, 2023)

Time And Date	9:00-10:30AM	10.30-11.00AM	11.00-12.30PM	12.30-2.00PM	2.00-3.00PM	3.00-4.30PM	4:30-5:00PM
Day 1 (04/09/2023)	Registration/ Inauguration/Keynote address	Tea Break	Large scale SVM algorithms and applications to healthcare (Dr. M. Tanveer , IIT Indore)	Quantum Computings Threat to Cyber Security & countermeasures (Dr. Harish Sahu, DRDO, New Delhi)	Lunch	Geometric Deep Learning for Graphs and Point Clouds (Dr. Charu Sharma, IIIT Hyderabad)	Tea Break
Day 2 (05/09/2023)	AI in Cybersecurity (Dr. Bruhdehswar Bejawara, Southern Arkansas University, USA)		Unleashing the Power of AI by Navigating NLP, Large Models and Speech Technology (Dr. Mahesh Bhargva,CDAC Pune)	AI in blockchain : Leveraging the power of AI to improve the scalability of blockchain (Mr. Vishal Bachani, New Benefits ,Dallas, USA)		Fuzzy Systems Modelling & Control (IIT Kanpur)	
Day 3 (06/09/2023)	AI in neurotechnology (Dr. Sidharth Pancholi , Harvard Medical School, USA)		Generative models for synthetic data generation (Dr. Hajar Homayouni San Diego State University, USA)	Towards an Inclusive Society: Artificial Intelligence in Provisioning Personalised Learning for Education 5.0 (Prof. Mufti Mahmud, NTU, UK)		Human-Centered Artifical Intelligence (Dr. Grace Eden,University of York, England)	
Day 4 (07/09/2023)	Climate Analytics through AI:unlocking Patterns and Detecting Extremes, (Dr. Tanu Wadhva, IIT Una) Hands-on		Climate Analytics through AI:unlocking Patterns and Detecting Extremes, (Dr. Tanu Wadhva, IIT Una) Hands-on	Generative AI Landscape and Hands-on LangChain Framework, (Ms. Anuradha Adiga, Infosys) Hands-on		Fine Tuning of Large Language Models , Semantic Search using Large Language Models (Ms. Supriya Aras , Ms. Keerthi Reddy, Infosys) Hands-on	
	Hackathon	***Hackathon***	***Hackathon***	***Hackathon***	***Hackathon***	***Hackathon***	***Hackathon***
Day 5 (08/09/2023)	**Panel Discussion**		**Social Event/ City Tour/Industry visit**			**Closing Ceremony**	

Meenakshi Tripathi
Chair

Prerna Jain
Chair

Activity Photos

Acknowledgement:

We would like to thank IEEE Computational Intelligence Society, Namibia University of Science, Technology and UNESCO Chair on Secure High-Performance Computing for Higher Education and Research, PISARV and Computer society of India for their full support in organizing this Summer School and Hackathon.

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Founder and CTO
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Lecture Material

Lecture recordings can be downloaded from the following Google Drive link:
https://drive.google.com/drive/folders/0BxL-NZn6TV4kfkEyYWpBb191U2tLMDVGWFZCV0ZQTHZBakFIR1FrRzdwZlVDMkVnNDljNjA?resourcekey=0-n2tWsnGDUBAdcjemHSv3VQ