Highlights of the 5-Day Workshop on AI and ML-Driven Approaches for Flood Prediction and Hazard Mapping in Himalayan Regions

The **Department of Civil Engineering and Information Technology** at **Dr. B R Ambedkar National Institute of Technology, Jalandhar**, under the **SPARC initiative**, sponsored by the **Ministry of Education, Government of India**, successfully organized a **5-day workshop** on cutting-edge AI and ML-driven techniques for **flood prediction and hazard mapping** in the **Himalayan region**. The workshop attracted **101 participants**, including **54 external attendees** from prestigious institutions such as **IITs, NITs, and central and state universities**. With an emphasis on **expert lectures and hands-on training**, the sessions explored **flood prediction, hydrological modelling, and AI-driven risk assessment**, delivered by **renowned academicians from India and international institutions**.

Day 1: Advancing AI-Driven Flood Prediction

The workshop commenced with an engaging session by **Dr. Ashutosh Sharma, Assistant Professor at IIT Roorkee**, on **"Advancing Streamflow Prediction and Flood Risk Mapping Using Deep Learning."** The session provided in-depth insights into **state-of-the-art deep learning techniques** for hydrological modelling, emphasizing their impact on **streamflow prediction and flood risk assessment**. Through **practical demonstrations**, participants explored **AI models for large-scale streamflow prediction**, setting a strong foundation for the subsequent sessions.

Day 2: Quantum Computing and Hydrodynamic Modelling

The second day featured two significant sessions:

- **Dr. Sandeep Sood, Associate Professor, NIT Kurukshetra**, delivered an insightful talk on **"Integrating Quantum Computing with Cloud and Fog Computing for Scalable IoT Solutions."** He emphasized **real-time data processing, security, and scalability**, demonstrating their relevance in **flood monitoring and early warning systems**.
- **Dr. P.V. Timbadiya, Associate Professor, NIT Surat**, presented on **"Flood Estimation in India"** and **"1D, 1D-2D Coupled, and 2D Hydrodynamic Modelling."** The session covered historical flood estimation techniques, AI-integrated forecasting models, and the application of hydrodynamic modelling in river flood prediction and hazard assessment.

Day 3: Snow Hydrology and AI in Seasonal Discharge Prediction

Three engaging sessions were conducted:

- **Dr. Ray Singh Meena, Assistant Professor, NIT Hamirpur**, elaborated on **"Integrated Modelling of Snow-Covered Areas and Hydrological Processes in the Beas Basin, Himachal Pradesh"** using **SRM and SWAT Models** to understand the **role of snow hydrology in water resources management**.

- **Dr. Mahesh Patel, Assistant Professor, NIT Jalandhar**, shared insights on **"Leveraging AI and Machine Learning to Optimize Seasonal Discharge Prediction: A Case Study of Beas River in the Himalayan Region."**
- **Dr. Mohit Kumar, Assistant Professor, NIT Jalandhar**, presented **"Applications and Challenges of Deep Learning Models in Hydrology."** This session explored **RNNs, CNNs, and LSTM models** for **real-time flood forecasting and water management**.

Day 4: Distributed Modelling and Global Hydrology Perspectives

The fourth day provided diverse perspectives:

- **Dr. Vijay Shankar, Associate Professor, NIT Hamirpur**, discussed **"Distributed and Data-Driven Approaches for Improved Catchment-Scale Flood Risk Assessment in the Himalayas"**, highlighting the integration of **AI and machine learning with spatial models**.
- **Prof. Carlo Gualtieri, University of Naples, Italy**, conducted an engaging **online session** on **"Mega-Rivers under Global Change: Field Observations from Amazon, Congo, and Orinoco"**, offering comparative insights into **flood dynamics in mega-rivers versus Himalayan rivers**.

Day 5: Infrastructure Vulnerability and Climate Change Impacts

The final day featured in-depth discussions:

- **Prof. P.L Patel, Director, VNIT Nagpur**, presented on **"Morphology-Associated Flood Risk to Water Infrastructure in Tapi Basin, India."** He shared field-based insights into **model calibration, validation, and infrastructure vulnerability assessment** in flood-prone regions.
- **Dr. Agustín Millares Valenzuela, Associate Professor, University of Granada, Spain**, discussed **"Understanding Hydrological, Erosive, and Fluvial Response in High Mountain Basins for Hazard Prediction."** His session highlighted AI-based forecasting methods for climate change-driven hydrological variations**.**

Closing Ceremony

The workshop concluded with an **engaging valedictory session**, attended by esteemed dignitaries, including **Prof. Ajay Bansal (Registrar, NIT Jalandhar), Prof. Anish Sachdeva (Dean Student Welfare), and Prof. S.P. Singh (Civil Engineering Department).** The event culminated in a **certificate distribution ceremony**, led by **Dr. Mahesh Patel, Dr. Kanish Kapoor, and Dr. Mohit Kumar**.

The workshop fostered **collaborative learning and knowledge exchange**, equipping participants with advanced expertise in **AI and ML-driven flood prediction and hazard mapping**, paving the way for future research and real-world applications in **hydrological risk assessment**.

SOME KEY MOMENTS OF THE WORKSHOP:


DR B R AMBEDKAR NATIONAL INSTITUTE OF TECHNOLOGY JALANDHAR


One-Week Workshop in Offline Mode
on
AI and ML-Driven Approaches for
Flood Prediction and Hazards Mapping in Himalayan Regions
SPARC
Chief Patron
Patrons
Conveners
Coordinators


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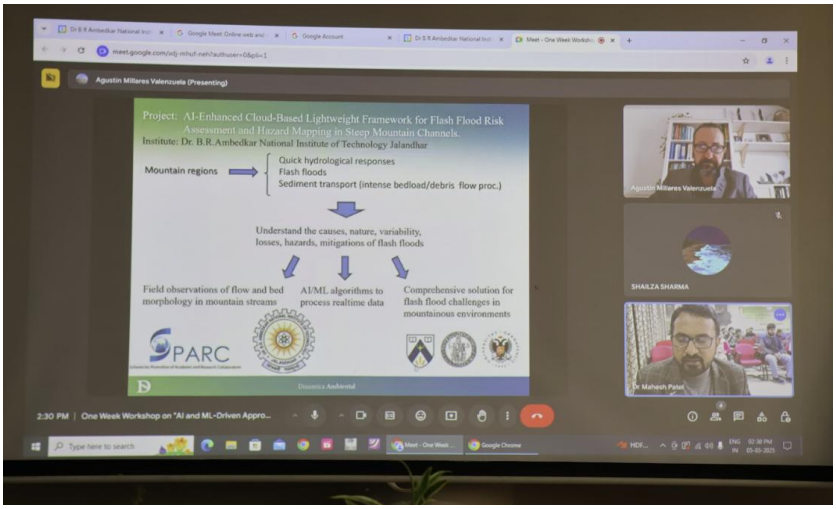
Agustin Millares Valenzuela (Presenting)
Project: AI-Enhanced Cloud-Based Lightweight Framework for Flash Flood Risk Assessment and Hazard Mapping in Steep Mountain Channels.
Institute: Dr. B.R.Ambedkar National Institute of Technology Jalandhar
Mountain regions
Quick hydrological responses
Flash floods
Sediment transport (intense bedload/debris flow proc.)
Understand the causes, nature, variability, losses, hazards, mitigations of flash floods
Field observations of flow and bed morphology in mountain streams
AI/ML algorithms to process realtime data
Comprehensive solution for flash flood challenges in mountainous environments
SPARC
SHAILZA SHARMA
Dr Mahesh Patel
2:30 PM | One Week Workshop on "AI and ML-Driven Appro...