<u>PRESS RELEASE</u>

IIT Mandi scientist develops AI algorithm to improve the accuracy of Landslide prediction

The developed algorithm has been tested for landslides and can be applied to other natural phenomena such as floods, avalanches, extreme weather events, rock glaciers and permafrost, mapping that tend to have very less data points, helping to estimate the risks

Please find the link to Video Bytes –
https://drive.google.com/drive/u/0/folders/1c_P9DpCaT0MLbTR8a7VM58cRJMUwc00z?pli=1

MANDI, 21st February 2023: Indian Institute of Technology Mandi Researchers have developed a new algorithm using Artificial Intelligence and Machine Learning (AI&ML) that could improve the accuracy of prediction for natural hazards. The algorithm developed by Dr. Dericks Praise Shukla, Associate Professor, School of Civil and Environmental Engineering, IIT Mandi, and Dr. Sharad Kumar Gupta, former research scholar, IIT Mandi, currently working at Tel Aviv University (Israel), can tackle the challenge of data imbalance for landslide susceptibility mapping which represents the likelihood of landslide occurrences in a given area. The results of their work have recently been published in the journal Landslides.

Landslides are a frequent natural hazard in mountainous areas around the world, causing significant losses of life and property. To estimate and eventually mitigate these risks, it is essential to identify areas that are susceptible to landslides. A Landslide Susceptibility Mapping (LSM) indicates the likelihood of a landslide occurring in a specific area based on causative factors such as slope, elevation, geology, soil type, distance from faults, rivers and faults and historical landslide data.

The use of Artificial Intelligence (AI) is becoming increasingly vital for the prediction of natural disasters such as landslides. They can potentially predict extreme events, create hazard maps, detect events in real-time, provide situational awareness, and support decision-making. Machine Learning (ML) is a subfield of Artificial Intelligence that enables computers to learn and improve from experience, without being explicitly programmed. It is based on algorithms that can analyse data, identify patterns, and make predictions or decisions, much like the human intelligence.

ML algorithms, however, require large amounts of training data for accurate prediction. In the case of LSM, this data consists of the causative factors of landslides as mentioned earlier, and historical landslide data. However, landslides are a rare occurrence in certain areas, leading to the unavailability of extensive amounts of training data, which hinders the performance of ML algorithms. For a given area, in comparison to non-landslide points (considered as negative), landslide points (considered as positive) are very less thus creating a imbalance between positive and negative points which affects the prediction.

Dr Shukla's team has developed a new ML algorithm that overcomes this issue of data imbalance for training of the algorithm. It uses two under sampling techniques, EasyEnsemble and BalanceCascade, to address the issue of imbalanced data in landslide mapping.

Data about the landslides that occurred in the Mandakini River Basin in northwest Himalaya, Uttarakhand, India, between 2004 and 2017 were used to train and validate the model. The results showed that the algorithm significantly improved the accuracy of the LSM, particularly when compared to traditional machine learning techniques such as Support Vector Machine and Artificial Neural Network.

Elaborating on the uniqueness of their work, Dr. D.P. Shukla, Associate Professor, School of Civil and Environmental Engineering, said, *"This new ML algorithm highlights the importance of data balancing in ML models and demonstrates the potential for new technologies to drive significant advancements in the field. It also underscores the critical need for large amounts of data to accurately train ML models, particularly in the case of geohazards and natural disasters where the stakes are high and human safety is at risk."*

Dr Shukla believes that this study opens up new avenues in the field of LSM and other geohazard mapping & management. It can be applied to other phenomena such as floods, avalanches, extreme weather events, rock glaciers and permafrost, , helping to minimize the risks posed to human safety and property.

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About IIT Mandi
IIT Mandi has nine Academic Schools and four major Research Centers. The Schools are the School of Biosciences and Bioengineering (SBBE), School of Chemical Sciences (SCS), School of Mathematical and Statistical Sciences (SMSS), School of Physical Sciences (SPS), School of Mechanical and Materials Engineering (SMME), School of Civil and Environmental Engineering (SCENE), School of Computing and Electrical Engineering (SCEE), School of Humanities and Social Sciences (SHSS), and School of Management (SOM). The Centers are Advanced Materials Research Centre (AMRC), Centre for Design and Fabrication of Electrical

Devices (C4DFED), BioX Centre , and Indian Knowledge System and Mental Health Applications Centre (IKSMHA Centre).

The Institute offers B.Tech. programs in seven different streams, one M.A. program, ten M.Tech. programs, nine Ph.D. programs, and one iPh.D. program. The unique, project-oriented B.Tech. curriculum is centered around its 4-year long Design and Innovation stream. Since the inception of the Institute, IIT Mandi faculty have been involved in over 275 Research and Development (R&D) projects worth more than Rs. 120 crores.

IIT Mandi established the IIT Mandi iHub and HCI Foundation (iHub; a section-8 company) on its campus at Kamand with significant funding of INR 110 crores from the Department of Science and Technology (DST), Government of India. The iHub is planned to fuel research and technology development, skill development, startup and innovation, and collaborations in the HCI and allied AI/ML areas in India. IIT Mandi is the only second-generation IIT to be featured at rank 7 in the Atal Ranking of Institutions on Innovation Achievements of the Innovation Cell, Ministry of Education, Govt. of India.

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