

REPORT

Topic: International Symposium on Biology and Medicine in the AI Era with Hands-on workshop on Datamining, Statistics, and AI ML tools in Biomedicine

Date: 18-20 February, 2025

Venue: Adi Kailash Auditorium

Organized By: Department of Community Medicine, Department of Clinical Research and CRI HIMS SRHU; In association with INTelligentOMIX Ltd NTU, UK and UTAR Malaysia

Introduction

International Symposium on Biology and Medicine in AI Era with Hands-on Workshop on Datamining, Statistics, and AI ML Tools in Biomedicine, hosted by Swami Rama Himalayan University (SRHU) from 18 February 2025 to 20 February 2025, was a significant academic event that brought together experts from across the globe. The symposium featured insightful discussions on the intersection of artificial intelligence (AI), multi-omics, epidemiology, neuroscience, public health, and environmental sciences. Additionally, a hands-on workshop on data mining, statistics, and AI/ML tools in biomedicine was conducted.

Objectives of the Lecture:

1. **Understand the Fundamentals** – Gain insights into the core principles of data mining, statistical analysis, and AI/ML techniques relevant to biomedicine.
2. **Explore Biomedical Data Processing** – Learn about data collection, preprocessing, and feature extraction methods used in biomedical research and healthcare.
3. **Analyze the Role of Statistics** – Understand how statistical models and techniques contribute to data-driven decision-making in biomedicine.
4. **Discover AI/ML Applications in Healthcare** – Examine how machine learning and artificial intelligence are applied to disease prediction, drug discovery, medical imaging, and personalized medicine.
5. **Identify Challenges and Ethical Considerations** – Discuss challenges such as data privacy, bias in AI models, and ethical concerns in biomedical AI applications.
6. **Explore Future Trends** – Gain insights into emerging trends, innovations, and potential advancements in AI/ML for biomedical research and clinical practice.
7. **Encourage Critical Thinking and Discussion** – Engage in discussions on the impact, limitations, and real-world implications of data-driven

approaches in biomedicine

18 February 2025: The program commenced on February 18th with a field visit to Badshahithaul, Chamba, Tehri Garhwal, followed by an engaging brainstorming session on **AI and data mining applications for health and Himalayan natural resources** where it was discussed how AI and data mining assist in monitoring biodiversity, predicting climate change impacts, and managing water resources. Remote sensing and satellite imagery, combined with AI, help track deforestation, glacier melting, and ecological balance, ensuring sustainable development and conservation efforts in the fragile Himalayan ecosystem. This was followed by a Workshop on Data Mining and Statistical Techniques which focused on extracting meaningful patterns and insights from large datasets. Statistical techniques, including regression analysis, hypothesis testing, Bayesian inference, and principal component analysis (PCA), help in data interpretation, decision-making, and predictive modeling.

19 February 2025: Day 2 of the Workshop focused on **Statistical and AI ML tools** that are crucial for analyzing complex data, making predictions, and automating decision-making. Statistical tools like SPSS, SAS, and R help with hypothesis testing, regression analysis, and data visualization. AI/ML tools, including TensorFlow, PyTorch, and Scikit-learn, enable deep learning, pattern recognition, and predictive analytics. These tools are widely used in fields like healthcare, finance, and environmental science to uncover insights, optimize processes, and drive innovation through data-driven approaches.

20 February 2025:

Inaugural Ceremony

The symposium began with an inaugural session led by MSc Epidemiology student Niharika Gaur and MSc Clinical Research student Anjali Mishra. They welcomed distinguished guests, including:

- Prof. Vijendra D. Chauhan, DG Academics, SRHU
- Prof. A.K. Deorari, Principal, HIMS, SRHU
- Dr. Dong Ling Tong, UTAR Malaysia
- Dr. Graham Roy Ball, UK
- Prof. Asha Chandola Saklani, SRHU
- Dr. A.K. Srivastava, HOD, Community Medicine, SRHU

The event commenced with the lighting of the lamp, followed by an introduction to the symposium by Prof. Asha Chandola Saklani and a welcome address by Prof. A.K. Deorari. Key highlights included a talk on AI/ML for Environmental and Health Solutions by Prof. Graham Roy Ball and insights into the Indo-UK-Malaysia Data Science Workshop by Dr. Dong Ling Tong.

Panel Discussions

The symposium featured four-panel discussions, each focusing on key interdisciplinary themes.

Panel Discussion 1: Epidemiology, Neuroscience & Behaviour

Moderators:

- Prof. Ruchi Juyal, Department of Community Medicine, HIMS, SRHU
- Prof. Judith Steen, Harvard Medical School

Panelists:

- Dr. Anjana Farswan (PG Govt College, Uttarakhand) – Big Data and Salt Iodization
- Prof. Sudhir Srivastava (NIH, USA) – AI/ML in Public Health
- Dr. Dono Widiatmoko (University of Derby, UK) – Data Science in Diabetes Epidemiology
- Prof. Judith Steen (Harvard Medical School) – Neuroscience & Cognitive Behavior
- Dr. Bipin Chandra Pathak (PG College, Haldwani) – Comparative Cognitive Behavior in Fish
- Dr. Malini Srivastava (SRHU) – Psychological Disorders & Demographics

The session highlighted the growing role of AI and data analytics in understanding public health trends, cognitive behavior, and Epidemiology in neuroscience and behavior focuses on studying the distribution and determinants of neurological and mental health disorders in populations. It explores risk factors, genetic influences, and environmental triggers affecting brain function and behavior. By using statistical analysis, AI-driven predictive models, and large-scale cohort studies, researchers identify patterns in conditions like Alzheimer's, depression, and anxiety. This field plays a crucial role in public health by informing prevention strategies, improving early diagnosis, and guiding interventions for better mental and neurological well-being.

Panel Discussion 2: Multi-Omics & AI in Health & Disease

Moderator: Dr. Arun Wiita, University of California, San Francisco

Panelists:

- Dr. Dong Ling Tong (UTAR, Malaysia) – AI in Disease Prediction
- Prof. Stephen Pennington (University of Dublin, Ireland) – Protein Biomarker Discovery
- Dr. Gokul Krishnan (NIMHANS, Bangalore) – Gestational Diabetes & Epigenetics
- Prof. Sanjiv Dhingra (University of Manitoba, Canada) – Regenerative Medicine
- Dr. Alan J Stewart (St. Andrews University, UK) – Metallo-Proteomics
- Dr. Babu Kaundinya Desiraju (THSTI, India) – Big Data & Child Growth

This session focused on the integration of AI with genomics and proteomics to enhance disease diagnostics, predictive healthcare, and regenerative medicine. Multi-omics integrates various biological data layers—such as genomics, proteomics, metabolomics, and transcriptomics—to provide a comprehensive understanding of diseases. AI enhances multi-omics analysis by identifying complex patterns, predicting disease biomarkers, and enabling early detection of conditions like cancer and neurodegenerative disorders. Machine learning models process vast omics datasets to uncover hidden correlations, leading to personalized medicine and targeted therapies. This combination of AI and multi-omics is revolutionizing precision healthcare, offering faster and more accurate diagnostics.

Panel Discussion 3: Multi-Omics & AI in Disease Detection

Moderator: Prof. Sanjeev Srivastava, IIT Bombay

Panelists:

- Prof. Graham R Ball (UK) – AI-based Cancer Prognostics
- Prof. Sunil K Saini (SRHU) – Cancer Database in Uttarakhand
- Prof. Ramesh NK Bamezai (Former JNU, Delhi) – Cancer Genomics
- Prof. Arun Wiita (UCSF, USA) – Cell Surface Proteomics
- Prof. Joshua LaBaer (Arizona State University) – Open-Source Multi-Omics Diagnostics
- Dr. Aavriti Batra (SRHU) – Hematological Malignancies

This discussion delved into the application of AI-driven multi-omics data for improving cancer diagnostics and personalized medicine. Multi-omics and AI are transforming healthcare by integrating genomics, proteomics, metabolomics, and other biological data to understand health and disease at a systems level. AI-driven analytics identify complex biomolecular interactions, enabling early disease detection, precision medicine, and targeted therapies. In conditions like cancer, cardiovascular diseases, and neurological disorders, AI-powered multi-omics approaches help discover novel biomarkers, predict patient outcomes, and personalize treatment strategies. This synergy enhances disease prevention, accelerates drug discovery, and improves overall patient care.

Panel Discussion 4: Environment, Agriculture & Fisheries Database

Moderators:

- Prof. Graham R Ball, UK
- Dr. Dong Ling Tong, UTAR Malaysia

Panelists:

- Prof. Vivek Kumar (SRHU) – Soil Microbiome & Environmental Sustainability
- Dr. Vijay P Semwal (Tehri Garhwal) – Biomarkers of Himalayan Rivers
- Prof. Dinesh K Sharma (HNBG University) – Himalayan Pheasant Database
- Prof. Naresh Agarwal (HNBG University) – Fish Database of Uttarakhand
- Prof. Maneesha Singh (SGRR University, Dehradun) – Ancient Grains & AI Applications
- Dr. Rachel Aleji Bolatito (Nigeria) – Drought-Resistant Maize Development
- Dr. Ayoade Adedolapo (Nigeria) – Fisheries Stock Assessment

This session emphasized AI applications in environmental conservation, sustainable agriculture, and fisheries research. Environment, agriculture, and fisheries databases play a crucial role in monitoring and managing natural resources, food security, and biodiversity. These databases store vast amounts of data on climate patterns, soil health, crop yields, fish populations, and ecosystem changes. AI and data mining techniques help analyze this data to optimize agricultural practices, predict environmental risks, and ensure sustainable fisheries management. By leveraging

these databases, researchers and policymakers can make data-driven decisions to enhance productivity, conserve biodiversity, and mitigate climate change impacts.

Key Takeaways

1. Introduction to Data Mining in Biomedicine

The speaker highlighted the significance of data mining techniques in extracting useful patterns and knowledge from large biomedical datasets. Commonly used techniques such as clustering, classification, and association rule mining were discussed, along with their applications in disease prediction, drug discovery, and genomics.

2. Statistical Methods for Biomedical Data Analysis

The lecture covered various statistical methods essential for analyzing biomedical data. Topics included hypothesis testing, regression analysis, Bayesian methods, and survival analysis. Real-world examples of statistical applications in clinical trials and epidemiological studies were provided.

3. AI and Machine Learning in Biomedicine

The speaker elaborated on the role of artificial intelligence (AI) and machine learning (ML) in transforming biomedicine. Key ML algorithms such as deep learning, support vector machines, and random forests were discussed. Applications in medical imaging, personalized medicine, and electronic health record analysis were showcased.

Conclusion

The symposium successfully facilitated knowledge exchange among global experts, highlighting AI's transformative role in medicine, epidemiology, and environmental sciences. It provided a platform for interdisciplinary collaboration and encouraged further research in AI-driven biomedicine. The discussions reinforced the importance of big data analytics, machine learning, and computational biology in shaping the future of healthcare and environmental sustainability. With such diverse and insightful discussions, the symposium marked a significant step toward integrating AI with life sciences for better health and environmental solutions.

The session ended with a vote of thanks by the Head of the Department, Community Medicines Prof. Ashok Kumar Srivastava, and Prof. Asha Chandola Saklani expressing gratitude to the distinguished speakers for sharing their expertise and enlightening the students and faculty members.

Photos and Attachments

Photos from the event and additional resources shared by the speaker are attached for reference.