

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

Topic: International Symposium on Biology and Medicine in 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

Speakers:

- Asha Chandola Saklani from SRHU
- Dong Ling Tong from UTAR MY
- Dono Widiatmoko from Derby University UK
- Alan J Stewart from St. Andrews University, UK
- RC Ramola
- LR Dangwal
- NK Agarwal from SRT Campus HNBGU, Badshaithaul Chamba
- Dr. Judith Steen from Harvard Medical School, USA
- Dr. Bipin Chandra Pathak from MBPG Government College, Haldwani, Uttrakhand
- Dr. Kaushik Sharma from Department of Neurology, SRHU
- Prof. Sanjeev Srivastava IITB, Mumbai
- Prof Graham R Ball from Intelligent OMIX Ltd, UK
- Prof Sunil Saini, Cancer Research Institute, SRHU
- Prof Ramesh NK Bamezai from Dean Life Sciences JNU, Delhi
- Prof Arun Wiita from HD Family Comprehensive Cancer Centre, University of California, San Fransisco USA
- Prof Joshua LaBaer from Centre for Biodesign, Arizona State University, USA
- Dr. Avriti Baveja from Cancer research Institute, HIMS, SRHU
- Dr. Ankit Batra from Cancer Research Institute, HIMS, SRHU
- Dr. Mansi Kala, from Department of Pathology, SRHU
- Dr.Gaurav Kumar, from HSBS, SRHU
- Prof Stephen Pennington from University of Dublin, Ireland
- Dr. Gokul Krishnan from NIMHANS, Bangalore
- Prof Sanjiv Dhingra from University of Manitoba, Canada
- Dr. CM Belwal from Department of Cardiology, SRHU
- Dr. Kunal Gururani from Department of Cardiology, SRHU
- Dr. Rashmi Jindal, Department of Dermatology, SRHU

- Prof. Vivek Kumar from HSBS, SRHU
- Prof. Dinesh K Sharma from HNBGU, SRT Campus, Badshaithaul Chamba
- Prof Maneesha Singh from Department of Botany, SGRRU, Dehradun
- Dr. Rachel Aleji Bolatito from Deptt of Plant Breeding and Genetics, Federal University of Minna, Nigeria
- Dr Ayode Adedolapo from Deptt of Zoology, University of Ibadan, Nigeria
- Dr. Manisha Saraswat from Government PG college, Karnaprayag, Chamoli.

No. of Participants: 200

Introduction

Epidemiology and Health Data Science Centre, the Department of Community Medicine and The Department of Clinical Research and CRI HIMS SRHU; In association with INTelligentOMIX Ltd NTU, UK and UTAR Malaysia at Swami Ram Himalayan University organized an International Symposium on Biology and Medicine in AI Era with Hands-on workshop on “Datamining, Statistics and AI ML tools in Biomedicine” was organized to provide insights into the latest advancements and applications of these technologies in the healthcare sector. The session aimed to educate students, researchers, and professionals on the integration of data-driven approaches in biomedical research and healthcare decision-making.

Objective of the Lecture:

- **Understand the Fundamentals** – Gain insights into the core principles of data mining, statistical analysis, and AI/ML techniques relevant to biomedicine.
- **Explore Biomedical Data Processing** – Learn about data collection, preprocessing, and feature extraction methods used in biomedical research and healthcare.
- **Analyze the Role of Statistics** – Understand how statistical models and techniques contribute to data-driven decision-making in biomedicine.
- **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.
- **Identify Challenges and Ethical Considerations** – Discuss challenges such as data privacy, bias in AI models, and ethical concerns in biomedical AI applications.
- **Explore Future Trends** – Gain insights into emerging trends, innovations, and potential advancements in AI/ML for biomedical research and clinical practice.
- **Encourage Critical Thinking and Discussion** – Engage in discussions on the impact, limitations, and real-world implications of data-driven approaches in biomedicine.

Hands on Workshop:

Day 1

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), that help in data interpretation, decision-making, and predictive modeling.

Day 2

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.

Day 3

20 February 2025: On Day 3, the symposium commenced with the theme "**Biology and Medicine in the AI Era.**" The event featured a panel discussion covering four key topics:

1. **Panel Discussion 1 on Epidemiology: Neuroscience and Behaviour, moderated by Dr. Judith Steen-** 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.
2. **Panel Discussion 2 on Multi-omics and AI in disease detection, moderated by Prof Sanjeeva Srivastava** - 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.

3. **Panel Discussion 3 on Multi-omics and AI in health and disease, moderated by Prof Arun Witta** - 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.
4. **Panel Discussion 4 on Environment, Agriculture and Fisheries Database moderated by Prof Graham R Ball and Prof Chandra Shekhar Nautiyal** - 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 lecture concluded with an interactive Q&A session where participants engaged with the speaker on various challenges and future prospects of AI/ML in biomedicine. Ethical considerations, data privacy, and the need for interdisciplinary collaboration were emphasized as crucial aspects of this evolving field.

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.