The University of Melbourne ＆ Hokkaido University
Advancing Digital Health & Medical AI

ABSTRACTS

Session 1: Current Status of Data Health

Kazuhiro Abe   Faculty of Health Sciences, HU

Advancing Data-Based Health Management

The data analysis results can assist in developing health and long-term care policies. Several studies will be presented here analyzing Japanese administrative data using causal inference methods. It will then draw out the future challenges and possibilities of Data-based Health Management.

Karin Thursky   Dentistry and Health Sciences, UoM

How can Clinicians Drive the Meaningful Use of AI in Healthcare

We will use the applied learning health systems framework to describe a user centred approach to the design of digital health programs. Whether it is understanding the data, co-designing clinical applications, implementation and evaluation, clinicians and researchers must work alongside each other. Using several examples of current digital research programs, the participants will gain an understanding of the key phases of the learning health framework, as well as approaches and methodologies that lead to successful implementation.

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Soki Maeda   Graduate school of Health Sciences, HU

Analysis of Sapporo Health Awareness Survey
Using Latent Class Analysis

This study analyzed health awareness and lifestyle habits among people aged 20 to 60 in Sapporo using data from a health awareness survey. By employing latent class analysis (LCA), four distinct groups were identified: 1 Housewife Type: Predominantly female, with low exercise habits and infrequent health check-ups. 2 Healthy Group: Higher average age and household income, with good exercise habits and high dietary awareness. 3 Unhealthy Group: Younger age group with unhealthy lifestyle habits. 4 Young and Single Type: Younger individuals with low exercise habits and a tendency to eat late-night snacks. The results of this study provide crucial insights for formulating appropriate health policies tailored to each group in Sapporo. Furthermore, future research aims to analyze individuals' disease conditions to evaluate health risks and develop more effective health promotion strategies.

Mike Conway   Engineering and IT, UoM

Natural Language Processing and Mental Health: Progress and Pitfalls

Mental illness and substance use disorders are leading contributors to the burden of disease in most developed countries, with 21.2% of adult Americans experiencing either a serious mental illness or substance use disorder in the previous 12 months. Over the last decade there has been an increasing emphasis on utilising Natural Language Processing (NLP) --- in conjunction with social media and clinical text derived from electronic health records --- to support mental health-related research and operational goals in epidemiology, surveillance, decision support, and intervention development. In this talk I will discuss some of the challenges and opportunities in operationalizing NLP for mental health applications.

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Daniel Cabrera Lozoya   Engineering and IT, UoM

Synthetic Data for Machine Learning in Mental Health: Optimization Strategies, Applications, and Evaluation Studies

Natural language processing (NLP) holds immense potential for analyzing and extracting valuable insights from therapy transcripts. Nonetheless, gathering the necessary data to train NLP models for clinical tasks is a challenging process due to patient confidentiality regulations that restrict data sharing and general institutional barriers to obtaining clinical data. To overcome this obstacle, we propose leveraging large language models (LLMs) to create synthetic therapy transcripts that can be used to train NLP models for downstream clinical tasks. In this talk I will discuss optimization strategies to create high quality synthetic data, applications that can be developed using synthetic data, and evaluation techniques needed to assess the quality and safety of the generated data.

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Session 2: Data Health and AI

Ren Togo   Faculty of Information Science and Technology, HU

Research Trends in Generative AI and Its Applications in the Medical Field

The lecture emphasizes the critical role of artificial intelligence, particularly generative AI, which has progressed significantly and is now utilized in various sectors. We focus on the technical evolution of generative AI, spotlighting self-supervised learning as a pivotal technology that departs from traditional supervised methods in medical AI. The discussion will explore how self-supervised learning can more effectively leverage medical data. It will also highlight the latest research trends and applications of generative AI in healthcare, both globally and in Japan, using studies from our lab. The lecture underscores the high quality of Japanese medical data as a catalyst for further innovations in healthcare through advanced generative AI technologies.

Daniel Capurro   Engineering and IT, UoM

AI-Based Interventions, An Evidence-to-Recommendations Framework

In this presentation, we will explore the critical considerations for transferring clinically effective AI algorithms between healthcare institutions. Unlike traditional medical innovations such as drugs and devices, AI-based interventions are highly sensitive to contextual factors, potentially leading to significant variations in performance and implementation success across different settings. We'll examine key aspects including data quality and interoperability, documentation practices, clinical workflows, legal and regulatory frameworks, and institutional readiness.

Hokkaido University – University of Melbourne Joint Research Workshops

Hiroyuki Sugimori   Department of Biomedical Science and Engineering
Faculty of Health Sciences, HU

Practical Applications of AI in Medical Imaging:
A Radiological Technologist's Perspective

This presentation will show the current state of AI applications in medical imaging, focusing on the radiological technologist's workflow. We will cover various aspects our laboratory is exploring, including AI-assisted assessment of chest X-ray quality, automated slice placement for brain MRI, and approaches to improve examination efficiency. The talk will also touch upon our work on analyzing high-resolution mammograms using a patch-based CNN method. Through these examples, we aim to provide an overview of how our research laboratory is approaching AI integration in radiological practice from a technologist's viewpoint. We'll present our research insights on AI's potential in medical imaging.

Vlada Rozova   Medicine, Dentistry and Health Sciences, UoM

AI in Healthcare: Case Studies on Design, Implementation,
and Transportability

By leveraging complex clinical datasets, AI offers an opportunity to support and automate clinical decision-making in hospital and primary care settings. In this talk, I will give an overview of three projects: hospital infection surveillance, assessment of antimicrobial prescriptions, and detection of self-harm in emergency departments. The projects will illustrate the importance of user-centred design, the implications of resource constraints, and the challenges in transporting AI models across sites.

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Ayako Yagahara   Faculty of Health Sciences, Hokkaido University of Science

Medical Natural Language Processing in Japanese Language

Japanese Natural Language Processing (NLP) presents several unique challenges compared to English NLP due to differences in its writing system, word segmentation, and syntactic and semantic ambiguity. Additionally, the relatively small number of Japanese speakers leads to a lack of data resources, and fewer pretrained models, which is also true for the medical domain. In this talk, I will introduce the challenges and innovations in Japanese NLP, highlighting specific difficulties and the solutions being developed through several ongoing projects.