

# 2018 WORKSHOP ON ARTIFICIAL INTELLIGENCE & DIGITAL HEALTHCARE

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## List of Abstracts

**Dr. Haibo Wang**

### **“The Application of Big Data and AI in Healthcare in China”**

As an emerging interdisciplinary field, big data is playing a vital role in various sectors in recent years. It has the unique advantages in capturing the trend and formulating the national level development strategies. Medicine, as a significant variable of social development, should be the backbone of big data science. But for a long time, medical data were separated in various medical institutions, and hence the development of real-world medical big data were stagnated and restricted due to the difficult access of aggregated data. Without the support of real-world big medical data (phenotype), it is hard to achieve the goal of precision medicine merely rely on genetic data. In the world arena, even developed countries, such as the United States, are difficult to obtain the high quality real-world big medical data. As for China, the large population, unified national medical social insurance system and strong government implementation have brought unique advantages in acquiring and consolidated big medical databases. In this report, we elaborated the essential characteristics of big data in real cases to spotlight China’s current situations and prospects of big medical data application, using AI technology.

## Mr. Kevin Cai

### “Developing AI Technology Platform in Hospital Authority”

With the advancement of Big Data Analytics and Artificial Intelligence, the application of these technologies has been growing rapidly in many industries, including in healthcare service planning and delivery. While it promises to bring higher efficiency and quality in patient care, it also comes with challenges that are unique to the healthcare industry.

The Hospital Authority (HA) has been exploring the use of medical Big Data and development of AI algorithms and models for patient care process in recent years. Having one of the most comprehensive electronic medical record systems in the region for public healthcare, HA began its Big Data and AI journey with 20+ years of clinical data captured by its Clinical Management System (CMS). The vision is to support clinical decision making and the overall transformation of Hong Kong’s public healthcare via enabling a highly interconnected, data-driven and algorithmic-enabled healthcare provision. This will be attained while ensuring the security, privacy and confidentiality of patients’ data, as well as the acceptance and support from the healthcare professionals.

HA pursues an in-house approach in developing its Big Data and AI capabilities. A Big Data and Machine Learning platform based on open source technology is being developed. Skills and experiences are also gradually developed via prototyping and collaboration with the academic community and industry experts.

A key initiative to attain the above vision is the establishment of a Data Collaboration Laboratory. Through this platform, HA will work collaboratively with external researchers and organizations to develop algorithms and Machine Learning models that could potentially enable the automation and innovation of care delivery process of HA, while at the same time supporting the research objective of its collaborating partners.

## Prof. Robert Sparrow

### “What Computers Can and Cannot Do in Healthcare”

While it seems clear that AI will play an increasing role in medicine in the future, it also seems likely that its adoption will be gradual and uneven. Even in an age of big data, the complexity of human biology and pathology poses significant challenges to machine learning systems. Moreover, the interconnected nature of hospitals and of healthcare systems more generally, the importance of human factors in the uptake of new technologies, and the presence of significant vested interests in the healthcare system all suggest that AI will be adopted more quickly in some roles rather than others. In order to maximise the benefits of

the use of AI in medicine, then, it is important to understand what computers can and cannot do in healthcare. In this presentation, I will highlight the potential of AI systems to identify patterns in data relevant to human health in a number of contexts as well as some possible threats to patient-centred care that might arise as a result of over-relying on such data. I will also argue that the importance of interpersonal skills and tacit cultural and social knowledge in diagnosis, and of human factors in shaping patient behaviour relevant to the management of chronic diseases, place important limits on the appropriate uses of AI in medicine. More generally, the role played by care, understood as a relationship between persons, in shaping patient outcomes, suggests that conscientious and empathic physicians and nurses will continue to be the most valuable asset of any healthcare system.

### **Dr. Carolyn Neuhaus**

#### **“AI for Care and Support of Aging Individuals and Societies: The Issue of Surveillance Technologies”**

Entrepreneurs in the United States and elsewhere are rapidly developing and marketing new products and technologies to mitigate the challenges of aging and to enhance its goods. Many of these new products employ machine learning and/or artificial intelligence to improve task performance, whatever their task may be. These products are designed for use in a variety of settings, including private homes, nursing homes, long-term care facilities, and hospitals, which means that they are utilized by and/or affect a variety of people. This presentation will explore different stakeholders involved in the development and implementation of new technologies and different values in play. Ethical conflicts and trade-offs abound, and highlight deeper normative questions about the meaning and significance of surveillance in the context of care, whose or which values and goals ought to be prioritized, and how these new technologies create, exacerbate, or mitigate injustices. I will use case studies to raise these ethical questions, and then defend, or at least suggest, some approaches moving forward.

### **Dr. Derrick Au**

#### **“Will Artificial Intelligence Augment Patient Safety?”**

Rapid developments in Artificial Intelligence (AI) technologies raise high hopes for improving and redesigning health care but also raise potential ethical concerns. In June 2018, the American Medical Association (AMA) issued its first policy declaration on the application of AI in healthcare. The policy declaration, using the term ‘Augmented Intelligence’ for AI, carries a fundamental theme that healthcare organisations, professional societies and other stakeholders must take the lead in ensuring that patient safety, care

quality, and clinical productivity do not suffer when AI tools are introduced. In this presentation, I shall consider the potential benefits and possible concerns of deploying AI technologies in the domain of clinical risk management and patient safety. The discussion is placed in the context of public hospital system in Hong Kong.

## **Dr. Kendall Ho**

### **“Use of AI and Digital Technologies in Supporting Transition of Patients Between Acute and Community Care”**

A common care gap in most health systems globally is the safe and high quality transition of patients between hospitals and homes. Because the care of patients in these two clinical contexts are often delivered by different healthcare teams, continuity of care of patients transitioning between hospitals and homes (e.g. Emergency Department visits, discharge home from hospitalization) and inter-professional communication are often suboptimal. Older populations, especially those with chronic diseases such as Heart Failure (HF) or Chronic Obstructive Pulmonary Diseases (COPD), are more likely to trigger frequent hospitalizations and ED visits. As a result, they are at increased risk of experiencing the transition-in-care gap between acute and community and acute care.

The innovative use of digital technologies in health is rapidly revolutionizing how healthcare services are conducted. Important advances to monitor patients' state of health include the use of wearables and sensors to track physiologic functions, data analytics and artificial intelligence to improve diagnostic and management decision making by clinicians, and data visualization to help patients to qualify themselves to optimize health and wellness. This presentation explores how the UBC Digital Emergency Medicine program is leveraging technologies to support the quality and safety of care for patients transitioning between acute and community care. Using our studies as backdrop, I will elucidate some of the opportunities and challenges in applying digital health technologies in this specific clinical context. I will then highlight the broader picture of AI and medicine learning in digital healthcare, and how some of the bioethics issues surface and influence digital health applications in this care gap. This session will conclude with an interactive exchange with the audience on their perspectives to promote knowledge exchange and identification of way forward.

## **Prof. Raymond Tong**

### **“AI for Rehabilitation Robotics and Diagnostics”**

Artificial intelligence (AI) is a new tools with big data to create impact in the healthcare. It shifts healthcare by increasing availability of healthcare data and provides decision and recommendations based on rapid progress of analytics techniques. AI can be applied in cancer detection and intervention, and also applied in medical imagining in neurology and cardiology. There are AI applications in stroke for early diagnosis and robotic control application for rehabilitation. AI will be contribute to further enhancing our quality of health. With an ageing population, AI maybe able to provide support to face the challenges to have more effective solutions for prevention and treatment protocols. AI applied for Rehabilitation Robotics to enhance the recovery for stroke survivors and mobility of spinal cord injured persons.

## **Ms. Stephanie Holmquist**

### **“The Ethics of Data Set Mining”**

Healthcare systems are generators, miners, and consumers of information held as datasets and databases. Alongside familiar repositories of medically significant data, personal health devices and surveilled forms of digital activity offer novel sources of potentially medically relevant information.

Datasets are in and of themselves inert repositories of mute digital or physical materials. Traditional analytic and statistical tools, plus increasingly computationally sophisticated algorithms transform datasets into sources for choice and recommendation in clinical and public health medicine.

A cluster of related ethical questions emerge from AI-based advances in dataset mining. These include the need for “explainable AI”, accounting for machine and human bias in dataset pattern recognition, and whether a right to AI-enhanced healthcare is ethically plausible.

## Speakers' Biographies

### **Dr. Derrick Au**

Dr. Derrick Au is Director of the Centre for Bioethics at the Chinese University of Hong Kong. He was formerly Director of Quality and Safety of the Hong Kong Hospital Authority and presently serves as Chairman of the HA Clinical Ethics Committee and Honorary Advisor for Quality and Safety. Dr. Au is a geriatrician by training and served in clinical geriatric and rehabilitation services in the public hospital system in Hong Kong for two decades before moving on to management work. Dr. Au is also a writer and newspaper columnist. A recently co-edited book 《如何走下去 – 倫理與醫療》(2018) considers the issues of professional ethics and sustainability in healthcare in Hong Kong.

### **Mr. Kevin Cai**

Mr. Kevin Cai serves as the Chief Information Officer of Hospital Authority Hong Kong since 2015, building and transforming one of world's largest healthcare IT system for all public hospitals across Hong Kong.

Prior to that Kevin assumed the CIO role in China Eastern Airlines for over 5 years. He rebuilt the entire IT capability and enabled China Eastern to become the 5th largest and one of the most profitable airlines in the world. He received China's Best CIO Award for 3 years consecutively since 2010.

Prior to China Eastern, Kevin assumed various IT roles in Cathay Pacific Airways, Dragonair, Hong Kong Airport Authority and IBM Australia.

Kevin also advised IBM as Board of Advisors for 4 years since 2011, and took up Board Directorship in global companies such as SITA and Travelsky. He holds an Executive MBA degree from China Europe International Business School, and received a Master degree from Australia's Monash University.

### **Dr. Kendall Ho**

Dr. Kendall Ho is an emergency medical specialist at the Vancouver General Hospital in Vancouver, BC, Canada, a professor in the UBC Faculty of Medicine Department of Emergency Medicine, and a member of the Royal College of Physicians and Surgeons of Canada. He leads the Digital Emergency Medicine Unit, and his research focuses on sensors and wearables, health apps, data analytics, virtual health to support care access, and raising

digital health literacy for health professionals and patients. He conducts his research in Canada and internationally with partners in Asia, Europe, and Australasia. He was elected as a fellow of the Canadian Academy of Health Sciences. He has received several awards for his work, including the eHealth Education Award from Association of Faculties of Medicine of Canada, eHealth Clinician Award from eHealth Canada, and innovation awards from UBC Faculty of Medicine and BC Vancouver Coastal Health.

### **Ms. Stephanie Holmquist**

Stephanie Holmquist is a New York based bioethicist affiliated with Columbia University. Her research interests include the ethics of artificial intelligence in biomedicine, animal ethics and biomedical research, and the meta-ethics of bioethics.

### **Dr. Carolyn Neuhaus**

Dr. Carolyn Neuhaus is a research scholar at The Hastings Center, where her work explores philosophical and ethical questions that arise throughout biomedical research and medical practice, ranging from the philosophical foundations of the use of animals in biomedical research to the development of digital medicine and use of AI in healthcare. She has previously held the Rudin Postdoctoral Fellowship in the Division of Medical Ethics of the NYU School of Medicine, and her research has appeared in JAMA, American Journal of Bioethics, and the Cambridge Quarterly of Healthcare Ethics, among other journals.

### **Prof. Robert Sparrow**

Rob Sparrow is a Professor in the Philosophy Program, a Chief Investigator in the Australian Research Council Centre of Excellence for Electromaterials Science, and an adjunct Professor in the Monash Bioethics Centre, at Monash University, where he works on ethical issues raised by new technologies. He has been an ARC Future Fellow, a Japanese Society for the Promotion of Science Visiting Fellow at Kyoto University, a Visiting Fellow in the CUHK Centre for Bioethics, in the Faculty of Medicine, at the Chinese University of Hong Kong, and a Visiting Fellow at the Centre for Biomedical Ethics, in the Yong Loo Lin School of Medicine, at the National University of Singapore. He is a co-chair of the IEEE Technical Committee on Robot Ethics and was one of the founding members of the International Committee for Robot Arms Control.

## **Prof. Raymond Tong**

Prof. Raymond Kai-yu Tong is a Biomedical Engineer. He received his PhD in Bioengineering from the University of Strathclyde, Glasgow, UK. Raymond currently is the Professor and Founding Chairman in the Department of Biomedical Engineering. His research interests include Rehabilitation Robotics (e.g. Exoskeleton robotic hand), Brain-Computer Control Interface (BCI), Neural Engineering, Functional Electrical Stimulation(FES) and Cognitive Assessment Software. Projects have been funded by Innovation and Technology Fund and UGC CERG/GRF as principal investigator. His research, innovation and service have received Awardee of the 2013 Ten Outstanding Young Persons (Hong Kong); the Grand Prix Award(the highest honor) of the International Exhibition of Inventions of Geneva 2012; Winner Award(e-Health) (the highest honor) in the Asia Pacific ICT Award 2012; and HKIE innovation awards for young members(2008), gold awards in international invention exhibitions(2004, 2007, 2010, 2015, 2016). Webpage: <http://www.bme.cuhk.edu.hk/kytong>

## **Dr. Haibo Wang**

Dr. Haibo Wang graduated with a degree of clinical medicine from the Sun Yat-Sen University of Medical Sciences in China and earned the degree of Master of Science at the University of Maryland and Master of Public Health at Harvard University in USA.

Dr. Wang is the member of World Health Organization (WHO) Task Force on organ transplantation and serves as a member of the National Organ Donation and Transplantation Committee for China. He is the founder and key architect of national organ allocation computer system (China Organ Transplant Response System, COTRS). Dr. Wang has been worked closely with the leaders of national and international transplantation communities to help China to build the big-data driven technical capacity for a transparent and equitable national organ allocation system (COTRS), which is crucial for the success of the reform of national deceased organ donation program. Dr. Wang is serving as the member of Ethic Committee of The Transplant Society (TTS) and the councilor of Declaration of Istanbul Custodian Group (DICG), which is coordinating the global efforts in against organ trafficking and transplant tourism.

Over the past 12 years, Dr. Wang has initiated and led several large national medical databases. Under the sponsorship of WHO and National Health Commission in China, Dr. Wang has been worked closely with the champions of national and international





medical communities to conduct the in-depth researches in the field of big data medicine, focusing on organ transplantation and chronic non-communicable diseases. He has published on international journals like New England Journal of Medicine (NEJM) and British Medical Journal (BMJ).