



# AMSAH·2019

ARTIFICIAL INTELLIGENCE IN MEDICINE SURGERY AND HEALTHCARE

March 9, 2019 | Westmead Conference Centre, Sydney | [www.amsah.org](http://www.amsah.org)



## CONFERENCE PROGRAM

# NOTES

# WELCOME

Welcome to the first Australian congress of the Society for Artificial Intelligence in Medicine, Surgery and Healthcare

In recent years, there has been an explosion in the use of Artificial Intelligence (AI) in healthcare. The time has come for computer engineers, data scientists, doctors, clinicians, public health officials, industry and government to convene and explore the frontiers of this exciting new field.

In our packed one-day program we will explore the technical aspects of AI in healthcare and discover cutting-edge real-world clinical applications. Our Faculty consists of leading innovators whose knowledge and insights will appeal to experienced researchers, novices entering the field, and interested observers alike.

The conference will be held at The Westmead Education and Conference Centre (WECC), located at the Westmead Hospital Campus of The University of Sydney. The University and Hospital are currently undergoing a >\$1.5 billion campus re-development with a specific focus in artificial intelligence research.

We look forward to the pleasure of your company in Westmead, Sydney on March 9, 2019.

# ABOUT AMSAH

Artificial Intelligence (AI) uses advanced computer algorithms to simulate intelligent human behaviour.

AI has the potential to revolutionise the way healthcare is delivered to better fulfil the needs of patients, doctors, healthcare providers, public health organisations, industry and government.

AMSAH was formed to foster collaboration and collegiality between researchers in this exciting new field.

# PROGRAM: SATURDAY MARCH 9, 2019

## 8:00-8:30: REGISTRATION

### SESSION 1: HEALTHCARE AI: PAST, PRESENT AND FUTURE

No.	TIME	TITLE	SPEAKER
W1	8:30	Convener's Welcome	Narinder Singh
W2	8:35	University Welcome	Andrew Black
W3	8:40	Health Informatics Welcome	Heiko Spallek
W4	8:45	Official opening, Guest of Honour	Jana Pittman
1.1	8:50	Introduction And Historical Overview: The Inevitable Rise Of AI In Healthcare	Enrico Coiera
1.2	9:15	Healthcare AI In 2019: Where Are We Now?	Louisa Jorm
1.3	9:35	Opportunities And Challenges: Where Are We Heading?	Dacheng Tao
1.4	9:55	Industry Perspective: Augmented Intelligence - Working At The Intersection Of AI, Big Data And Healthcare To Drive Better Patient Outcomes	Terry Sweeney
1.5	10:15	Clinical Insight: Using Computer Vision And Natural Language Processing To Decode Cancer	Aparna Elangovan

## 10:30-11:00: MORNING TEA

### SESSION 2: HYPE, HOPE OR REALITY – IS THE AI REVOLUTION HERE YET?

No.	TIME	TITLE	SPEAKER
2.1	11:00	Everyone Likes Innovation. No One Likes Change: How To Prepare For The Digital Disruption Tsunami	Louise Schaper
2.2	11:25	Industry Perspective: Progressing a Digital Future – Keeping It Real	Nic Woods
2.3	11:45	Data Analytics In Telstra Health: Current Examples And Future Initiatives	Vincent McCauley
2.4	12:05	Clinical Insight: Using Data Science To Predict Treatment Outcomes In Paediatric Cancer	Paul Kennedy
2.5	12:25	Clinical Insight: Bringing Trusted AI to the Intensive Care Unit	Brent Richards
2.6	12:45	Startup Guide: How To Launch An AI Startup: Doclink's Journey In The Cicada Medlab Accelerator	Martin Orliac

## 13:00-13:45: LUNCH

### SESSION 3: REAL-WORLD IMPLEMENTATION

No.	TIME	TITLE	SPEAKER
3.1	13:45	People first. Technology second.	Alexander Rannaleet
3.2	14:03	Clinical Insight: Machine Learning And Medical Records: Identifying Readmission Risk And Other Unexpected Findings	David Hansen
3.3	14:21	Industry Perspective: The Challenges of Implementing AI in Health Care – Hype vs Reality	Malcolm Pradhan
3.4	14:39	Eight Key Ethical Principles for AI in Medicine	Mark Nevin
3.5	14:57	Using Information Processing Features To Understand Neural Properties	Joseph Lizier
3.6	15:10	Clinical Insight: Machine learning in Medical Imaging	Jinman Kim
3.7	15:20	Clinical Insight: AI In Solving Indigenous Ear Disease	Al-Rahim Habib
3.8	15:30	Implementing AI: Key Steps For Hospitals and Providers	Kuljit Singh

## 15:40-16:00: AFTERNOON TEA

# PROGRAM CONTINUED

## SESSION 4: PRACTICAL INSIGHTS FROM THE CLINICAL COALFACE

No.	TIME	TITLE	SPEAKER
4.1	16:00	Harnessing Worldwide Big Data To Transform Radiology And Cardiology: Siemens Healthineers' Teampay And Other Digital Solutions	Benjamin Schmitt
4.2	16:20	Machine Learning Haptic Feedback in Real-Time Surgery, and Intelligent Image Retrieval	Mo Namazi
4.3	16:40	Startup Insight: The Anatomy of an AI Healthcare Project	Aengus Tran
4.4	16:50	Government Perspective: Sharing Large Volumes of Data – Made Easy	Ian Oppermann
4.5	17:10	How To Mitigate Risk In The Application Of AI In Healthcare: The Critical Importance Of Governance Frameworks	Sandeep Reddy
4.6	17:30	Startup Insight: Bringing Deep Learning To Digital Mammography	Joe Logan
4.7	17:40	Clinical Insight: PET Image Synthesis At Low Dose	Luping Zhao
4.8	17:50	Using AI to Maintain Integrity in Medical Coding	Stephan Curiskis
4.9	18:00	NLP Coming of Age - Automated Case Identification and Coding at the California Cancer Registry	Jon Patrick
4.10	18:10	Engagebot: An AI-System to Provide Information Support For Discharged Patients	David Grayson

**18:20: CONFERENCE CLOSE**



PROFESSOR  
ENRICO COIERA

Director,  
Centre for Health Informatics,  
Australian Institute of Health  
Innovation, Macquarie University

## 1.1 Introduction And Historical Overview: The Inevitable Rise Of AI In Healthcare

Professor Coiera is Foundation Professor in Medical Informatics at Macquarie University, Director of the Centre for Health Informatics, and Director, NHMRC Centre of Research Excellence in Digital Health.

Trained in medicine and with a computer science PhD in Artificial Intelligence (AI), Coiera has a research background in both industry and academia and a strong international research reputation for his work on decision support and communication processes in biomedicine. Coiera is driving the integration of the application of Artificial Intelligence (AI) in healthcare across the Centre's existing research streams in a decade-long research program.

Coiera spent 10 years at the prestigious Hewlett-Packard Research Laboratories in Bristol UK where he led numerous health technology projects. He has overseen the development and trial of multiple eHealth interventions, including the Healthy.me consumer system as well as clinical decision support systems. Healthy.me technologies underpin a new US health startup called Healthbanc. His textbook Guide to Health Informatics, is widely used internationally, and is translated into several languages.

Coiera's awards include the 2015 International Medical Informatics Association (IMIA) François Grémy Award for Excellence and the 2011 UNSW Inventor of the year (Information and Communication Technology).

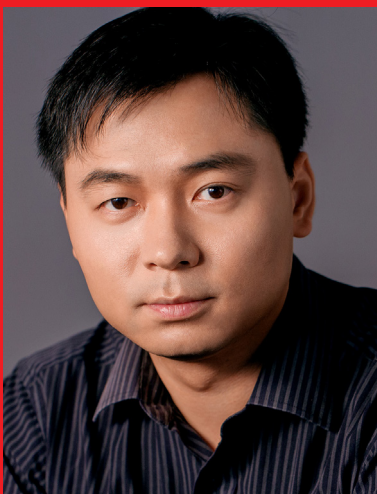
### Synopsis

Professor Coiera will present an historical overview of AI in the healthcare space with an introduction to current and future directions.



PROFESSOR  
LOUISA JORM

Director,  
Centre for Big Data Research  
in Health, University of NSW



PROFESSOR  
DACHENG TAO

Director,  
UBTECH Sydney Artificial  
Intelligence Centre, University  
of Sydney

## 1.2 Healthcare AI In 2019: Where Are We Now?

Professor Jorm is the Foundation Director of the Centre for Big Data Research in Health at UNSW Sydney, the first Australian research centre dedicated to health research using big data. She is an Australian leader in 'big data' health research, conducting detailed analytics on routinely collected data and linked data, including hospital inpatient, mortality and Medicare records. She has made major scientific contributions to research in the areas of health system performance, Aboriginal health, and shaping national policy regarding access to publicly funded health data for research.

Professor Jorm has played a leading role in the establishment of major infrastructure and capacity for 'big data' health research in Australia, including the NSW/ACT Centre for Health Record Linkage, the Population Health Research Network, the NSW Biostatistical Officer Training Program and the new UNSW Sydney Masters program in Health Data Science. She led the development of the Secure Unified Research Environment (SURE) and E-Research Institutional Cloud Architecture (ERICA) secure data analysis facilities.

### Synopsis

AI techniques, in particular Machine Learning (ML) are shaping our everyday lives, across sectors including media, retail, banking, transportation and human services, and yet healthcare lags behind. Digital healthcare data are proliferating at an unprecedented rate, and application of ML has the potential to enable rapid transformation from current imprecise, highly variable and inequitable care to value-based, precise, evidence-based and equitable care. However, despite the hype, ML has as yet largely failed to move from the research domain into evidence-based, real-world, applications in health. Critical translational gaps remain in the domains of data, algorithms, behaviour and culture, and policy and regulation. This presentation will explore these gaps, and what we need to do to tackle them.

## 1.3 Opportunities And Challenges: Where Are We Heading?

Prof Dacheng Tao is an Australian Laureate Fellow and the Inaugural Director of the UBTECH Sydney Artificial Intelligence Centre at the University of Sydney. His research results in AI have expounded in one monograph and 500+ publications at leading journals and conferences, including T-PAMI, T-MI, IJCV, JMLR, NeuroImage, AAAI, IJCAI, CVPR, ICCV, ECCV, MICCAI, NIPS, ICML, ICDM; and ACM SIGKDD, with best paper awards, e.g. the 2018 IJCAI distinguished paper award, the 2014 ICDM 10-year highest-impact paper award, and the 2017 IEEE Signal Processing Society Best Paper Award. He is a highly-cited researcher in both engineering and computer science, and has an H-index of 93. He received the 2015 Australian Scopus-Eureka Prize and the 2018 IEEE ICDM Research Contributions Award. He is a Fellow of the Australian Academy of Science and a Fellow of the IEEE.

### Synopsis

Since the concept of the Turing machine was first proposed in 1936, the capability of machines to perform intelligent tasks has been growing exponentially. Artificial Intelligence (AI), as an essential accelerator, pursues the target of making machines as intelligent as human beings. It has already reformed how we live, work, learn, discover and communicate. In this talk, I will review our recent progress on AI by introducing some representative advancements from algorithms to applications, and illustrate the pathways for its realisation from perceiving to learning, reasoning and behaving. To push AI from the narrow to the general, many challenges lie ahead. I will bring some examples out into the open, and shed light on future targets. Today, we teach machines how to be intelligent as ourselves. Tomorrow, they will be our partners to step into our daily life.



**DR TERRY SWEENEY**

Managing Director (Asia),  
Partnerships & Commercial  
Strategy, IBM Watson Health

## 1.4 Industry Perspective: Augmented Intelligence - Working At The Intersection Of AI, Big Data And Healthcare To Drive Better Patient Outcomes

Originally from the UK and now based in Sydney, Terry is the IBM Watson Health Commercial Leader for Asia. Terry is recognised as a thought leader in healthcare technology and commercial strategy, with almost 20 years industry experience. His industry insight is regularly in demand from international governments, media, industry publications and keynote addresses.

Leading all aspects of Watson Health partnerships and commercial operations, Terry is responsible for a multi-million dollar business, developing new and emerging markets at the intersection of AI, big data and healthcare.

Most notably, Terry has recently been working at the forefront of the Chinese Government's 'Healthy China 2030' national agenda, leading negotiations and closing a > \$1bn partnership to bring new technology to the largest market in the world. This year, Terry has achieved triple-digit growth for the business.

Terry has held a number of global senior strategic positions in both public and private sectors. Reporting directly to the Secretary of State for Health, Terry was the UK Government Special Advisor on health/social policy and digital strategy, leading the transformation of front line services through technology adoption. He also headed up a government technology think tank, providing thought leadership on business transformation through technology. In addition, Terry led the government and healthcare practice for a Big Four consulting firm.

Terry is a former Founding Director of the social health and human services technology start-up, Cúram Software. He established the Cúram UK business, and subsequently Cúram Asia, achieving triple-digit growth year-on-year. Based in Ireland, Cúram's global presence and market leadership led to IBM acquiring the company in 2011 for a nine-digit sum. It remains part of the IBM Watson Health portfolio.

A former professional athlete, Terry holds a Ph.D. in Economics from Cambridge University, a first class honors degree in Economics also from Cambridge University, and a Masters of Science in Business Information Technology. Terry was honoured by HRH Queen Elizabeth II with a C.M.G. in recognition of his service overseas on behalf of the British Government.

### Synopsis

Dr Sweeney will discuss the convergence of AI, big data and healthcare in IBM Watson and how this drives improved patient outcomes.

## 1.5 Clinical Insight: Using Computer Vision And Natural Language Processing To Decode Cancer

Aparna Elangovan is a Solutions Architect at Amazon Web Services, focusing on helping customers build AI/ML solutions. She specializes in Natural Language Processing using deep learning and helps build production quality AI/ML pipelines for customers.

### Synopsis

Artificial intelligence, particularly natural language processing (NLP) and computer vision, has significant application in medicine and the health industry. Image recognition has been successfully applied to diagnose diseases such as melanoma, achieving dermatologist-level classification. Natural language processing (NLP) techniques have been applied in identifying drugs & diseases from doctor's notes and text mining accelerates curating their relationships. In this talk we look at the some of the common applications & techniques and what it takes to successfully implement a AI solution in practice.



**APARNA ELANGOVAN**

Solutions Architect,  
Amazon Web Services





**DR LOUISE SCHAPER**

CEO, Health Informatics  
Society of Australia

## 2.1 Everyone Likes Innovation. No One Likes Change: How To Prepare For The Digital Disruption Tsunami

Dr Louise Schaper is on a mission to fix healthcare.

As leader of Australia's peak body for digital health, Dr Louise Schaper, is a passionate advocate for the transformation of healthcare. As CEO of HISA she brings together world-class clinicians, researchers, innovators and organisations from across the biomedical, health and technology spectrum who are committed to the improvement of health outcomes enabled through innovative uses of technology and information. She is a facilitator, an innovator and a change agent who explores and leverages the convergence of people, systems and technologies in the transformation and future of health and medicine.

With a background as an occupational therapist, Louise has a PhD in technology acceptance among health professionals, is a Fellow of the Australasian College of Health Informatics, a graduate of Stanford's Executive Leadership Program, a Certified Health Informatician and a Salzburg Global Seminar Fellow.

Louise is an in-demand speaker and writes for academic and industry publications. Louise is host of the popular Dissecting Digital Health podcast, she is always online, and yes, she does have the coolest job!

### Synopsis

Healthcare is by nature an innovative industry. New medical techniques, therapies and tools are welcomed developments that aim to improve health outcomes. However, when it comes to managing the information of healthcare, we aren't so welcoming of change. In this energetic talk, Louise will present technologies and ideas to challenge and inspire as to the innovation health is likely to see which will impact models of care and the business of health.

## 2.2 Industry Perspective: Progressing a Digital Future – Keeping It Real

Having over 25 years' experience in clinical medicine (mostly emergency medicine and urgent care) and digital health globally, Nic has held diverse roles in health technology incubators, national digital health programs and medical executive leadership roles within the digital health and technology industry.

His role as Health Industry Exec, Chief Medical Officer at Microsoft Australia is to improve healthcare for Australians across the continuum, through a thriving ecosystem of partners and the use of innovative digital technologies.

He believes this is an incredibly dynamic time to be working in this intersection with health information technology increasingly contributing to the delivery of more efficient and safer healthcare now and into the future.

### Synopsis

As health becomes more digitised, what are the real drivers and achievements in digital health globally and in Australia?

During this presentation, Dr Woods will give a view on the health of digital health, how Microsoft is thinking about the role of AI in health and how he is seeing its evolution in impacting healthcare.



**DR NIC WOODS**

Chief Medical Officer,  
Microsoft Australia

## 2.3 Data Analytics In Telstra Health: Current Examples And Future Initiatives



DR VINCENT MCCAULEY

Chief Medical Officer,  
Telstra Health

Dr Vincent McCauley has dual qualifications in Medicine and Computer Science and for his Ph.D in Medicine designed and oversaw the construction of the first fully computerised sleep laboratory in Australia at the Royal Prince Alfred Hospital (RPAH), Sydney. In addition he was a member of the four man team that developed nasal CPAP as the definitive treatment for Obstructive Sleep Apnoea.

He has extensive clinical experience in Respiratory and Emergency Medicine and ran the RPAH Emergency Department part-time for more than 20 years. As Managing Director of his eHealth company, McCauley Software, he has designed, developed and deployed innovative solutions for Pathology Laboratories, Radiology and Primary Care with extensive experience in health software architecture, DHS/Medicare eClaiming, SQL (Microsoft Certified SQL Server expert) and laboratory instrument interfacing. He has worked extensively in eHealth Standards and is a regular member of the Australian delegations to HL7 International and ISO TC215 (eHealth, Patient safety, Network security and Healthcare Devices), a member of the Standards Australia peak eHealth committee (IT14) and Chair of IHE Australia as well as a member of the IHE International Board and past member of the HL7 Australia Board. He was Chair of the HL7 Australia Working Group that published the first version of the Australian Medicines Terminology (AMT) which was subsequently handed to NeHTA as one of its first work items. Dr McCauley has been an invited speaker at numerous Australian and International conferences.

Dr McCauley has published extensively both in Medicine and eHealth. He has lectured at HL7 educational events as well as at the University of Western Sydney eHealth summer school, previous Adjunct Professor of eHealth at Central Queensland and Edith Cowan University, Perth. He is currently co-supervising eHealth post-graduate students at Flinders University following his appointment as Professor of Digital Health in April 2018.

Dr McCauley has been Co-chair of the HL7 International Service Oriented Architecture (SOA) Committee for the last 8 years, a leader at HL7 International FHIR Clinical Connectathons and a current member of the HL7 Australia pathology and eReferral committees.

Dr McCauley was a member of the Medical Software Industry Association (MSIA) management Board for 6 years, serving as Secretary for two years and a three year term as President. His contribution was recognised with the Andrew Magennis award for leadership in 2010. From 2011 to 2015 he was the MSIA National eHealth Implementation Coordinator liaising between the eHealth software vendors, government and the private sector. He chaired the MSIA Clinical Council, the eHealth Industry Safety and Security Committee, the MSIA/NeHTA Secure Messaging Delivery (SMD) work group and the MSIA Interoperability Committee as well as representing MSIA on a number of government and private sector consultative forums.

In 2015, Dr McCauley was appointed as Chief Medical Officer at Emerging Systems, Telstra Health. In that role, he led the development of a new AMT based comprehensive Medication Management module as well being part of the design team for new pathology viewing capabilities, a mobile Drs App, HL7 interoperability for Emerging and the NCSR and a general responsibility for patient safety and clinical incident management. Dr McCauley was appointed as Telstra Health Chief Medical Information Officer in October, 2017 and Chief Medical Officer in December 2017. In those roles he established a comprehensive clinical safety program and associated metrics and championed the role of Clinical terminology Services and FHIR enabled data as the path to semantic interoperability and platforms for quality data analytics and Artificial Intelligence.

### Synopsis

This paper will explore current data analytic implementations and plans at Telstra Health including issues in research translation as well as data quality, governance and data availability. Current architectural trends for data analytics including micro-services, DaaS and HL7 Fast Health Interoperable Resources (FHIR) will be discussed. Telstra Health products and projects to be used as examples include Patient Flow Manager (PFM), HealthTracker, Predict and the Dr Foster product suite.



**PROFESSOR  
PAUL KENNEDY**

Director,  
Biomedical Data Science  
Laboratory,  
Head of Discipline (Data  
Analytics/Artificial Intelligence),  
University of Technology Sydney



**DR BRENT RICHARDS**

Director of Critical Care  
Research, Gold Coast Health,  
Associate Professor, Griffith &  
Bond Universities

## 2.4 Clinical Insight: Using Data Science To Predict Treatment Outcomes In Paediatric Cancer

Professor Paul Kennedy is Head of Discipline (Data Analytics / Artificial Intelligence) in the School of Software, Faculty of Engineering & IT, University of Technology Sydney. He is also Director of the Biomedical Data Science Laboratory in the UTS Centre for Artificial Intelligence. He has a PhD (Computing Science) and joined UTS in 1999. Paul's research interests are in data analytics in the biomedical domain. He is co-initiator of a 15 year research collaboration with the Tumour Bank at The Children's Hospital at Westmead and Western Sydney University. That work develops AI approaches to predict treatment outcomes and aggressiveness of childhood cancers, including Acute Lymphoblastic Leukaemia and Neuroblastoma, with the aim of helping medical researchers understand the diseases, inform clinicians in devising their treatments and histopathologists in analysing slides. He also has interests in bioinformatics and text analytics.

### Synopsis

Biomedical data analysis presents many interesting and challenging problems, most notably those stemming from high dimensional, noisy, unbalanced genomic datasets. Data analytics in the childhood cancer domain is more challenging because, being associated with rare diseases, the data has few instances relative to the dimensionality. This talk describes a multi-disciplinary research collaboration we have built over 15 years. It outlines a pipeline we have developed to deal with the paediatric cancer data and some of the methods developed by my team, specifically focusing on acute lymphoblastic leukaemia and neuroblastoma. Apart from data analysis techniques, the talk aims to reflect on how to enhance cross-disciplinary research, identifying barriers and success indicators.

## 2.5 Clinical Insight: Bringing Trusted AI to the Intensive Care Unit

Associate Professor Brent Richards is Medical Director of Innovation and Director of Critical Care Research at Gold Coast Hospital and Health Service, and Associate Professor at Griffith and Bond Universities. He was previously also director of ICU for 15 years, executive director of Surgery, and chair of the state Intensive Care network.

Realising the opportunities and responsibilities in the big data sets being created in Healthcare, Brent is working on ways to expand, understand and interrogate these data sets for clinical understanding, business KPIs and research possibilities. He has co-founded IntelliHQ, a not-for-profit organisation bringing together start-ups, industry partners, researchers and educators to work collaboratively to unlock the potential that AI can bring to Healthcare, improving both patient and system outcomes.

### Synopsis

Artificial Intelligence is the 4th industrial revolution, rapidly affecting every corner of society. The promise is for markedly improved both system and patient outcomes, with more personalised care, faster more accurate diagnosis, fewer errors and better outcomes.

The keys to AI, data, algorithms, computing and talent, are becoming easier to acquire and use. There is already considerable data produced in Healthcare, and many avenues to grow this. Additionally, most of the AI techniques developed are straight forward to translate in to a Healthcare arena.

However, Healthcare has many challenges before there is widespread acceptance, particularly developing trust both in the recommendations produced and systems that support this. Fortunately many of the tools we already utilise (e.g. capable research governance, evidence based medicine), alongside those used in industry (e.g. ISO production standards, Unit based testing, Cloud security), mean that developing a trusted pathway and outcome is achievable today, with careful implementation. The opportunity therefore increasingly exists to markedly improve outcomes for both patients and the Healthcare system, by careful attention to developing and deploying trusted AI through well designed and carefully managed pathways.

## 2.6 Startup Guide: How To Launch An AI Startup: Doclink's Journey In The Cicada Medlab Accelerator



MARTIN ORLIAC

CEO and Co-Founder,  
Doclink (Cicada Medlab  
Accelerator Graduate)

Martin has spent the past 15 years developing digital, data and cloud technology businesses and teams. Over the past 5 years, Martin has been operating at the leading edge of data and cloud technology including Artificial Intelligence and Machine Learning. Having personally been affected when his younger brother was diagnosed with Stage 4 cancer at age 12 after two misdiagnoses, and grateful to have seen the medical community join efforts to ultimately cure his brother, Martin always wanted to get involved in applying the technology and expertise available in his field to give back and support the medical community and improve patients outcomes. This quest ultimately led him to co-found Doclink in 2017 to improve cancer survival by applying AI across the patient's journey, from diagnosis to treatment.

### Synopsis

Artificial Intelligence is a hot topic, and often over-hyped. Just like cloud computing was a new paradigm 10 years ago, AI is just another set of computing tools that can be applied to make humans more efficient.

AI arguably took off in the advertising industry to enable people to better interact with machines, and a major and very successful application has been around image recognition. From being able to identify familiar objects and faces, the technology has been successfully applied across search engines and ecommerce.

These applications have since been made widely available through the likes of Amazon Web Services and Google Cloud Platform, the two leaders in the field, and many industries have been benefiting from this AI technologies breakthrough over the past few years, with costs decreasing as performance improved exponentially.

The Medical industry has proven to be a prime candidate for AI applications, with image recognition algorithms having the capabilities to be trained to detect conditions from medical imaging.

Doclink harnesses its deepest and most advanced applications by building state-of-the-art Neural Networks able to detect cancer nodules with a higher accuracy and speed than humans. This is not about replacing clinicians, who will always have to make the final diagnosis, but just like computers and modern medical imaging equipment have made clinicians more efficient and advanced medicine in the past, Doclink provides AI clinical decision support to make clinicians more efficient, ultimately helping them save lives and costs to the healthcare system



ALEXANDER RANNALEET

National Director,  
Health, Commonwealth Bank



DR DAVID HANSEN

CEO,  
Australian e-Health  
Research Centre, CSIRO

### 3.1 People first. Technology second.

Alexander is responsible for driving the strategic and tactical development of CommBank's national healthcare portfolio with a particular focus on Medical Services.

Alexander brings in-depth industry knowledge and experience from his previous role as a management consultant in EY's global health advisory team. His international consulting experience spans strategy development, innovation, infrastructure, program management, public procurement, risk management, quality assurance and audit within the Nordic and Australian Health Systems.

#### Synopsis

As healthcare providers lift their technology investment, including almost one in ten already using or trialling artificial intelligence, organisations are also seeking skills that can help them prepare for the future.

While there is a clear desire for technology and digital skills, organisations are even more cognisant of the need for softer skills that can help them adapt to change, complement technology adoption and enhance the patient experience.

In its upcoming research launch, based on responses from 275 decision-makers and 295 employees within Australian healthcare businesses, CommBank examines the way in which organisations are developing future skills, and perceptions of technology's impact on the workforce.

### 3.2 Clinical Insight: Machine Learning And Medical Records: Identifying Readmission Risk And Other Unexpected Findings

The Australian e-Health Research Centre (AEHRC) is CSIRO's national Digital Health Research Program and a joint venture between CSIRO and the Queensland Government and. The AEHRC research program of digital innovation in data capture and analytics, clinical decision support, improved diagnosis and treatment, and the development of new services, is transforming the way healthcare is delivered.

The AEHRC research program is across Health Informatics, Biomedical Informatics and Health Services research.

Our Health Informatics research develops and applies data collection and analytics tools that support improved decision making. These include tools to support interoperability of health data and predictive analytics tools for health service and patient decision support.

Our biomedical informatics research develops advanced processing algorithms for analysing biomedical data such as whole genome sequences and multi dimensional biomedical imaging data sets to inform clinical care and clinical research.

Our Health Services research seek to use mobile and tele-health technology to change the way services are delivered to improve patient outcomes. This includes a world first Randomised Controlled Trial in mobile health for cardiac rehabilitation and national tele-health trials in aging and remote tele-health services. Our health Internet of things research uses in-home sensors to support the Aged to live at home safely.

#### Synopsis

The Australian e-Health Research Centre (AEHRC) health informatics team uses a wide range of artificial intelligence technologies to improve the capture, use and analysis of data in electronic health collections. The AEHRC clinical terminology tools use first order description logic to support the use of clinical terminology across our health records, greatly improving the ability to analyse this data. While our data scientists use machine learning to develop algorithms that identify patient risk of adverse events.



DR MALCOLM PRADHAN

Chief Medical Officer,  
Alcidion



MARK NEVIN

Senior Executive Officer,  
RANZCR

### 3.3 Industry Perspective: The Challenges of Implementing AI in Health Care — Hype vs Reality

Malcolm is co-founder and Chief Medical Officer of Alcidion Group, an ASX listed health informatics company that specialises in real-time analytics, clinical decision support and Artificial Intelligence predictive algorithms. Malcolm has a medical degree from the University of Adelaide and a PhD in Medical Informatics from Stanford University, with a focus on clinical artificial intelligence systems that manage uncertainty and incorporate patient utilities. He is a founding fellow of the Australian College of Health Informatics and an Adjunct Professor at the University of South Australia.

#### Synopsis

Many companies around the world are racing to develop AI applications in health care, however it's not clear how these systems will perform in settings in which they were not trained, or over time. I will briefly review some of the strengths and the limitations of implementing AI in health care and discuss why systems must be specifically designed to ensure safety and high performance of AI systems. I will show examples how Alcidion is using AI in health care today, and how the Miya Precision platform has been designed from the ground up to run AI safely and at scale in the health care setting.

### 3.4 Eight Key Ethical Principles for AI in Medicine

Mark has held several high-level positions in international peak membership bodies overseeing policy, strategy, regulation and government affairs, and has wide ranging experience of advocacy, policy development and implementation. His qualifications include a BSc Economics, MSc in Politics and Governance and certificates in leadership development. Prior to specialising in policy and advocacy, Mark worked as an optometrist, delivering front line care for over 10 years.

Mark joined RANZCR in 2014, initially heading up the Faculty of Clinical Radiology. In early 2018, he also became responsible for the Faculty of Radiation Oncology. Mark oversees the development and implementation of strategy, advocacy, government relations, policies and programs determined by the Faculty Councils.



A/PROFESSOR  
JOSEPH LIZIER

Associate Professor in  
Complex Systems,  
Faculty of Engineering and IT,  
University of Sydney

A/PROFESSOR  
JINMAN KIM

Associate Professor,  
Faculty of Engineering and IT,  
University of Sydney

### 3.5 Using Information Processing Features To Understand Neural Properties

Associate Professor Joseph Lizier is an ARC DECRA fellow and SOAR Fellow, in the Complex Systems group of the Faculty of Engineering and IT at The University of Sydney. His research focusses on studying the dynamics of information processing in biological and bio-inspired complex systems and networks. He uses tools from information theory to reveal when and where in a complex system information is being stored, transferred and modified. A/Prof. Lizier's research has produced fundamental theoretical insights into the nature of information processing, whilst simultaneously being successfully applied to a number of domains including computational neuroscience, where it has revealed directed information structure in the brain from neural recordings. He is a developer of the JIDT toolbox for measuring the dynamics of complex systems using information theory, and the related IDTxI toolbox for inferring effective network structure in neural data. Before joining The University of Sydney in 2015, A/Prof. Lizier was a Research Scientist and Postdoctoral Fellow at CSIRO ICT Centre (Sydney, 2012-14), and a Postdoctoral Researcher at the Max Planck Institute for Mathematics in the Sciences (Leipzig, 2010-12). He has also worked as a Research Engineer in the telecommunications industry for 10 years, including at Seeker Wireless (2006-2010) and Telstra Research Laboratories (2001-2006). He obtained a PhD in Computer Science (2010), Bachelor degrees in Electrical Engineering (2000) and Science (1998), and a Graduate Certificate in Educational Studies (2016), from The University of Sydney.

#### Synopsis

The dynamics of many complex systems -- such as the brain -- are often described using terminology of information processing, or computation, in particular regarding how information is stored, transferred and modified by the interactions within these systems. In this talk, I will describe how we have been quantifying these operations on information in neural imaging data such as MEG using information theory, and what this tells us about the brain. In particular, I will focus on how measurements of information processing can be considered as pre-processed features for AI use in order to differentiate between different neural conditions or tasks. As an example, I will describe a recent experiment revealing significantly lower use of stored information in (MEG) resting-state neural dynamics of Autism Spectrum Disorder (ASD) subjects versus controls, suggesting that use or precision of prior knowledge is reduced in the neural dynamics of ASD subjects. Using these information processing features not only allows investigation of hypotheses on how neural information processing changes under different conditions, but also permits explanations of differences when they are identified.

### 3.6 Clinical Insight: Machine learning in Medical Imaging

A/Prof Jinman Kim received his PhD in Computer Science from the University of Sydney in 2006. He was an ARC Postdoctoral Research Fellow at Sydney and then a Marie Curie Senior Research Fellow at the University of Geneva, prior to joining the University of Sydney in 2013 as a Faculty member.

A/Prof Kim is the founding Research Director of the Nepean Telehealth Technology Centre (NTTC) at the Nepean hospital, responsible for translational telehealth and digital hospital research. He is also an A/Director of the Biomedical and Multimedia Information Technology (BMIT) Research Group responsible for the external engagement and research commercialisation. He has produced a number of publications in the field of medical image processing and visualisation, and received multiple competitive grants. Dr Kim is actively involved in the imaging and visualisation communities where he is the V/P of computer graphics society (CGS) and also the co-chair of the Computer Graphics International (CGI) 2018.

#### Synopsis

This talk will present our research on machine learning algorithms to integrate imaging and biological data for disease modelling, analysis and visualization. Various clinical applications will be discussed, including PET-CT co-fusion learning, dermoscopy detection and classification, and orthopaedic mixed reality.



**DR AL-RAHIM HABIB**

Resident Medical Officer,  
University of Sydney



**DR KULJIT SINGH**

President,  
Association of Private Hospitals,  
Malaysia, ENT Surgeon

### 3.7 Clinical Insight: AI In Solving Indigenous Ear Disease

Dr Al-Rahim Habib is currently a Resident Medical Officer at Greenslopes Private Hospital in Brisbane. Al-Rahim was awarded his medical degree from the University of Sydney in 2018. He completed a research-based Master of Science in Biostatistics, Epidemiology, Population and Public Health at the University of British Columbia in 2014. His thesis was focused on constructing user-friendly statistical models to predict sinonasal disease in adult patients with cystic fibrosis and determine the relative impact of chronic rhinosinusitis on productivity and quality of life. Al-Rahim completed a Bachelor of Science in Health Sciences at Simon Fraser University in 2011.

Al-Rahim is a key member of A/Professor Narinder Singh's Healthcare AI Research Team within the University of Sydney and Westmead Hospital's Dept of Otolaryngology, Head and Neck Surgery. He is interested in the role of AI to deliver high-quality, specialist-level care to under-resourced and marginalized communities in rural and remote areas. Al-Rahim is also interested in the value of big data to provide clinicians insight into the determinants of health that affect their patient's well-being, response to treatment, and prognosis. Al-Rahim will be researching these topics as a prospective PhD candidate at the University of Sydney.

#### Synopsis

Indigenous (Aboriginal and Torres Strait Islander) children have one of the highest rates of ear disease in the world, resulting in significant health and socio-economic harm. This has been identified by the WHO, Government and AMA as an Australian "Public Health Crisis" requiring urgent and innovative solutions. We describe our use of recent advances in AI, driven by the superiority of deep learning over conventional computing methods, that may assist in the triage of high-risk cases of indigenous ear disease, particularly in rural and remote areas.

Deep learning permits algorithms to train themselves by exposing multilayered neural networks to vast amounts of data. AI has the potential to significantly improve healthcare delivery by streamlining and automating processes that are labour intensive, reducing healthcare expenditure and providing services to under-resourced and marginalised/remote communities.

This presentation will discuss the burden and challenges of Indigenous ear disease in Australia, previous endeavours to address the gap in otolaryngology services across regions, forms of AI that may be applicable to the diagnosis of ear disease, and logistical approaches for integrating AI into routine clinical practice, as well as strategies to monitor and assess the effectiveness of AI for community practitioners.

### 3.8 Implementing AI: Key Steps For Hospitals and Providers

Datuk Dr. Kuljit Singh earned his Master's in Otorhinolaryngology from University Malaya, Kuala Lumpur in 2002. Prior to that, he served at Hospital Kuala Lumpur & Hospital Kangar, as the ENT Clinical specialist in HKL [2002], Lecturer & ENT Specialist at University Malaya Medical Centre (UMMC) and now Consultant ENT Surgeon at Prince Court Medical Centre (PCMC) since 2007.

An active member in Malaysian Medical Association (MMA) since 1996 and he has contributed and engaged himself in various roles at state and national level of MMA where he also served as the Honorary General Secretary from 2013 – 2014. In terms of networking and foreign collaborations; he has conducted meetings and presented in all the ASEAN countries and has a great networking with all the leading ENT doctors within the region and many other parts of the world. He has served the Malaysian Society of Otorhinolaryngologist [ENT] as President in 2007 and awarded meritorious awards by the society.

He leads the way on minimal invasive sinus surgery and recently using Imaging Guidance System in navigating sinus surgery. Currently, he serves the position of Medical Director at PCMC, Kuala Lumpur, Malaysia and is also the President of Association Private Hospitals Malaysia (APHM). His passion is to serve towards the healthcare of the people of his country.





DR BENJAMIN SCHMITT

Head of Collaboration and  
Research (ANZ),  
Siemens Healthineers

DR MO NAMAZI

Senior Data Scientist,  
Intellify

## 4.1 Harnessing Worldwide Big Data To Transform Radiology And Cardiology: Siemens Healthineers' Teampay And Other Digital Solutions

Dr Benjamin Schmitt recently took on the role as the Portfolio Executive for AI & Digital Archiving for Siemens Healthineers in Australia & New Zealand. He previously held the role of Head of Collaborations for Siemens Healthineers in Australia and New Zealand, in which he oversaw all research partnerships and R&D activities in the region for more than 5 years.

His areas of expertise and professional experience are in the management of academic/industry research partnerships in medical imaging and AI with a strong background in method development for Magnetic Resonance Imaging (MRI).

He graduated with a PhD in Physics/Biophysics at the German Cancer Research Center (Deutsches Krebsforschungszentrum, DKFZ) in Heidelberg in 2011. In 2012, Benjamin Schmitt was awarded the Merit Award for Scientific Contributions at the Medical University of Vienna. He is author of more than 20 clinical research publications including the first articles demonstrating the clinical advantages of ultra-high field (7 Tesla) MRI for neuro and MSK applications. He also holds 8 patents relating to medical imaging technology and artificial intelligence.

### Synopsis

Artificial intelligence (AI) is transforming care delivery and expanding precision medicine. Siemens Healthineers has served as a pioneer in AI development for more than 20 years, and new deep learning technology now enables us to automate complex diagnostics and support optimal treatment.

This talk will focus on the latest research around AI-powered solutions that address major challenges that the healthcare field faces. It will paint a picture of the near future in which further advances and innovations in digitalisation support healthcare.

Diagnostic experts and physicians need a new set of tools that can handle large volumes of medical data quickly and accurately. This will allow for more objective treatment decisions based on quantitative data and tailored to the needs of every patient. To provide this new toolset, we need to draw on the power of AI.

## 4.2 Machine Learning Haptic Feedback in Real-Time Surgery, and Intelligent Image Retrieval

Mo Namazi is a senior data scientist at Intellify. Professionally, Mo has consulted on a wide range of commercial projects, implementing advanced data science and machine learning methodologies in transport, telecommunications, and infrastructure; as well as experience in data science applications for medical research.

Intellify is a data science and machine learning consultancy specialising in delivering customised solutions across a range of industries and verticals. As a team of dedicated data scientists with both academic and commercial experience, we work with leading Australian organisations to support innovation, and the growing demand for AI & machine learning.

### Synopsis

In this talk we will outline previous work done by our team on haptics feedback in percutaneous heart biopsy in real-time. We will also look at some other work on medical image retrieval using a similarity-based search scheme.



**DR AENGUS TRAN**

CEO and Co-Founder,  
Harrison.ai



**DR IAN OPPERMANN**

CEO and Chief Data Scientist,  
Data Analytics Centre,  
The Treasury

### 4.3 Startup Insight: The Anatomy of an AI Healthcare Project

Aengus is a world-ranked AI engineer and data scientist. He is also a serial entrepreneur and a medical doctor who received his training at the University of New South Wales. Aengus is the mind behind IVY an AI that selects the best embryo for IVF. This patent pending technology was developed in collaboration with VirtusHealth one of the world largest IVF providers. Aengus is passionate about harnessing the latest techniques in AI to make healthcare better, faster, and cheaper for large populations through meaningful clinician-AI partnerships. In 2017, Aengus co-founded Harrison.AI, a clinician-led AI technology development firm that partners with the world's largest healthcare enterprises to build sustainable AI strategy while rapidly identifying and deploying high value AI applications with its full-stack capabilities.

#### Synopsis

Last year, hundreds of articles were published both in mainstream media and reputable medical journals demonstrating the incredible predictive power of the AI model in many areas of medicine. In 5 short years, AI has rapidly zoomed passed the age of discovery and into the age of implementation. At the same time, as front-line clinicians and health leaders, very few have yet to witness the promise of AI in delivering better patient care in their organisation. In this talk, we will explore how AI has enhanced workflow in the field of In-vitro fertilisation (IVF) and highlight some key learnings in bringing AI from the research lab to the bedside.

### 4.4 Government Perspective: Sharing Large Volumes of Data – Made Easy

Dr. Ian Oppermann is the NSW Government's Chief Data Scientist and CEO of the NSW Data Analytics Centre. Ian has 25 years' experience in the ICT sector and, has led organizations with more than 300 people, delivering products and outcomes that have impacted hundreds of millions of people globally. He has held senior management roles in Europe and Australia as Director for Radio Access Performance at Nokia, Global Head of Sales Partnering (network software) at Nokia Siemens Networks, and then Divisional Chief and Flagship Director at CSIRO. Ian is considered a thought leader in the area of the Digital Economy and is a regular speaker on "Big Data", broadband enabled services and the impact of technology on society. He has contributed to 6 books and co-authored more than 120 papers which have been cited more than 3500 times

#### Synopsis

Fundamental to the effective application of AI is the open sharing of large volumes of data. However, this gives rise to numerous issues, challenges and concerns. In this essential talk, Dr Oppermann discusses key strategies for the easy sharing of big data.



A/PROFESSOR  
SANDEEP REDDY

A/Professor of  
Healthcare Management,  
Deakin University



DR JOE LOGAN

CTO and Co-Founder,  
Alixir

## 4.5 How To Mitigate Risk In The Application Of AI In Healthcare: The Critical Importance Of Governance Frameworks

Associate Professor Sandeep Reddy is a certified health informatician and Artificial Intelligence (AI) in Healthcare researcher based at the Deakin School of Medicine, Geelong. He has a medical and healthcare management background in addition to having completed AI and machine learning training through several sources. He is currently engaged in research about application of AI in healthcare delivery in addition to developing AI models to treat and manage type 2 diabetes. He has authored several articles about the use of artificial intelligence in Medicine including a book chapter about this topic. Further, he is advising several start-ups that are focused on providing AI solutions for healthcare issues.

### Synopsis

While the utilisation of AI techniques in healthcare has come after its use and maturity in other sectors, the promise of AI is most significant in healthcare. This significance is because AI can help in reducing medical errors, improving evidence-based clinical practice, decreasing healthcare delivery costs and increasing healthcare access for patients. However, many have expressed reservations about the use of AI in healthcare because of potential biases in the decision-making process and limited ability to audit deep learning-based AI models coupled with the absence of regulatory frameworks to monitor the application of AI in healthcare. While these concerns are valid and should be seriously considered, they shouldn't be a deterrent for the use of AI in Healthcare. Increasingly experts across the world have been focusing on the ethics and regulatory aspects of the use of AI. In my presentation, I will discuss the ethical and regulatory concerns associated with the use of AI in Healthcare and present recommendations as to how these issues can be addressed.

## 4.6 Startup Insight: Bringing Deep Learning To Digital Mammography

Dr Logan is the co-founder and CTO at Alixir, a Sydney based machine learning startup focusing on improving the detection rates of breast cancer in screening mammography using cutting edge computer vision technology. Dr Logan holds an MBBS and MBA and is working towards completing his PhD in computer vision and artificial intelligence at UTS.

### Synopsis

Can a machine outperform a radiologist in the detection of cancerous lesions on routine screening mammograms?

Over the past year since founding Alixir, we have been investigating the use of deep neural networks to improve both the accuracy and speed of detection of breast cancer in digital screening mammography. In this talk, I will present the scale of the problem we are addressing both locally in Australia and overseas, the technical and architectural challenges that we have faced, and the fundamental importance for a startup to form partnerships with providers of high-quality data.



**DR LUPING ZHAO**

Senior Lecturer,  
School of Electrical and  
Information Engineering,  
University of Sydney



**STEPHAN CURISKIS**

Senior Data Scientist,  
Lorica Health

## 4.7 Clinical Insight: PET Image Synthesis At Low Dose

Dr Luping Zhou is a Senior Lecturer and ARC DECRA Fellow in the School of Electrical and Information Engineering at the University of Sydney. She obtained her PhD from Australian National University, and did her post-doctoral training in University of North Carolina at Chapel Hill. Before her Ph.D, Dr Zhou was a senior research engineer, developing medical image applications for surgical navigation and planning through virtual/augmented reality systems. Dr Zhou has a broad research interest in medical image analysis, machine learning and computer vision. Her current research is focused on brain image analysis with statistical graphical models and deep learning.

### Synopsis

It is of great interest to synthesise high-quality PET images from low-dose images to reduce the radiation exposure during PET scanning. In this talk, I will introduce our recent work in developing a 3D locality adaptive multi-modality generative adversarial networks model (LA-GANs) to synthesise high-quality FDG PET images from the low-dose images with the accompanying MRI images that provide anatomical information. Our model has been tested on both simulated and real PET images, and the experimental results demonstrate its superior performance over the state-of-the-art PET estimation approaches on both normal and MCI brain PET images.

## 4.8 Using AI to Maintain Integrity in Medical Coding

Stephan is a senior data scientist with extensive experience delivering analytical solutions and leading data science teams and initiatives within diverse organisations. Specialising in statistical modelling, machine learning and AI, he has developed predictive models and behavioural segmentations for a range of industries, including healthcare, banking and finance, digital media and technology, automotive and retail. He has particular expertise in creating end-to-end machine learning systems to deliver interpretable and actionable results.

Lorica Health is a software and analytics company providing SaaS solutions for detecting and actioning fraud, abuse, waste and errors in the healthcare marketplace. Lorica combines extensive health domain knowledge with software engineering and data science expertise, creating products with global reach. In his role at Lorica Health, Stephan leads a team of data scientists developing state-of-the-art machine learning methods to detect and interpret inappropriate billing behaviour in electronic health records.

### Synopsis

Clinical coding is a health administration function that involves the translation of clinical statements into procedure and diagnosis codes. One use of the resulting diagnosis and procedure codes is for billing. During hospital admissions, procedure codes are typically claimed by Doctors, while hospitals can claim a range of codes related to prosthetics, accommodation, operating theatre charges, and so on.

There are many guidelines and requirements for clinical codes to be included in a hospital admission, but the space of possible code combinations is large and complex. Health insurers have systems in place to insure invoiced claims are valid, but often the whole set of codes in the episode of patient care is not analysed collectively. Lorica Health provides SaaS solutions to validate the integrity of the medical codes used. The core of these systems is a rules engine to identify inappropriate billing behaviour related to fraud, abuse, waste and errors. Detecting inappropriate billing behaviours for rules to be created is the core challenge. In this talk, Stephan will present an overview of how state-of-the-art AI and machine learning can be used to model relationships between diagnoses, procedures and patient profiles, detect anomalies, and provide an interpretation of the issues detected.



PROFESSOR  
JON PATRICK

CEO,  
Innovative Clinical Information  
Management Systems (iCIMS)

## 4.9 NLP Coming of Age - Automated Case Identification and Coding at the California Cancer Registry

Professor Jon Patrick is the CEO and co-founder of Innovative Clinical Information Management Systems (iCIMS). Jon is a researcher of nearly 40 years standing with over 100 publications. He has proven expertise in software engineering, language technology and psychology. Formerly he has held both the Chairs of Language Technology and Information Systems at the University of Sydney. He has worked in health applications of IT and language processing for the past 8 years but has a career of IT innovations stretching back 30 years. He won Australia's national Eureka Science Prize in 2005 for Scamseek which identified financial scams on the Internet.

### Synopsis

#### Aim:

This project aimed at using the methods of Statistical Natural Language Processing to perform case identification, and coding to ICD O3 for the 5 core attributes (Site, Histology, Grade, Behaviour and Laterality) at sufficient accuracy and throughput so as to achieve increased efficiency for the Californian Cancer Registry (CCR) operations.

### Methods

The solution consists of a processing pipeline. Firstly documents are classified to their pathology type of histopathology, genomics and immunohistochemistry. A second classifier identified reportable, non-reportable, or unusable documents.

A Clinical Entity Recognition (CER) engine uses statistical NLP methods to identify entities required to complete the coding correctly. The pipeline was trained on 5000 records manually annotated for 140,000 CERs using 32 tags.

A coding engine used the CERs to identify codes for all attributes. Coding covers all tumour streams and the Multiple Primaries rules manual.

### Results

The pathology type classifier achieved 98.5% accuracy. The reportability classifier had 98.2% accuracy. The CER tagging had an accuracy of 99.5% for self testing and 96% for 10-fold cross validation. The cancer coding to ICD O3 has an overall accuracy of 97.8% but with up to 100% for certain tumour streams.

### Conclusions

The technology is being used operationally at the California Cancer Registry. An estimated 72% of reports are automatically coded with 28% diverted to manual processing. The technology will significantly reduce delays in recruiting patients into clinical trials and increase the number of patients, particularly for rapidly developing cancers.



DR DAVID GRAYSON

Clinical Director ORLHNS,  
Waitemata DHB,  
Auckland, NZ

## 4.10 Engagebot: An AI-System to Provide Information Support For Discharged Patients

David is the Clinical Director of Otolaryngology Head & Neck Surgery at North Shore Hospital, Waitemata DHB in Auckland, NZ. He is also Clinical Lead for Patient Safety & Patient Experience. David has a strong interest in innovative approaches for safer care and better patient experiences using digital health technologies and process improvement.

### Synopsis

#### Aim:

To develop an intelligent learning Chatbot system prototype that can be used by patients and their families, following Head and Neck cancer surgery, to ask and receive simple to sophisticated support when and where they need it.

### Study design and methodology

A prospective qualitative design utilising key informant interviews, focus groups, recordings of discharge conversations and patient feedback in a closed online community.

### Rationale

This research proposes the development of a chatbot in collaboration with patients, clinicians, and a technical/research team. It addresses an expressed need by patients for far better support around the time of discharge from hospital.

We are working with clinicians and patients in the Head and Neck Service at Waitemata District Health Board to co-design and test a library of themes, questions and responses and incorporate them into a Chatbot called EngageBOT.

### Analysis

Information gathered will be analysed using thematic analysis to determine key themes and corresponding responses. An automated conversational agent that has been built based on Natural Language Processing and using deep machine learning techniques will be used to manage the EngageBOT through an internet-based communication paradigm.

### Conclusions

Preliminary feedback from participants and key stakeholders supports our belief in the acceptance and utility of chatbot support in the early stages after discharge from hospital following surgery. Our study is not yet complete, however our progress to date will be shared during this presentation.



A/PROFESSOR  
NARINDER SINGH

## CONVENER

A/Prof Narinder Singh is a Rhinologist (Nose & Sinus Specialist) and Chief of Otolaryngology, Head & Neck Surgery at Westmead Hospital in Sydney, Australia's largest hospital complex. He is a Clinical Associate Professor at The University of Sydney, Australia's oldest and largest Medical Faculty.

A/Prof Singh specialises exclusively in nasal airway surgery, complex and extended endoscopic sinus procedures, anterior skull base surgery, rhinoplasty (functional and aesthetic) and surgery for OSA.

A/Prof Singh undertook his medical degree at The University of Sydney and Otolaryngology training in Sydney, Australia. He was awarded a three year clinical/ research fellowship in rhinology, fully funded by The Guy's and St Thomas' NHS Foundation Trust, London, UK. During his fellowship, Dr Singh completed his Master's Thesis on "Allergen specific cytokine production by cells derived from human nasal polyps" through the University of Sydney, with laboratory experiments at King's College, London. He was awarded three research grants during his thesis: The Garnett Passe and Rodney Williams Foundation Trust Grant-in-aid, The University of Sydney John B Moore Memorial Scholarship and The University of Sydney Vernon Barling Memorial Fellowship. He is currently the recipient of the Garnett Passe and Rodney Williams Foundation Trust Conjoint Grant for his research into Computational Fluid Dynamics (CFD) in the human airway.

A/Prof Singh is a frequent conference convener, keynote and invited speaker on rhinology topics, with an extensive background in research, publication and editorial board membership. His early use of computer technology in surgery led to an interest in AI and its revolutionary capacity to bring innovation to the field of Otolaryngology. He is currently exploring the use of Deep Learning and Convolutional Neural Networks in combatting Indigenous paediatric ear disease.

## ORGANISING COMMITTEE

Dr Eugene Wong - Organising Committee Lead

Mr Marin Duvnjak

Dr Al-Rahim Habib

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