

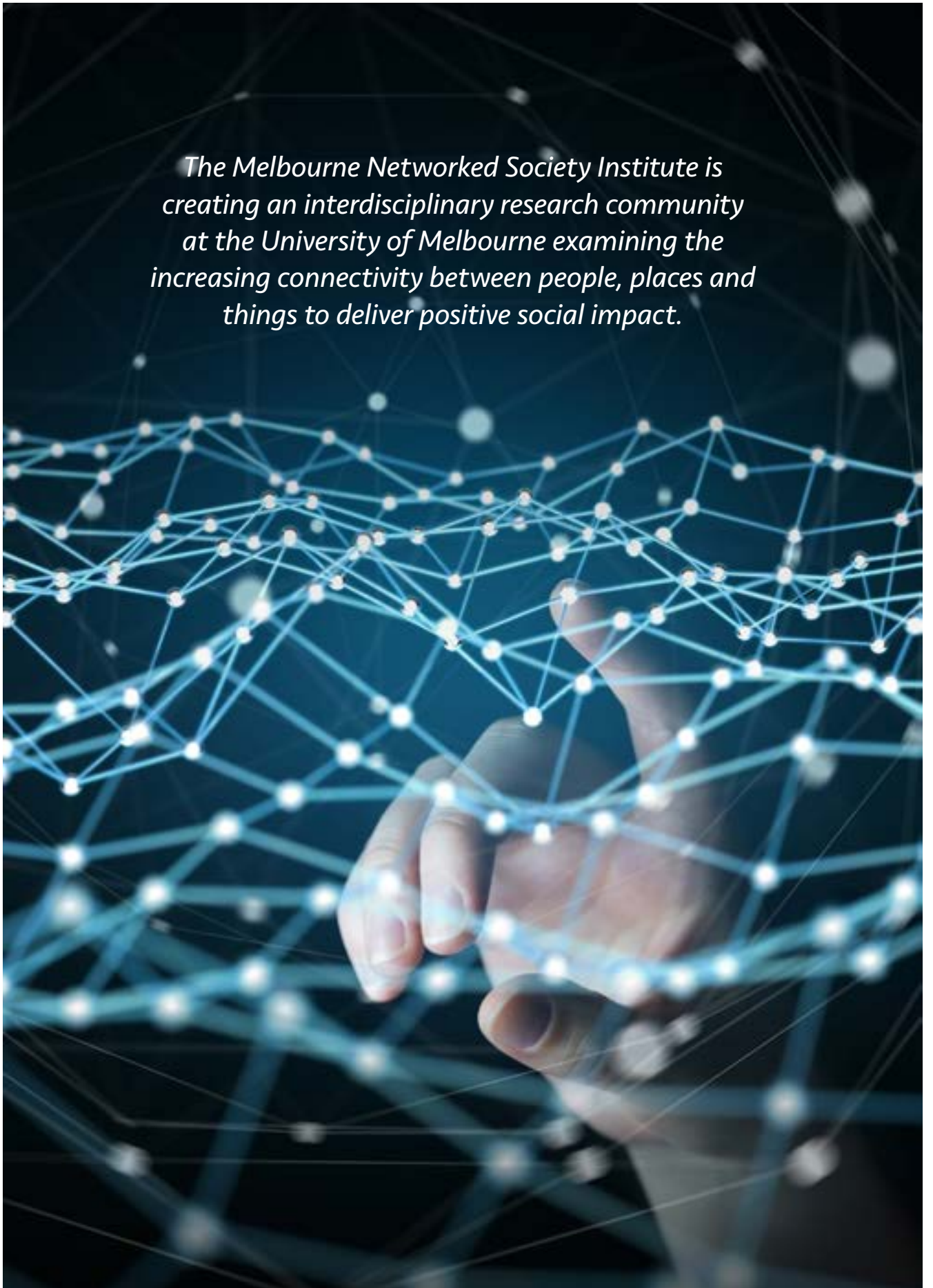


Melbourne  
Networked Society  
Institute

# Annual Report 2016

*Catalysing interdisciplinary  
research to understand and  
create the connected future*

*The Melbourne Networked Society Institute is creating an interdisciplinary research community at the University of Melbourne examining the increasing connectivity between people, places and things to deliver positive social impact.*



# Annual Report 2016

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*The Institute is uniquely positioned among its peers through its ability to enable deep interdisciplinary engagement across technology, theoretical, clinical and social domains. A key part of this, has been the energy and enthusiasm of the Institute's team and the role played by the MNSI Lab.*

Thas Nirmalathas



# Director's Welcome

Welcome to the Melbourne Networked Society Institute's Annual Report. 2016 was our second year of operation as the Melbourne Networked Society Institute (previously the Institute for a Broadband-Enabled Society (IBES)). The Institute has consolidated its position in establishing itself as a leading institute focused on understanding and creating the networked society.

The Institute is funded through the Deputy Vice-Chancellor (Research) to enable interdisciplinary collaborations to undertake exciting research on the networked society.

I am delighted to lead our talented team of researchers, staff and collaborators. Together we explore and examine the impact of increased connectivity between people, places and things in society. The Institute is uniquely positioned among its peers through its ability to enable deep interdisciplinary engagement across technology, theoretical, clinical and social domains. A key part of this, has been the energy and enthusiasm of the Institute's team and the role played by the MNSI Lab.

Highlights over the past year include watching our Seed Funded Projects in 2015 develop, engaging with researchers from across the University to support a new series of projects, and celebrating our research community and collaborators at the Annual Symposium, where we hosted Professor Bill Dutton, Director of the Quello Institute at Michigan State University.

Three new staff members joined the team this year. Kate Murray commenced as Communications Officer in February and has led to an increase in the quality and depth of engagement conducted by the Institute, including the content of this annual report. Anchalee (Mai) Laiprasert and Yunhan Li joined the Institute working as software developers and analysts in the MNSI Lab. Both Mai and Yunhan had previously interned in the MNSI Lab while Masters students and their skills and capabilities enhance the Institute's software capabilities.

Over the past year the Institute has furthered our understanding of the networked society. Our researchers have engaged critically with new and emerging technologies and platforms, while also pioneering new approaches for new tools such as virtual reality.

I am happy to share with you our achievements over the past year in this annual report. I invite you to engage with us, be it through our research, public events, or online channels as together we fashion our connected future.

**Thas Nirmalathas**

*Institute Director*

## Overview

The Melbourne Networked Society Institute undertakes interdisciplinary research to further our understanding of the impact of the increased connectivity between people, places and things. The Institute enables applied research activities to actively create the technologies, applications and services that will be a key feature of our connected future.

The Institute has a distinctive interdisciplinary approach as it enables research across the breadth of activities at the University of Melbourne. A key objective of the Institute is to nurture and support new and innovative interdisciplinary research project ideas and collaborations to further our understanding and existence in the networked society.

### Delivering Research Impact and Results

Central to the Institute is the delivery of research impact and results through securing competitive funding. The Institute's activities played a role in enabling \$2.5 million of research funding to the University of Melbourne. The funding is the result of the Institute's investment in innovative research projects through seed funding, providing support to researchers and building a community of interdisciplinary research leaders focused on the networked society through the Institute's Fellows scheme.

The Institute is actively engaging and disseminating our content to a wide variety of audiences. In 2016 the Institute published four research papers that reported on the findings of our research projects. The research papers provide a convenient way to disseminate the Institute's message and deliver impact.

Researchers regularly published papers and publications for the scholarly community. In 2016, Institute researchers produced 51 academic publications comprising books, book chapters, journal articles and conference papers. These publications ensure that the findings of the Institute's research are disseminated throughout the academic community.

# Snapshot

## 2016 By The Numbers

|   |                    |                                   |
|---|--------------------|-----------------------------------|
| • | <b>3</b>           | PhD Graduates                     |
| • | <b>3</b>           | MNSI Lab Development Projects     |
| • | <b>4</b>           | Institute Research Papers         |
| • | <b>7</b>           | New Seed Funded Research Projects |
| • | <b>11</b>          | Institute Fellows                 |
| • | <b>11</b>          | Members of the MNSI team          |
| • | <b>12</b>          | 12 PhD Students                   |
| • | <b>17</b>          | MNSI Lab Interns                  |
| • | <b>51</b>          | Research Projects                 |
| • | <b>51</b>          | Academic Publications             |
| • | <b>62</b>          | Media Mentions                    |
| • | <b>92</b>          | Researchers                       |
| • | <b>1,052</b>       | Event Registrations               |
| • | <b>1,086</b>       | Twitter Followers                 |
| • | <b>1,706</b>       | MNSI Newsletter Subscribers       |
| • | <b>9,054</b>       | Visits to MNSI website            |
| • | <b>\$2,500,000</b> | Leveraged Research Funding        |

## Leveraged Research Funding

The innovative and novel nature of the Institute is recognised through the awarding of competitive research funding to our researchers and research projects. This is an important aspect of the Institute's activities. Leverage research funding in 2016 is listed below.

| Investigators                                                                                                                                                     | Grant                                                  | Amount    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------|
| <b>Developing a small, lightweight and low cost chip for accurate spectral measurements</b>                                                                       |                                                        |           |
| Prof Kenneth Crozier, Mr Jiatian Liang                                                                                                                            | ARC Linkage Project (LP160100959)                      | \$350,000 |
| <b>Optical wireless frontier: Design challenges of multi gigabit wireless</b>                                                                                     |                                                        |           |
| Prof Ampalavanapillai Nirmalathas,<br>Prof Christina Lim, Dr Ke Wang,<br>A/Prof Elaine Wong, Prof Kamal Alameh                                                    | ARC Discovery Project<br>(DP170100268)                 | \$376,000 |
| <b>Self-healing maps: Protecting maps through automatic updating processes</b>                                                                                    |                                                        |           |
| Prof Stephan Winter, Prof Abbas Rajabifard,<br>A/Prof Allison Kealy, Dr Kourosh Khoshelham,<br>Dr Martin Tomko, Dr Mohsen Soltanieh                               | ARC Discovery Project<br>(DP170100109)                 | \$410,500 |
| <b>Making human place knowledge digestible by computers</b>                                                                                                       |                                                        |           |
| Prof Stephan Winter; Prof Jochen Renz,<br>Prof Timothy Baldwin, Dr Martin Tomko,<br>Prof Werner Kuhn                                                              | ARC Discovery Project<br>(DP170100109)                 | \$399,500 |
| <b>Web-based help-seeking for intimate partner sexual violence</b>                                                                                                |                                                        |           |
| Dr Laura Tarzia                                                                                                                                                   | ARC Discovery Early Career<br>Researcher (DE170100080) | \$363,000 |
| <b>#thismymob: Digital land rights and reconnecting Indigenous communities</b>                                                                                    |                                                        |           |
| Dr Christopher Lawrence, A/Prof Steven Bird,<br>Dr Greg Wadley, Dr Simon Graham,<br>Dr Kevin Rowley, Prof Nicola Bidwell,<br>Prof Sandra Eades, Prof Paul Dourish | ARC Discovery Indigenous<br>(IN170100030)              | \$473,000 |
| <b>Optimising a mobile mental health intervention for taxi drivers</b>                                                                                            |                                                        |           |
| Dr Sandra Davidson, A/Prof Darryl Wade,<br>Dr Greg Wadley, Dr Susie Fletcher,<br>Dr Nicola Reavley, Prof Jane Gunn                                                | Shepherd Foundation                                    | \$78,810  |
| <b>UAV-borne Hyperspectral System for Real-time Monitoring of Horticultural Crop Diseases</b>                                                                     |                                                        |           |
| Dr Dongryeol Ryu, Dr Sigfredo Fuentes                                                                                                                             | Horticultural Innovation Australia                     | \$25,000  |
| <b>Development of a novel App to estimate risk of sunburn and the prediction of fruit size at harvest</b>                                                         |                                                        |           |
| Dr Sigfredo Fuentes, Dr Mark OConnell                                                                                                                             | Horticultural Innovation Australia                     | \$25,000  |





## **Building an Interdisciplinary Research Culture**

Collaboration is at the heart of the Institute. It is the key for enabling interdisciplinary research. MNSI has developed an active engagement program to support the development of effective collaborations, explore new connections and engage new people. A central component of the Institute's mission is the facilitation of an interdisciplinary research culture within the University. The Institute actively encourages and supports collaborations through a series of engaging seminars and events. Additionally, the Institute enables the development and cultivation of new ideas through its investment in research projects across a range of levels.

Additionally, the Institute has provided support to other research initiatives across the University that relate to the Institute's primary research focus. In 2016 this included supporting seed funding and technical advice for two projects focused on domestic violence and technology with the Melbourne Research Alliance to End Violence Against Women and their Children. The first project is examining a mobile optimised child safety tool, while the other project is exploring the use of a healthy relationship tool for early intervention for men who commit domestic violence.

## From Masters Students to Developers

*Yunhan and Mai*



This year Anchalee Laiprasert (Mai) (Right) and Yunhan Li (Left) joined the MNSI team. Each came to the Institute as interns through the Masters of Information Technology program. Both became welcome members of our team and Lab.

Their skills in information technology provide a valuable resource to the Institute. They have helped the MNSI Lab to support a variety of initiatives from collaborative development projects to providing technical input to enable MNSI Research projects.

Mai now works as a Systems Analyst at MNSI. While Yunhan has done great work as our new Software Developer.

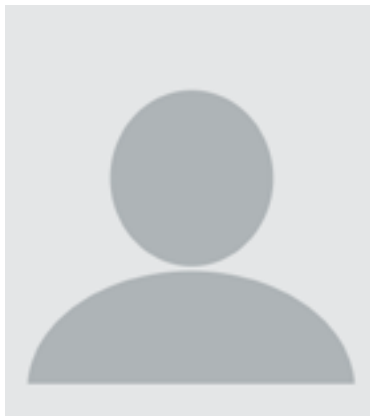
Mai and Yunhan are stirring examples of the benefits that nurturing new careers and rising talent can bring.

# Our People

## MNSI Team



**Prof Thas Nirmalathas**  
Institute Director



**Fiorella Chiodo**  
Executive Assistant



**Ken Clarke**  
Deputy Director (MNSI Lab)



**Adam Ladders**  
Executive Officer



**Roger Hughes**  
Finance Manager



**Kate Murray**  
Communications Officer



**Dr Chamil Jayasundara**  
Research Fellow



**Dr Luke Heemsbergen**  
Research Fellow



**Scott Cameron**  
STEM Research Assistant



## About Our People

People are at the heart of the Institute. They provide the key resource to undertake and deliver on our mission and objectives. The talent and labour of these individuals ensure that the Institute is ready for success. This includes Institute Staff, Fellows, Researchers and Students along with our Executive Committee and Advisory Board who assist in the development and input regarding research strategy.

Over the past year, the Institute has welcomed some new faces to the team to further the Institute's research capabilities, enhancing the capacity of the MNSI Lab and assisting with engagement and communications.

## Communicating the Institute's Message

Kate joined the Institute in February 2016 as the Institute's Communications Officer. She is responsible for voicing the Institute's message to the public. Kate comes to the Institute as an experienced communicator with a passion for story telling in written and aural context. Since joining the team, Kate has been responsible for developing the MNSI Radio podcast, as well as furthering engagement through social media, online and digital channels.

## Enabling research activities

Two researchers are affiliated to the Institute conducting research on Institute projects. Scott Cameron joined the Institute as a research assistant on the STEM Education Resource Project. He is currently undertaking a PhD on Mathematics Education in the Melbourne Graduate School of Education.

Dr Luke Heemsbergen has started working with the Institute to investigate the impact of 3D printing in the medical context. This builds upon Luke's previous work in relation to 3D Printing supported by the Institute and ACCAN. Luke graduated with a PhD in 2016, which looked at the evolution of radical transparency mechanisms in terms of both media theory and governing practices.

## Institute Fellows

Institute Fellows support MNSI's research and outreach to foster and build interdisciplinary collaborations across a number of key areas, which are essential to MNSI achieving its vision of becoming a leading research institute dedicated to the networked society.

Institute Fellows are an integral part of the Institute and will be involved in shaping research and building relationships across the University and the wider community.



**Dr Lynda Ball** – *STEM Education*



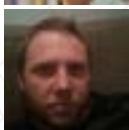
**Dr Richard Chenhall** – *Digital Anthropology*



**Prof Chris Leckie** – *Data and Security*



**A/Prof Kwanghui Lim** – *Innovation*



**Dr Bjorn Nansen** – *Digital Media*



**Prof Marimuthu Palaniswami** – *Connected Devices*



**Dr Victoria Palmer** – *Applied Ethics*



**A/Prof Andrew Roberts** – *Privacy*



**Dr Laura Tarzia** – *Domestic Violence*



**Prof Peter Taylor** – *Networks and Traffic Processes*



**Prof Stephan Winter** – *Urban Connectedness*



## Executive Committee

The Executive Committee provides research leadership to the Institute. The Committee is comprised of senior academics with research interests aligned with the Institute to inform the strategic, research and operational direction of the Institute.



**Dr Thas Nirmalathas** – Melbourne Networked Society Institute



**Prof Scott McQuire** – School of Culture and Communication



**Prof Peter Gahan** – Department of Management and Marketing



**Prof Jane Gunn** – Department of General Practice



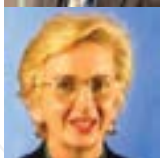
**Prof Tom Kvan** – Melbourne School of Design



**Mr Adam Lidders** – Melbourne Networked Society Institute



**Prof Terence O'Brien** – Royal Melbourne Hospital



**A/Prof Eliabeth Ozanne** – Department of Social Work



**Prof Megan Richardson** – Melbourne Law School



**Prof Frank Vetere** – Microsoft Centre for Social Natural User Interfaces

## Advisory Board

The Melbourne Networked Society Institute's Advisory Board assists the Institute to achieve its objectives and to maximise its influence, impact and engagement. The Advisory Board provides extensive industry experience to the Institute providing essential support to MNSI's research objectives.

- **Steve Wood (Chair)** – *Vice President, Aruba Networks, a HP company*
- **Brian Fitzpatrick (Deputy Chair)** – *Account Executive, Dialog Information Technology*
- **Mark Ablett** – *Senior Vice President and General Manager Asia Pacific, Hitachi Data Networks*
- **Genevieve Bell** – *Intel Fellow and Vice President Corporate Strategy Office, Intel*
- **Kate Cornick** – *Chief Executive Officer, LaunchVic*
- **Tim Fawcett** – *Director Corporate and Government Affairs, Cisco*
- **Chris Hancock** – *Chief Executive Officer, AARNet*
- **Anthony McLachlan** – *Vice President and General Manager, Asia Pacific, Ciena*
- **Carolyn Phiddian** – *General Manager for Technology Strategy, nbn*
- **Emilio Romeo** – *Chief Executive Officer, Ericsson Australia*



Adam & Thas Networking at the Melbourne Accelerator Program (MAP) Gala Dinner (August 2016)



# Investing in Active Collaboration

## Building an interdisciplinary research culture

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## Undertaking active engagement

The Institute has an active engagement program of marketing, events and communications to support the development of a research community at the University of Melbourne dedicated towards the networked society. A central aspect of the Institute's activity is the capacity for the Institute to develop and establish itself as a thought leader focused on the networked society.

### Events

The Institute has an active program of events and has hosted 19 events in 2016, ranging from small workshops through to the Annual Symposium.

In 2016, the Institute hosted two large public lectures, the first in February focused on Cybersecurity, while Mike Quigley, former CEO of NBN Co gave a public lecture about the state of the NBN in the lead-up to the election.

In September, the Institute and partners furthered the State of the Art in Virtual Reality hosting an executive briefing and masterclasses to enhance the knowledge, applications and skills of the VR Development Community.



## Annual Symposium

The main event on the Institute's calendar was the Annual Symposium. The event is an opportunity to showcase the Institute's breadth of research while fostering new ideas through robust debate around the key issues facing the networked society.

Our 2016 Symposium focused on four main themes: privacy, health technology, disruption, and social change. Twelve MNSI research projects presented their work, and engaging panel discussions that were inclusive of the audience followed the presentations.

William H Dutton, Director of the Quello Centre at Michigan State University delivered the opening keynote setting the tone of the day. His talk looked at the development of connectivity, its increasing presence in our lives, and how we can harness this knowledge while looking to the future. He shared tales and information about his cornerstone research on the Fifth Estate and how increasing connectivity has caused shifts of power in society.

The Symposium concluded with a lively panel discussion with six University thought leaders around the use and value of data. At the close of the day attendees were invited for drinks and networking. The mood was jovial and the range of exciting new research and ideas that had been shared elated many.

The Symposium also allowed our researchers to solidify and contextualise their year's work into a comprehensive presentation. Government, industry and researchers were able to connect and collaborate. The event generated a lot of interest with almost 200 attendees, and 50,000 tweets on the #NSS2016 hashtag. All round the event was a wonderful success and we look forward to making it a regular feature on the MNSI calendar.







Zaher Joukhadar and Ben Loveridge enjoying the Symposium.



Attendees experiencing interactive demonstrations at the Networked Society Symposium 2016.

## Communications

The Institute welcomed Kate Murray to the team as Communications Officer in February 2016. This appointment has resulted in a boost in content production and a rise in the Institute's visibility. Our research projects have featured in University-wide promotional campaigns, our researchers have appeared on television, radio, and print in both local and international media. Our online community has grown through Twitter, live-streamed events, and the MNSI website.

The Institute actively encourages the dissemination of its messages through media channels. In 2016, we were featured in 62 articles in print, television, radio and online.

### Podcast

In June 2016 the Institute launched MNSI Public Lectures podcast on SoundCloud and Stitcher. People can tune into the public lectures presented by the Institute and hear big ideas, get inspired, and get involved with the networked society. Each podcast, so far, has received hundreds of plays.

### Social Media

In January 2016 the @MelbNSI Twitter account had fewer than 700 followers, at the close of the year it had over 1,000. We have used this platform to live-stream events so that people can watch from anywhere in the world. Likewise, we have engaged a broader audience by live-tweeting events and including questions from Twitter in the Q&A section of our events. Twitter has allowed the Institute to connect with the broader University community and to share its events, publications and research with media and the general public.

### Newsletter

MNSI produces a monthly online newsletter that is delivered to a growing mailing list and shared through social media networks. Over 1,700 subscribers enjoy the Institute News each month with a 38% click through rate.

While other communication mediums target a broad audience, the newsletter is written for key stakeholders such as University staff, academics, industry and government.

# Kickstarting Data Research and Collaboration

The Institute hosts an emerging research network at the University, the Data, Systems and Society Research Network (DSSRN). The Network is supported through the Deputy Vice-Chancellor (Research) and provides leadership to facilitate the development of research initiatives, support collaborative research, and assist in forming research clusters in conjunction with suitable partners by planning and delivering targeted research events.

DSSRN aims to kickstart research arising from the increased sophistication and ubiquity of data garnering technologies, the quantity, resolution, and scope of data that is collected. This is commonly known as big data. Beyond investing in enhanced data capacity, the true potential of having more data is highly dependent on format and context, behind which are hidden many domain-specific subtleties, constraints, risks and blind-spots.

There is a challenge because many fields that have typically been seen as data-poor are now becoming data-rich, and face the prospect of being able to explore many new questions. With greater quantities, and new types of data available, there are new opportunities to borrow from methods and tools that have been developed in traditionally data-rich disciplines. However cross-disciplinary knowledge transfer is critical to building meaningful and appropriate capacities around data.

Methods cannot be borrowed from other domains and applied indiscriminately to any dataset, just because something can be computed does not mean that the result has meaning. Locked away in many disciplines is a wealth of knowledge, much of it implicit, which must be understood in order to conduct valid research. Big data does not always translate to better or more objective results. DSSRN aims to break down these barriers and facilitate deep interdisciplinary engagements to develop new and innovative research.

DSSRN is Chaired by Prof Jodie McVernon, Director of Doherty Epidemiology and is supported by two Academic Co-Convenors who reflect the diversity of the impact of data. Dr Rob Moss, a Research Fellow in the Centre for Epidemiology and Biostatistics in the Melbourne School of Population and Global Health and Suneel Jethani a PhD Candidate and Lecturer in the School of Culture and Communication.



*Exploring how virtual reality can improve community health and wellbeing.*



# Music Therapy in Virtual Environments

This project is developing a proof-of-concept online virtual reality platform designed to deliver telehealth group singing interventions for people with quadriplegia to improve respiratory function, voice, mood, and social connectedness.

Quadriplegia is the reduction or loss of function in the arms, trunk, legs and pelvic organs as a result of cervical spinal cord injury. Respiratory dysfunction is a major cause of illness and death following quadriplegia. Previous clinical research has demonstrated that group singing can help people with quadriplegia to breathe better, speak louder and to make social connections.

Many of the motivational and emotional benefits come from singing with others rather than in isolation. Disproportionately high numbers of people with quadriplegia live in rural and remote areas; areas often poorly served by traditional health services however, telehealth is becoming an accessible and cost-effective means to treat patients in their homes.

Currently thousands of Australians with quadriplegia are significantly disadvantaged in terms of accessing the group music-making that able-bodied people take for granted. Successful demonstration of this proof-of-concept in this particularly vulnerable group will provide future scope to benefit other groups who are unable to access face-to-face music participation due to physical or geographical constraints.

The main technical issue that this project is addressing is latency – the delay between when someone starts singing and when the person hears it at the other end of a videoconference. This latency is due to the time it takes for the signal to travel from one computer to the other over the internet and causes difficulties in allowing for synchronous point-to-point live music performance.

This project will attempt to deal with the latency effect by utilising hardware and software solutions that enable real-time uncompressed audio over the internet and incorporating this into a virtual reality experience.

New advancements in virtual reality technology will be incorporated into the environment to enhance the depth of the group's participation experience. The project will design and test a virtual environment (such as singing around a campfire) that will enrich both the group's experience and the participant's motivation to sing.

## Research Team

### Jeanette Tamplin

Melbourne Conservatorium of Music &  
Victorian College of Arts

### Ken Clarke

Melbourne Networked Society Institute

### Ben Loveridge

University Services

### David Berlowitz

Institute of Breathing & Sleep  
Austin Hospital



# Domestic 3D Printing

It is still early days for 3D printing in Australia, both commercially and culturally. This research project explored the meanings, practices, and expectations of 3D printing from multiple stakeholder perspectives. It addressed social meanings, user practices, and economic implications associated with the technological affordances and barriers presented by such additive manufacturing technologies.

What the results reveal is a decentralised sharing economy of design that raises questions around issues of accountability, ethics, policy, education and the environment.

The impacts of 3D printing cover many areas from cultural formation, to emerging technologies, to intellectual property and beyond. The evidence gathered by our research team suggested opportunities for 3D printing will need to consider how to engage the following pathways to turn 3D promises into practice:

- Educational pathways for rifts in communities and institutions
- Accountability pathways within decentralised economies
- Methodological pathways for researching networked objects

The team released a research paper titled '3D Printing: Civic practices and regulatory challenges' in April 2016. They received further funding from ACCAN, launched the *3D Printing Info* website (<http://www.3dprintinginfo.org>) in July 2016 and a second research paper titled '3D Printing rights and responsibilities: Consumer perceptions and realities' released in August.

## Research Team

**Bjorn Nansen, Robbie Fordyce,  
Luke Heemsbergen**

Culture and Communication

**Michael Arnold**

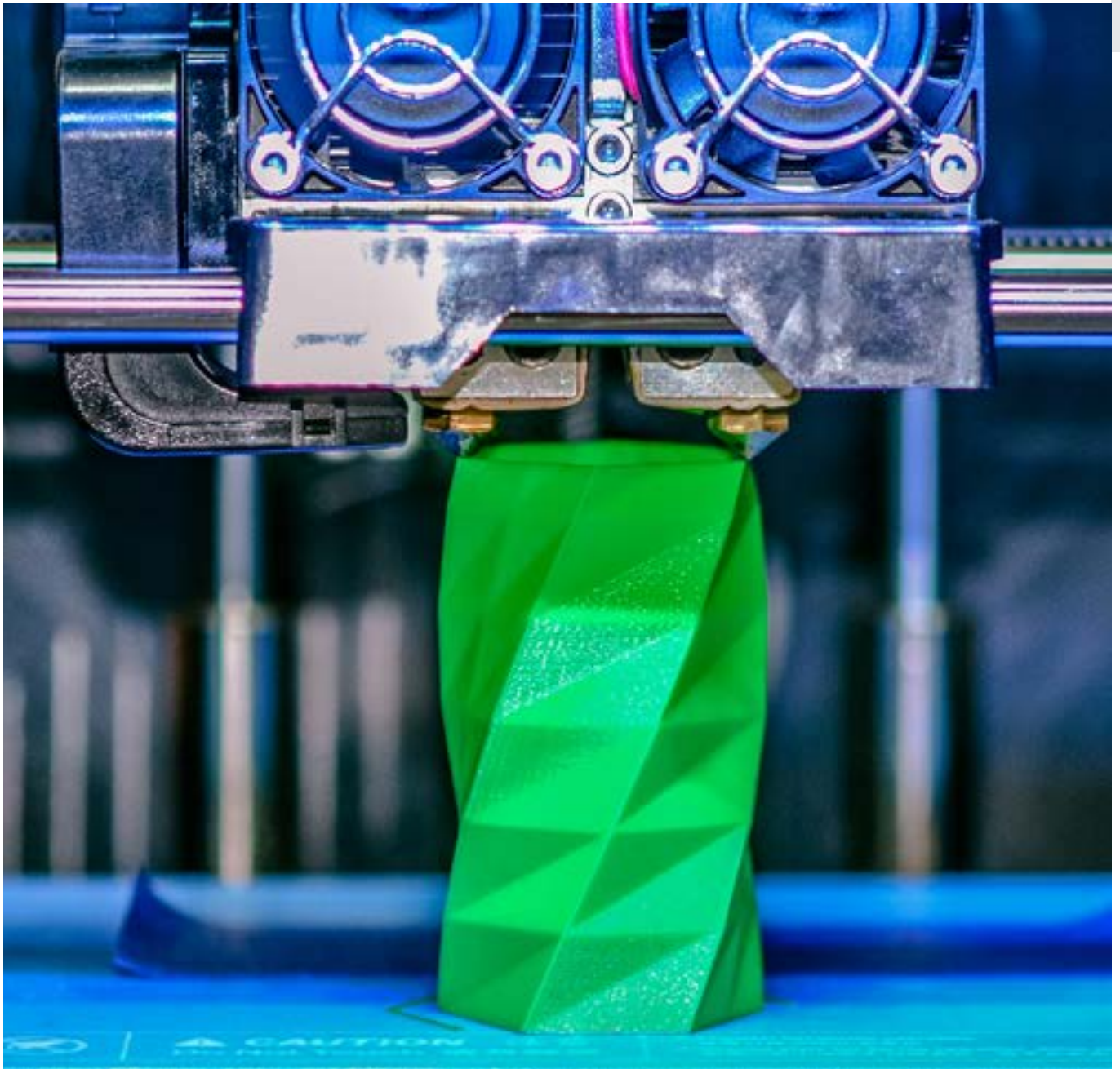
Historical and Philosophical Studies

**Thomas Apperley**

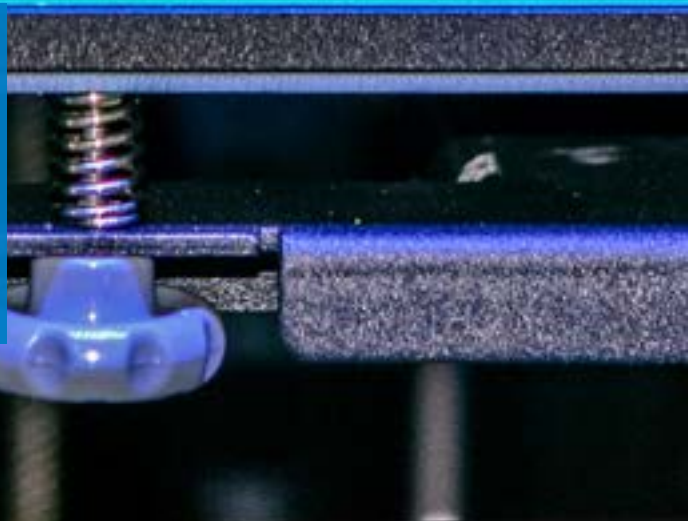
University of New South Wales

**Thomas Birtchnell**

University of Wollongong



*3D printing is an emerging industry in Australia, our researchers have created extensive resources for education in this field to enhance understanding of new industries.*





*Creating digital solutions  
to improve agriculture,  
wine and food.*

# The Digital Vineyard

Wine is one of Australia's chief exports. Australia is the world's fifth largest exporter of wine and the seventh largest producer of wine in the world. The wine industry is a significant contributor to the Australian economy. Growing conditions are, however, predicted to change with higher average temperatures, water scarcity and more pressure on land use from a growing population. The result is that wine makers will need to manage resources much more efficiently without comprising wine quality.

In the vineyard of the future, growers will use data from in-ground sensor and drones flying overhead taking multi-spectral images to better manage their crops and the environment within their vineyards. The ground sensor data and aerial imagery can be combined into metrics that growers can easily use to make decisions about growing conditions and when and where to irrigate and apply fertiliser. This is a form of precision agriculture that can target anything from larger blocks within a vineyard to small collections of plants that may need special attention.

This project takes a significant step towards this vision by developing the algorithms and software to acquire, combine, analyse and disseminate data from in-ground sensors and the multi-spectral images taken from drones. In-ground sensors provide a wealth of data about the condition of the soil such as the soil temperature, soil moisture content, salinity, pH levels and some other factors, while drones map valuable metrics for growth, early symptoms of undesirable plant health conditions, and indicators for fruit quality.

The project is developing key elements of sensor network and camera calibration, research and methods for combining the data from the different types of sensors and developing data analysis methods that will provide actionable metrics for growers. Development will focus on designing a standardised optical sensor calibration procedure, automated optical image geo-referencing and ortho-mosaic generation, dissemination and visualisation to end users.

## Research Team

### **Sigfredo Fuentes**

Agriculture and Food Systems

### **Dongryeol Ryu, Richard Collman**

Infrastructure Engineering

### **Ed Kazmierczak**

Computing and Information Systems

### **Mark O'Connell**

Department of Economic Development,  
Jobs, Transport and Resources

# Mapping the Melbourne Sharing Economy

A new economic system is emerging: where once we bought and sold, today we exchange, share, barter, lend and give. The sharing economy is renting out that lawnmower you never use, catching a lift via an app instead of a taxi, or shirking the hotel to stay at the home of a local on your next holiday. These new forms of exchanges have been made possible by our increasing connectivity through the internet and social networks.

Sharing has become a topic of interest to consumer regulators; local councils; the popular press; and urban planning policy makers. This research project has made a significant evidence-based contribution to these important debates through documentation and analysis of these networks.

Mapping the Melbourne Sharing Economy delivered the first comprehensive listing of sharing networks active and available to people in Melbourne from data collected across eight months in 2016. The project mapped the services, geographies and technologies entwined with the local sharing economy. It synthesised the local sharing economy through the analysis of publicly available documents, data analytic tools such as web scraping and discursive analyses of sharing platform interfaces.

In their work of mapping the sharing economy, our researchers have helped develop a generalised conceptual understanding of the key characteristics of the sharing economy for Melbourne. The research results speak to a wider cultural shift taking place where our concept of ownership and our relationship with possession is changing.

## Research Team

**Jenny Kennedy,  
Martin Gibbs**

Computing and Information  
Systems

**Bjorn Nansen**

Culture and Communication

**Michael Arnold**

History and Philosophical Studies

**Tamara Kohn**

Social and Political Sciences

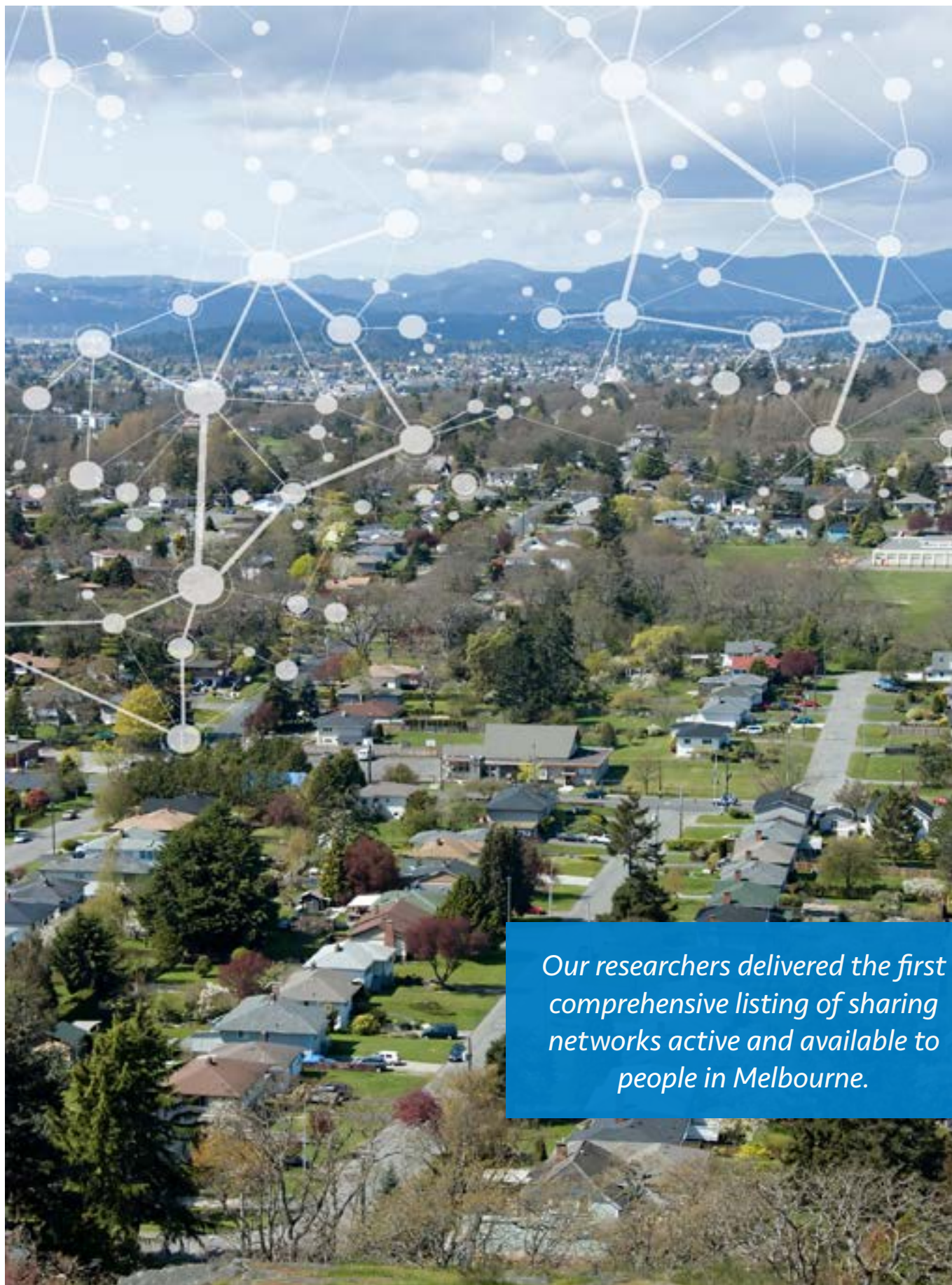
**Rowan Wilken**

RMIT University

**James Messe**

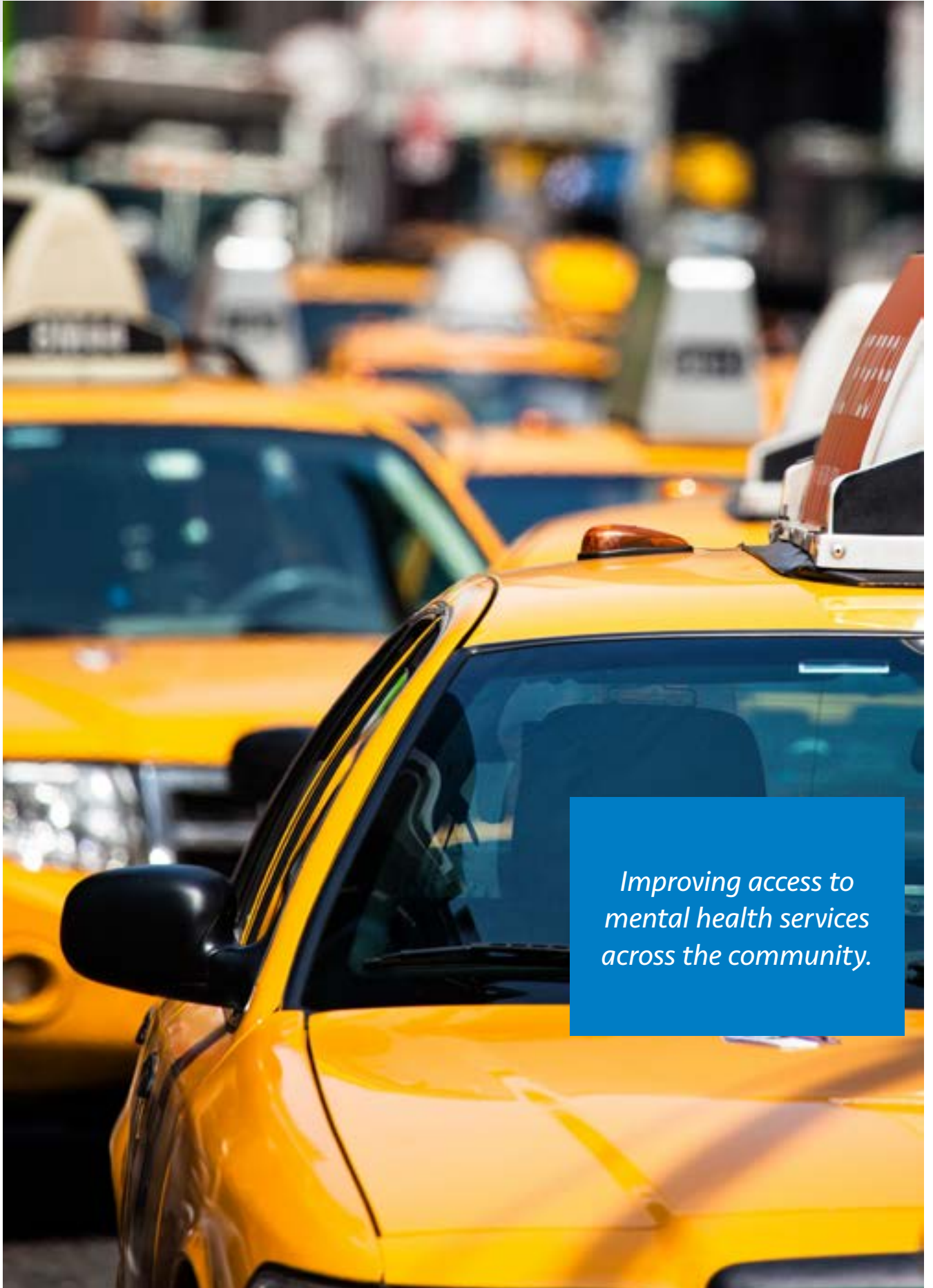
University of Technology, Sydney





*Our researchers delivered the first comprehensive listing of sharing networks active and available to people in Melbourne.*





*Improving access to  
mental health services  
across the community.*

## Driving for Change

Taxi drivers have many risk factors for poor mental health, including high stress, unregulated competitors, abuse, threats to personal safety, long and irregular working hours, unstable income, sedentary lifestyle, changing regulations and lack of bargaining power. In addition, two-thirds of drivers are born overseas, with many being recent arrivals. Migration contributes to a lack of supportive social networks among these men. Despite their high health needs, studies indicate that taxi drivers have very low levels of help-seeking.

Researchers from this project conducted a mental health survey of over 200 drivers waiting at Melbourne Airport. Almost two-thirds of respondents reported high psychological stress. The challenge for this project was to develop an intervention that could fit around the unusual working lives of the drivers, while also appealing to them and being easily accessible to a group where language is a barrier.

The team have developed a prototype mobile app, which offers physical and mental exercises tailored to whatever time a driver can spare, whether inside the car or out. It offers options for a two-minute session, a five-minute session or a 10-minute session. It includes exercises similar to those recommended for long-haul flights, as well as muscle relaxation to combat anxiety. There are also mindfulness sessions such as listening to guided-imagery as a relaxation tool.

The ultimate goal is improving the mental health of drivers but the app also focuses on their physical health. Muscle tension can build up in drivers over long periods of time and that can lead into feelings of stress. Taxi-drivers sit down for long periods with exercises as part of the intervention the aim is to break up those long periods of sitting down.

The app also reminds drivers to stay hydrated and will link to useful information such as the location of public toilets. Some previous research has shown that taxi drivers are at higher risk of kidney and urinary tract infections because of the excessive time they spend seated and delaying going to the toilet.

The researchers were awarded \$78,810 in funding from the Shepherd Foundation in November 2016 to develop the prototype.

### Research Team

**Sandra Davidson, Jane Gunn**

General Practice

**Greg Wadley**

Computing and Information Systems

**Nicola Reavley**

Population and Global Health

**Penni Russon**

Orygen

**Blair Davies**

Australian Taxi Industry Association

# Internet of Things (IoT) and Consumer Privacy

The Internet of Things (IoT) promises a new world where almost every conceivable physical item sends and receives data via the Internet. The potential to transform physical 'things' such as toothbrushes and pacemakers into interconnected and intelligent devices from which data can be generated, shared, and analysed, ushers in unprecedented business opportunities.

However, the prospect of such comprehensive and all-encompassing collection of data inextricably linked to the lives of humans raises troubling scenarios. For example consumer surveillance, identity theft, invasive marketing, and more potent hacking methods affecting personal lives, including the most sensitive private information.

This project explores how consumers feel about privacy in a world of increased connectivity enabled by the IoT. Whether privacy-by-design can be effectively built into the IoT development process without stifling innovation and creativity? How can third party users (i.e. data analysts) of IoT data meet and adhere to consumers' privacy needs?

Initial findings indicate that consumers are concerned about their privacy and data protection.

While privacy views and needs vary, most consumers want greater control of their privacy commensurate with the purpose, use and service delivery associated with their data. In particular, consumers want greater transparency in terms of knowing who benefits from their data, how and when their data is used, and for what purposes.

Effective means of giving consent and assurance of anonymity and encryption of their data throughout the data life cycle were also part of the requirements.

## Research Team

**Rachelle Bosua**  
**Atif Ahmad**  
**Sean Maynard**

Computing and  
Information Systems

**Megan Richardson**  
**Karin Clark**

Melbourne Law School





# Active Defence

The security of critical infrastructure that underpins modern society has always been a national priority. However, over the past few decades the security-risk exposure to critical infrastructures has escalated due to increased interconnectivity within cyber infrastructures and between cyber and physical infrastructures. As a result, intelligent adversaries seek new pathways and opportunities, and employ more sophisticated tactics.

Although the responsibility to assure the long-term viability of critical infrastructure falls on government institutions, direct control is frequently delegated to private enterprise. Unfortunately, the private-business mindset of maintaining service availability at the lowest possible cost frequently competes with the need for a high-security environment that provides adequate protection from a complex and evolving threat landscape. Recent research points out that business security strategies rely on passive controls which are not suited to counter intelligent adversaries that use innovative means to exploit vulnerabilities in defensive systems.

This project is developing an Active Defence system to support real-time security decision-making for network operators. This includes tools for a network visualisation to promote real-time 'situation awareness' of security events to network operators. It uses new methods of information integration and 'big data' visualisation of disparate sources of security information. Additionally, it provides a recommendation system that advises human operators on defensive tactics to be employed while the network is under attack.



## Research Team

**Benjamin Rubinstein, Atif Ahmad, Chris Leckie**

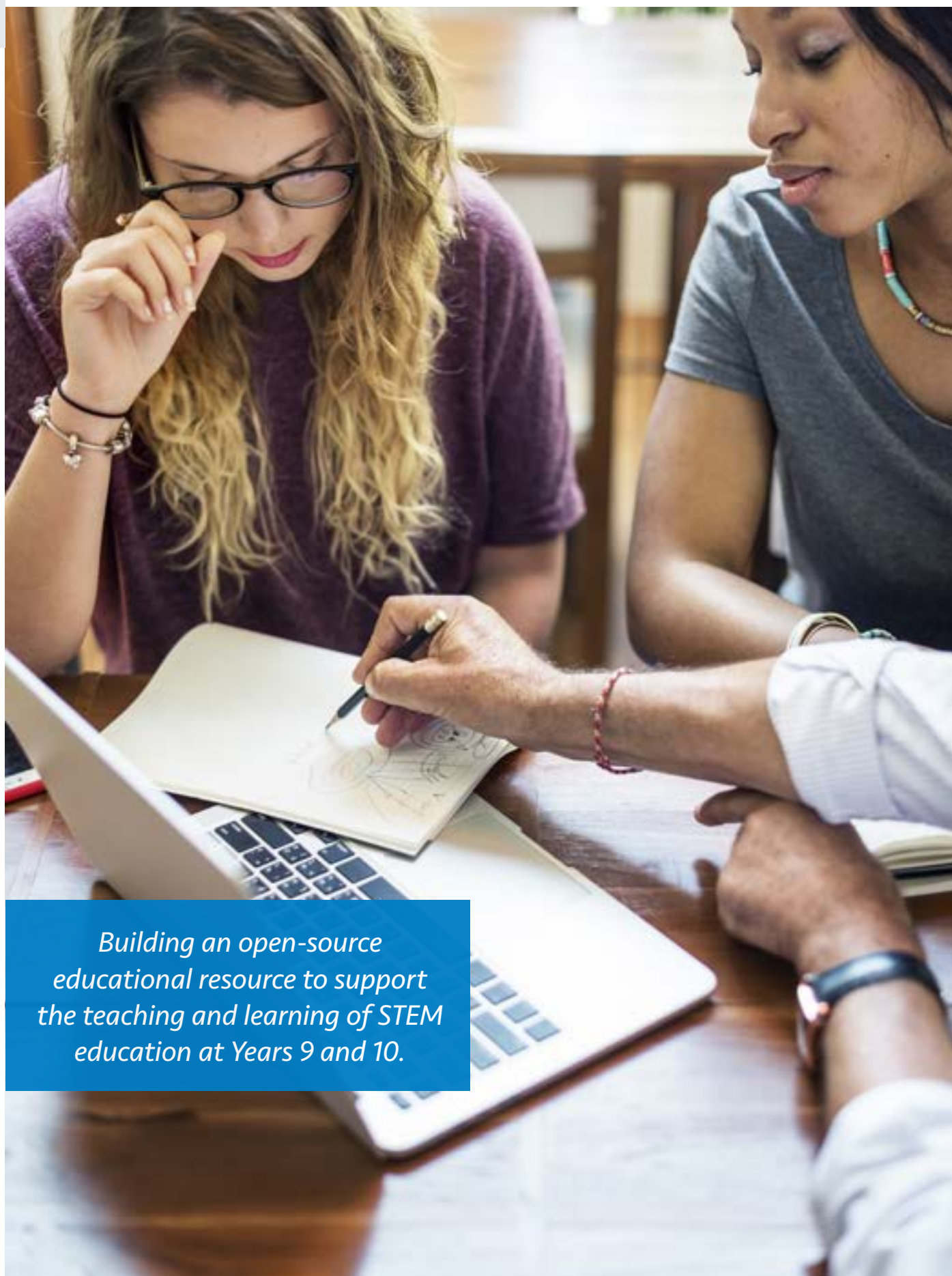
Computing and Information Systems

**Andre Gygax**

Finance

**Tansu Alpcan**

Electrical and Electronic Engineering



*Building an open-source educational resource to support the teaching and learning of STEM education at Years 9 and 10.*

# STEM Education Resource

Science, Technology, Engineering and Mathematics (STEM) education is integral in preparing current students with the essential skills and knowledge for building the networked society. STEM underpins the future economy, as recognised by the Australian Government's National Innovation and Science Agenda.

This project involves the development and evaluation of an online open-source educational resource to support the teaching and learning of STEM education at Years 9 and 10. The resource supports secondary students in the development of high-level knowledge and skills for solving real-life multi-disciplinary STEM problems. The resource will consist of a series of modules to promote development of skills and knowledge related to:

- problem identification
- formulation of problem solving strategies
- identification, collection and display of data
- interpretation, analysis and reflection
- use of evidence in decision-making

The resource will be supported by case studies to support the implementation of the resource nationally. This project is supported by Google Australia.



## Research Team

**Lynda Ball**

Melbourne Graduate School of Education

**Thas Nirmalathas, Scott Cameron,  
Anchalee Laiprasert (Mai), Ken Clarke  
Chamil Jayasundara, Adam Ladders**

Melbourne Networked Society Institute

## Seed Funding 2016

The Institute hosted a round of seed funding in 2016, which saw the Institute invest in 7 research projects. The selection process was a two stage process with 24 applications, shortlisted to 10 who were then invited to a second round of interviews.

### Mapping Urban Mobility for Flu Forecasting

Influenza infections are major contributors to losses of life, decline of wellbeing, and economic losses worldwide. The influenza season in Australia usually peaks between June and September, but the severity and length of the epidemic varies considerably between years.

Effective influenza epidemic prediction systems can save lives and greatly reduce the economic impact of the epidemic. Vast volumes of data are generated within the networked society. This data is enabling new understandings of how people move across the city. This project is investigating how this large-scale tracking data can improve the modelling of influenza infections within metropolitan populations.

### Politics of Open Data

In Australia and internationally, governments at the local, state and national level are embracing 'open data'. This project is examining the opportunities and challenges that open data presents to governments, businesses and citizens. The research aims to critically evaluate the practical implications of open data at the level of city planning and management. It focuses on three cities – Melbourne, Geelong and Singapore – which are embracing open data as part of their local and national governments' strategies for future development.

Drawing on the expertise of an interdisciplinary team of scholars this project will evaluate current approaches to open data in the selected cities; highlight cases of 'best practice' around open data in Australia, Singapore and internationally; and contribute to scholarly and policy debates about open data.



## VR for Youth Mental Health

There is a growing interest within clinical psychology in using virtual reality technologies within therapy programs. One area is whether young people suffering a broader set of conditions including psychosis and depression might benefit from VR.

Self-compassion has been shown to reduce psychopathology and increase wellbeing and resilience, but creating experience of self-compassion is difficult. We believe that VR can provide an engaging platform to illustrate self-compassion.

This project seeks to examine whether commercial VR technologies are effective in youth mental health. This project will design a VR app via a participatory design process that embodies the “self-compassion” approach to treatment, and pilot-test it with Orygen. The primary advantage offered by VR is the ability to offer patients compelling, perceptually realistic scenarios that are therapeutically salient. Secondary advantages include therapist control over the environment and the appeal of game-like technologies to young people.

## Regulating Automated Legal Services

Automation is placed to transform vast swathes of the economy. Lawyers and the law are not immune. New automated legal services are developing against a backdrop of broader transformation in the market for legal services. Lawyers are developing new business models and strategies that harness advances in artificial intelligence, natural language processing and machine learning.

This project is examining the technical and regulatory barriers facing automated legal services. The project examines the limits to the delivery of automated online legal services and seek to inform the development of appropriate policy, regulation and practice settings to accommodate these developments. Findings from this project will inform policy makers, regulators and practitioners about the impact and effective management of automated online legal services and how best to increase access to delivery of legal advice within an increasingly networked society, and will provide a foundation for further projects by the research team.

## Urban Green Spaces Initiative

Urban Green Spaces is a research initiative comprised of three projects: Sensor Networks, Monitoring, and Social Networks. The three projects are working in unison to better understand the values of urban green spaces.

As more people increasingly live in cities that are increasing in density, the green heart of the city becomes its essential lifeblood. Green spaces are a valuable asset to the cities and their inhabitants. Green spaces help to regulate the urban heat island effect, provide habitat for animals and open recreation spaces for the community. In short, green spaces are essential for healthy and happy cities.

Connectivity can play an important role in optimising the management, use, and maintenance of urban green spaces. To this end, the Institute is supporting three interrelated projects that aim to develop a framework to support our urban green spaces.

### Monitoring Urban Green Spaces

This project is focused on maintaining the health of the central part of urban green spaces – trees. Trees are an essential component within city environments; they regulate the atmosphere and provide shade. However, with the advent of global warming some established trees are coming under increased climate pressure.

The team is developing a remote monitoring and decision-making system built upon cameras that capture infrared and visible light installed on vehicles. The system will obtain geo-referenced upward-looking images of the trees and will capture and analyse this data through the use of models to map and monitor the resolution of the green infrastructure.





## Social Networks and Urban Green Spaces

Urban green space plays a critical role in shaping the health and wellbeing of residents and promotes community health and wellbeing. However, measuring their benefits is currently difficult. This project is conducting a human dynamics study of urban green space and wellbeing by examining social media to better understand users' mood and social connectedness. This will provide important information about how to effectively incorporate green space as a health promotion tool across cities around the world.

The project will create detailed mood snapshots and maps of mood and social connectedness across cities around the world, and to understand the role of green space in influencing these important measures of peoples' wellbeing.

## Sensor Networks for Urban Green Spaces

This project is establishing and trialling a sensor network to demonstrate the potential of a distributed sensor network to measure and monitor the conditions in the urban environment. The sensors will continuously monitor air temperature, relative humidity, noise levels, light levels as well as carbon monoxide and nitric oxide concentrations. This data provides a unique layer to be included with numerous other data sets (traffic, population profile, building footprints) and the data will be linked to spatially discrete indicators of environmental benefit on the City of Melbourne's Urban Forest Visual Map.

# Indigenous Communities in the Networked Society

The Institute has supported a number of projects centred upon how connectivity and improves and enables service provision, cultural transmission and preservation in indigenous communities. The findings of three research projects were published as Institute Research Papers in 2016.

## Aboriginal Young People and Digital Storytelling

This ARC Linkage Project (130100733) is supported by the Institute and explores digital storytelling as a creative forum for supporting Victorian Aboriginal youth. The digital stories created by the Korin Gamadji Institute as part of the project were exhibited at the Sovereignty exhibition at the Australian Centre for Contemporary Art (ACCA) in December 2016 to March 2017. The stories were made during three workshops conducted at Museum Victoria, ACMI and at Camp Jungai in Central Victoria. Various Aboriginal Elders, artists, filmmakers, performers and scriptwriters, including Kimba Thompson, Maree Clarke, Tim Church, Tammy Anderson, Uncle Mick Harding, Auntie Di Kerr and Uncle Jack Charles, assisted the young participants in the creation of their stories.

The exhibition includes the display of the digital stories as a series of video installations shown simultaneously on seven screens. The exhibition of the stories was organised and conducted in collaboration with Korin Gamadji Institute at the Richmond Football Club and ACCA. Along with the young participants, the research team was involved in public and education programs, supplying information about the digital story telling workshops, and writing the extended label and captions for the stories on display.

This project published an Institute Research Paper – *Aboriginal Knowledge, Digital Technologies and Cultural Collections: Policy, Protocols, Practice*, in October 2016, which examined the management and use of collections arising from digital story telling. The paper canvases the experiences of curators, collections managers, archivists, production managers and librarians, including members of the Aboriginal community in southeast Australia, who currently work in collecting institutions or with digital collections. The paper highlights their concerns and ambitions as we seek to understand how the current suite of collection policies and protocols contributes to new and progressive approaches to the care of these collections.

Download a copy from: <http://networkedsociety.unimelb.edu.au/publications>



## Digital Futures in Indigenous Communities From Health Kiosks to Community Hubs

MNSI published the findings of this research project that explored how to overcome the digital divide within Indigenous communities using a network of touch screen kiosks for public use. Researchers worked closely with Hitnet, a provider of information kiosks to three northern Australian Indigenous communities. The researchers assessed how the kiosks were being used to ascertain what features contribute to a successful interaction, such as physical placement, digital literacy and the relevance of the content.

Results from the assessment informed how the kiosks can adapt to the diverse and evolving needs of indigenous people in remote areas of Australia. Aboriginal and Torres Strait Islander Australians are under-served by digital technologies, with Indigenous Australians being 69% less likely than non-indigenous people to have any Internet connection and are about half as likely to have broadband access.

This 'digital divide' contributes to and reinforces educational, income, employment and geographical disadvantage. While uneven access remains a particular problem for rural and remote Aboriginal communities, digital technology also provides a way of overcoming Indigenous social disadvantage.

The Hitnet model provides engaging and relevant health information to Indigenous communities. This was particularly the case for content that was co-created by the communities that use it, and where stories and knowledge are networked and shared between communities through the kiosks.

The future directions from this research see Hitnet now looking at implementing changes suggested by this research, including the adaptation of cross platform technologies, such as smart phones and tablets, into the HITnet kiosk network.

This paper is available for download at: <http://networkedsociety.unimelb.edu.au/publications>





Kristen Smith took this photograph at the opening of the Pormpurkuuyikngathar Culture, Knowledge and Learning Centre in Pormpuraaw in late 2014. Written permissions for the use of photos taken at the ceremony were gained from parents/guardians through Pormpur Paanthu Aboriginal Corporation.



Mark Crocombe (Kanamkek-Yile Ngala Museum Director)  
(Photograph: Jacinta Crocombe)

## **When Magnets Collide**

### **Digital Preservation and Access of At-Risk Audiovisual Archives in a Remote Aboriginal Community**

This was the first Institute Research Paper published in 2016 that presented the findings from the Wadeye IPTV project that commenced in 2013.

Indigenous-owned organisations for over thirty years, with recordings depicting facets of Indigenous culture, language and community life and constituting defined acts of Indigenous self-determination and representation. This project trialled a digital platform in the community, providing access to the archive for the people of Wadeye and inviting them to contribute their knowledge of the people, languages and events recorded. This information is of great research value, with particular benefit to projects investigating language acquisition in Murrinhpatha (the lingua franca of Wadeye and the surrounding Thamarrurr region) and in the safeguarding of local endangered languages. Much of the Indigenous knowledge held within this archive, such as preparation of bush foods, is retained by only a handful of living peoples, and is thereby invaluable. Furthermore, the project supports the growth of culturally meaningful jobs in the Wadeye community, advancing the capacity of the Museum to continue its work in digital preservation through the training and development of skilled Indigenous archive workers – priority areas identified by the Indigenous Remote Communications Association.

The cultural significance of the audiovisual collection of the Kanamkek-Yile Ngala Museum has been identified by community members and reinforced by the audit undertaken as a part of this project. The full audit of that contained over 800 VHS tapes, 600 MiniDV tapes and around 100 SVH compact tapes, in total comprising over 2,000 hours of footage. The cultural, social, historical and linguistic information of this collection is extremely important, with footage of cultural sites, stories, language and traditions of Thamarrurr clan groups from the region recorded over a period of decades. As magnetic tapes have a limited life span, the community members fear that if the material is not digitised and transferred to other formats, it is in danger of being lost forever. Digitisation ensures the continued use and longevity of this important cultural collection.

Delivery of audiovisual material through digital technologies presents a means for the Wadeye community to access, revitalise and maintain local languages, customary law, customs and cultural heritage.

A copy of this paper is available at: <http://networkedsociety.unimelb.edu.au/publications>





*The MNSI Lab enables collaborative interdisciplinary efforts by contributing technical expertise.*



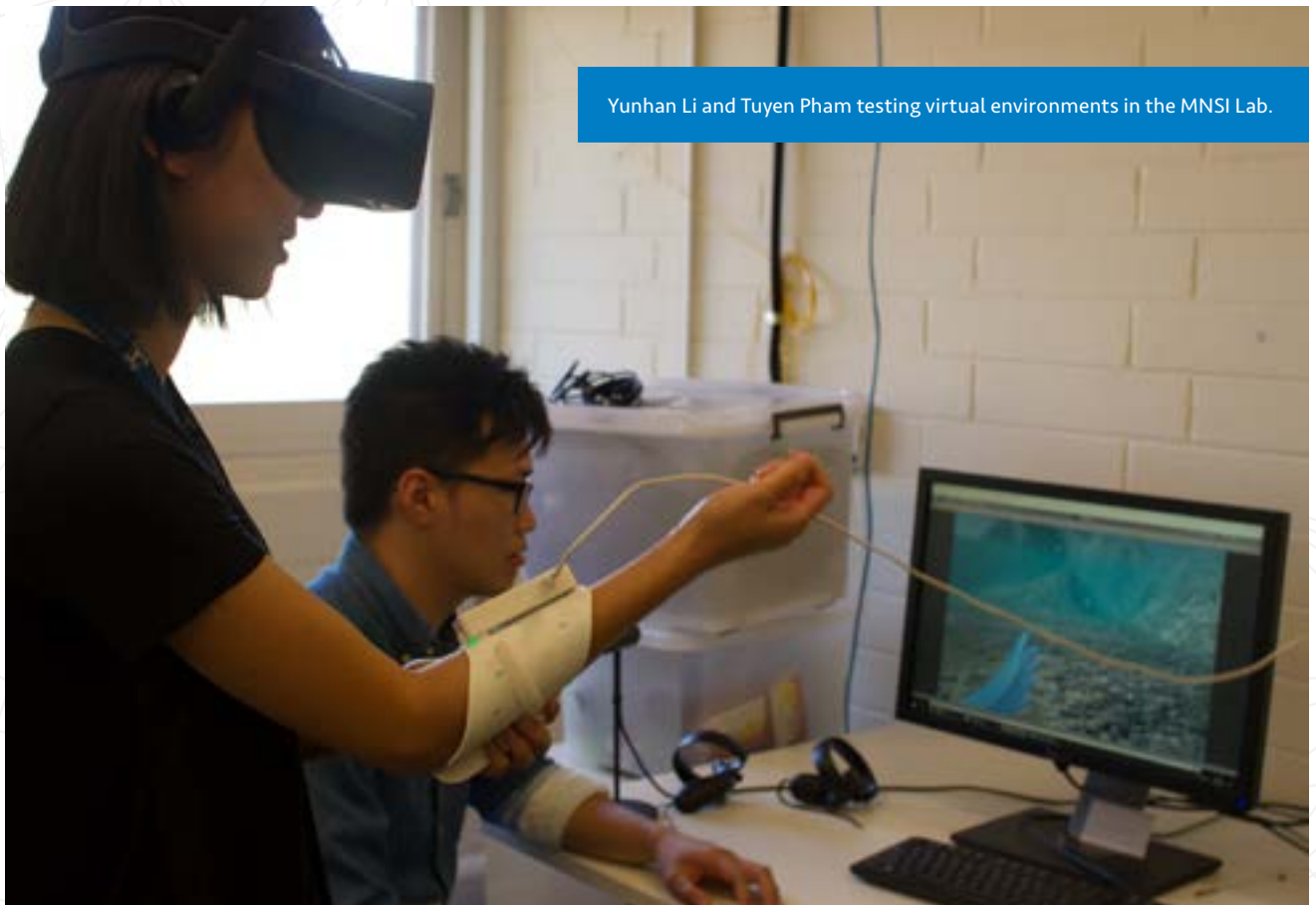
## MNSI Lab

A key part of the Institute, is the MNSI Lab, which provides an environment to actively undertake research and development activities that are creating the networked society. The Lab is a physical space within the Institute providing an area that allows for experimentation, testing and demonstration of new applications and services.

The Lab is supported by a dedicated team of researchers with the knowledge, skills and expertise to fashion practical solutions and support Institute research projects. The team actively contributes across the full spectrum of activities and is an essential component to ensuring the technological dimensions of the networked society are a key feature of many projects.

The MNSI Lab has a central role in research development, through engagement the Lab enables collaborative interdisciplinary efforts contributing technical expertise. A central aspect of this is the Lab's Development Projects and Intern program.

The Lab is connected to external resources that support the research efforts of MNSI by bringing together experimental networks, software, and connected devices to facilitate interactions between MNSI's research programs and enable innovation. Additionally, the Lab provides an opportunity to develop and foster collaboration with a diverse range of partners.



## Development Projects

The Institute undertakes development projects, which leverage the knowledge, skills and technology within the MNSI Lab to enable new activities to support the activation of new research collaborations. In 2016, the Institute undertook four large scale development projects in partnership with collaborators across the University.

### Smart App

The MNSI Lab team is working with the Department of Surgery at St Vincent's Hospital to develop a smart app to assist in guiding surgical interventions for patients requiring total knee replacements. The smart app codifies existing research led by Prof Peter Choong and A/Prof Michelle Dowsey that has developed an effective measurement tool for recording the probability of non-response to surgery for patients. Currently, the tool is a paper based measurement. The MNSI Lab is developing an online tool that will enable orthopaedic surgeons to better capture the probability of non-response to improve performance and patient outcomes.

### Target-D

The MNSI Lab worked in collaboration with the Department of General Practice to build a web-based platform to support the delivery of tailored depression interventions. The platform enabled researchers to effectively screen, consent, and undertake a baseline symptom review before assessing patients' risk for depression and offering targeted treatments. The Target-D platform was used in 10 GP clinics throughout Melbourne and resulted in the delivery of tailored information based upon patient responses. The data from the Target-D platform will provide a framework to enable a stratified approach to the primary care management of depression, resulting in clinical and economic benefits.

### Dental Trauma Tracker

The Dental Trauma Tracker application takes advantage of mobile phone data capture capabilities (text, photo, video, and audio) for epidemiologic surveillance of dental trauma. The initial stage has seen the development of a working prototype system collecting dental trauma data, with a future stage providing an overview of the nature and extent of DT, letting researchers view and summarise the collected data, and making greater use of the data for improvements at a local level (e.g., educating on the best first aid, identifying high-risk locations and activities). This project is being conducted in collaboration with the Melbourne Dental School at the University of Melbourne. Industry partners include Melbourne Dental School; Oral health CRC; Royal Dental Hospital of Melbourne; Dental School, University of La Frontera, Chile, Faculty of Dentistry, University of Valparaiso Chile.

## Not the Only One

Domestic violence has been a growing part of the national conversation as we face statistics that one in six women experience violence from a current partner, while on average one woman per week is killed as a result of domestic violence. The statistics are daunting. Services in Australia struggle to keep up and many shelters are forced to turn women away because they just do not have space.

In 2016, the Institute funded Not the Only One, an initiative of the Department of General Practice's Researching Abuse and Violence program (RAVE) in association with the Melbourne research Alliance to End Violence against women and their children (MAEVe).

The initiative worked directly with women who had experienced domestic violence to explore how connectivity could facilitate social change. The result was Not the Only One website, launched in February 2016. The website is providing a secure forum for Australian women who have experienced domestic violence to share their stories anonymously. It hopes to build a support network with solidarity found in shared experiences, while also informing the community about the context and dynamics of domestic violence.

The interdisciplinary team was headed by Dr Laura Tarzia, a MNSI Fellow who has worked extensively in researching abuse and violence with a particular focus on how technology can aid intervention and response. Dr Tarzia was awarded \$363,000 in a Discovery Early Career Researcher Award (DECRA) from the Australian Research Council enabling research examining a web-based help-seeking for intimate partner sexual violence.

At its essence Not The Only One is a database of survivor stories, but it has promise to evolve into something bigger. Dr Tarzia wants to see the website expand to include multiple languages and engage women from diverse cultural backgrounds.

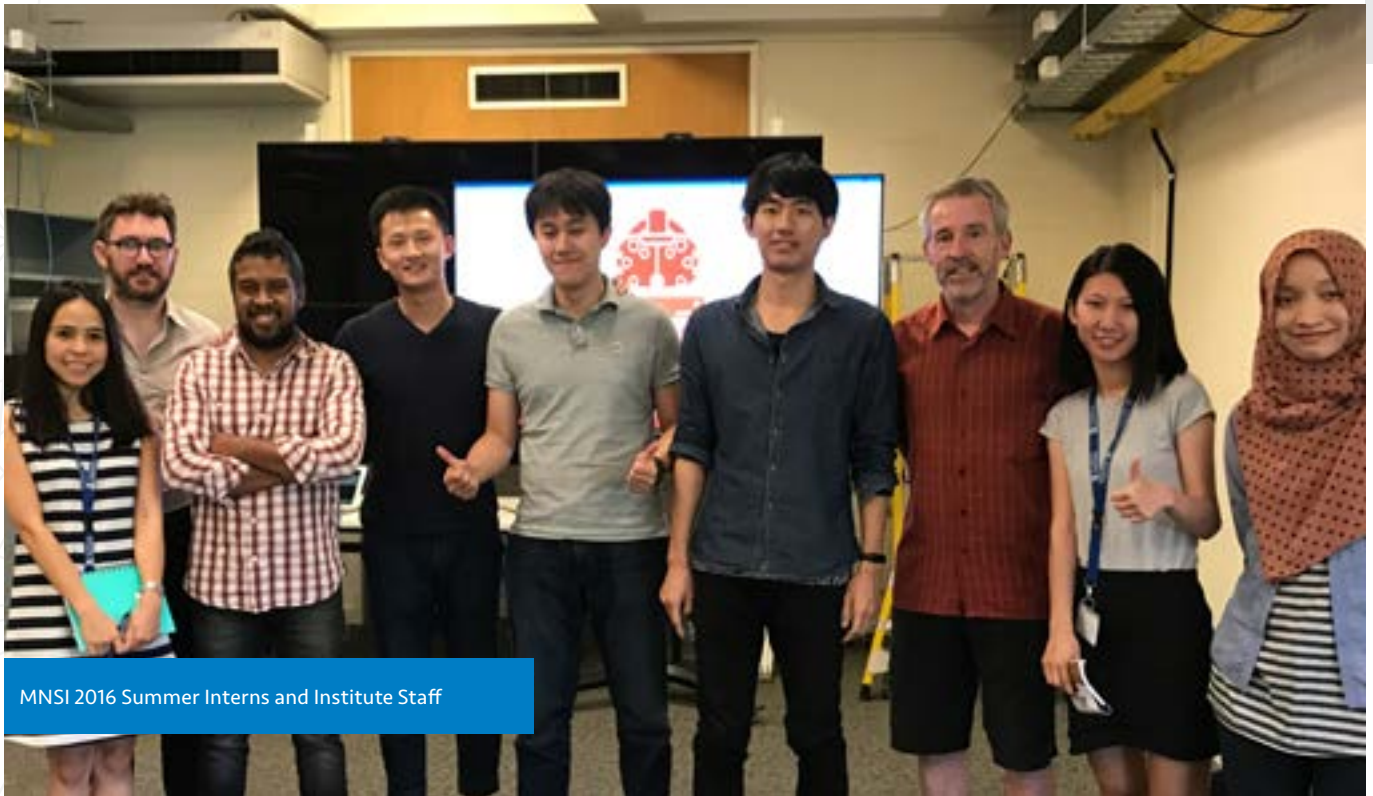


## MNSI Lab Interns

The MNSI Lab hosts student interns who work on a variety of projects. In 2016, 16 students were hosted at the MNSI Lab working on a variety of projects. The contributions of Interns provides a valuable mechanism to enable research and development activities.

- **Liang Han** – *Sentiment Analysis*: use of textual analysis to measure emotional responses and gauge opinions for online ‘under the line’ comments.
- **Gagan Khanna** – *High Resolution wireless location services*: working with the Uniwireless team to deliver a flexible app to collect user feedback based on wireless tracking.
- **Felipe Moscoso** – *RSSI levels as indicator for WI-FI indoor location system*: investigation of problems in pinpointing indoor user location based on wireless beacons.
- **Yunhan Li** – *Pulse Oximetry Application for COPD treatment*: development of an app for Austin Health to collect pulse rate and oxygenation data for home based rehabilitation service.
- **Lan Zhang** – *Dental Trauma Tracker*: working with the Oral health CRC to develop an app to collect data on number of, and reasons for dental trauma in the community.
- **Vivek Kumar** – *Emergency Responders*: integration of disparate IoT sensors used by emergency services with open source GIS visualisation platform with Infrastructure Engineering.
- **Ray Chen** – *Google STEM Education Resource*: development of software module to automate setting up and collection of data from IoT sensors to be used in Years 9 & 10 classrooms.
- **Yunhan Li** – *Music Therapy in Virtual Environments*: Blending of low latency audio and Virtual Reality to provide rehabilitation for quadriplegic patients in collaboration with VCA.
- **Kecheng Guo** – *Salutogenesis, emotional analysis via video*: working with Melbourne School of Design to gather data for better design of mental health facilities using machine learning and video footage of building occupants.
- **Haolan Liu** – *Salutogenesis, emotional response to the built environment*: as above but collection of data via a smartphone app and location beacons that trigger questions based on user location in a building.





- **Bishal Tamang** – *VR for Youth Mental Health*: development of a prototype virtual reality environment to enable clinicians from Orygen Health to better engage with, and treat, young people with mental health issues.
- **Louice Paraprolu** – *GHRANITE*: exploration with Health and Biomedical Informatics Centre and the Department of General Practice into pathways to next generation integrated tool to make patient-doctor interactions more effective via automated use of medical ecosystem data.
- **Verra Mukty** – *GHRANITE App*: proof-of-concept app to showcase practicality of integration of patient data collection (pulse oximetry) with GP's software and external databases in a secure manner with a view to more impactful and efficient patient visits.
- **Shiyu Jin** – *Kinect Integrated with VR*: blending of body tracking and virtual reality to allow full avatar control in a virtual environment which is important for more immersive collaborative experiences and in performance arts training.
- **Siyu Feng** – *Big Data Infrastructure*: construction of a tool to allow highly automated set up of resilient clusters of machines in Hadoop/Spark/Kafka environment for application in any Big Data project.
- **Di Mao** – *Google STEM Education Resource*: tool to allow schools to quickly and easily configure a large number of Raspberry Pi single board computers and set up data collection from associated diverse sensors.

# Enabling the Next Generation of Interdisciplinary Researchers

The Melbourne Networked Society Institute is supporting the next generation of interdisciplinary researchers through the provision of support to PhD students, through scholarships and stipends.

## PhD Scholarships

In 2016, three scholarships were awarded to support the University's Interdisciplinary research strategy. The scholarships were awarded to the following students:

- **Anna-Claire Blogg** to undertake a PhD on urban data within the School of Culture and Communications
- **Amanda McKenzie** to undertake a PhD on technology and domestic violence within the Department of General Practice
- **David Cumming** to undertake a PhD on e-Sports within the School of Computing and Information Systems.

These three students complement our existing research higher degree scholars.

- **Estelle Boyle** (School of Culture and Communication): *Mediating Social Exclusion: ICT Access in Australian Refugee Communities*
- **Alexa Scarlata** (School of Culture and Communication): *Producing Pirates: The Cultural Legitimisation of Television Piracy in Australia*
- **Kevin (Kwang Baek) Lee** (Department of Electrical and Electronic Engineering): *Low Energy Routing Protocol in IoT (Internet of Things)*
- **Thechanamoorthy Gnanakumar** (Department of Electrical and Electronic Engineering): *N<sup>th</sup> Order Assortativity Influence Modelling*

## Supporting Higher Degree Research Students

The Institute provides a variety of support to higher degree research students. These include the provision of partial awards and top-up scholarships established by the Institute for a Broadband-Enabled Society. Three top-up scholarship holders graduated in 2016, while an additional five students received a benefit from the Institute.

### 2016 PhD Graduations

- **Mark Merolli** (Health & Biomedical Informatics Centre): *Participatory health through social media in chronic disease: a framework for research and practice*
- **Joji Mori** (Department of Computing and Information Systems): *Designing digital memorials: commemorating the Black Saturday Bushfires*
- **Marian Lok** (Department of Social Work): *Taking matters into their own hands: an exploration of being online and disaster-affected*

### 2016 PhD Scholars

- **Robbie Fordyce** (School of Culture and Communication): *The Electric Empire: networked resistance and networked media after Empire*
- **Tshepo M Rasekaba** (Department of General Practice): *Telemedicine for Insulin Treated Gestational Diabetes Mellitus*
- **Manal Almalki** (Health & Biomedical Informatics Centre): *Developing a model for effective Health Data Management in the context of Self Quantification and Personal Knowledge Management*
- **Kate O'Connor** (Melbourne Graduate School of Education): *Disciplinarity, epistemic authority and curriculum: new online course forms and the production of knowledge in changing times*
- **Paula de Barba** (Melbourne Graduate School of Education): *Motivation and Autonomous Learning in Online Learning Environments*

# Finance

## Institute Expenditure

| Administration & Operating Expenditure  |                  |
|-----------------------------------------|------------------|
| Directorate salaries                    | 410,144          |
| General Expenses                        | 15,149           |
| Events and communications               | 15,344           |
| Sub total operating expenditure         | 440,638          |
| Research Enabling Expenditure           |                  |
| Salaries (research-enabling staff)      | 582,682          |
| Research Project Funding                | 312,883          |
| Partnership development                 | 73,158           |
| PhD scholarships                        | 20,892           |
| Other (MNSI Lab Expenses)               | 7,363            |
| Sub total research enabling expenditure | 996,978          |
| <b>Total Expenditure</b>                | <b>1,437,615</b> |







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