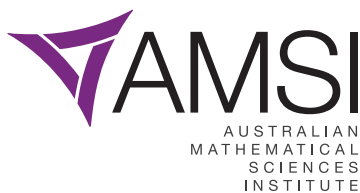




2015/16

BioInfoSummer

The University of Sydney
7 – 11 December 2015



Australian Government
Department of Education and Training



THE UNIVERSITY OF
SYDNEY

BioInfoSummer 2015 would like to thank our sponsors for all their support:

Gold



Australian Government
Department of Education and Training



EMBL
Australia



Silver



THE UNIVERSITY OF
SYDNEY

Bronze

DNA**nexus**



BioInfoSummer

The University of Sydney, 7 – 11 December 2015

2015

Introduction	3
Opening	4
Schedule	5
Speakers	6
Program Extras	8
Grant Awards	9
Event Highlights	10
Public Event	11
Participation Statistics	12
Student Profile	13
Meet The Speakers	14
BioInfoSummer AMSI Internship	16
Feedback	18
Director's Report	19
Media Release	20
Committees	21

01

Introduction

BioInfoSummer is one of AMSI's flagship higher education outreach programs. Over 200 researchers and students gathered at BioInfoSummer 2015 to increase their understanding and skill levels in bioinformatics, with an excellent panel of Australian and international keynote speakers.

Bioinformatics is an exciting, fast moving area, analysing and simulating the structures and processes of biological systems. It is a truly interdisciplinary field that uses mathematics, statistics and information technology to analyse large and complex biological datasets.

Bioinformatics plays a crucial role in our understanding of genes and cellular structure. In the health and medical fields, bioinformatics enables advances in areas such as drug discovery, diagnostics and disease management. Bioinformatics is also important in agriculture allowing the identification of unique adaptations, desirable properties and differences between populations.

BioInfoSummer provides bioinformatics training to students, researchers and others working in related areas. The 2015 event included both specialist lectures and hands on introductory and advanced computer workshops.



BioInfoSummer 2015 was officially opened with a message from Senator the Hon Simon Birmingham, Minister for Education and Training, inspiring participants in speaking of the Australian Government's support for bioinformatics.

"Inspiring students, researchers and professionals to pursue study and careers in fields such as bioinformatics, is crucial to the future of research and innovation in Australia.

That is why the Australian Government supports events such as this and is continuing to encourage the uptake of science, technology, engineering and mathematics subjects in schools, universities, and in vocational education and training.

You are at BioInfoSummer today because you share a common goal; to learn, to build networks, to share your work and your thoughts in this fascinating and important field of bioinformatics.

This week you will participate in a series of lectures and hands-on workshops, which I imagine will introduce you to new mathematical and biological concepts and enlighten you about recent bioinformatics advances in medical research.

I would like to recognise the work of AMSI in making the BioInfoSummer symposium series the success it is today, and to the presenters who will have you asking questions and stimulating your passion for research and science."

Monday 7 December

Introduction to Biology & Bioinformatics

A general introduction of biology for attendees with mathematics, statistics and computer science backgrounds, the session also covered introductory statistics for participants from a biology background.

Tuesday 8 December

Epigenomics

The future of epigenomics - how epigenetic information and genome-wide data is generated, why it is useful and an introduction to some of the methods used to analyse and evaluate the data.

Wednesday 9 December

Translational Genomics

This emerging field harnesses the power of new discoveries resulting from the Human Genome Project and applies them to the development of improved diagnostics, prognostics and therapies for cancer, neurological disorders, diabetes and other complex diseases.

Thursday 10 December

Microbiomics

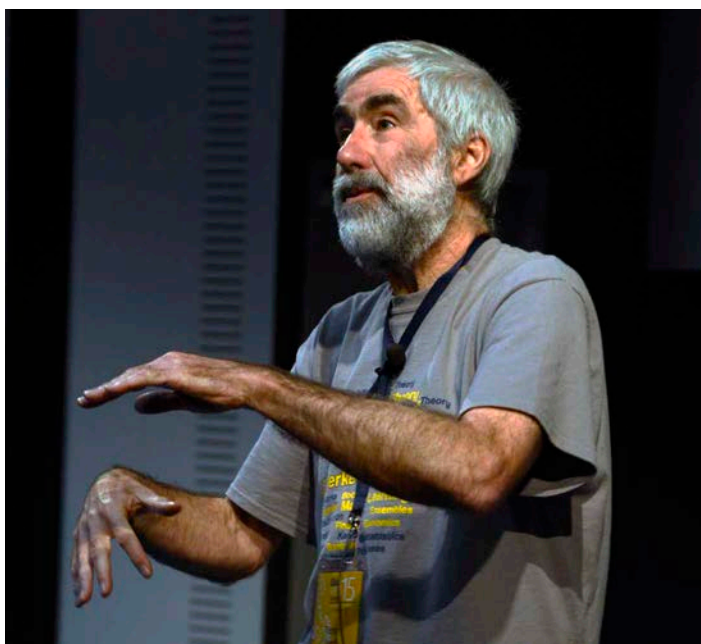
This rapidly expanding research field has shown that the human body is home to an entire ecosystem of bacteria, viruses, fungi, and other microbes that play an important role in regulating many physiological processes that have important implications in bioinformatics research.

Friday 11 December

Systems Biology, Networks & Data Integration

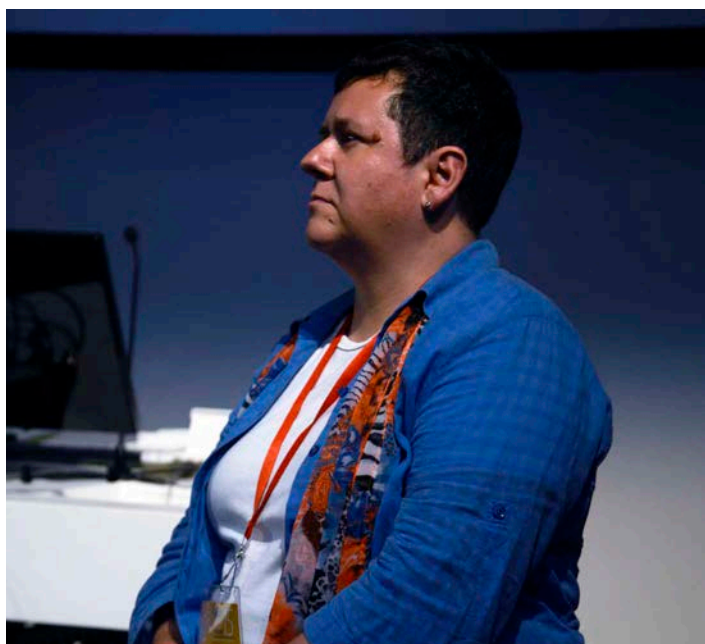
Biology-based interdisciplinary field of study that focuses on complex interactions within biological systems, using a holistic approach to biological and biomedical research.

Speaker	Talk	Organisation
Dr Judith Zaugg	<i>Integrative epigenomics: the genetic basis of variation in gene regulation and its link to complex diseases</i>	European Molecular Biology Laboratory
Professor Sue Clark	<i>Beyond the genome</i>	Garvan Institute of Medical Research
Professor Vanessa Hayes	<i>Complex genomic view of prostate cancer</i>	
Professor Sean O'Donoghue	<i>Data visualisation: a strategy for complex biological data</i>	
Professor Shoba Ranganathan	<i>Biomarker discovery in ovarian cancer – A systems approach</i>	Macquarie University
Dr Alicia Oshlack	<i>ChIP and chips: bioinformatics for epigenomics</i>	Murdoch Childrens Research Institute
Professor Susan Holmes	<i>Analysing multidimensional time course data for the analysis of the human microbiome.</i>	Stanford University
Dr Rachel Wang	<i>Gene coexpression measures in large heterogeneous samples using count statistics</i>	
Dr Mark Ibberson	<i>A systems biology approach to the study of type 2 diabetes (T2D)</i>	Swiss Institute of Bioinformatics
Professor Sue Wilson	<i>An introduction to statistics in the omics era</i>	The Australian National University
Professor Marc Wilkins	<i>Proteome-scale discovery of protein isoforms, including those predicted from RNA-seq analysis</i>	The University of New South Wales





Speaker	Talk	Organisation
Associate Professor Neville Firth	<i>Molecular biology crash course</i>	The University of Sydney
Professor David James	<i>Metabolic cybernetics</i>	
Dr Uri Keich	<i>Controlling the rate of false discoveries in tandem mass spectra identifications</i>	
Dr Peter Kim	<i>Dynamics of anti-cancer viruses and dendritic cell vaccines</i>	
Professor Claire Wade	<i>Beginning a selection program for working behaviour in the Australian Working kelpie</i>	
Associate Professor Katerina Kechris	<i>Metabolomics and translational research in pulmonary disease</i>	University of Colorado, Denver
Associate Professor Aaron Darling	<i>Statistical, computational, and laboratory techniques for deconvolving metagenomes into genomes</i>	University of Technology Sydney
Professor Keith Baggerly	<i>Genomics and ovarian cancer</i>	University of Texas, MD Anderson Cancer Centre
Dr Jerry Gao	<i>Visualization and analysis techniques for single cell haematopoietic lineage tracing</i>	Walter and Eliza Hall Institute of Medical Research
Professor Terry Speed	<i>The relentless march of technology: how to survive in a rapidly changing world</i>	
Dr Natalie Thorne	<i>Clinical bioinformatics – an introduction to an exciting new field</i>	



Special Session: Mathematical Biology

This session brought together four talks in mathematical biology. The talks presented examples of how one can use ordinary and partial differential equations and agent-based models to capture the dynamics of biological systems.

*Dynamical Systems and Biological Networks:
Integrating multiple experiments to get better models
and better understanding*

Dr Adelle Coster
University of New South Wales

Mathematical models for the formation of cell aggregates

Dr Edward Green
University of Adelaide

*The search for new drugs for malaria:
what makes a drug effective?*

Dr David Khoury
University of New South Wales

*Evolution of pathogens:
connecting within-host and between-host dynamics*

Associate Professor
Mark Tanaka
University of New South Wales

Wet Lab Workshops

The Wet Lab Session workshops were aimed at researchers who primarily work in silico, but provided the opportunity for all attendees to get a taste of what it is like to get their hands dirty in a molecular biology wet laboratory.



“Its multidisciplinary approach. I come from statistics and it was amazing to interact with academics and students from biology, chemistry, bioinformatics etc. I specially liked getting my hands dirty at the wet lab!”

Roy Costilla, **Victoria University of Wellington**

Travel Grants

AMSI, the Australian Bioinformatics and Computational Biology Society and EMBL Australia annually offer travel support for students to attend BioInfoSummer.

This year, fifteen students and early career researchers received travel awards:

- Clare Anstead, **The University of Melbourne**
- Hasseeb Azzawi, **Deakin University**
- Scott Booth, **Federation University Australia**
- Ankit Dutta, **The University of Adelaide**
- Kahli Flekac, **The University of Melbourne**
- Charles Gray, **La Trobe University**
- Brittany Howell, **The University of Adelaide**
- Cibir Joseph, **RMIT University**
- Cassandra Koh, **Monash University**
- Annelie Marquadt, **The University of Queensland**
- Heloisa Milioli, **The University of Newcastle**
- Seyed Mohammed Hossein Oloomi, **The University of Melbourne**
- Robert Qiao, **Flinders University**
- Gerard Terradas, **Monash University**
- Ingrid Wise, **Federation University**



EMBL
Australia



Choose Maths Grants

The Choose Maths Grants are designed to offer full or partial support for Australian female mathematical sciences students and early career researchers to participate in the AMSI higher education programs to build and extend their skills and professional networks. These grants provide financial funding to attend and/or assist with caring responsibilities.

These grants are funded by BHP Billiton Foundation and are an initiative of the Choose Maths Project.

In 2015, five students were awarded a Choose Maths Travel Grant to attend BioInfoSummer 2015:

- Rosemarie Herbert, **Monash University**
- Atma Ivancevic, **The University of Adelaide**
- Himel Nahreen Khaleque, **Curtin University of Technology**
- Farhana Sadia, **Monash University**
- Lu Zeng, **The University of Adelaide**

**CHOOSE
MATHS**



“As a molecular biologist learning bioinformatics, BioInfoSummer 2015 really provided a great starting foundation field. The hands on workshop tutorials gave me a flavour of the array of topics applicable in bioinformatics. It was also a great opportunity to network with computer science majors interested in computational biology.”

Ankit Dutta, **The University of Adelaide**

Poster Session Competition

Attendees were invited to showcase their research through a Poster presentation. This session in the program gave participants an opportunity to network and discuss their research with individuals from across the country in different areas of bioinformatics.

Fast Forward Presentations

Attendees were given 120 seconds to talk about their work with the aim of getting people interested in speaking to them about their poster in detail. This was an exciting new addition to the program; assisting students to perfect their 'elevator pitch'.

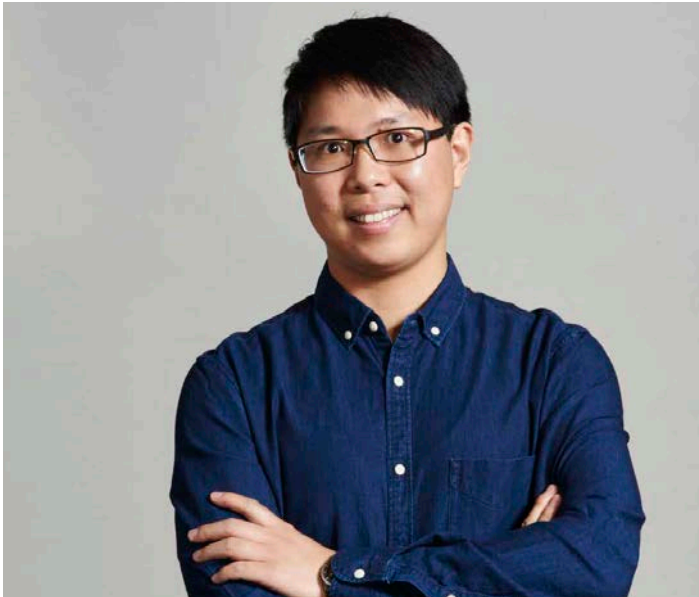
Prizes

Best Poster Session Presentation:

Heloisa Milioli,
University of Newcastle

Best Fast Forward Presentation:

Katherine Giles,
Garvan Institute of Medical Research



COMBINE Careers Panel

The careers panel session in the program is an opportunity for students to find out more about careers in bioinformatics and to engage the wider community. The COMBINE careers panel, showcased how to get a career in the bioinformatics space industry. Various queries from the students were tackled by a group of experts currently in that field, giving them insight and specialist industry knowledge.

Panel included:

- Professor David James, **The University of Sydney**
- Dr Joshua Ho, **The University of New South Wales**
- Dr Rachel Wang, **Stanford University**
- Professor Shoba Ranganathan, **Macquarie University**

Women in Science Networking Event

The Women in Science lunchtime networking event was held on Tuesday 8 December at The University of Sydney, highlighting the contribution of women in mathematics and science, which provided a forum for discussion of career paths.

Panel included:

- Dr Alicia Oshlack, **Murdoch Childrens Research Institute**
- Professor Susan Holmes, **Stanford University**
- Dr Eleni Giannoulatou,
Victor Chang Cardiac Research Institute
- Dr Juidith Zaugg, **European Molecular Biology Laboratory**



How Bioinformatics is Revolutionising Cancer Research

Professor Jacqui Ramagge from the School of Mathematics and Statistics at The University of Sydney hosted the Maths Saves Lives panel discussion, examining the exciting new field of 'forensic bioinformatics' and its role in protecting the integrity of cancer research to deliver sound outcomes for scientists, clinicians and patients.

Panel included:

- Professor Keith Baggerly,
MD Anderson Cancer Centre
- Professor Graham Mann,
Westmead Institute and The University of Sydney
- Associate Professor Jean Yang,
The University of Sydney

Professor Keith Baggerly talked about his forensic analysis of data published by Dr Anil Potti, from Duke University, which revealed issues and caused a retraction of the papers, cancellation of the clinical trial based on the research, and an investigation of scientific misconduct on Dr Potti.

The panel session and audience Q&A session followed the presentation with lively discussion and debate between the panel and the audience.

In the Media

Professor Keith Baggerly interviewed by Ros Childs on ABC TV News24, simulcast on ABC TV Channel 2
9 December, ABC News

Maths Saves Lives

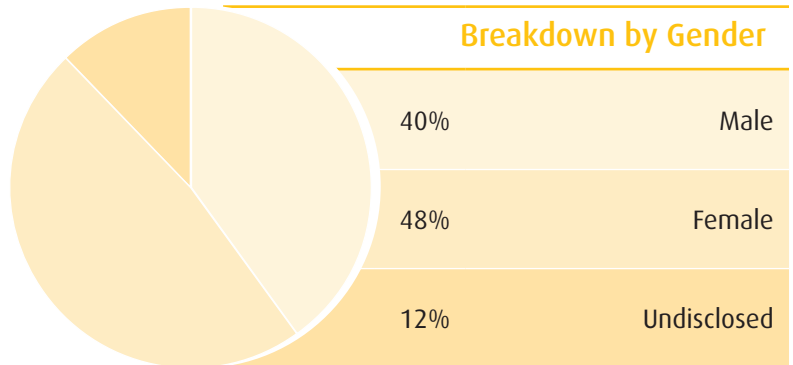
Panel Discussion



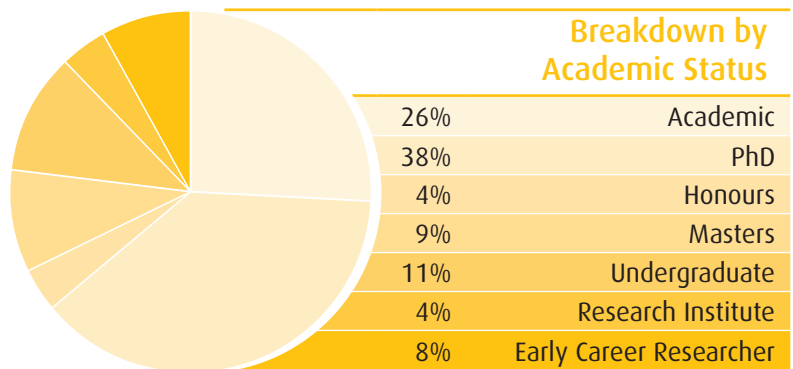
Enrolments by Institution

Children's Medical Research Institute	1
CSIRO	4
Curtin University of Technology	2
Deakin University	3
Defence Science and Technology Group	2
Edith Cowan University	1
European Molecular Biology Laboratory	1
Federation University Australia	1
Flinders University	2
Fujian Agriculture and Forestry University (China)	1
Garvan Institute of Medical Research	2
Humboldt State University (United States)	1
Iowa State University (United States)	1
La Trobe University	2
Macquarie University	4
MD Anderson Cancer Research Centre (United States)	1
Monash University	9
Murdoch Childrens Research Institute	1
Murdoch University	2
Neuroscience Research Australia	1
O'Donoghue Lab	1
Queensland University of Technology	1
RMIT University	2
SIB Swiss Institute of Bioinformatics (Switzerland)	1
Stanford University (United States)	2
The Australian National University	3
The Catholic University of Korea (South Korea)	5
The University of Adelaide	9
The University of Melbourne	9
The University of New England	1
The University of New South Wales	31
The University of Newcastle	5
The University of Queensland	3
The University of Sydney	83
University of Canberra	1
University of Colorado (United States)	1
University of Moratuwa (Sri Lanka)	2
University of South Australia	1
University of Southampton (England)	2
University of Southern Queensland	1
University of Technology Sydney	6
University of Western Sydney	9
University of Wollongong	2
Victoria University	1
Walter & Eliza Hall Institute of Medical Research	4
Total	228

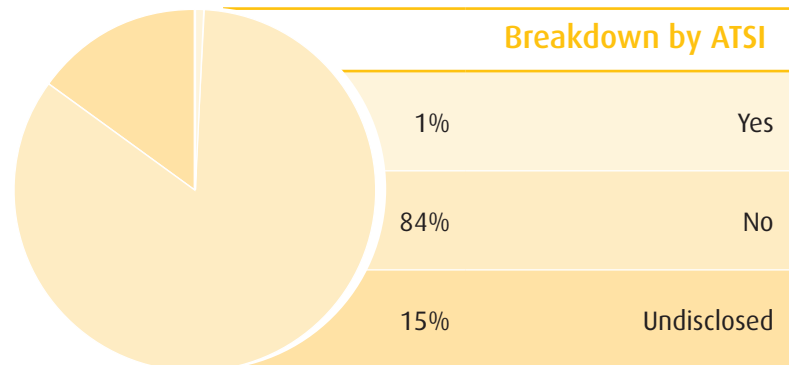
Breakdown by Gender



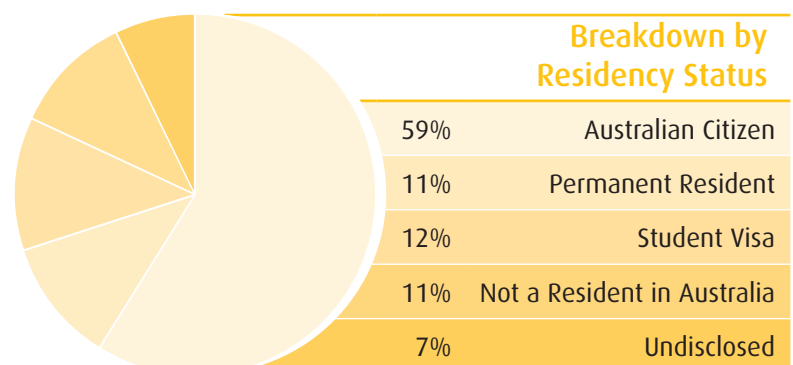
Breakdown by Academic Status



Breakdown by ATSI



Breakdown by Residency Status



Statistical genomics might seem a million miles from life as a gigging musician and teaching piano, but according to PhD student and AMSI BioInfoSummer 2015 participant, Charles Gray, music and maths have a great deal in common.

“It isn’t strange or far fetched for a musician to become a mathematician. In retrospect, it was music’s mathematical axioms I liked the most,” she explains.

Anything but traditional, Charles’ maths journey started with a desire for greater stability. After a decade in music, a degree in musicology and a Bachelor of Arts with majors in cinema studies and literature, she decided to study Pure Mathematics. Having completed her honours she was drawn to the practicality of biostatistics and decided to complete a PhD in Statistical Genomics. A smooth transition she credits in part to AMSI.

“I always wanted to do maths but didn’t have the courage to try until my thirties. I love pure maths but it is increasingly competitive and I was drawn to biostatistics as it plays to my creative strengths and has wider career options. I also love its cross-disciplinary nature and the daily variety,” Charles explains.

Her recent experience at AMSI’s week-long bioinformatics and mathematical and computational biology research training event, BioInfoSummer has left her in no doubt that she has made the right decision. Hoping for a better understanding of key statistical models and tools used for DNA methylation analysis, Charles left a step ahead and with her expectations well and truly exceeded.

“BioInfoSummer provided a great foundation for my PhD. I can’t think of anywhere else where you can access a week of bioinformatics talks and workshops perfectly pitched to someone with my level of mathematics and biology,” she says.

In particular, a workshop with the University of Newcastle’s Dr Garth Tarr had a profound impact on her transition to bioinformatics and PhD studies.



Charles Gray

La Trobe University

“I was so inspired by Dr Garth Tarr’s data visualisation workshop, I spent the rest of summer learning as much as possible about new R packages. Impressed with my knowledge, my supervisor asked me to give a guest lecture on data visualisation.”

As well as opening career pathways, the switch to bioinformatics has given Charles a sense of belonging as part of Australia’s fraternity of medical discovery. In particular the support she has received within the maths community.

“After surviving from gig to gig as a musician, the support I have received has been incredible. AMSI has been an ever present entity in my world opening up opportunities such as a Vacation Research Scholarship at Walter Eliza Hall Institute and its world class training events,” she says.

As she catches up on biology and progresses her PhD research to minimise effects in the measurement of DNA methylation, a mechanism that activates cells that is of particular interest in epigenetics and cancer research, she continues to draw on the her BioInfoSummer experience.

“Not only has it provided a great foundation for my PhD, but I continue to benefit from the great connections I made within the field. Just recently I was having a bad day and was able to ring a BioInfoSummer friend for a virtual coffee. It makes such a difference to not only be able to share knowledge and skills but draw on much needed support as part of a community.”

Professor Shoba Ranganthan

Macquarie University

Professor Shoba Ranganthan gave lectures on biomarker discovery in ovarian cancer during BioInfoSummer, and she also gave us five minutes of her time to explain why she specialised in this area.

Q. What do you think are the most interesting “big questions” in your field?

Using -omics data to actually provide personalised health care.

Q. Please tell us about your research interests and what you are currently working on.

We are currently working on understanding the driving forces behind protein-protein interactions, finding the “missing” proteins in the human proteome and in designing candidate peptide vaccines and small molecule inhibitors.

Q. Do you have favourite applications of your work and what is the impact of these applications?

Yes, we identified a specific protein-protein interface by structural modelling and docking implicated in metastasis, which is abrogated by the interface peptide from one of the proteins. This is a possible therapeutic strategy and we are very excited about this. Also, GWAS studies implicated a rare MHC Class II allele and we were contacted by the authors of this study to suggest candidate T cell epitope peptides, which will suppress T cell activation. This is a difficult task and we are working on it.



Q. Why did you choose this career?

I trained as a quantum chemist way back in 1983. In order to find practical applications of this training, I embarked on a post-doc in theoretical biochemistry in France and have been working in the area since then – it now has a new name: bioinformatics.

Q. Can you tell us about the highlight of your career so far?

The single most rewarding study has been predicting biomarkers for ovarian cancer – one of the candidate genes has been independently confirmed and we are waiting on results for the other predicted candidate genes.

Dr Rachel Wang

Stanford University

Dr Rachel Wang spoke under the theme of translational genomics at BioInfoSummer 2015. We chatted to her about her interests, her work and her reason for choosing a career in Bioinformatics.

Q. What do you think are the most interesting “big questions” in your field?

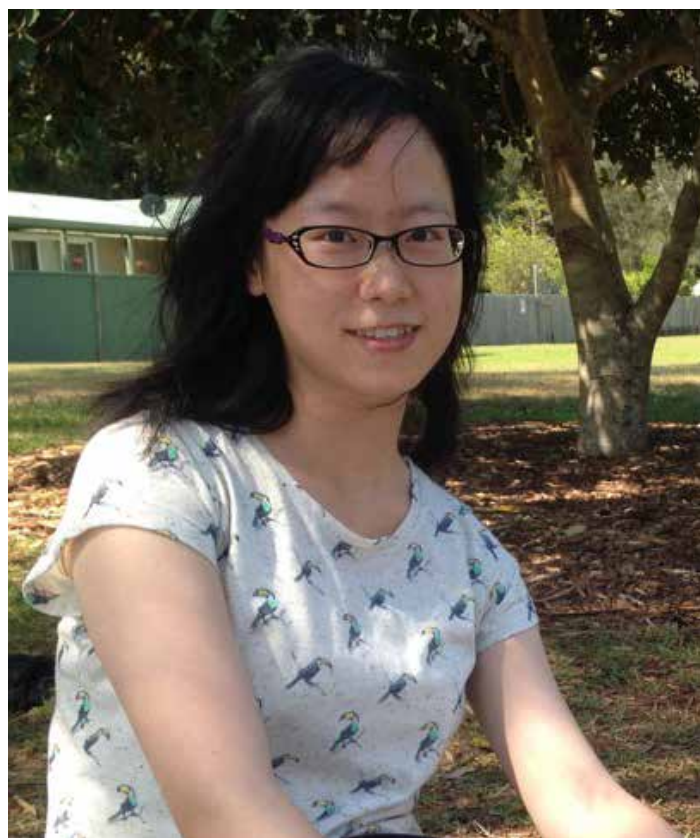
Network modelling has been an intense area of research interest in a number of fields including statistics, probability, and computer science. Important questions include reconstruction of network edges from covariates, statistical inference of network models, incorporating node features for improved inference, network denoising, and the list goes on.

Q. Please tell us about your research interests and what you are currently working on.

I am interested in inferring various biological networks using genomic data and applying random graph models to the constructed networks. I am also working on statistical inference problems for stochastic block model and its variants.

Q. Do you have favourite applications of your work and what is the impact of these applications?

The study of biology has seen a fast-expanding effort to analyse individual biological components in the context of large-scale, complex networks with interacting constituents. Successful applications can help elucidate the nature of complex biological processes and disease mechanisms in a variety of organisms. Some examples include mapping out gene-gene interactions, annotating regulatory elements on the human genome, and studying the 3D folding of DNA.



Q. Why did you choose to study statistics?

Statistics offers a perfect blend of theory and application. The maths can go as deep as you like; there are also numerous real world applications in which theoretical work can have an immediate and far-reaching impact.

Since 2012, EMBL Australia has supported AMSI internship placements linked to BioInfoSummer. The program builds research-industry partnerships and establishes long-term industry-research partnerships in bioinformatics.

The Intern, Dr David Price

Albert Einstein once said, "In theory, theory and practice are the same. In practice, they are not."

This truth is not lost on Dr David Price, who recently discovered the challenges of industry thanks to an AMSI Intern placement with SA Pathology. The then PhD student provided applied statistics expertise to improve outcomes for Chronic Myeloid Leukaemia patients through tailored treatment plans.

"The internship was the first time I had properly worked with non-statistical research scientists on a project. Adding to the challenge it was also an unfamiliar research area, which required close collaboration with experts outside my field," Dr Price explains.

With industry engagement a big part of the job for applied statisticians, David welcomed the chance to gain experience under the guidance of his University of Adelaide supervisor and mentor, Dr Jonathan Tuke. A former veterinarian, Jonathan's biology background and understanding of industry proved invaluable.

"I was excited to take on this challenge with him, as I know he is a fantastic supervisor and mentor. As well as valuable insights from his background and personal experience, he was always there to provide support as needed".

Jonathan also worked closely with David to develop his soft-skills such as time management, planning, data storage and cross-discipline communication.

Intern:
Dr David Price
University of Cambridge

Mentor:
Dr Jonathan Tuke
University of Adelaide

Industry Partner:
SA Pathology

"This experience has given me the skills and confidence to seek cross-discipline consulting opportunities in the future. Jonathan's insights regarding industry, best consulting practices and communication with non-statistical research scientists were invaluable."

After years of focusing on tools and methodology, the internship helped David understand the value of his statistics expertise as he put theory into practice.

"This project showed me how the skills and knowledge I have gained through my studies could be applied to deliver practical outcomes. It was a chance to visit the other side of industry engagement and work on a real-world problem but with a safety net."

As he steps into a postdoctoral role at the University of Cambridge he will have ample opportunity to make use of the skills he developed through AMSI Intern.

"At Cambridge, I will be working closely with biologists, and the experience through AMSI Intern will mean I am able to communicate effectively and establish their needs and preferences as I progress my project."

As for future endeavours with Jonathan, he makes it clear the door is well and truly open.

"Jonathan has made it clear he is available if I need anything. He is someone I thoroughly enjoy working with and would love to do so again in the future if possible."

The Mentor, Dr Jonathan Tuke

Summing up the challenge of applying academic theory in the real world, University of Adelaide statistics lecturer and former veterinarian, Dr Jonathan Tuke draws on personal experience, “books don’t bite but dogs do.”

As a veterinary science graduate, it was only after months on the job and more than a few bites and scratches that he felt he was a vet. The same can be said for his current field of statistics, says Jonathan, with the divide between theory and practical application just as wide.

“So often in practical application, statistical theory and modelling collapse under the wings of reality. Suddenly you are in the real world with all the variables and challenges that brings.”

When he was given the opportunity to act as an Academic Mentor on a project with AMSI Intern industry partner, SA Pathology, Jonathan immediately thought of student and collaborator, David Price. Now nearing the end of his PhD, the internship was the perfect opportunity for David to gain exposure to statistics in the real world.

“We provide PhD students with strong theoretical and academic background, but not the understanding of the real-life application of their work. AMSI Intern was the ideal platform to address this for David through industry exposure and soft skill development.”

“This project has been a great stepping stone for further conversation with SA Pathology and involvement in their research. They now have a better idea of what I can do and how statistics can benefit their work.”

Dr Jonathan Tuke, **University of Adelaide**

Leaving David to drive the project, Jonathan used his mentor role to provide support and guide him on industry best practice, as well as tools of the trade. Thanks to his biology background, he was also able to help facilitate cross-discipline communication.

“Working in statistics, you invariably end up working in someone else’s backyard. My role was to equip David with the skills and confidence to work with non-statistical researchers as well as solve problems within industry environments.”

Jonathan also hopes the experience will shape David’s approach when he trains the next generation of statisticians.

“When he comes to teaching his own students, I hope he will in turn harness opportunities such as AMSI Intern to direct them towards consulting.”

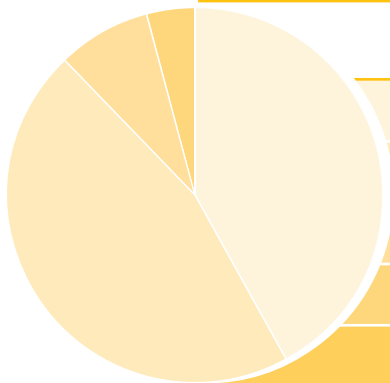
There were also benefits for Jonathan. A closer relationship with SA Pathology has opened doors for future consultation and opportunities for other students.

“This project has been a great stepping stone for further conversation with SA Pathology and involvement in their research. They now have a better idea of what I can do and how statistics can benefit their work.”

As for whether he has played any role in David’s success – he has recently taken up a postdoctoral position with the University of Cambridge – Jonathan gives his student all the credit.

“David is not only a skilled statistician but a great communicator. I have just been lucky enough to steer him in the right direction.”

The Content Presented Was Relevant To My Needs



STRONGLY AGREE

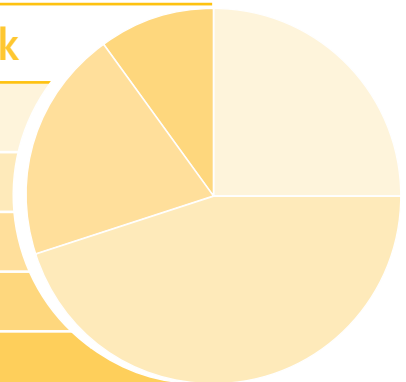
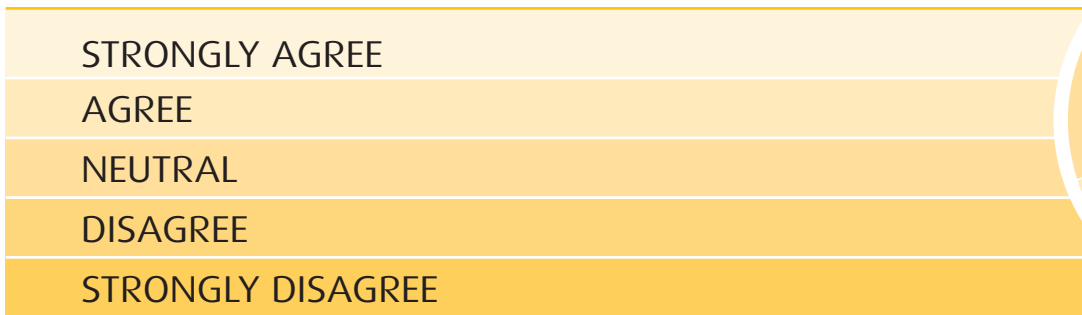
AGREE

NEUTRAL

DISAGREE

STRONGLY DISAGREE

I Found The Social Events A Good Opportunity To Network



STRONGLY AGREE

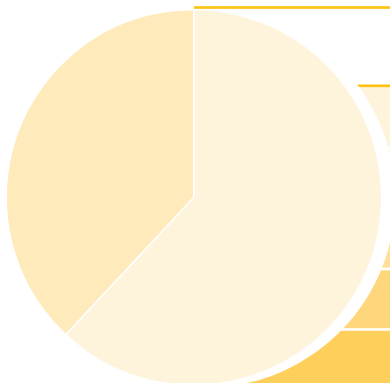
AGREE

NEUTRAL

DISAGREE

STRONGLY DISAGREE

The Presentations Were Professional & Engaging



STRONGLY AGREE

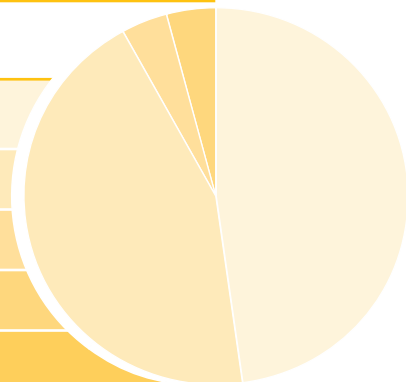
AGREE

NEUTRAL

DISAGREE

STRONGLY DISAGREE

I Would Recommend BioInfoSummer



STRONGLY AGREE

AGREE

NEUTRAL

DISAGREE

STRONGLY DISAGREE

Sydney's first ever BioInfoSummer workshop was co-hosted by the University of Sydney's School of Mathematics and Statistics together with the Charles Perkins Centre (CPC). The CPC is a new research centre specially designed to support and foster multidisciplinary research and was an absolutely ideal venue to host this workshop. With an active and growing community of bioinformatics-orientated researchers, this year's workshop had the largest number of participants to date with well over 200 people registered.

“...this year's workshop had the largest number of participants to date with well over 200 people registered.”

The committee ensured that our program was well represented from a variety of scientific backgrounds as well as good representation of early and mid-career researchers. Furthermore, we had a program with equal gender representation and over 50% female participants.

Extending from previous years' models, we offered multiple parallel lab sessions in the afternoons tailoring to various backgrounds and interests with the largest lab sessions accommodating over 100 participants. We are fortunate to have a team of outstanding local volunteers to assist with the many lab sessions running smoothly and effectively.

This year also saw the first ever introduction of wet lab experience for computational students, placing BioInfoSummer towards a path of a genuinely interdisciplinary summer school experience. We are very grateful to the School of Biological Sciences for providing the lab environment, equipment and materials for such a unique and rewarding afternoon. Special thanks to Associate Professor Neville Firth who patiently



explained the various biological procedures to a crowd of excited mathematicians and statisticians. The overwhelmingly positive feedback we received was that everyone enjoyed the experience and this aspect is certainly something to continue in future BioInfoSummer events.

Jean Yang
BioInfoSummer 2015 Director
The University of Sydney

Mathematics helping reduce the cost of diabetes

SYDNEY, NEW SOUTH WALES

Friday, 4 December 2015

With an ageing population and obesity crisis, Type 2 diabetes costs Australian taxpayers over \$1.7 billion per year. Hoping to save lives and dollars, Australian researchers believe they have opened the door to diagnosing insulin resistance (IR), one of the earliest predictors of the disease.

The team, including AMSI BioInfoSummer 2015 speakers and Charles Perkins Centre at the University of Sydney diabetes researchers, Professor David James and Dr Rima Chaudhuri, have used the power of mathematics to identify a set of genes they believe is able to discriminate between insulin sensitivity and resistance.

“Currently there is no way to diagnose insulin resistance, a key indicator of type 2 diabetes. Excitingly this gene set appears to perform better than existing crude measures such as BMI, waist-hip ratio and blood glucose levels,” says Professor David James.

Published in leading journal, *Nature Systems Biology & Applications*, the research led by Dr Chaudhuri used cutting-edge computational approaches to develop a gene signature for insulin sensitivity (a pattern of genetic expression that describes how the body responds to insulin). While still in the early stages, initial predictive modelling based tests has indicated promise for clinical application following further investigation.

“The ability to identify at risk individuals and prevent onset of type 2 diabetes through measures such as diet and exercise could significantly reduce the health and economic impacts of not only the disease itself but its associated complications.”

The research highlights the growing role of bioinformatics in analysing and modelling biological structures and processes as new technology platforms increase the amount of data produced by researchers. Experts such Professor James and Dr Chaudhuri are playing an increasing role in driving health innovation and discovery.

The rapid pace of technological advancement continues to fuel demand for bioinformatics to analyse and apply large volumes of data. Leading Australian and global bioinformaticians create a unique training experience at AMSI BioInfoSummer, exposing students, researchers and field professionals to the cutting edge of mathematical and computational biology.

“The Australian Mathematical Sciences Institute (AMSI) sets the gold standard for cross-discipline research training infrastructure. Programs such as AMSI BioInfoSummer help skill researchers to drive innovation in industry to position Australia as a global STEM leader,” says AMSI Director, Professor Geoff Prince.

A MSI wishes to acknowledge the generous donation of time and scientific advice of the following committees - without their contribution this event would not be a success.

Local Organising Committee (The University of Sydney)

Gemma Ashton
Charles Perkins Centre

Rima Chaudhuri
Charles Perkins Centre

Sanjaya Dissanayake
School of Mathematics and Statistics

Peter Kim
School of Mathematics and Statistics
(Mathematical Biology)

Mary Myerscough
School of Mathematics and Statistics
(Mathematical Biology)

Lake-Fe Quek
Charles Perkins Centre

Fatemeh Vafae
Charles Perkins Centre

Organising Committee

Jean Yang
The University of Sydney
AMSI Summer School 2016 Director

Nicola Armstrong
Murdoch University

Simi Henderson
Australian Mathematical Sciences Institute

Standing Committee

Nicola Armstrong
Murdoch University

Gary Glonek
The University of Adelaide

Simi Henderson
Australian Mathematical Sciences Institute

Barbara Holland
University of Tasmania

Jonathan Keith
Monash University

Alicia Oshlack
Murdoch Childrens Research Institute

Ville-Petteri Makinen
Helsinki University of Technology

Geoff Prince
Australian Mathematical Sciences Institute

Matt Ritchie
Walter and Eliza Hall Institute of Medical Research

Jean Yang
The University of Sydney



AMSI WINTER SCHOOL 16

ON BIOLOGICAL & ENVIRONMENTAL MODELLING

4-15 JULY | THE UNIVERSITY OF QUEENSLAND

In the twenty-first century, modelling is a crucial research tool for studying complex phenomena and processes.

Our impressive line-up of speakers will build your knowledge of models, algorithms, theoretical analysis tools and topical applications, from molecular biology through to ecosystems analysis.

FULL TRAVEL GRANTS AVAILABLE!

OUR "SECOND BRAIN": MODELLING ITS DEVELOPMENT & DISEASE

Kerry A Landman, The University of Melbourne

USING A.I., NETWORKS THEORY & BUTCHERS PAPERS TO CONSERVE SPECIES

Eve McDonald-Madden, The University of Queensland

THE MATHEMATICAL MODELLING OF CHEMOTAXIS

Graeme Pettet, Queensland University of Technology

MATHEMATICAL APPROACHES TO CONSERVATION BIOLOGY

Hugh Possingham, The University of Queensland

THE DYNAMICS OF CALCIUM: THE INTERACTION OF MODELLING & EXPERIMENTS

James Sneyd, The University of Auckland

REGISTER [AMSI.ORG.AU/WS](https://amsi.org.au/ws)

AMSI RESEARCH

AMSI 16

BIOINFO SUMMER

28 NOV - 2 DEC

THE UNIVERSITY OF ADELAIDE

AMSI BIOINFOSUMMER introduces bioinformatics to students, researchers & professionals working in mathematics, statistics, IT, medical sciences, biological & chemical engineering

INTERNATIONAL SPEAKERS:

ONLY ALTER The University of Utah

SIMON ANDERS Institute for Molecular Medicine Finland

MINGYAO LI University of Pennsylvania

STEPHEN TURNER Pacific Biosciences

XIA YANG University of California, Los Angeles

THEMES:

INTRODUCTION TO BIOINFORMATICS

ANALYSIS OF HIGH DIMENSIONAL DATA

RNA SEQ EXPERIMENTAL DESIGN & ANALYSIS

USING LONG READ SEQUENCING FOR WHOLE GENOME ASSEMBLY

CODING FOR BIOINFORMATICS

REGISTER:

AMSI.ORG.AU/BIS

IMAGE: OVERLAPS BETWEEN
KNOWN BIOLOGICAL PROCESSES
BY VILLE-PETTERI MÄKINEN, SAHMRI

AMSI RESEARCH

AMSI SUMMER SCHOOL 17

IN THE MATHEMATICAL SCIENCES

9 JAN - 3 FEB 2017

THE UNIVERSITY OF SYDNEY

CATEGORY THEORY & COMPUTER SCIENCE

Richard Garner & Dominic Verity, Macquarie University

COMPUTATIONAL BAYESIAN STATISTICS

Scott Sisson, The University of New South Wales

COMPUTATIONAL MATHEMATICS

Markus Hegland, The Australian National University

GEOMETRIC GROUP THEORY

Lawrence Reeves, The University of Melbourne
& Anne Thomas, The University of Sydney

HARMONIC ANALYSIS

Pierre Portal, The Australian National University

MATHEMATICAL BIOLOGY

Mary Myerscough, The University of Sydney

MATHS & STATS OF BIG DATA

Kerrie Mengersen, Queensland University of Technology

OPTIMISATION

Michelle Dunbar, The University of Sydney

REGISTER:

AMSI.ORG.AU/SS

AMSI RESEARCH

AMSI
VACATION
RESEARCH
SCHOLARSHIPS

2016/17



APPLY
FOR AN
AMSI RESEARCH
SCHOLARSHIP



Australian Government
Department of Education and Training



AMSI.ORG.AU/VRS

Australian Mathematical Sciences Institute

Research & Higher Education
Building 161, c/- The University of Melbourne,
Victoria 3010 Australia

events@amsi.org.au
www.amsi.org.au

