



POSITION DESCRIPTION

School of Mathematics and Statistics
Faculty of Science

Research Fellow in Optimization and Machine Learning of Flows in Complex Networks

POSITION NO	0043594
CLASSIFICATION	Research Fellow Level A
SALARY	\$66,809 - \$90,657 p.a. (Level A PhD entry level \$84,458 p.a.)
SUPERANNUATION	Employer contribution of 9.5%
WORKING HOURS	Full-time
BASIS OF EMPLOYMENT	Fixed term for a period of 2 years
OTHER BENEFITS	http://about.unimelb.edu.au/careers/working/benefits
HOW TO APPLY	Online applications are preferred. Go to http://about.unimelb.edu.au/careers , select the relevant option ('Current Staff' or 'Prospective Staff'), then find the position by title or number.
CONTACT FOR ENQUIRIES ONLY	Name Antoinette Tordesillas Tel +61 3 8344 9685 Email atordes@unimelb.edu.au <i>Please do not send your application to this contact</i>

For information about working for the University of Melbourne, visit our website:
about.unimelb.edu.au/careers

Position Summary

This research position is part of a new research program in complex systems data analytics. The program is a joint venture between the School of Mathematics and Statistics (M&S) of the Faculty of Science and the School of Computing and Information Systems (CIS) of the Melbourne School of Engineering. Broadly, this program seeks to strengthen the link between mathematics, statistics and computer science in the area of complex systems data analytics. Specifically, its mission is to contribute to the development of mathematical models and efficient algorithms for data-driven characterization, modelling and optimization of networked complex systems.

As part of this program, the Research Fellow is expected to undertake high level methodological and theoretical research that is directed towards understanding, design and applications of resilient networked systems. The research is multidisciplinary and the Research Fellow will be expected to draw concepts and techniques from one or more of the following areas: optimization, complex networks, dynamical systems and data mining/machine learning techniques for analytics. Problems to be addressed may include: characterization and early prediction of vulnerabilities, bottlenecks and failure in node/link-capacitated networks; network redundancy optimization; and anomaly detection and explanation.

The Research Fellow will be based in the School of Mathematics and Statistics (M&S) and will work closely with a multidisciplinary research team comprising Prof. Antoinette Tordesillas (M&S), Dr. Benjamin Rubinstein (CIS), Prof. James Bailey (CIS), Dr. Charl Ras (M&S), and some of their PhD students. This team has broad expertise in the analysis of data from a wide range of real complex systems including infrastructure, communication and materials systems. The successful applicant will report to Prof. Tordesillas (M&S).

1. Key Responsibilities

- ▶ Conduct internationally competitive research and produce conference and seminar papers and publications from that research.
- ▶ Contribute ideas to the development and application of analytics tools for a diverse suite of complex systems.
- ▶ Contribute to the development and implementation of the data management plan, including determining how data may be stored, backed up and archived.
- ▶ Co-supervise, or where appropriate, supervise major postgraduate research projects and minor undergraduate research projects within the position's area of research.
- ▶ Administrative functions primarily connected with his/her area of research
- ▶ Subject to availability of funds, participate in professional activities including attendance at conferences and seminars in the field of expertise.
- ▶ Contribution to the preparation, or where appropriate, individual preparation of research proposal submissions to external funding bodies.
- ▶ Occupational Health and Safety (OH& S) and Environmental Health and Safety (EH&S) responsibilities as outlined below.

2. Selection Criteria

2.1 ESSENTIAL

- ▶ Completion, or near completion, of a PhD in Mathematics, Computer Science, Statistics or an associated discipline. If near completed, submission of the PhD by the date of commencement in the position.
- ▶ Ability to code in Python, Matlab or R.
- ▶ Demonstrated ability to undertake high quality research, with a sound publication record.
- ▶ Demonstrated ability to manage competing priorities and excellent time management skills.
- ▶ Excellent oral and written communication skills in English.
- ▶ Strong interpersonal skills, including demonstrated ability to work co-operatively in a multi-disciplinary team environment and liaise with associates from diverse range of stakeholders.
- ▶ Ability to undertake and to initiate new research ideas and directions.
- ▶ Ability to show initiative and work independently on day-to-day research activities

2.2 DESIRABLE

- ▶ Experience in complex systems science
- ▶ Evidence of, or potential in, honours and graduate student supervision.
- ▶ A track record in the preparation of grant applications.

3. Equal Opportunity, Diversity and Inclusion

The University is an equal opportunity employer and is committed to providing a workplace free from all forms of unlawful discrimination, harassment, bullying, vilification and victimisation. The University makes decisions on employment, promotion and reward on the basis of merit.

The University is committed to all aspects of equal opportunity, diversity and inclusion in the workplace and to providing all staff, students, contractors, honorary appointees, volunteers and visitors with a safe, respectful and rewarding environment free from all forms of unlawful discrimination, harassment, vilification and victimisation. This commitment is set out in the University's People Strategy 2015-2020 and policies that address diversity and inclusion, equal employment opportunity, discrimination, sexual harassment, bullying and appropriate workplace behaviour. All staff are required to comply with all University policies.

The University values diversity because we recognise that the differences in our people's age, race, ethnicity, culture, gender, nationality, sexual orientation, physical ability and background bring richness to our work environment. Consequently, the People Strategy sets out the strategic aim to drive diversity and inclusion across the University to create an environment where the compounding benefits of a diverse workforce are recognised as vital in our continuous strive to service for excellence and reach the targets of Growing Esteem.

4. Occupational Health and Safety (OHS)

All staff are required to take reasonable care for their own health and safety and that of other personnel who may be affected by their conduct.

OHS responsibilities applicable to positions are published at:

<http://safety.unimelb.edu.au/topics/responsibilities/>

These include general staff responsibilities and those additional responsibilities that apply for Managers and Supervisors and other Personnel.

5. Other Information

5.1 ORGANISATION UNIT

<http://www.ms.unimelb.edu.au>

The University of Melbourne's School of Mathematics and Statistics is one of Australia's leading mathematics and statistics schools. It has achieved this status through the high quality of its research and teaching programs. The School offers a wide range of subjects to undergraduate and postgraduate students and is involved in aspects of community life that impact on the interests of the School and the discipline.

The School of Mathematics and Statistics has a total of 57 continuing teaching and/or research staff; 27 research only staff and consultants; 5 teaching specialists, 3 academic specialists; and 12 support staff. The School has over 100 casual and honorary staff. In 2016, there were 88 Research Higher Degree and 78 Coursework Master of Science students. Four members of the School staff and one Emeritus Professor are members of the Academy of Science.

Infrastructure support for research and basic information technology facilities are provided to all members of the department. Special facilities such as high end workstations and salaries for research fellows are supported through individual competitive external research grants. Members of the School have had considerable success at attracting support from the Australian Research Council. The school hosts two ARC Centres of Excellence, has one ARC Laureate Fellow, two ARC Future Fellows and two DECRA Fellows.

It is one of the objectives of the University to develop and maintain a strong international profile. In this context, members of the School have strong collaborative links with colleagues in the United States of States of America, most countries in Europe and the Asia-Pacific region.

5.2 BUDGET DIVISION

<http://www.science.unimelb.edu.au>

Science at the University of Melbourne is the most highly ranked Faculty of Science in Australia.* Science is defined by its research excellence in the physical and life sciences and is at the forefront of research addressing major societal issues from climate change to disease. Our discoveries help build an understanding of the world around us.

We have over 150 years of experience in pioneering scientific thinking and analysis, leading to outstanding teaching and learning and offer a curriculum based on highly

relevant research, which empowers our STEM students and graduates to understand and address complexities that impact real world issues and the challenges of tomorrow.

We aspire to engage the broader community with the impact that Science has on our everyday lives. Through the strength of our internships and research project offerings, our students are provided opportunities to engage with industry partners to solve real-world issues.

The Faculty of Science has over 50,000 alumni and is one of the largest faculties in the University comprising seven schools: BioSciences, Chemistry, Earth Sciences, Ecosystem and Forest Sciences, Geography, Mathematics and Statistics, and Physics.

The Faculty is custodian of the Bio21 Molecular Science and Biotechnology Institute, Office for Environmental Programs and home to numerous Centres.

Science manages more than \$290 million of income per annum, with a staff base in the order of 270 professional staff, and more than 580 academic staff.

We offer a range of undergraduate, honours, graduate and research degrees; enrolling over 8,600 undergraduate and 2,440 graduate students. The Faculty of Science is the custodial Faculty for the BSc (Bachelor of Science). The Faculty of Science is a leader in research, contributing approximately \$70 million in HERDC income per annum. The Faculty of Science is highly research focused, performing strongly in the ARC competitive grants schemes, often out-performing the national average. The Faculty of Science is currently growing its competitiveness and standing in the NHMRC space.

The Faculty of Science provides community services and industry partnerships based on a solid foundation of research in the pure and applied sciences. The Faculty has an endowment of approximately \$56 million. The annual income from the endowment supports more than 120 prizes, scholarships and research awards.

*Figures from the latest available data for 2015, including published international rankings data.

5.3 THE UNIVERSITY OF MELBOURNE

Established in 1853, the University of Melbourne is a leading international university with a tradition of excellence in teaching and research. The main campus in Parkville is recognised as the hub of Australia's premier knowledge precinct comprising eight hospitals, many leading research institutes and a wide-range of knowledge-based industries. With outstanding performance in international rankings, the University is at the forefront of higher education in the Asia-Pacific region and the world.

The University employs people of outstanding calibre and offers a unique environment where staff are valued and rewarded.

Further information about working at The University of Melbourne is available at <http://about.unimelb.edu.au/careers>.

5.4 GROWING ESTEEM, THE MELBOURNE CURRICULUM AND RESEARCH AT MELBOURNE: ENSURING EXCELLENCE AND IMPACT TO 2025

Growing Esteem describes Melbourne's strategy to achieve its aspiration to be a public-spirited and internationally-engaged institution, highly regarded for making distinctive contributions to society in research and research training, learning and teaching, and engagement. <http://about.unimelb.edu.au/strategy-and-leadership>

The University is at the forefront of Australia's changing higher education system and offers a distinctive model of education known collectively as the Melbourne Curriculum. The new educational model, designed for an outstanding experience for all students, is based on six broad undergraduate programs followed by a graduate professional degree, research higher degree or entry directly into employment. The emphasis on academic breadth as well as disciplinary depth in the new degrees ensures that graduates will have the capacity to succeed in a world where knowledge boundaries are shifting and reforming to create new frontiers and challenges. In moving to the new model, the University is also aligning itself with the best of emerging European and Asian practice and well-established North American traditions.

The University's global aspirations seek to make significant contributions to major social, economic and environmental challenges. Accordingly, the University's research strategy *Research at Melbourne: Ensuring Excellence and Impact to 2025* aspires to a significant advancement in the excellence and impact of its research outputs.

<http://research.unimelb.edu.au/our-research/research-at-melbourne>

The strategy recognises that as a public-spirited, research-intensive institution of the future, the University must strive to make a tangible impact in Australia and the world, working across disciplinary and sectoral boundaries and building deeper and more substantive engagement with industry, collaborators and partners. While cultivating the fundamental enabling disciplines through investigator-driven research, the University has adopted three grand challenges aspiring to solve some of the most difficult problems facing our world in the next century. These Grand Challenges include:

- ▶ Understanding our place and purpose – The place and purpose grand challenge centres on understanding all aspects of our national identity, with a focus on Australia's 'place' in the Asia-Pacific region and the world, and on our 'purpose' or mission to improve all dimensions of the human condition through our research.
- ▶ Fostering health and wellbeing – The health and wellbeing grand challenge focuses on building the scale and breadth of our capabilities in population and global health; on harnessing our contribution to the 'convergence revolution' of biomedical and health research, bringing together the life sciences, engineering and the physical sciences; and on addressing the physical, mental and social aspects of wellbeing by looking beyond the traditional boundaries of biomedicine.
- ▶ Supporting sustainability and resilience – The sustainability and resilience grand challenge addresses the critical issues of climate change, water and food security, sustainable energy and designing resilient cities and regions. In addition to the technical aspects, this grand challenge considers the physical and social functioning of cities, connecting physical phenomena with lessons from our past, and the implications of the technical solutions for economies, living patterns and behaviours.

Essential to tackling these challenges, an outstanding faculty, high performing students, wide collaboration including internationally and deep partnerships with external parties form central components of Research at Melbourne: Ensuring Excellence and Impact to 2025.

5.5 GOVERNANCE

The Vice Chancellor is the Chief Executive Officer of the University and responsible to Council for the good management of the University.

Comprehensive information about the University of Melbourne and its governance structure is available at <http://www.unimelb.edu.au/governance>