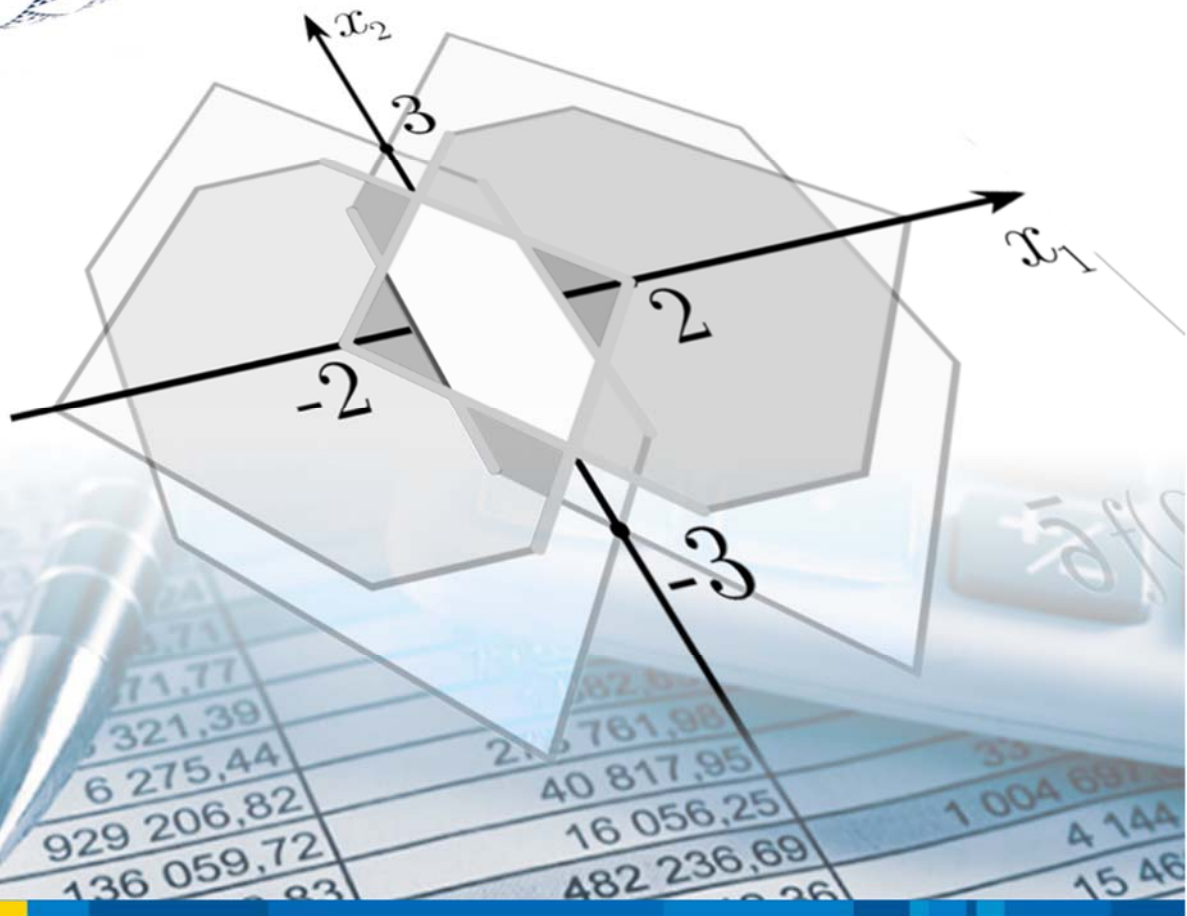




CIAO Newsletter

Centre for Informatics and
Applied Optimization

Edition #35: Jan-Mar 2018



Director's section

Welcome to the first CIAO Newsletter this year. It covers the period January – March 2018.

This period was rich in various events. Let me mention the *Variational Analysis Down Under (VADU)* conference which took place on 19-21 February 2018 at FedUni Mount Helen Campus. The conference was dedicated to renowned expert in the area of optimisation and Partner Investigator on the current CIAO ARC Discovery project Professor Asen Dontchev from University of Michigan, USA, who is getting 70 this year. The conference attracted to Ballarat a number of leading optimisers from Australia and overseas, including legendary Terry Rockafellar, a recipient of numerous prestigious international awards and titles, who is famous, among other things, because two new branches of mathematics: *Convex Analysis* and *Variational Analysis* inherited these names from the titles of two of his books. Terry turned 83 in February on the eve of the conference.

15 years of fruitful collaboration between Internet Commerce Security Laboratory and Westpac Bank are going to continue thanks to the new 5-year agreement signed recently. \$600,000 of funding coming from Westpac is going to boost research into cyber security.

CIAO 2017 Report has recently been released and can be downloaded from CIAO web site.

During the first three months of this year we have hosted 10 international visitors from USA, China, Finland, Russia, Turkey and Oman. The list of 24 new research papers by CIAO members can be found at the end of this Newsletter.

This edition contains news from the Research Group on Pure Mathematics, Federation Learning Agents Group, Health Informatics Laboratory and Information Systems Research Hub.

Enjoy the reading.



A/Prof Alex Kruger

All available previous issues starting from 2003 as well as the series of the *School of Information Technology & Mathematical Sciences* Research Newsletters dating from 1998 can be accessed from the CIAO web site: <http://federation.edu.au/ciao>.

In this issue:

- Grants and awards
- Industry connections
- Past and forthcoming events
- Research group news
- Research visits
- Staff news
- Announcements
- New publications



Prof Alex Rubinov
CIAO Founding
Director



A/Prof Alex Kruger
CIAO Research
Director



Dr Guillermo Pineda
Editor of CIAO
Newsletter

Grants, awards, promotions, PhD completions

Westpac and ICSL collaboration agreement to conduct cyber security

Research into cyber security will be boosted following the signing of a renewed agreement between Westpac Bank and Federation University Australia. The five-year contract between the university and the bank will financially support the Internet Commerce Security Laboratory (ICSL) to the tune of \$600,000. The new contract will bring the relationship between Westpac and ICSL to 15 years.

Westpac's generous support to the ICSL helps to create a great environment to conduct industry-relevant research and hosting conferences in cyber security. Cyber security is crucially important for everyone so we are particularly appreciative of Westpac's support.

The ICSL team conducts important research applying advanced analytic techniques to threat intelligence, threat profiling, forensics, fraud detection, malware analysis, identity theft, blockchain, and IoT security. ICSL provides a flexible environment and support for PhD students who are working with industry, so they can conduct research relevant to their industry needs.

Remote PhD

Congratulations to Dr Ragheed Dawood Allami on the award of Doctor of Philosophy for his thesis *Cardiovascular Data Analytics for Real Time Patient Monitoring*. Dr Allami was supervised by A/Prof Andrew Stranieri, Dr Venki Balasubramanian and A/Prof Herbert Jelinek (Charles Sturt University). He advanced new algorithms that enable electrocardiogram data from wearable sensors to be processed in real time on smartphones. Dr Allami has settled in Baghdad, Iraq where he resumes his research and teaching post as a senior lecturer.



Pixel Associate

Dr Pradnya Kulkarni's has been recognised as a Federation University honorary research fellow. Dr Kulkarni's PhD thesis, awarded in December 2017, was supervised by A/Prof Andrew Stranieri and Dr Julien Ugon. She developed new algorithms for classifying mammograms. Dr Kulkarni is now based at MIT World Peace University, Pune, India.



Australian Research Council Discovery Projects

Several ARC Discovery Projects and one ARC DECRA Project have been submitted by CIAO researchers. We wish them well in their applications.

Industry connections

Capital Markets Cooperative Research Centre

CIAO researcher Dr Musa Mammadov is working on a CMCRC project with the Transport Accident Commission (TAC). The main aim of this project is assisting the TAC Forensics Group to develop a novel methodology for the behavioural study and outlier detection of health care providers servicing TAC clients. The findings have been presented at the Australian Data Mining conference in 2017 in collaboration with leading TAC Forensics Analyst Rob Muspratt and CIAO researcher Julien Ugon. Additional application of the above research is currently underway to explore the relationship between TAC Client Outcomes cohorts and a Health Provider Segmentation based on these behavioural characteristics.



Dr Musa Mammadov

The work has been well recognised by TAC mentioning that “*The outputs of this work have been held up as a shining example of the tangible benefit of TAC's contract engagement with CMCRC and Federation University*” (from TAC internal quarterly award for Q1 2017).

Successful Project with City West Water

David Ebbs successfully completed his AMSI Internship (now called Australian Postgraduate Research Intern) at City West Water, with A/Prof Andrew Barton acting as his mentor, in December 2017.

David's work contributes to Melbourne's 50-year Sewerage Strategy, and involved collaborating with Melbourne Water, South East Water, Yarra Valley Water, Western water and City West Water to undertake analysis around the availability of water, carbon, and nutrients as a resource, and helping to develop a prioritised list of opportunities to increase resource recovery and leverage increased value from the sewerage system. David's time spent working on Melbourne's sewerage strategy will also go towards one of the chapters of his PhD thesis. City West Water and AMSI were very appreciative of David's efforts and have praised their relationship with FedUni.

Australian Postgraduate Research Internships

Several applications for APR Internships (formerly Australian Mathematical Sciences Institute Internships) have been submitted in recent weeks by Higher Degree Research students.

We look forward to successful outcomes for these students. In this scheme HDR Students work with industry partners on real world issues for the company. Our students have found these internships to be a valuable experience, with many leading to employment.

For more information, consult <http://aprintern.org.au>.

Events

Algebraic Geometry, Approximation and Optimisation at MATRIX

The Algebraic Geometry, Approximation and Optimisation program at the Creswick campus of the University of Melbourne took place 5-16 February 2018 and was co-organised by CIAO, RMIT University and Swinburne University of Technology. It included a series of lectures by world leading experts.

The workshop also featured several intensive group research sessions. A number of CIAO researchers were involved in these sessions which have resulted in extended international research collaboration. There has been very positive feedback from the participants to both the research program and the facilities at Creswick.

There has been notable success in applying the tools of algebraic geometry to problems in approximation and optimisation. In optimisation, a whole new field of convex algebraic geometry has emerged based on the ideas of semidefinite programming relaxations of polynomial problems pioneered by J.-B. Lasserre.

Some notoriously difficult problems remain still open, for instance, optimisation problems arising from multivariate polynomial approximation and Smale's 7th problem. This implies that there is a need for new approaches that combine approximation, optimisation and algebraic geometry. This workshop aimed to bring together researchers from all the three areas to develop collaborative investigations of these problems.



Variational Analysis Down Under

The **Variational Analysis Down Under (VADU) 2018** conference took place on 19-21 February 2018 at FedUni Mount Helen Campus. The conference was dedicated to Professor **Asen Dontchev's** 70th Birthday.

Variational Analysis is a new rapidly developing branch of mathematics providing theoretical foundations for optimization, equilibrium, control, and stability of linear and nonlinear systems. The term was coined by Rockafellar and Wets in their famous book *Variational Analysis* (1998). VADU 2018 continued the line of conferences started by *Mathematical Optimisation Down Under (MODU) 2016* in Melbourne co-organised by CIAO and several other optimisation groups at Australian universities.

There were 30 participants: 5 international, 14 national and 11 local (FedUni). Among them 5 PhD students (2 from FedUni). It is important to note that 30% of participants were females (50% among keynote speakers). The conference was opened by FedUni Vice-Chancellor Prof Helen Bartlett.

The keynote speakers included A/Prof Regina Burachik (UniSA), Prof Asen Dontchev (University of Michigan, USA), Prof Lyudmila Polyakova (St Petersburg State University, Russia), and Prof Terry Rockafellar (University of Washington, USA).

Besides FedUni, the conference was sponsored by

- Australian Mathematical Sciences Institute
- Australian Mathematical Society
- Mathematics of Computation and Optimisation special interest group of AustMS
- ARC Discovery project DP160100854



Einstein Workshop Discrete Geometry and Topology

This was a four-day workshop with lectures, presentations and informal discussions on discrete geometry and topology, and related topics (combinatorial topology, computational geometry, polytope theory). It was held at the Free University of Berlin during March 13-18 2018.

The workshop was funded primarily by the **Einstein Foundation Berlin**, as part of Prof Francisco Santos' Einstein Visiting Fellowship at FU Berlin for 2016-2019. Additional funding was provided by the project *Discretization in Geometry and Dynamics (SFB Transregio 109)* and the *Berlin Mathematical School*. Dr Guillermo Pineda-Villavicencio from CIAO was one of the invited speakers at the workshop. For more information visit <http://www.mi.fu-berlin.de/en/math/groups/discgeom/Events/DiscGeomTop>.



Faculty of Science and Technology Research Forum

On the 29th of March, CIAO organised the FOST Research Forum “*Building a Research Funding Track Record: Diverse Approaches*”. The forum had a panel of FOST researchers that represented different approaches to research funding. The participants provided very positive feedback, some of which is summarised below.

“Thank you so much for organising the forum this afternoon. It was good for ECRs like me. I would like this type of forum to happen regularly, may be once a month. In future, we can cover topics such as writing grant applications, building research profile and network, collaborative (internal and external) research, industry engagement, HDR supervision, etc.”

“Research funding is like the chicken-and-egg problem for ECRs. You need a good funding track record to receive new funding and need funding to build track record. It is not easy to break this deadlock. I hope forum like this will help.”

“It might be a good idea to engage HDR students as well...”

Several more forums are scheduled for the coming weeks.

Health Informatics and Knowledge Managements Conference

CIAO’s Health Informatics Laboratory (HIL) researchers A/Prof Andrew Stranieri and Dr Tony Sahama chaired the 2018 Health Informatics and Knowledge Management Conference (HIKM), part of the Australasian Computer Science Week Conference (ACSW) in Brisbane recently. Australasian Computer Science Week Conference in Brisbane recently. HIKM 2018 brought together researchers who apply computational intelligence techniques to health. The HIL duo invigorated HIKM 2018 by forming a steering committee comprised of leading researchers from Fiji, Papua New Guinea, New Zealand, Australia and Canada. Proceedings were published by the American Computing Machine ACM Press. Several CIAO researchers gave talks at the conference. The PhD candidate Meenaa Santhanagopalan presented work with A/Prof Madhu Chetty and Dr Cameron Foale on neurocognitive modelling. PhD candidate Vishakha Sharma presented work with A/Prof Andrew Stranieri on representing patient’s pathways visually. A/Prof Stranieri and Dr Sahama also delivered a well-attended tutorial on Complementary Medicine Informatics.






Conference founder Professor Jim Warren declared HIKM 2018 as the best ever.



CIAO honorary research fellow Prof Zhaohao Sun (PNG University of Technology) with A/Prof Andrew Stranieri at ACSW

CIAO Seminars

Optimisation

Date	Name	Affiliation	Topic	
8, 15 Mar	Ms Hoa T Bui	CIAO, FedUni	Variational analysis revision	
22 Feb	Prof Asen Dontchev	Mathematical Reviews & University of Michigan, USA	The inverse function theorems: an overview and open problems	
29 Jan	Prof Limin Wang	Jilin University, China	Target learning for Bayesian network: a framework to achieve good tradeoff between classification performance and causality expressivity	
19 Jan	Prof Ole Warnaar	University of Queensland, Australia	Plane partitions & Schur functions	
19 Jan	Prof Mehiddin Al Baali	Sultan Qaboos University, Oman	On self-scaling and damped techniques for quasi-Newton methods	

For more information please visit <https://federation.edu.au/faculties-and-schools/faculty-of-science-and-technology/research/computational-science-and-mathematics/ciao/events/optimisation-seminars>.

Information technology

Date	Name	Affiliation	Topic	
7 Mar	John Oliver,	Trend Micro	Locality Sensitive Hashing	

Forthcoming events

Malware Reverse Engineering Workshop 2018

The Malware Reverse Engineering Workshop 2018 (MRE-2018) will be held on 2 and 3 July 2018 in Melbourne. The workshop, organised by the ICSL, is a bridge between industry, law enforcement and academia, with a strong focus on practical results from research and development projects in malware reversing. The conference aims to cover:

- Reverse engineering methods, analyses and algorithms
- Behavioural and attribution analysis of malware
- Impacts into the financial sector and government agencies
- Advanced monitoring schemes for Malware attacks

Registration for MRE is now open <https://federation.edu.au/icsl/mre2018>.

CIAO Showcase and Workshop 2018

Each year CIAO holds a showcase and presentations of its research activities for the previous year. An invitation is extended to the 2018 CIAO Showcase to be held on Thursday 12 April 2018 with presentations in Room T102, T Building from 9.30am and displays in the Airport Lounge in T Building throughout the day at the Mount Helen Campus.

Professor Leigh Sullivan, Deputy Vice Chancellor (Research & Innovation) will launch the 2018 CIAO Showcase at 11.00am in the Airport Lounge and all staff and students are welcome to join us for morning tea following the launch and to view the displays. The 2017 CIAO Annual Report will also be launched at this time.

AMSI Optimise 2018

AMSI Optimise is returning in 2018. It will be held at the University of Melbourne on 18-22 June 2018. It is an annual networking and research-training event that aims to strengthen mathematical optimisation research engagement and its applications across industry.



This year the event will comprise a three-day industry-focused conference, followed by a two-day research workshop. The symposium features expert and end-user talks, international guest speakers, collaboration showcases, industry challenge sessions and tutorials. The themes of the 2018 conference are Decision Making under Uncertainty and Humanitarian Applications.

AMSI Optimise is aimed at:

- anyone using optimisation, with opportunities to learn more about the current state of the art and to connect with others who have similar interests
- industry practitioners interested in exploring the benefits of engagement with optimisation research
- academics and postgraduate students wanting to better understand drivers and needs in this area

The event will provide a forum to bring together people from the diverse companies and research disciplines that use and develop optimisation models and software. It provides a platform for research training and developing new collaborations in this vital area through PhD internships, research partnerships and postgraduate research projects.

Annual FedUni HDR Conference

The FedUni Higher Degree Research conference will be held on Thursday July 26th, 2018. This annual conference provides one of the few opportunities for the University to come together and celebrate the wonderful research being done by HDR candidates. Even if you don't plan to present this year, please come along as an audience member to support your peers and network with researchers from across the university. It would be great to see as many HDR supervisors as possible attend this important event. Please put this date in your diary. Further details of the conference will soon be made available.

For further information regarding the HDR conference, please email FedUni conference coordinator.

Research group news

Research Group on Pure Mathematics

Members: Dr Guillermo Pineda-Villavicencio, A/Prof David Yost and Dr Julien Ugon

Dr Guillermo Pineda-Villavicencio visited the Technical University of Berlin (TUB) during 19-23 April 2018 to collaborate with members of Prof Michael Joswig's research group.

Currently, Guillermo is writing a paper with Dr Benjamin Schroter on reconstruction of matroid polytopes. Benjamin is a postdoc at the group of Prof Michael Joswig.

Federation Learning Agents Group (FLAG)

Members: A/Prof Peter Vamplew, Dr Richard Dazeley, Dr Cameron Foale and Dr Dean Webb.

In March FLAG welcomed a new PhD student Charlotte Young. After completing her Honours thesis with us last year, Charlotte has secured an RTS scholarship place and will be developing a framework for accessible artificial intelligence, addressing rising concerns that the use of Artificial Intelligence for decision-making by corporations and governments may infringe on peoples' rights.

Also, FLAG was recently notified that the application we made for funding through the Future of Life Institute's AI Safety Grants scheme has successfully passed through the initial round of reviews. We have now been invited to submit a full application in May. This proposal will apply our expertise in multiobjective reinforcement learning to the task of developing artificial general intelligence which is constrained to act safely.



Dr Guillermo Pineda



A/Prof Peter Vamplew



Ms Charlotte Young

Health Informatics Laboratory (HIL)

Members: A/Prof Andrew Stranieri and Dr Venki Balasubramanian

The inaugural teams of La Trobe University's Accelerator Program graduated from their 12-week mentoring program in December 2017 at a graduation ceremony at Queen's Hall, Parliament House. CIAO team Dr Venki Balasubramanian and A/Prof Andrew Stranieri proudly represented CIAO in the programme that ran over four months in 2017.

The final pitches were introduced by the Hon Minister for Trade and Investment, Phillip Dalidakis.



A/Prof Andrew Stranieri
HIL Leader



Dr Venki Balasubramanian



Grant Meredith
TEPPS Leader

Technologies for Empowering People for Participation in Society (TEPPS)

Member: Grant Meredith

Grant Meredith's project Simulated Scenario System (Scenari-Aid, www.scenariaid.com) has received great positive feedback in the tweetsphere.



Suze Leitao
@Suze_Freogirl

Following

This is the work of the amazing [@GrantMeredith1](#) who has been a community member on [@SpeechPathAus](#) [#SPAethics](#) board for many years - we have gained much from his wisdom and now many [#wespeechies](#) will access this resource

Scenari-Aid is a free system which aims to improve social, interview and speech skills of people with speech issues. Scenari-Aid contains over 100 recorded video scenarios for a person to work through

A/Prof Suze Leitao, Curtin University

Information Systems Research Hub

Information Systems is the multidisciplinary field of research which is concerned with understanding the way in which information and communication technologies impact on society.

A group of four Early Career Researchers Dr Mehmood Chadhar, Dr Taiwo Osana, Dr Sasha Ivkovic and Sally Firmin (PhD under examination) have banded together in an extraordinary display of collegiality to form an information systems hub within CIAO. The quartet support each other's joint publications and future plans. The main research of each member is as follows.

- Dr Mehmood Chadhar: Enterprise wide information systems
- Dr Sasha Ivkovic: Software project management
- Dr Taiwo Osana: National cyber-security assessments
- Sally Firmin: Reflective inquiry in information technology courses



CIAO Visitors

Dates	Name	Institution
17 Feb – 3 Mar	Prof Asen Dontchev	Mathematical Reviews and University of Michigan, USA
14 – 22 Feb	Prof Terry Rockafellar	University of Washington, USA
12 – 24 Feb	Dr Napsu Karmitsa	University of Turku, Finland
12 – 24 Feb	Ms Kaisa Joki	University of Turku, Finland
7- 21 Feb	Prof Fusheng Bai	Chongqing Normal University, China
1- 23 Feb	Prof Lyudmila Polyakova	Saint Petersburg State University, Russia
2- 25 Feb	Prof Zhiyou Wu	Chongqing Normal University, China
23-31 Jan	Prof Retail Kasimbeyli	Anadolu University, Turkey
23-31 Jan	Dr Nergiz Kasimbeyli	Anadolu University, Turkey
15-22 Jan	Prof Mehiddin Al Baali	Sultan Qaboos University, Oman

Staff News

It's a boy!

Congratulations to Gen Maddox and Rohan on the arrival of their baby boy Aston who was born on Sunday 25 February. Everyone is doing really well and looking forward to many cuddles when they settle in at home.

Andrew Barton appointed to the Scientific Reference Group for Onshore Conventional Gas

A/Prof Andrew Barton has been appointed to the Scientific Reference Group for Onshore Conventional Gas with the Department of Economic Development, Jobs, Transport and Resources and the Victorian Chief Scientists' Office.

A/Prof Barton is also involved in consultancies with Water Technology on Improving Flows to the Budj Bim Landscape and on Latrobe Valley Water Resources Modelling Scoping Study.

Departures

Dr Julien Ugon has left Federation University Australia to take up a lectureship position at Deakin University, Burwood Campus. Dr Ugon was senior lecturer at FedUni and Deputy Director of CIAO.

Dr Julien Ugon is currently an Honorary Research Fellow and will continue to work with CIAO.

Dr Vera Roshchina will be leaving RMIT to take up a lectureship position at the University of New South Wales. Vera is a DECRA Research Fellow at the School of Science at RMIT.

We wish Julien and Vera all the best in their new positions.

Announcements

Higher degree scholarship policy at FedUni

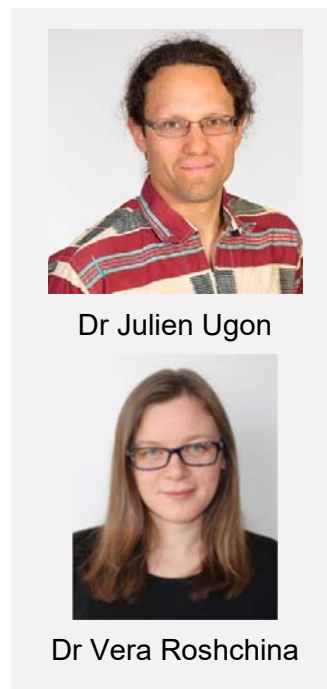
A new HDR policy has been put in place at FedUni. It provides a framework for the administration and allocation of HDR scholarships for which the University has primary responsibility.

Academics at FedUni, and particularly, HDR supervisors are strongly encouraged to revise this new policy, available at

http://policy.federation.edu.au/research/higher_degrees_by_research/hdr_candidate_selection/hdr_candidate_selection/ch06.php.

EMCR Forum

The EMCR forum is run by and for all early- and mid-career researchers (EMCRs) in science, technology, engineering and mathematics in Australia. The website contains information and contacts to help develop a career in and around STEM. Whether you are a recent PhD graduate in university research, based within the private sector, or making your contribution in Government, the EMCR Forum is here for you.



Dr Julien Ugon

Dr Vera Roshchina

2019 New Colombo Plan Scholarships

New Colombo Plan Scholarships are designed to support Australian students with overseas study in the Indo-Pacific region and are up to \$20,000 to cover tuition fees along with additional funds to assist with travel, living expenses and language support.

The New Colombo Plan is an initiative of the Australian Government which provides funding to Australian students and universities to support a range of study options in the Indo-Pacific region.

For more information about the New Colombo Plan or FedUni's exchange and study abroad programs, please contact Tiffany Forbes, Centre for University Partnerships on 03 5327 9009, t.forbes@federation.edu.au or studyabroad@federation.edu.au.

Research Data Science Winter School

Applications are open to participate in the Research Data Science Winter School in Brisbane on 12-15 June 2018. The Australian Academy of Science, in association with Software Carpentry, CODATA and RDA, would like to invite EMCRs from various disciplines to apply to participate in this Winter School. This Theo Murphy Initiative (Australia) sponsored activity is aimed at EMCRs who have experience in collecting and analysing data but are looking to take their data skills to the next level and become more effective using data for their research.

Science Pathways 2018: Diversify your thinking

The EMCR Forum's fifth national meeting, 'Science Pathways 2018: Diversify your thinking', will be held in Brisbane at the Mercure Hotel on 23-24 April 2018. The event will bring together early- and mid-career researchers (EMCRs) and scientific leaders from academia, industry and government.

Australia's scientific and innovative future calls for a generation of science leaders equipped with the right tools and strategies to better understand the key considerations for interdisciplinary research and collaborations, to achieve more inclusive and equitable environments, and to improve their access to funding opportunities from non-traditional sources.

The event aims to create an insightful discussion and present key findings on how to face these challenges and implement solutions. It offers an interactive program with a strong professional development focus for EMCRs and with networking opportunities with other future leaders from different backgrounds.

ON Prime - CSIRO pre-accelerator experience for research teams

If you're working on some promising research and are trying to establish a real-world application for it, fast-track it with ON Prime - a free pre-accelerator experience tailor-made for Australia's brightest researchers and powered by CSIRO.

Running from April to June (with 5 face-to-face sessions in total), participants will test paths for their know-how or technology through a process of end-user discovery and market validation and build their entrepreneurial capabilities. For further information about ON Prime and how to apply, please visit <https://events.csiro.au/Newsletters/ON-Newsletter/ON-Prime-setup>

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