CIAO Newsletter

Centre for Informatics and Applied Optimization

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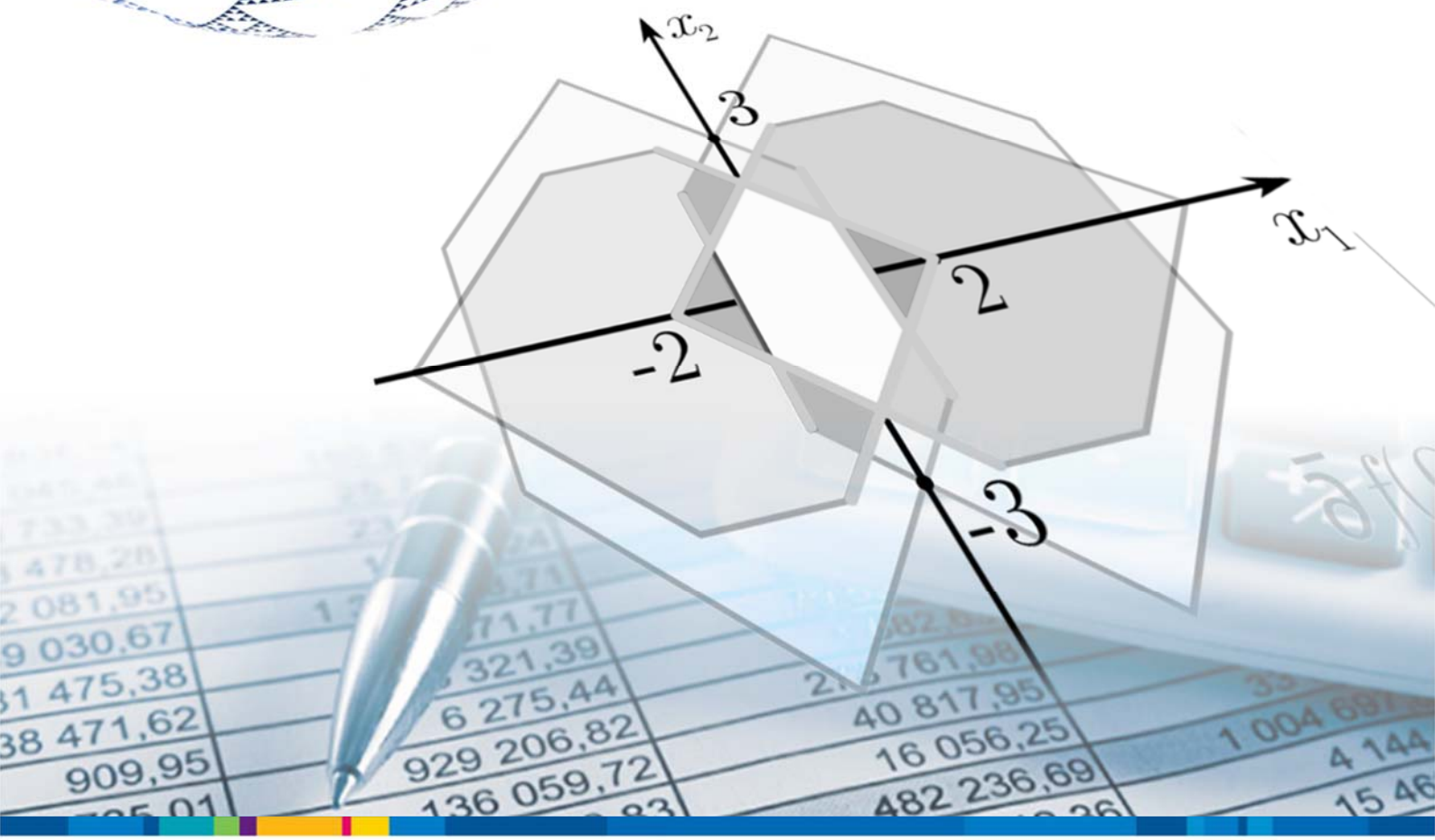

Centre for Informatics and Applied Optimization (CIAO)
Federation UNIVERSITY • AUSTRALIA

Director's section

Welcome to the new CIAO Newsletter, which covers the period July – September 2017. 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.

CIAO optimisation seminars take place fortnightly on Thursdays at 11:30 am in room T121, Mount Helen campus. Remote access via Visimeet is available. This year we have had 23 research talks so far. The seminars are not strongly restricted to optimisation. Every CIAO researcher, as well as visitors from other national and overseas universities, are welcome to present.

We continue hosting international visitors. This year we have had 18 visitors.

This period was rich in various events. Let me mention *Alexander Rubinov Memorial Oration 2017* held on the 14th of September. This annual event, commemorating the life of Professor Alexander Rubinov and celebrating his contribution to the University as an outstanding researcher and the founding Director of CIAO, was run this year for the 10th time. We had a remarkable speaker – Professor John Croucher, AM, FaustMS, FRSA, who shared with the audience his fascination for mathematics in an engaging lecture titled "*The Romance of Numbers*". The contributions of Professor Alexander Rubinov were acknowledged by Professor Helen Bartlett, Vice-Chancellor & President of the university.

CIAO initiated a new series of research support forums/workshops to discuss various issues related to organising research. It started with a presentation by A/Prof Peter Vamplew "*Beware the Predatory Publisher*" on 7 September, and is going to become a regular monthly faculty research support event.

CIAO long-time collaborator and Adjunct Professor Jiří Outrata from the Institute of Information Theory and Automation of the Czech Academy of Sciences celebrated his 70th birthday in June this year. 19-22 September, world leaders in optimisation gathered in Prague for the *11th International Conference on Parametric Optimisation and Related Topics (ParaoptXI)*, dedicated to Jiří Outrata. We congratulate Jiří Outrata on this birthday and wish him a lot of energy both for ongoing scientific activities and for active sporting, namely his lifetime favorite sailing, skiing and mountain hiking.

Congratulations to A/Prof Andrew Stranieri and Dr Venki Balasubramanian who won the 2nd place at the LaTrobe University Start-Up program for their health system, which monitors a patient's vital signs and transmits the data to a central server for analysis, and to Dr Savin Chand who received a research grant of $183,211 from the Department of Environment and Energy to advance tropical cyclone research.

This edition contains news from the Federation Learning Agents Group, Health Informatics Laboratory, Research Group on Pure Mathematics and Climate Informatics Research Group, information about research visitors to CIAO and the list of recent publications by CIAO members. Enjoy the reading.

A/Prof Alex Kruger

In this issue:

Prof Alex Rubinov
CIAO Founding Director

A/Prof Alex Kruger
CIAO Research Director

Dr Guillermo Pineda
Editor of CIAO Newsletter

Events

Alexander Rubinov Memorial Oration 2017

Each year the Centre for Informatics and Applied Optimisation organises an oration to commemorate the life of Professor Alexander Rubinov and celebrate his contribution to the University as an outstanding researcher and the founding Director of CIAO.

The 2017 Alexander Rubinov Memorial Oration was held on Thursday 14 September 2017, at 6.00 pm in Y016 Lecture Theatre, Y Building, Mt Helen Campus. This year's speaker was Professor John Croucher, AM FAustMS FRSA, a Professor of Statistics at Macquarie University, Sydney. The title of the presentation was "*The Romance of Numbers*".

As with all good love stories, John has a fascination for maths and is captivated by everything it does. In this presentation, he shared his passion with the attendees, beginning with the way he was drawn into the world of mathematics. He then discussed the intriguing lives of his two favourite contemporary mathematicians and offered some intriguing examples of how maths can be applied to some very practical problems.

The Alexander Rubinov Memorial Oration 2017 was well attended by the university staff and students, guests from other universities and school communities. Professor Helen Bartlett, Vice-Chancellor & President of the university introduced the speaker.

Alex Rubinov

Prof Alexander Rubinov (1940 – 2006) was the Founding Director of CIAO and transformed it into an internationally recognised research centre in optimisation and informatics.

Alexander Rubinov was born in Leningrad, now S.-Petersburg, Russia, and graduated from the Department of Mathematics of Leningrad State University. He completed his PhD at the Institute of Mathematics of the Siberian Branch of the Academy of Sciences of the USSR in Novosibirsk and an advanced doctorate at the Computer Centre of the Academy of Sciences of the USSR in Moscow. He then held positions in Leningrad, Novosibirsk and Kalinin (Russia), Baku (Azerbaijan), Beersheba (Israel), and Ballarat.

Prof Rubinov attracted to Ballarat first-class researchers from around the world. Under his leadership, CIAO became an extremely successful centre of both national and international repute, recognised especially for its theoretical and applied research in optimisation.

Alexander Rubinov was a strikingly modest and humble family man loved by everybody

From left to right: Prof Rosalind Croucher, Dr Zari Dzalilov, Prof John S. Croucher, and Mr Eldar Rubinov.

Biography of Prof **John S. Croucher**

John S. Croucher is a Professor of Statistics at Macquarie University, Sydney. He has published over 130 research papers, 30 books and over 1000 newspaper articles. He was a Visiting Professor at the University of London (Birkbeck) and for eight years was a television presenter on rugby league telecasts on Channel 10.

John holds four PhDs (in mathematics, statistics and history, and an honorary doctorate for 'services to mankind'). He was the winner of the inaugural Distinguished Alumni Award at Macquarie University and in 2013 won the prestigious Prime Minister's Award for Australian University Teacher of the Year, his five individual national outstanding teacher awards being the most of anyone in the country.

For ten years, Professor Croucher was the author of the popular column *Statistically Speaking* for the *Mail on Sunday* in the UK as well as *Number*

Prof John S. Croucher

Crunch in the *Sydney Morning Herald*. His textbooks on mathematics are used both nationally and internationally, although he has also written others on diverse topics including crime, humour, romance, gambling and several biographies.

A Fellow of both the Royal Society of Arts (RSA) and the Australian Mathematical Society, in 2015 John was made a Member of the Order of Australia (AM) for 'significant service to mathematical science in the field of statistics, as an academic, author and mentor and to professional organisations'.

Research Support Forums/Workshops

CIAO initiated a new series of research support forums/workshops to discuss various issues related to organising research. The initiative got full support from the Faculty. From A/Prof David Piedrafita, Associate Dean Research:

Dear All – the Faculty is keen to support research and research acumen. There seems to be limited opportunities to discuss academic strategies around the difficulties of having a research career, the pitfalls, complexities and 'smart-moves' to make it happen in the most effective ways. Well here is your chance to contribute, learn and have some lively debates! This would be particularly useful for our HDRs, early and mid-career scientists.

We plan to hold relaxed, interactive style presentations/debates. Dependent upon the speaker, we will rotate talks between Mt Helen, Berwick and Gippsland (Speaker will be video–linked to the alternative campuses). We have some speakers already locked in – details to follow shortly (but feel free to suggest speakers/topics that you feel are of particular interest).

The forums/workshops are expected to be run monthly. The first one happened 7 September with a presentation by A/Prof Peter Vamplew "*Beware the Predatory Publisher*", followed by a discussion facilitated by Peter. The topic attracted significant attention of stuff and students and the workshop was well attended at Mount Hellen and Gippsland.

The 11th International Conference on Parametric Optimisation and Related Topics (ParaoptXI), 19-22 September, Prague

The conference was dedicated to internationally renowned optimisation expert and CIAO adjunct professor, Prof Jiří Outrata on the occasion of his 70th birthday. World leaders in optimisation gathered in Prague to exchange ideas and celebrate this date. A/Prof Alex Kruger delivered a plenary lecture. For more information visit http://paraoptxi.fsv.cuni.cz.

CIAO Optimisation Seminars

Date	Name	Affiliation	Topic	
31 Aug	Mr Jeffrey Christiansen	RMIT University	Decomposition and duality for stochastic integer programs	
17 Aug	Dr Diederik Roijers	Vrije Universiteit Brussel, Belgium	Policy / value reuse in incremental multi-objective planning and learning	

14 Aug	Dr Diederik Roijers	Vrije Universiteit Brussel, Belgium	Interactive multi-objective reinforcement learning	
10 Aug	Prof Hong Kun Xu	Hangzhou Dianzi University, China	Projection methods for constrained minimization of a finite sum of convex functions	
3 Aug	A/Prof Elisabetta Maluta	Milan Polytechnic, Italy	Diametrically complete sets in Banach spaces lacking normal structure	
20 Jul	A/Prof Adil Bagirov	CIAO, Federation University Australia	Smoothing techniques in nonsmooth optimisation and applications	
6 Jul	Prof Nezam Mahdavi-Amiri	Sharif University of Technology, Iran	Constrained nonlinear least squares: an exact penalty approach	

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.

CIAO IT Seminars

11 Sep	Manish Kumar & Deeban James	IBM Global Services	Big Data Management – Hadoop and MapReduce	

Forthcoming Events

Second Workshop on Metric Bounds and Transversality (WoMBaT 2017)

WoMBaT is back. The *Second Workshop on Metric Bounds and Transversality (WoMBaT)* is going to be held at RMIT University from November 30th to December 2nd 2017. The workshop is co-organized by CIAO and RMITOpt researchers. http://www.wombat.rmitopt.org/.

The Joint Optimization Conferences (JOC 2017)

Several conferences will be held this summer in Perth, Western Australia from December 4th to December 10th 2017, with a strong involvement of CIAO researchers.

- *The Eighth Australia-China Workshop on Optimization: Theory, Methods and Applications (ACWO 2017)*. *China-Australia Collaboration in Applied Optimisation (CACAO)* is going to be officially launched during the meeting.
- *The Second Pacific Optimization Conference (POC 2017)*.
- *South Pacific Optimization Meeting in Western Australia (SPOM in WA 2017)*.

For more information refer to http://scieng.curtin.edu.au/science/mathematics-and-statistics/joc-2017/.

Workshop on Variational Analysis with Applications

This is an annual international event at Hong Kong Polytechnic University attracting leading researchers in variational analysis. This year it is going to happen 11-13 December after the optimisation week at Curtin. The formal announcement is going to appear soon.

61st Annual Meeting of the Australian Mathematical Society (AustMS)

The *61st Annual Meeting of the Australian Mathematical Society* will be held 12–15 December 2017 at the Macquarie University, Sydney. The lists of international and national invited speakers are as follows.

There will be an optimisation session co-organised by Dr Guoyin Li and Dr Vera Roshchina. Please consider giving a talk at this session.

MATRIX program Algebraic Geometry, Approximation and Optimisation

Members of CIAO were successful in obtaining over $30k for the MATRIX program *Algebraic Geometry, Approximation and Optimisation*. The workshop will be held 5-16 February 2018. The organisers: Enrico Carlini, Jochen Garcke, Wolfgang Hackbusch, Markus Hegland, Vera Roshchina, Nadezda Sukhorukova, Julien Ugon and David Smyth.

Variational Analysis Down Under 2018, a conference in honour of Asen Dontchev's 70th birthday

The workshop is designed to bring together researchers working in various areas of modern mathematical optimisation, to prompt an exchange of ideas between Australian and overseas researchers. It is focussed on the modern aspects of optimisation that involve deep interplay between computational problems and pure mathematical questions.

The workshop will be held during 19-23 February 2018 at the Mount Helen campus of FedUni. For more information, please visit https://sites.rmit.edu.au/asen/.

Research Group News

Federation Learning Agents Group (FLAG)

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

In August, FLAG was fortunate to host a visit by Dr Diederik Roijers from Vrije Universiteit Brussel (VUB) in Belgium. Diederik gave two very interesting presentations titled *Interactive Multi-objective Reinforcement Learning* and *Policy/Value Reuse in Incremental Multi-Objective Planning and Learning*.

Diederik first collaborated with Peter Vamplew and Richard Dazeley in 2013 whilst he was a PhD student at the University of Amsterdam, and the joint paper surveying the field of multiobjective sequential decision making has made a rapid impact, with a citation count exceeding 100 in less than four years since publication. Diederik's visit was funded by the Research Foundation – Flanders (FWO), and has allowed us to explore possible directions for new collaboration. This has already resulted in a demonstration paper being submitted to BNAIC, as well as plans for two comparative studies of both planning and learning approaches to multiobjective decision making. In addition, FLAG undergraduate student Tanya Pedersen will be applying for an AMSI-funded summer project scholarship to be co-supervised by Diederik and the academic members of FLAG.

A/Prof Peter Vamplew
FLAG Leader

Dr Diedrik Roijers

Diederik's visit coincided with the *International Joint Conference on Artificial Intelligence*, which was held in Melbourne. Several FLAG members attended the tutorials and presentation sessions for this conference. This allowed an opportunity for the PhD student Adam Bignold to meet up with Dr Matt Taylor from Washington State University, who is part of a collaborative team working on a survey of assisted reinforcement learning. This team also includes Dr Tim Brys (VUB) and other FLAG members. Matt's tutorial has also inspired a new FLAG project which will utilise crowdsourced information from Amazon's Mechanical Turk service to facilitate a study into issues around the misspecification of rewards in reinforcement learning.

The last few months also saw several other important pieces of news for FLAG. We received confirmation of $30K in funding from the Defence Science and Technology Group and $15K from the Defence Science Institute to support a PhD scholarship on the application of multiobjective reinforcement learning to discovering of novel tactics for adversarial multi-agent systems – details of the student appointed to this scholarship will be in the next CIAO newsletter.

In addition, the journal *Ethics and Information Technology* notified us of the acceptance of a paper for their special issue on Ethics and Artificial Intelligence. Entitled "*Human-Aligned Artificial Intelligence is a Multiobjective Problem*", this paper represents the first step in an important new research direction for FLAG – applying our expertise in multiobjective reinforcement learning to important problems in the creation of safe and ethical AI. This work was a collaboration between Peter Vamplew, Richard Dazeley, and Cam Foale from FLAG, Sally Firmin from CIAO, and Jane Mummery from FedUni's philosophy discipline.

Finally, Peter Vamplew has been co-editing a special issue of *Neurocomputing* journal on the topic of multiobjective RL, along with Madalina Drugan, Marco Wiering and Madhue Chetty. This issue was finalised in September, and is now available from Neurocomputing's website.

Health Informatics Laboratory (HIL)

Members: A/Prof Andrew Stranieri and Dr Venki Balasubramanian

HIL researchers develop a remote health monitoring system

A/Prof Andrew Stranieri and Dr Venki Balasubramanian won the 2nd place at the LaTrobe University Start-Up program for their health system, which monitors a patient's vital signs and transmits the data to a central server for analysis. As a remote monitoring system, potential applications may include hospital settings, aged care facilities and outpatient care. The system has been trialled in an Indian hospital where nurse-to-patient ratios are far greater than in a similar facility in Australia. The researchers plan to use the funding from the start-up program to accelerate the commercial release of the product and carry out a larger trial at an Indian hospital. The start-up program and the work of A/Prof Stranieri and Dr Balasubramanian featured in an article at the Ballarat local newspaper, The Courier; see http://www.thecourier.com.au/story/4955455/vital-signs-go-via-the-cloud/?cs=62.

A/Prof Andrew Stranieri
HIL Leader

Dr Venki Balasubramanian

thecourier.com.au Saturday September 30, 2017 THE COURIER 17

NEWS

Tech start-up monitors patients at home

Vital signs go via the cloud

BY MICHELLE SMITH

A BALLARAT tech start-up has developed a remote health monitoring system that could take on the world.

Their system uses wearable sensors to monitor a patient's vital signs and transmit the data to a central server where it is analysed. If the patient is deteriorating or needs assistance, an alarm or alert message is sent to the mobile phones of medical staff to ensure a rapid response.

Developers Andrew Stranieri and Venki Balasubramanian have been working on the system for almost a decade and last year trialled the system in an Indian hospital where nurse-to-patient ratios are far greater than in the Australian health care system.

The pair also see applications in other hospital settings, aged care, and in the rapidly growing sector of hospital in the home which many Australian hospitals offer.

"As of now there is no real time monitoring of patients remotely," Dr Balasubramanian said. "They do it within hospitals but not remotely from anywhere in the world."

Associate Professor Stranieri said the pair initially looked toward India because of a nursing shortage through the country. "Each nurse looks after quite a large number of patients making it difficult to stay on top of their vital signs," he said.

Locally the pair see strong use of their system in hospital in the home programs, which allow patients to recover at home instead of a hospital ward.

"Most hospitals run a hospital in the home unit allowing hospital patients to recover at home so this sort of system will allow patients to recover while having their vital signs monitored remotely by a doctor and nurse back in the hospital. If the patient, carer or doctor is worried about their recovery they can pop on the device and be monitored."

Patients with chronic health conditions such as COPD and cystic fibrosis, which require ongoing monitoring particularly of blood oxygen levels and respiratory rates, could also benefit.

LaTrobe University recently granted the start-up $10,000 and will provide 12 weeks of business mentoring and assistance from their engineering, law, science and nursing faculties to get their business up and running.

The arrival on the market last year of affordable health sensors that monitor all five vital signs at once has accelerated the system's potential commercial development.

"We were able to customise our software to use its data, then ran a pilot trial in India last October," Dr Balasubramanian said.

The cash injection will accelerate plans for commercial release and allow a larger trial to run at an Indian hospital for at least three months with 12 to 14 patients on the system at any one time.

START-UP: Health monitoring system inventors Andrew Stranieri and Venki Balasubramanian at Greenhill Enterprise Centre in Mount Helen. Picture: Luka Kauzlaric

Excerpt from The Courier where the achievement of A/Prof Andrew Stranieri and Dr Venkin Balasubramanian was documented

La Trobe Accelerator Program

The program was funded by a State government grant awarded to LaTrobe, FedUni and Deakin; see http://www.latrobe.edu.au/industry-and-community/research-partnerships-with-industry/accelerator/launch.

The La Trobe Accelerator Program provides students, researchers, alumni and Victorian communities the opportunity to accelerate the development of their start-up. It does so over a 12-week period, where projects receive support, resources, funding, mentorship and connections to communities in Victoria. The start-up teams can receive up to $20,000 to use while participating in the program. The LaTrobe accelerator program normally accepts up to 12 start-ups in the Summer Cohort.

Research Group on Pure Mathematics

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

A/Prof David Yost was a keynote speaker at the *10th Conference on Nonlinear Analysis and Convex Analysis*, which was held from July 4th to 9th at the Chitose City Cultural Centre, Hokkaido, Japan. This popular biennial conference generally attracts about 200 participants. David gave a lecture entitled "*Twisted sums, intersecting balls and Chebyshev subspaces*".

Prior to the conference, he visited Professor Satoshi Murai at the University of Osaka, where they discussed their common research interests in combinatorial geometry, in particular the relationships between the numbers of vertices and edges of low dimensional polytopes.

Elizabetta Maluta, David Yost and Clemente Zanco

David Yost was visited from 2 to 8 August by Elisabetta Maluta (Department of Mathematics at Milan Polytechnic) and Clemente Zanco (Department of Mathematics at the University of Milan). Their association has a long history. After meeting at several conferences, David had two month-long visits to Milan, supported by the Italian National Research Council. David was also based in Milan from 1991 to 1994. The research activity of both visitors started in Fixed Point Theory, indeed they and David were participants in the 12th International Conference on Fixed Point Theory and Its Applications, held the week before in Newcastle. The research of all three has focussed mainly on the geometry of Banach spaces and some problems in infinite dimensional convexity. During the visit, Elisabetta presented a seminar titled "*Diametrically complete sets in Banach spaces lacking normal structure*". Following this, they succeeded in constructing sets of constant width with empty interior in reflexive Banach spaces; previously such examples were only known in non-reflexive spaces. This should lead to a publication.

Climate Informatics Research Group

Members: Dr Savin Chand

Dr Savin Chand received a research grant of $183,211 from the Department of Environment and Energy to advance tropical cyclone research. This research grant is part of the CSIRO's and the Australian Bureau of Meteorology's National Environment Science Programme Project 2.8 Extreme Weather Projection.

Dr Savin Chan
Leader of Climate Informatics

Savin's role in this project will be to assess characteristics of tropical cyclones, as well as associated extreme weather in general in the changing climate. He will look at factors affecting regional-scale changes in tropical cyclone tracks globally, with emphasis over Australia, and determine potential shifts – if any – because of tropical expansion. Savin will be working closely with his collaborators from the CSIRO and the Australian Bureau of Meteorology.

In January, Savin's cutting-edge research published in *Nature Climate Change* received widespread scientific and media attention, work that played an instrumental role in Savin's successful bid for the research grant.

Mathematics of Computation and Optimisation

Mathematics of Computation and Optimisation (MoCaO), established in 2016 as a Special Interest Group of the Australian Mathematics Society, is now up and running. The group's web site is https://mocao.mathsig.org/. The main objective of the group is to facilitate communication and collaboration between researchers in optimisation and computational mathematics on the national level, organize conferences and workshops, and represent the group members at various levels. At the first election to the executive, which took place in January 2017, A/Prof Alex Kruger was elected a co-chair.

Other News

After 12 years of service at Monash University and then FedUni, Dr Andrew Percy is leaving FedUni on 25 September. Andrew has relocated to Woolgoolga where he was planning to retire eventually. This move will allow Andrew to spend time with his two sons.

As part of the mathematics discipline, Andrew has been a great person to work with. He is one of those people who smoothed the journey of combining two departments from two different universities into one. The mathematics discipline certainly loses much with his departure.

We wish Andrew all very best and good luck for the future.

Dr Andrew Percy

CIAO Visitors

Dates	Name	Institution
12-25 Aug	Dr Diederik Roijers	Vrije Universiteit, Brussel
2-8 Aug	A/Prof Clemente Zanco	Milan Polytechnic University, Italy
2-8 Aug	A/Prof Elizabetta Maluta	Milan Polytechnic University, Italy
7 Jan – 11 Feb	Prof Peicheng Zhu	Shanghai University, China
27 Jun – 12 Jul	Prof Nezam Mahdavi-Amiri	Sharif University of Technology, Iran
27 Jun – 12 Jul	Mr Maziar Mahdavi Amiri	College of Ferabi, University of Tehran, Iran

Publications: July – September 2017 (SCOPUS)

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