Centre for Informatics and Applied Optimisation - CIAO
2014 Annual Report
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Executive Summary

2014 has seen many changes for CIAO, starting with the merger of University of Ballarat and the Gippsland Campus of Monash University to Federation University Australia.

We have also seen changes to the leadership of CIAO with Andrew Stranieri stepping from the Director’s position in August to allow him more time with his family and for his own research. A big thank you to Andrew for his commitment and support of CIAO over the years. A special thank you goes to Andrew Barton, Robert Layton, and Julien Ugon who were Acting Directors while a new Director was appointed. They did an excellent job and kept CIAO ticking along until the appointment of Alex Kruger as the new Research Director. Following the departure of Prof Paul Watters late 2013, we welcome the appointment A/Prof Iqbal Gondal as the new director of the Internet Commerce Security Laboratory (ICSL).

Another notable change in the structure of CIAO is the establishment of an International Academic Advisory Group, which will enable CIAO to further consolidate its international outreach and reputation, which we consider one of our strengths.

2013 was a fast year for CIAO’s research activities, in particular with the success of two ARC grant applications (one through FedUni and one through Monash), and 2014 has also been an exciting year. Research output has been impressive, with A/Prof Adil Bagirov, Dr Zari Dziallov and Dr Zhaohao Sun each publishing their first book. CIAO has organised and co-organised several successful research workshops, of particular note the Constructive Optimisation Workshop in April to honour Vladimir Demyanov’s 75th birthday (in collaboration with RMIT and Swinburne), and the Malware Reverse Engineering Workshop, in August, which attracted significant interest from the Industry. Thanks to Dr Musa Mammadov’s work, CIAO has pursued its ongoing involvement with NiCTA, and two projects have been negotiated (started in 2015) with major players in the health insurance industry through our participation in the Capital Market Cooperative Research Centre. The first cooperative research project between Mt Helen and Gippsland campuses has been initiated by Dr Sheila Devasayham. We hope that there will be many more to follow.

CIAO’s involvement with the community has remained very strong in 2014. Dr Guillermo Pineda-Villavicencio volunteered to mentor mathematics higher education students at St Patrick’s college. Dr Eldar Hajilarov continued his work with Damascus College in mentoring year 8 students with a view to their participation in the Mathematics Olympics when in year 11. Eldar has had a great response and we have linked some of those students into the Graeme Clark Oration.

There have been a number of staff changes including the appointment of Dr Sona Taheri as a Research Associate for Adil Bagirov. A number of members have changed their positions. We would like to thank Prof John Yearwood for his support of CIAO as director and then Head of School and Executive Dean of the Faculty. We wish him well in his new position at Deakin University. Other staff members who have stepped down over the year include Dr Changzi Wu, Dr Zhiyou Wu, Dr Vera Roschina, Dr Shamsul Huda, and Dr Charlynn Miller who has moved to the Faculty of Health. Peter Martin will be retiring in February 2015. We wish him well.

That CIAO researchers were able to carry out such terrific activities through this year of much uncertainty and change is a testimony to their commitment and dedication, and they can be proud, as a group, of this achievement. It has been a challenge to maintain the momentum of 2013, which has resulted in a drop in our grant success. A clear message was received from CIAO members of the need for more practical support in applying for grants and industry projects.

In 2015, which is marked by the new ERA round, we are going to increase our ratings in the 01 and 08 areas.

Alex Kruger, Research Director
CIAO Performance in 2014

The CIAO Strategic Plan is aligned with the Faculty of Science and Technology research plan.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Indicators</th>
<th>Measure</th>
<th>Target 2013</th>
<th>Actual 2013</th>
<th>Target 2014</th>
<th>Actual 2014</th>
<th>Target 2015</th>
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<tbody>
<tr>
<td>Perform quality research in FoR 01 Mathematical Sciences and 08 Information and Computing Sciences</td>
<td>Number of large funded research (category 1 or 2) projects (through FedUni or other)</td>
<td>No. ¹</td>
<td>4</td>
<td>9</td>
<td>5</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Number and quality of new research grants awarded in the indicated year</td>
<td>Cat 1²</td>
<td></td>
<td></td>
<td></td>
<td>1 $1,000K</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Cat 2</td>
<td></td>
<td></td>
<td></td>
<td>1 $63K</td>
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<td></td>
<td></td>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td>10 $151.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of research publications</td>
<td>Total</td>
<td>90</td>
<td>99</td>
<td>85</td>
<td>83³</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Books</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
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<tr>
<td></td>
<td>Maintain a number and diversity of researchers</td>
<td>No of CIAO members</td>
<td>35</td>
<td>43</td>
<td>35</td>
<td>36</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>HDR enrolments</td>
<td>No. EFT HDR</td>
<td>28</td>
<td>44</td>
<td>30</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td>Engage collaboratively with researchers and</td>
<td>Host internationally recognised research visitors</td>
<td>No. of visitors / no. countries</td>
<td>15/10</td>
<td>18/10</td>
<td>17/12</td>
<td>14/6</td>
<td>20/14</td>
</tr>
</tbody>
</table>

¹ Category 1 or 2 grants > $50,000 where a CIAO researcher was a CI
² Grants where a CIAO researcher was a CI
³ Only Scopus covered publications are counted
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<thead>
<tr>
<th>Objective</th>
<th>Indicators</th>
<th>Measure</th>
<th>Target 2013</th>
<th>Actual 2013</th>
<th>Target 2014</th>
<th>Actual 2014</th>
<th>Target 2015</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>research communities globally</td>
<td>Host internationally recognised conference events</td>
<td>No. of conferences organised by CIAO</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Visits to overseas universities and research centres</td>
<td>No. of visits</td>
<td></td>
<td></td>
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<td></td>
<td>Presentations at international research conferences and workshops</td>
<td>No. of presentations</td>
<td></td>
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<td></td>
<td>Formal arrangements with leading research centres (eg NICTA, IBM, Westpac, GWMWater)</td>
<td>No. of MOU's or agreements with leading research centres</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Engage with industry</td>
<td>Industry engagement in pursuing research funding</td>
<td>Number of applications for funding made with industry partners</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Industry engagement in research projects</td>
<td>Number of industry partners involved in collaborative research with CIAO.</td>
<td>10</td>
<td>18</td>
<td>18</td>
<td>15</td>
<td>20</td>
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### CIAO Team Members 2014

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<thead>
<tr>
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<tbody>
<tr>
<td>Emeritus Professor Sid Morris</td>
<td>Research Director, Associate Professor Alex Kruger</td>
<td>Professor John Yearwood, Executive Dean, Faculty of Science &amp; Technology</td>
<td></td>
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<tr>
<td>Dr Julien Ugon, Deputy Director CIAO</td>
<td>Professor David Gao, Complex Systems group Leader</td>
<td>Associate Professor Iqbal Gondal, Director ICSL</td>
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<tr>
<td>Associate Professor Andrew Stranieri, HIL Leader</td>
<td>Associate Professor Adil Bagirov, MAORG Leader</td>
<td>Dr Zhiyou Wu</td>
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<tr>
<td>CIAO Team Members 2014</td>
<td></td>
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<tr>
<td>Associate Professor Madhu Chetty</td>
<td>Dr Andrew Barton</td>
<td>Dr Robert Layton</td>
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<tr>
<td>Dr Musa Mammadov</td>
<td>Dr Siddhi Kulkarni</td>
<td>Mr Alastair Lansley</td>
<td></td>
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<tr>
<td>Dr Sheila Devasayaham</td>
<td>Dr Peter Martin</td>
<td>Dr Guillermo Pineda-Villavicencio</td>
<td></td>
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<tr>
<td>CIAO Team Members 2014</td>
<td></td>
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<td>------------------------</td>
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<tr>
<td>Dr Venki Balasubramanian</td>
<td>Dr Sona Taheri</td>
<td>Mr Grant Meredith</td>
<td></td>
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<tr>
<td>Dr Sheila Devasayaham</td>
<td>Dr Vera Roschina</td>
<td>Dr Shamsul Huda</td>
<td></td>
</tr>
<tr>
<td>Dr Savin Chand</td>
<td>Dr Eldar Hajilarov</td>
<td>Dr Zari Dzalilov, Honorary</td>
<td></td>
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</table>
Honorary appointments in 2014

During 2014 there were a number of new or renewed honorary appointments including:

Honorary Research Fellows:
Mr Scott Ainslie, Sycon Industries
Dr Zhaohao Sun, the Papua New Guinea University of Technology
Lady Megan Storrar, DTZ
Dr Ian Smart, Optias Pty Ltd
Dr Omaru Maruatona
Dr Mofakharul Islam
Dr Jaipu Zhang

Honorary Adjunct Professor:
Professor Meir Shillor, Oakland University, Rochester, USA

Honorary Professor:
Professor Guarong (Ron) Chen, City University of Hong Kong (Renewal)

Adjunct Research Fellow:
Dr Zhiyou Wu
Dr Ian Spark (Renewal)

International Academic Advisory Committee

In 2014 CIAO established an International Academic Advisory Committee (IAAC) with founding members Professor Michel Théra (University of Limoges, France), Professor Marco Antonio López Cerdá (University of Alicante, Spain), and Professor Jean-Pierre Crouzeix (University Blaise Pascal, France).

As listed in the Terms of Reference the role of the IAAC is:
1. Providing advice and feedback from an international academic perspective on;
   a. Research activities within CIAO,
   b. Supervision of research students and ECRs,
   c. Annual and strategic CIAO Research Plans and Reports.

2. Working in partnership with CIAO to;
   a. Ensure the improvement of research outcomes,
   b. Promote CIAO, the Faculty and FedUni internationally,
   c. Identify opportunities for international research collaboration and attracting research students to CIAO.

As the IAAC progresses, new members can be added.

International Collaboration

CIAO researchers are actively collaborating with researchers from a diverse range of countries:

- United Kingdom
- Germany
- France
- Spain
CIAO has Memorandums of Understanding with the following international universities:

- Systems Research Institute of the Polish Academy of Sciences
- University of Limoges, Frances
- Belarusian University of Informatics and Radioelectronics
- University of Chile

Students

PhD:

Masters Students:
Dan Xu, Kylie Turville, Vijay Haribabu Chakravarthy, Mehrdad Razmoo (leave), Hugh Townsend, Chaojie Li.

Honours Students: This year there were 6 in our area: 2 IT, 2 Maths, and 2 other.

A large number of CIAO PhD’s have either submitted their thesis or completed by the end of 2014.

Increasing Technological Capacity for CIAO

CIAO contributed funds towards establishing a Maths Access Grid to allow greater access to mathematicians and research collaboration with other Universities. This technology is up and running.
Mathematics Analysis and Optimization Research Group (MAORG)

Members of the group conducted research in optimisation and its applications in engineering and data mining. They published three books (including one by adjunct professor Marco López), more than 40 refereed journal articles, several conference papers and book chapters, gave a number of invited talks at international conferences and visited many overseas universities to conduct joint research.

Selected projects

Stationarity and regularity in variational analysis with applications to optimization. ARC Discovery, 2011-2015 (A. Kruger, M.A. López Cerdá, M.A. Théra, J.V. Outrata)


Capital Markets Cooperative Research Centre. (A. Stranieri, J. Ugon; begins in 2015)

Conference/workshop organization

Constructive optimisation workshop in honour of Prof Vladimir Demyanov’s 75th Birthday, 16-17 April 2014 at FedUni & RMIT

Conference presentations


- Workshop on Optimization, Nonlinear Analysis, Randomness and Risk, University of Newcastle, July 12, 2014 (M. Mammadov – contributed talk).
• The 4th Asian Conference on Nonlinear Analysis and Optimization, August 4-9, 2014, Taipei, Taiwan (A. Bagirov – invited talk).
• The 1-st Pacific Optimization Conference, October 31 - November 2, 2014, Wuxi, China (A. Bagirov).
• 8th Australia New Zealand Mathematics Convention, University of Melbourne, December 6-9, 2014 (S. Ezzati, Jo-ann Larkins, M. Mammadov – contributed talks).
• Educational Forum at KAZNTU, Almaty, Kazakhstan (Z. Dzalilov – invited talk).

Visits to other universities and research centres
• Universidad de Chile, Santiago, Chile, January 2014 (A. Kruger).
• Weierstrass Institute for Applied Mathematics, Berlin, Germany, April 2014 (M. Théra).
• Chongqing Normal University, China, May 18-31, 2014 (A. Bagirov).
• Southwest University of Science and Technology, Mianyang, China, May 25-28, 2014 (A. Bagirov).
• University of Autonoma de Barcelona, Spain, July 1-20, 2014 (A. Bagirov).
• Chiang Mai University, Chiang Mai, Thailand, July, 2014 (A. Kruger).
• Naresuan University, Phitsanulok, Thailand, July - August, 2014 (A. Kruger).
• Hong Kong Polytechnic University, July 31 - August 4, 2014 (A. Bagirov).
• University of Alicante, Alicante, Spain, September, 2014 (A. Kruger).
• University Hospital CHUV, Paediatric Respiratory Department, Lausanne, Switzerland (Z. Dzalilov).
• Centre of Risk Studies, University of Cambridge, Judge Business School, UK (Z. Dzalilov).
• KAZNTU, Almaty, Kazakhstan (Z. Dzalilov – 2 weeks’ lecture course on brain data analysis for Masters students).
• Hong-Kong Polytechnic University (Z. Dzalilov).
• Chongqing Normal University, China (Z. Dzalilov – 2 lectures on data mining for Masters students).

International visitors
• Prof Jean-Pierre Crouzeix, Université Blaise Pascal, February 3-23, 2014.
• Prof Hans Mittelmann, Arizona State University, March 7-8, 2014.
• Prof Phan Quoc Khanh, International University, Vietnam National University, 7-26 April 2014.
• Ms Huynh Thi Hong Diem, International University, Vietnam National University, 7-26 April 2014.
• Ms Thidaporn Seangwattana, Naresuan University, Thailand, September – December 2014.
• Mr Panu Yimmuang, Naresuan University, Thailand, September – December 2014.
• Prof Anatoli Ivanov, Pennsylvania State University; ongoing collaboration.
**HDR students**

Two PhD students successfully completed their PhD study:

1. Ehsan Mohebi. The title: “Nonsmooth Optimization Models and Algorithms for Data Clustering and Visualization”.
2. Qiang Long. The title: “Nonsmooth and Derivative Free Optimization Based Hybrid Methods and Applications”.

PhD student Mehdi Zarei: examination report has been submitted recently.

**Australian Mathematical Sciences Institute (AMSI) internships (academic mentor – Dr Zari Dzalilov)**

PhD student Medhi Zarei.

1. Project: Medium Term Projected Assessment of System Adequacy (MTPASA) disaggregation.
   Industry partner: Intelligent Energy Systems Pty Ltd.
2. Project: Device localization based on Received signal strength indications in mesh network.
   Industry partner: Universal Site Monitoring (USM).

**Editorial board membership**

- *Journal of Global Optimization* (Adil Bagirov, Michel Théra),
- *Journal of Industrial and Management Optimization* (Adil Bagirov, Marco López Cerdá, Michel Théra),
- *Journal of Optimization Theory and Applications* (Jean-Pierre Crouzeix, Marco Antonio López Cerdá, Michel Théra),
- *Kybernetika* (Jiří Outrata),
- *Nonlinear Analysis and Optimization* (Phan Quoc Khanh)
- *Optimization* (Adil Bagirov, Alex Kruger, Jean-Pierre Crouzeix),
- *Optimization Letters* (Musa Mammadov),
- *Pacific Journal of Optimization* (Adil Bagirov, Michel Théra),
- *Positivity* (Michel Théra),
- *TOP* (Marco López Cerdá),

**Other activities**

- Jiří Outrata continued as a member of the IFIP TC 7 Committee.

**Awards**

Alex Kruger, Research Excellence Award, School of Science, IT and Engineering, 2014.
Complex Systems Research Group

2014 was a great harvest year for the group’s research and professional activities. The group has got an additional research grant US$75,000 from US Air Force, finished about 30 research papers (7 published and 7 accepted by top international journals), hosted 4 international/national visitors; organized/attended 3 international/national conferences/workshops, presented 3 plenary/invited lectures and 9 colloquium lectures. The canonical duality theory has been recognized as a breakthrough methodological theory by the communities in applied mathematics and global optimization. Two special journal issues will be dedicated to this theory.

Selected projects

1. Nonconvex Variational Analysis and PDEs.
   b. Achievements: One paper finished and accepted.

   a. Researchers: D. Gao, N. Ruan.
   b. Achievements: One paper published.

   b. Achievements: Two papers published, several papers are accepted.

4. Canonical Duality and Algorithms
   b. Achievements: Several deterministic methods and algorithms for solving some “NP-hard” integer programming problems developed. The results show that the canonical duality theory can be used for solving efficiently large scale discrete optimization problems. Several papers have been published online. Three papers are in progress.

   a. Researchers: D. Gao, Q. Qin (ANU), K. Cai (China).
   b. One paper published. One paper is accepted, and one paper is finished.

6. Chaotic Dynamical Systems.
   a. Researchers: D. Gao, N. Ruan, Xiaojun Zhou
   b. One paper has been published.

International visitors

- Professor Meir Shillor, Oakland University, USA
- Dr. Zhong Jin, Shanghai Maritime University (sponsored by Chinese Government),
- Miss Shiqing Xu, China Reming University (sponsored by CSC Scholarship),
- Professor Horymir Netuka, Palacký University, Olomouc, Czech Republic,
• Professor Jitka Machalova, Palacký University, Olomouc, Czech Republic.

Other senior collaborators:
• Professor Qinghua Qin, Australian National University,
• Dr. Eldar Hajilarov, Federation University,
• Dr. S.C. Fang, Graduate Alumni Professor of Industrial Engineering, North Carolina State University,
• Professor Wenxun Xing, Tsinghua University, China,
• Dr. Reuy-Lin Sheu, Professor and Chair of Math Department, National Cheng Kung University, Taiwan,
• Dr. K. Cai, Northwest A & F University, China.

Activities

1. Conferences organized

2. Plenary/invited lectures
   2) Invited Speaker, Mixed-Integer Nonlinear Programming, June 2-5, 2014, Carnegie Mellon University, Pittsburgh, PA, USA.

3. Colloquium talks
   2) Colloquium Lectures at Institute for Computational Engineering and Sciences, University of Texas, Austin. Title: Canonical Duality and Triality: Unified

3) Colloquium Lecture at College of Arts and Science, Shanghai Maritime University, December 21, 2014. Title: Canonical duality-triality principle: Unity in art, science and philosophy.


3) Colloquium Lecture at Faculty of Mathematics and Computer Science, Jagiellonski University, Krakow, Poland, June 18, 2014. Title: Canonical Duality Theory and Finite Element Solution to NP-hard Unilateral Post-Buckling Problem of Large Deformed Beam on Rigid Foundation.


5) Invited Lecture at Department of Mechanical Engineering, University of Melbourne, April 3, 2014. Title: Canonical duality-triality: Unified understanding for bifurcation, chaos, and NP-hard problems in computational mechanics and global optimization.

HDR students and postdocs

- Daniel Morales-Silva (Postdoc),
- Ning Ruan (CRN Research Fellow),
- Xiaojun Zhou (Ph.D. student; graduated in 2014),
- Yi Chen (Ph.D. student),
- Elaf J Ali (Ph.D. student),
- James Apap (honours student).
Pure Mathematics

Group research activities fall within the following branches of mathematics:

- **Topological groups** (Prof Sidney Morris),
- **Variational analysis** (A/Prof Alex Kruger, Dr Vera Roshchina, Nguyen Hieu Thao; Adjunct Professors: Marco López Cerdá, Jiří Outrata, Michel Théra, Phan Quoc Khanh),
- **Functional analysis** (A/Prof David Yost),
- **Convex geometry** (A/Prof David Yost, Dr Guillermo Pineda-Villavicencio),
- **Graph theory** (Dr Guillermo Pineda-Villavicencio).

**Highlights:**

- Published: 1 book (Marco López Cerdá), 3 journal special issues (Alex Kruger, Michel Théra, Phan Quoc Khanh), and many refereed journal articles;
- A series of YouTube videos to support the online book "*Topology without Tears*" (Sidney Morris) have now had about 7,000 views;
- More than 30 conference (mostly invited) presentations including several keynote and plenary talks;
- More than 10 visits to other universities worldwide;
- 6 international visitors;
- Research collaboration with 29 institutions in 12 countries;
- Editorial board membership in 19 research journals.

**Selected projects**

- Varieties of Abelian topological groups with coproducts; nonmeasurable subgroups of compact groups;
- Stationarity and regularity properties of set-valued mappings and collections of sets;
- Variational principles;
- Generalised differentiability;
- Banach space geometry;
- Approximation properties and projectional resolutions of identity for non-separable Banach spaces;
- Contractive projections in Banach spaces;
- Decomposability of compact convex sets;
- Analysis of large graphs with prescribed constraints.
**HDR Students**

- 1 PhD student at Mount Helen (Nguyen Hieu Thao);
- 1 PhD student at University of Newcastle (co-supervised by Guillermo Pineda-Villavicencio);
- 2 PhD students at Naresuan University, Thailand (co-supervised by Alex Kruger);
- Several associate supervisions (by Alex Kruger, David Yost and Guillermo Pineda-Villavicencio).

**Editorial board membership**

- *Axiom* (Sidney Morris),
- *Bulletin of the Australian Mathematical Society* (David Yost),
- *Communications on Applied Nonlinear Analysis* (Michel Théra),
- *Extracta Mathematicae* (David Yost),
- *Gazette* of the Australian Mathematical Society (Sidney Morris, David Yost),
- *Journal of Convex Analysis* (Jean-Pierre Crouzeix, Michel Théra),
- *Journal of Fixed Point Theory* (Phan Quoc Khanh),
- *Journal of Nonlinear and Convex Analysis* (Michel Théra),
- *Set-Valued and Variational Analysis* (Marco López Cerdá, Michel Théra),
- *Thai Journal of Mathematics* (Phan Quoc Khanh),

**Other activities**

- Sidney Morris and David Yost continued as members of the Council of the Australian Mathematical Society;
- Sidney Morris continued as Chair of the Academic Board of The William Light Institute;
- Michel Théra continued as a member of the European Mathematical Society committee for developing countries.

**Visits to other universities:**

- David Yost visited the University of NSW, 10-11 July 2014, and provided an invited seminar on 11 July, “A lower bound theorem for general polytopes“

**Conference presentations**

- Constructive Optimisation Workshop in honour of Professor Vladimir Demyanov’s 75th Birthday, Ballarat-Melbourne, April 16-17, 2014 (A. Kruger, Hieu Thao Nguyen, V. Roschina, D. Yost – invited talks).
- Biarri Applied Mathematics Conference, RMIT, 25-26 November 2014 (attended by David Yost; contributed talks not accepted).
- Australian Mathematical Society Council meeting, University of Melbourne, December 5, 2014 (attended by D. Yost and S. Morris).
• 8th Australia New Zealand Mathematics Convention, University of Melbourne, December 6-9, 2014 (Hieu Thao Nguyen, A. Kruger, D. Yost, S. Morris – contributed talks).
Health Informatics Laboratory (HIL)
Group Leader: A/Prof Andrew Stranieri

Key research directions in health informatics

- Data mining in health,
- Telehealth,
- Complementary and alternative medicine informatics,
- Support systems in health,
- Public health and safety,
- Technologies for empowering people for participation in society.

Selected projects

An experimental evaluation of the usefulness of computer-supported argumentation to improve occupational health and safety in construction design. ARC Linkage LP120100587 (Nick Blismas and Helen Lingard, RMIT; A/Prof Andrew Stranieri, FedUni).

Assessing a structure for safety is difficult at many levels. This project explores an information visualisation approach revolving around an infographic to enhance communication and knowledge sharing between stakeholders in the construction industry.

Low bandwidth HD3D video-conferencing (A/Prof Andrew Stranieri, Dr Cameron Foale).

This world first technology involves a software and hardware configuration that enables a HD3D video to be streamed across the internet to be viewed using a standard html 5 browser. This provides a compelling 3D experience at transmission rates that can be managed by low capacity networks.

Cloud Platform for Active Healthcare Applications with Wearable Sensors, ANZ Medical Trustees grant (Dr Venki Balasubramanian, A/Prof Andrew Stranieri and A/Prof Iqbal Gondal).

Wearable sensors that detect physiological signs such as heart activity (ECG), body temperature and blood pressure are rapidly emerging onto the consumer market. These sensors will ultimately play a central role in healthcare globally for remote, continuous patient monitoring in hospital, home and in workplace contexts. Currently sensors are expensive; their installation requires the complex establishment of a wireless sensor network transmitting data to healthcare application in Cloud environments, and new algorithms to process the data to raise specific alarms.

Broadband 3D Telehealth Applications for the Empowerment of Patients in Health Care Facilities and the Home, A/Prof Andrew Stranieri.

This project examined the feasibility and utility of high definition and 3D Tele-health with participation by eleven healthcare organizations, two universities an e-Research facility and a rural network provider from regional Victoria including:

- West Wimmera Health Services (Nhill), Wimmera Healthcare Group (Horsham), Ballarat District Nurse and HealthCare (Ballarat), Ballarat Oncology and Haematology Services, Ballarat Health Services, Northern Health (Epping) and Goulburn Valley Medical
(Shepparton), Eventide Aged Care (Stawell), Benetas Aged Care (Brunswick) and Heritage Lakes (Sth Morang).

The project demonstrated that 3D tele-health applications that realize clinical benefits and productivity gains are possible. However, technologies are currently cutting edge, existing network capacity is challenged to support 3D and clinical benefits of 3D over high definition require further investigation which is now occurring.

The technical innovation in this project resulted in three world “firsts”:

• **HD3D wound image store and forward**: A Store and Forward Online system that enables 3D image files (.mpo) to be uploaded, downloaded and viewed with a 3D television.

• **High bandwidth 3D video conferencing**: The configuration and integration of commercial 2D codecs to transmit very high quality 3D video conferencing.

• **Low bandwidth 3D video conferencing**: The development of software that enables 3D video conferencing to be performed on low capacity networks using conventional web browsers.

The project worked in areas of tele-dentistry, tele-wound and tele-oncology.

**Enhancing and supporting deliberations within multidisciplinary decision teams.** ARC Discovery DP140100047 (Frada Burstein, Monash; A/Prof Andrew Stranieri and John Yearwood, FedUni; James Warren, University of Auckland; Alan Wolff, Wimmera Healthcare Group).

This project explores IT support for exchange of insights and assertions by multidisciplinary community in treatment planning for patients with multimorbidity. By analysing the reasoning of clinician groups in a hospital setting a Knowledge-Deliberation template is being developed to inform the design of generic Deliberation Simulator (DS). The online environment will provide a template for complex decision support.

**Active academic research collaborations**

- Anna University, Chennai, India;
- Deakin University;
- Monash University;
- Rajarata University, Sri Lanka;
- RMIT University;
- Queensland University of Technology;
- University of Auckland;
- University of Colombo;
- University of Melbourne;
- UTS.

**Active industry based research collaborations**

- Epworth Hospital;
- Ballarat Base Hospital;
- Ballarat Oncology and Haemotology Services;
- Lake Imaging;
- Northern Hospital;
- Wimmera Health Care Group.

**PhD students**

Elmabrook Ben Lamma, Evan Dekker, Pradnya Kulkarni, Ahmad Azab, Rageed Al-Lami, Suleiman Alnaimi, Ather Saeed, William Harvey, George Kadampuzha, Vishaka Sharma.
Technologies for Empowering People for Participation in Society (TEPPS)

The TEPPS programme aims to enable the lives of people the world over through the radical design of software and hardware solutions. TEPPS are designed through close target user collaboration and have the aim of empowering peoples' lives. The TEPPS programme focuses on researching, designing, implementing and evaluating simple, accessible and cost-effective enabling systems. Another focus of the TEPPS programme is to research equity in terms of health support provision and quality of life issues.

Close target user informed design and key stakeholder collaboration are key priorities for any ventures that the TEPPS programme decides to explore. Universal design is a priority in order to create appeal and to encourage uptake for a product beyond the intended target audience. By carefully simplifying design you can maximise the user experience and enhance interaction. Projects range in nature from immersive virtual worlds with rich interactions and three dimensional environments, through to DVD-based applications and simple web-based interfaces.

TEPPS sought to form collaborative partnerships within industry, government bodies, community organisations and academics. Examples of past and current relationships, and collaborations include Australian Speak Easy Association; The Australian McGuire Programme; and The Australian Stuttering Research Centre.

TEPPS/MARG merger

Early 2015 it was decided to combine the membership of TEPPS and the Mobile Application Research Group (MARG) under the TEPPS banner. Both research groups have been working on similar applications and it was thought that it was not rational to operate in such a style. By combining the groups we could pool research output and successful grant applications. Having a larger combined group can also lead to future collaborations and stronger grant applications. It was decided to keep the TEPPS identity due to TEPPS already having a more established and known brand. The current section of the report partially reflects also MARG activities.

Programme membership

- Grant Meredith (Programme leader)
- Leigh Achterbosch
- Evan Dekker
- Alastair Lansley
- Dr Eldar Hajilarov
- Dr Philip Smith

Projects

Scenari-Aid

Scenari-Aid in its current phase is an interactive website (www.scenariaid.com) designed to be a social simulator primarily marketed towards people who stutter (PWS). Scenari-Aid hosts over 100 streaming video-based scenarios covering the likes of restaurants, jobs interviews and other common interactive social settings. Each scenario contains a number of steps within giving the user the opportunity to challenge themselves and reflect upon how to respond appropriately in terms of both narrative content and also a preferred fluency management technique. People who stutter have used it to practise their speech and any associated fluency shaping management technique. Some PWS have also used it to assist them with issues of social confidence possibly influenced by their stuttering behaviour. Since
release Scenari-Aid has found a much wider target audience beyond PWS and is being touted as a great tool for the likes of: long term unemployed, people from a non-English speaking backgrounds, acquired brain injury recovery and Down syndrome.

The next phase of Scenari-Aid will include building in user tools such as a diary system, goal tracking and video/audio recordings for registered users.

A study currently in the write-up phase of Scenari-Aid users of the initial DVD phase has indicated that the DVD alone allowed improvements of the user’s general fluency levels, social confidence levels and assisted with the transference into the real world of such practise skills.

We are currently working on the early development of a new version of Scenari-Aid to be for children who stutter. This is called “Scenari-Kids” and it will feature a new suite of purpose shot scenarios for children aged 6-10. This has come about from user feedback and suggestions. Currently the infrastructure is being developed.

**Fluency Fun Land**

Fluency Fun Land (https://asterius.ballarat.edu.au/fluencyfunland/) is a website designed by a project capstone team in 2011. Fluency Fun Land (FFL) has been designed as a series of mini-games to encourage children who stutter to practise their learnt fluency techniques with family support. The novel idea behind FFL is not the games themselves but the hopeful inclusion of them into fluency practise in the future in family and clinical settings. The idea is to use the games to build spoken narratives around the gameplay. These games can be played both in a private home setting and also a clinical setting. During the narratives built around the game play proper use of speech management technique will be encouraged.

Fluency Fun Land has been redesigned slightly this year and updated via the help of a QuT student completing their final year project. This will serve as a prototype to gain interested from different target user groups. FFL was redeveloped using HTML5 to ensure cross-platform functionality. We are collaborating with Assoc. Prof. Ann Packman from the University of Sydney’s Australian Stuttering Research Centre on this project and we will be looking for grant support in the future to develop more and expand. Recently the site has been user tested by clinical speech pathologists and small changes have been made.

**Dave’s Diary**

A tablet-based application designed to enable carers and patients to track and monitor day-to-day planned activities and medications. Dave’s Diary is not quiet complete and TEPPS will endeavour to address minor modifications during the year.

**Wimmera Base Hospital project**

A tablet-based application designed to assist health professionals to track the progress of coronary patients within the first 24 hours of their admission. The project is complete up to the point of the current funding.
Events
During July of 2014, Grant presented two studies at the prestigious Oxford Dysfluency Conference in the UK. The two presentations were:
- The perceived benefits of video-based simulation for people who stutter;
- The experiences of university students who stutter: a quantitative and qualitative study.

Funding
- Grant will been noted as an Associate Investigator in the next NHMRC funding round lead by researchers from the Australian Stuttering Research Centre (USYD);
- A funding was submitted for IELTS (International English Language Testing System) research funding from the Australian Government.

Award nominations & outcomes
- Grant Meredith was nominated for the Federation University Australia Alumni of the Year Award for 2014. The nomination was successful and Grant will receive the award in August of 2015.

Research Collaborations

Flinders University
Grant Meredith and Chris Turville from FOST are collaborating with Michelle Swift and Julie McCulloch from Flinders University on a project called “Investigating the effects of online simulation practise on maintenance of speech fluency and communication attitudes”.

The aim of the project is to determine whether or not use of an online simulation tool results in improved speech fluency in real-life situations, improved maintenance of speech skills, improved communication attitude and improved social participation compared to not using the tool. The tool, in this case meaning “Scenari-Aid”. This is a very important project in terms of video-based sensitization outcomes for people who stutter/and or may have anxiety issues. The results of this pilot study were presented at the 2014 Oxford Dysfluency Conference and the study is still on going.

University of Sydney
A grant proposal has been made lead by the Australian Stuttering Research Centre (USYD) for an NHMRC grant for a 2017 start. The project is titled “Stuttering, disability, and social participation across the lifespan”. This research develops three lines of defence against the disabling effects of stuttering through the lifespan. Those three lines of defence span the preschool years, the school years, and adulthood. Outcomes will prevent or minimise distress from the disorder and maximise participation in society for those affected.

Guest presentations
- Meredith, G. From VR to video-based scenarios: From rad to radical. 30th April, 2014; The College of New Jersey, New Jersey, USA.
- Meredith, G. Telemedicine and sensor technologies for health care. 10th November, 2014; The College of New Jersey, New Jersey, USA.
- Meredith, G. A games-based approach to teaching science. Research presentation; 3rd December, 2014; Shaoguan University, Guangdong Province, China.
Publications & Presentations (peer reviewed)

Publications & Presentations (non-peer reviewed)

Media appearances
Data Mining and Informatics Research Group (DMIRG)

CIAO reputation and influence in the field of multiobjective reinforcement learning continued to grow during 2014, with the survey paper co-authored by CIAO members Associate Professor Peter Vamplew and Dr Richard Dazeley with Diederik Roijers and Shimon Whiteson having an immediate impact with more than 20 citations in 2014.

CIAO researchers also collaborated with leading reinforcement learning expert Prof Michael Littman from Brown University on an ARC Discovery Grant application which was unfortunately unsuccessful.

In addition to our multiobjective reinforcement learning research, a new research direction in expert-assisted reinforcement learning was established, led by Dr Richard Dazeley. Adam Bignold performed an initial study of this topic for his Honours research project, and will continue to examine this area for his PhD research.

Some progress has been achieved in the areas of big data analytics, business intelligence, and intelligent systems (Dr Zhaohao Sun). A series of peer-reviewed papers is going to be published. Applications for research grants are going to follow.

DMIRG changing to FLAG

Early in 2015 DMIRG will re-organize to become the Federation Learning Agents Group (FLAG) with the main focus on multiobjective reinforcement learning. Having a more focused group can lead to more efficient collaborations and stronger grant applications.

Dr Zhaohao Sun, Honorary Research Fellow

Dr Sun continues his research interest in big data analytics, business intelligence and intelligent systems.

In 2014 Dr Sun and Prof Yearwood published the Handbook of Research on Demand-driven Web Services: Theory, Technologies and Applications http://www.igi-global.com/book/handbook-research-demand-driven-web/95218 and a number of other publications.

Conference presentations and visits to other universities

- Hebei Normal University, Hebei University of Science and Technology, and Chongqing Normal University, China, November – December 2014 (Z. Sun).
National ICT Australia (NICTA)

CIAO has been involved with the NICTA for several years. This included joint research in the area of optimal control and support by NICTA of CIAO PhD students. In 2015, Dr Musa Mammadov was coordinating CIAO’s collaboration with NICTA. He was involved in optimal control research and supervised PhD student Sara Hassani supported by NICTA.

Here are the highlights of 2014 NICTA related events.

**NICTA Executive Board Meeting 14 August 2014 @ Mt Helen**

The NICTA Executive Board meeting was hosted at Mt Helen. It included two presentations by CIAO staff:

- Dr Musa Mammadov presented on his joint NICTA/Federation University research and PhD students.
- Dr Julien Ugon provided an overview of CIAO research capability.

**NICTA Showcase 28 & 29 August 2014**

CIAO staff and students participated in the NICTA Showcase in Melbourne on the 28 & 29 August 2014. PhD Students Yi Chen, Sara Hassani, manned a stand at the Showcase which highlighted two research projects: Leak Detection Algorithm with South East Water and Optias and the Container Optimisation Project with Visa Logistics through an AMSI Internship.

**PhD Student Sara Hassani**

started the second part of her thesis devoted to applications in infinite horizon optimization. The work involves three stages. (i) Optimization formulation; completed. (ii) Stability of sequence of trajectories; completed. (iii) Applying the above techniques to Markov decision process and Turnpike theorem; in progress.

Publications:

Internet Commerce Security Laboratory (ICSL)

The departure of Paul Watters in December 2013 started the search for a new Director in 2014. A/Prof Iqbal Gondal was appointed in September 2014. Thanks to A/Prof Peter Vamplew and Dr Robert Layton for maintaining laboratory activities in the interim.

Selected projects

Technology Voucher Program (TVP) Load Optimisation. The Data Enterprise (Robert Layton, Yi Chen)

Red Marker Project 1: Prototype for social media parsing project

Red Marker Project 2: Developing prototype to find issues relating to poor financial advice

Phishlabs: Encryption Key Detection

Westpac – continued to work on projects of specific interest for Westpac in the areas of phishing and financial fraud.

IBM – multiple presentations and meetings with IBM to discuss opportunities for ICSL

Conference/workshop organization

Malware Reverse Engineering Workshop, 25 August 2014, the Royal Society of Victoria, Melbourne and sponsorship support from Phishlabs was greatly appreciated.

Mr Pete Szabo, Sophos, Canada provided an excellent keynote talk on “A study of Malware’s anti-analysis and anti-detection techniques. Other presentations were from Jon Oliver, Trend Micro, Paul Black, Phishlabs, Silvio Cesare, Qualys, Dan, Xu, ICSL, Sean Park, Kaspersky, Ian Welch, Victoria University of Wellington, Robert Layton, ICSL. The workshop was attended by 35 people from a wide cross section of industry.

Cybercrime and Trustworthy Computing Workshop, 24-25 November 2014, Massey University, New Zealand

2014 CTC conference was held in New Zealand and although there were a limited number of academic papers there was excellent participation from industry and interest in our work from New Zealand Police. Ahmad Azab, Phd student attended.

HDR Students

PhD students: Oana Ureche, Ahmad Azab, Christian Kopp, Paul Black, Rosemary Hay, Jatinder Warraich, Sean Park.

Masters Students: Dan Xu, Kylie Turville

Undergraduate students competed in the Cyber Security Challenge Australia led by coach and ICSL Research Fellow Dr Robert Layton and achieved 27th out of 56 teams.
Events, Colloquiums and Research Seminars

Events

<table>
<thead>
<tr>
<th>NAME</th>
<th>EVENT</th>
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<tbody>
<tr>
<td>NBN Launch - HD3D demonstration</td>
<td>11th February 2014</td>
</tr>
<tr>
<td>Constructive Optimisation Workshop in honour of Prof. Vladimir Demyanov’s 75th birthday</td>
<td>16 &amp; 17 April 2014</td>
</tr>
<tr>
<td>Graeme Clark Oration 2014, Melbourne</td>
<td>5th June 2014</td>
</tr>
<tr>
<td>HANA Workshop</td>
<td>10th June 2014</td>
</tr>
<tr>
<td>Host NICTA VRL Executive Meeting &amp; Presentations</td>
<td>14th August 2014</td>
</tr>
<tr>
<td>Launch of Maths Drop in Centre</td>
<td>6th August 2014</td>
</tr>
<tr>
<td>Malware Reverse Engineering Workshop</td>
<td>25th August 2014</td>
</tr>
<tr>
<td>NICTA Executive Meeting Ballarat</td>
<td>28/29 August 2014</td>
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<tr>
<td>NICTA Technology Showcase</td>
<td>28/29 August 2014</td>
</tr>
<tr>
<td>Defence Sciences Institute Meeting</td>
<td>15 September 2014</td>
</tr>
<tr>
<td>AUSIMM Technical Workshop</td>
<td>24th October 2014</td>
</tr>
<tr>
<td>Alex Rubinov Memorial Lecture 2014</td>
<td>6th November 2014</td>
</tr>
<tr>
<td>2nd HANA Workshop</td>
<td>7th November 2014</td>
</tr>
<tr>
<td>5th Cybercrime and Trustworthy Computing Workshop, NZ</td>
<td>Nov, 2014</td>
</tr>
</tbody>
</table>

L-R David Glynn, Ahmad Azab, Gayle Boschert, David Ryan at NBN Launch

David Ryan, Vicki Coltman, George Fong, Telstra Rep, Ruth Bollard at NBN launch Feb 2014
Constructive optimisation workshop in honour of Prof Vladimir Demyanov's 75th Birthday, 16-17 April 2014 at FedUni & RMIT

The main goal of the meeting was to celebrate the wonderful scientific contribution of Professor Vladimir Demyanov, and to build closer links between different groups of local researchers, and to expose students and Early Career Researchers to a broad range of topics in nonsmooth and discrete optimisation with 20 talks.

The workshop was a collaboration between CIAO at Federation University, RMIT, University of Melbourne, and Swinburne University of Technology.

Thanks to Vera Roschina and Nadezda Sukhorokova who assisted with the planning.

Sadly Prof Vladimir Demanyov died the day after the workshop was held and will be much missed.


CIAO members John Yearwood, David Gao and PhD student Yi Chen participated in the pre-IMARC event held at Greenhill Enterprise Centre to meet with a Chinese delegation and highlight the skills at Federation University and to launch the FedUni Industry Advisory Group.

Following on from this FedUni had a display at the IMARC Conference held in Melbourne to highlight the work occurring and capability to raise the profile of FedUni. Students also participated in a poster display of their work at the conference.

CIAO has many research links in China.

Graeme Clark Oration, 5 June 2014

Each year the faculty provides sponsorship for the Graeme Clark Oration. CIAO and Faculty members attended a number of activities.
associated with this event. Two secondary school students Bethany Claridge & Michael Donaldson and their teacher Caroline Nolan from Damascus College attended the oration at our invitation.

This year's Orator was Dr Donald Ingber and the title was “The Next Technology Wave: Biologically Inspired Engineering”

Alex Rubinov Memorial Lecture 2014

The annual Alex Rubinov Memorial Lecture was held on the 6 November 2014 to celebrate the life and work of the founding Director of CIAO who was a brilliant and internationally known mathematician whose dedication to the development and communication of mathematics was tireless.

This year's guest presenter was Professor Geoff Prince, Director of the Australian Mathematical Sciences Institute. Geoff has a long academic career as a teacher and researcher at RMIT, the University of New England and La Trobe University where he was Head of Department.

Topic: “Do Maths, Don’t do Medicine!”

Contrary to popular opinion being good at maths is a predictor of mathematical, not medical, success. Australia desperately needs more maths graduates: more statisticians, more meteorologists, more epidemiologists, more maths teachers, more optimisers. Mathematicians and statisticians influence almost every part of our public lives and to a far greater extent than do the
medical profession. Geoff painted a picture of Australia’s current mathematical capacity, the challenges and showed examples of mathematicians in amazing careers.

Colloquiums and Research Seminars

A diverse range of seminars were provided by staff, students, international and domestics visitors to CIAO.

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof Meir Shillor, Dept. of Mathematics and Statistics, Oakland University, USA</td>
<td>17/01/2014</td>
<td>Mathematics of Change</td>
</tr>
<tr>
<td>Dr Ian Spark, Adjunct Research Fellow</td>
<td>31/01/2014</td>
<td>Revolutionary Steering/Drive System for Wheeled Vehicles (or how to eliminate both the dreaded differential and the contrary castors)</td>
</tr>
<tr>
<td>Prof Jean Pierre Crouzeix, Universite Blaise Pascal, France</td>
<td>21/02/2014</td>
<td>The finite revealed preferences problem: concave approximation versus concave interpolation</td>
</tr>
<tr>
<td>Prof Hans Mittelmann, Arizona State University, USA</td>
<td>7/03/2014</td>
<td>Computing Strong Bounds in Combinatorial Optimization</td>
</tr>
<tr>
<td>Dr Scott Nankervis, Federation University</td>
<td>14/03/2014</td>
<td>Designing a computer game to teach immunology</td>
</tr>
<tr>
<td>Dr Andrew Barton, Federation University</td>
<td>21/03/2014</td>
<td>Development of an Algal Response Model to Inform Water Resource System Operations &amp; Measuring the Near Wall Flow Characteristics of Freshwater Biofilms</td>
</tr>
<tr>
<td>Dr Marjorie Chan, University of Utah, Salt Lake City, USA</td>
<td>28/03/2014</td>
<td>Mars for Earthlings: Using Earth Analogs to Decode the Sedimentary History of Mars</td>
</tr>
<tr>
<td>Prof Prasad Yarlagadda, Queensland University of Technology</td>
<td>4/04/2014</td>
<td>Impact of ICT and Automation on Aviation Industry: A Case Study through the Airports of the Future Research</td>
</tr>
<tr>
<td>Mr Sachindra Dhanapala Arachchige, Victoria University</td>
<td>11/04/2014</td>
<td>PhD by Publication – My Experience</td>
</tr>
<tr>
<td>Name</td>
<td>Date</td>
<td>Topic</td>
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<tr>
<td>Prof Phan Quoc Khan, International University, Vietnam</td>
<td>16/04/2014</td>
<td>Constructive Optimization Workshop presentation</td>
</tr>
<tr>
<td>Grant Meredith, Federation University</td>
<td>2/05/2014</td>
<td>Assertive Technologies: The Scenari-Aid example</td>
</tr>
<tr>
<td>Dr Ean Tat Ooi, Federation University</td>
<td>9/05/2014</td>
<td>Polkygon-Based Scaled Boundary Finite Elements for Computational Modeling</td>
</tr>
<tr>
<td>Dr Chris Gouramanis, Earth Observatory of Singapore, Nanyang</td>
<td>30/05/2014</td>
<td>Same-same but different: Multi-proxy comparison of the 2004 Indian Ocean Tsunami and 2011 Cyclone Thane sedimentary deposits from the southern coast of India</td>
</tr>
<tr>
<td>University</td>
<td></td>
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<tr>
<td>Dr Francine Marques, Early Career Research Fellow</td>
<td>2/06/2014</td>
<td>New Mechanisms regulating blood pressure arising from the kidney Trim 55 AS A NEW CANDIDATE GENE for cardiac hypertrophy</td>
</tr>
<tr>
<td>Dr Martin Hughes, Research Associate, Geologist Consultant</td>
<td>13/06/2014</td>
<td>The Road of Bones, Pole of Cold and the Siberian gulags – a visit to the Kolyma goldfield</td>
</tr>
<tr>
<td>Dr Tanmoy Paul, Indian Institute of Technology Hyderabad, India</td>
<td>20/06/2014</td>
<td>Proximality in Banach Spaces</td>
</tr>
<tr>
<td>Nick Schultz, Federation University</td>
<td>4/07/2014</td>
<td>Plant diversity in Agricultural landscapes</td>
</tr>
<tr>
<td>Mr Ata Atazedeh, Federation University</td>
<td>15/08/2014</td>
<td>Ecological response model for evaluation of water quality and river health and configuring consumptive flows in the Mackenzie River.</td>
</tr>
<tr>
<td>Dr Venki Balasubramanian, Federation University</td>
<td>15/08/2014</td>
<td>AppA: Assistive Patient monitoring cloud Platform for Active healthcare applications</td>
</tr>
<tr>
<td>Mr Ander Guinea, Federation University</td>
<td>29/08/2014</td>
<td>Geoelectrical prospecting applied to hydrology</td>
</tr>
<tr>
<td>Mr James Apap, Federation University</td>
<td>29/08/2014</td>
<td>Logistical Warehousing and Distribution Scheduling: A focus on Green Logistics and Emissions</td>
</tr>
<tr>
<td>Mr Madhi Zarei, Federation University</td>
<td>12/09/2014</td>
<td>Analysis of functional magnetic resonance imaging data sets using data mining and optimization algorithms.</td>
</tr>
<tr>
<td>ASM Sajeev, MIT Sydney Campus</td>
<td>28/09/2014</td>
<td>Analysis of Error Frequencies in Business Process Models</td>
</tr>
<tr>
<td>Mr Pramrod Wangikar</td>
<td>9/10/2014</td>
<td>Circadian program of cyanobacteria</td>
</tr>
<tr>
<td>Ms Kathleen Keogh, Federation University</td>
<td>10/10/2014</td>
<td>Using Software Agents to Coordinate Knowledge and Plans in Emergent Planning</td>
</tr>
</tbody>
</table>
Publication List for 2014

Books

Edited books

Journal special issues

Refereed articles (Source: SCOPUS. The list is incomplete as many publications are not covered by SCOPUS.)


35. **Keogh K., Sonenberg L.** Coordination using social policies in dynamic agent organizations. (2014), Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), vol. 8368, pp. 83-102, 10.1007/978-3-319-07346-9_5.


## Risk Management for 2014

<table>
<thead>
<tr>
<th>Identified risk</th>
<th>Why a risk to CIAO?</th>
<th>Category</th>
<th>Risk mitigation or management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract staff</td>
<td>Lack of continuity for staff. Loss of skills and knowledge and relationships through uncertainty of tenure</td>
<td>H</td>
<td>Advocate for clear HR policies. Ensure that staff receive support to meet performance requirements.</td>
</tr>
<tr>
<td>Low ERA Scores</td>
<td>Negative reflection on CIAO and FedUni</td>
<td>H</td>
<td>Improve publication practices and procedures for collecting data.</td>
</tr>
<tr>
<td>Merger with Monash Gippsland Campus</td>
<td>Restructure of Faculties/Schools/Centres may adversely affect CIAO</td>
<td>H</td>
<td>Executive Dean to keep CIAO informed on developments. Be alert and ready to act.</td>
</tr>
<tr>
<td>Workloads</td>
<td>Limited time for some staff to conduct research due to teaching and admin commitments</td>
<td>H</td>
<td>Advocating for the importance of research on the Faculty and University levels.</td>
</tr>
<tr>
<td>Falling number of HDR students</td>
<td>Loss of income which impacts on staff and research capacity</td>
<td>M</td>
<td>Look at options for scholarships to attract new students. Increase CIAO marketing through the website, showcases of CIAO research and advertising at overseas research centres.</td>
</tr>
<tr>
<td>Administrative procedures</td>
<td>Too many layers and number of forms for approvals for projects, professional development, visitors and travel</td>
<td>M</td>
<td>Review with new structure how administrative procedures can be streamlined and improved. Review travel document approval process.</td>
</tr>
<tr>
<td>Loss of maths staff</td>
<td>Maths is central to CIAO</td>
<td>H</td>
<td>Ensure the understanding that maths is central to new Faculty structure.</td>
</tr>
</tbody>
</table>
SWOT Analysis for 2014

Strengths

- Skilled and knowledgeable staff.
- A brand name that is well known internationally and nationally as well as that of the Founding Director Prof Alex Rubinov.
- A University Designated Research Centre.
- Strong publication record (approx. 30% of the University publications).
- Proven success rate in ARC grants and the CMCRC.
- PhD completion levels are above the University and Faculty average.
- Well-developed international research relationships.
  - CIAO International Advisory Group with high profile researchers.
  - Memorandums of Understanding with a number of universities worldwide.
  - Strong collaboration with researchers from France, Spain, Czech Republic, Germany, Poland, Belarus, Switzerland, Russia, Finland, Denmark, US, UK, Brazil, Israel, New Zealand, China, Taiwan, India, Vietnam, Korea, Turkey.
  - Involvement in international bodies: IFORS, EURO, EUROPT, Pacific Optimization Group (POP).
    - Adil Baghirov is a EUROPT Fellow. Formerly, Alex Rubinov was a EUROPT Fellow; he was also one of the founders of POP.
  - Membership of editorial boards of international journals and book series in the area of optimisation and a few others.
  - Involvement in PhD supervision and thesis examination at overseas universities.
  - Involvement in assessment of grant applications for overseas granting bodies.
  - Success in international grant applications (Air Force Office of Scientific Research, USA).
  - A large number of international visitors to CIAO annually.
- Collaborations with other research centres in Australian Universities: University of Newcastle, UNSW, UniSA, RMIT, Deakin University, Curtin University.
- Excellent relationships with Australian Mathematical Sciences Institute, National ICT Australia, Capital Markets Cooperative Research Centre and Defence Sciences Institute for workshop funding, internships and student support.
- Strong industry relationships.
- Cost effective with minimal resources.
- CIAO & ICSL are different to other FedUni research centres and have built on their diversity to provide a rounded package to partners and in accessing funding from contract research.
- Cross discipline collaboration of maths and IT researchers that builds on researcher strengths and is recognised in the CIAO & ICSL brands.
- A good combination of senior & early career researchers (ECR’s) and can accommodate multiple disciplines and mentoring of ECR’s.
- Strong relationship with FedUni commercialisation unit.

Weaknesses

Limited business development/industry relations resources, so we cannot seek out opportunities even though our track record with contract research is pretty good.

CIAO’s inclusive policy means that not all members are equally research active and this can reduce the average output.
Opportunities

- There are good opportunities for building on the CIAO brand and our strong research potential, for expanding the existing international research collaboration. There is still room for expanding and strengthening our relationships in Europe and Asia, but there are also new exciting opportunities in South America.
  
  The priority areas:
  - Joint grant applications in Australia and overseas;
  - Attracting PhD students, joint supervision;
  - Increase the role of and expand the CIAO International Advisory Group.
- Expanding CIAO involvement with the Australian Mathematical Society, Australian Mathematical Sciences Institute, and other optimisation centres and groups in Australia. This should result in a better integration of CIAO into the national research environment.
- Excellent commercial relationships for contract research:
  - Defence Sciences Institute (DSI) and National ICT Australia (NICTA) collaborations increase access to industry projects;
  - Cross discipline research collaboration provides team resources for research projects;
  - Research opportunities with industry funded PhDs.
- Former staff members and honoraries are happy to collaborate with CIAO.

Threats

- Uncertainty in research organisation and management both in the Faculty and the University is destabilising and detrimental.
- Staff contract uncertainty undermines the existence of research centres.
  - Research capability in general and industry engagement in particular can reduce.
  - Mentoring of early career researchers can decline.
  - Planning for the future investment of time and resources becomes challenging.
- Administrative silos in FedUni make it difficult to navigate for best outcomes in research.
  - Onerous and ever changing administration procedures required for grants, visitors and travel makes the conduct of research challenging.
  - CIAO finance arrangements make it impossible to accumulate funds to support and invest in research. Availability of research income is whittled away by the University and profit earned cannot be accumulated to build resources for research work.
  - Inaccurate and incomplete measurement of research output due to overcentralisation and numerous identified issues with Research Master and Scopus adversely affects ERA submissions.
- Lack of recognition of industry relations, contract research and community engagement. Investment of time and resources to develop relationships with organisations like NICTA can be lost due to a lack of support from the University.
- Continuing poor evaluation of FedUni research environment by ARC assessors and panels reduces our competitiveness with other universities and undermines our chances of getting government funding for fundamental and applied research. ARC Discovery is the only source of support of fundamental research in Australia.
  
  The permanent difficulty of attracting strong HDR candidates gets worth due to the lack of scholarships.