CIAO Newsletter

Centre for Informatics & Applied Optimization

School of Information Technology & Mathematical Sciences

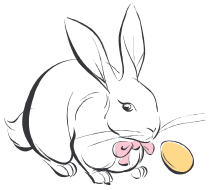
Edition 15 – March 2007

What's in this Edition?

From the Editors

This edition includes interesting research news we would like to share with you, stretching back into late 2006.

We also extend warm Easter greetings to you and your family.



News

University Alliance with China

CIAO is very pleased to announce that it has signed a Memorandum of Understanding (MOU) with the Institute of Mathematics and System Science (IMSS) at Shanghai University, China.

The purpose of the MOU is to establish a joint research alliance, to be called the "China-Australia Collaboration in Applied Optimization" (CACAO).

This activity builds on past collaboration and formalises future work. Both Universities will contribute financially to ensure CACAO is a success.

CIAO has a history of successful research collaboration with individual researchers in China, but now this new alliance will help build research capability and enhance international relations.

The Agreement was signed by the University of Ballarat's Vice-Chancellor Professor David Battersby and Shanghai's Professor Liansheng Zhang, Director of IMSS.

The CACAO Agreement will see an exchange of Chinese and Australian researchers and research students between Ballarat and Shanghai. CACAO also plans to run joint international conferences and workshops.

Australian Defence Force Showcase

CIAO representatives visited Canberra in late 2006, to present our anthropometry capability to approximately thirty high ranking representatives from the Australian Defence Force (ADF), as well as the Army and Navy.

Associate Professor John Yearwood, Dr David Stratton and Mr Michael Fraser were invited to participate in this event, which showcased the capability CIAO has developed during the Anthropometry Project with the ADF.

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ARC Discovery Success

We are delighted to announce that CIAO has been successful in obtaining an Australian Research Council Discovery Grant valued at $210,000.

Dr Zhiyou Wu won the three-year Grant to research the topic "Filled function methods for global optimization and their applications".

Project Summary:
Many real problems in science, commerce and industry are restricted in the way that they are modelled and solved, by the known inability to deal with global optimization problems.

The development of computational efficient global optimization methods in this project will allow new, more complete approaches to these problems, especially in new areas of bio informatics, data mining, economic modelling, supply chain management, air traffic management, biochemical engineering and automotive industry, consequently helping Australia advance in these various areas.

It will also enhance the understanding of global optimization from both theoretical and numerical viewpoints, particularly boosting optimization research in Australia.

Pictured above: Dr Zhiyou Wu

Industrial Training Program with MaxiTRANS

ITMS has commenced a statistical-based industrial training program with MaxiTRANS of Ballarat.

The program has been designed by Mr Peter Martin (pictured right).

It has been specifically tailored to the needs and roles of individuals within the company to provide the background, skills and statistical tools needed to better use data to improve business performance and increase efficiencies throughout the company.

The training is being delivered by Mr Martin both on-site at MaxiTRANS, and on some occasions, in the computer laboratories at the University of Ballarat. MaxiTRANS are Australia's foremost supplier of road transport trailers.

Tribute to Professor Alexander Rubinov

Written by:
Associate Professor Regina Burachik (pictured right), School of Mathematics & Statistics, University of South Australia

Abstract Convexity and Augmented Lagrangians
Burachik, R. S. and Rubinov, A.

Research with Alex was always full of excitement.

He always had a very clear idea of what kind of results he wanted, and how these results should “look” from the mathematical point of view.

Very often he would discard a new result, just because it was not addressing the problem he had in mind. He would write to me detailed emails where he would describe very clearly the problem, and which kind of result he was expecting from our study together.

It was important for him to devise a duality theory of augmented Lagrangians, which would use the ideas and the concepts of abstract convexity. Alex and I did this (for a general class of augmented Lagrangians) in a paper which was accepted by SIAM-Optimization in November 2006.

Alex was among the most patient co-workers I have ever had. He was so kind that he could explain the same thing as many times as necessary, with the same patience and calmness, as if he were explaining it only for the first time.

We started working on the project which gave rise to the above mentioned paper in June 2005. Because I was based in Adelaide, we worked by email until November 2005, by which time the manuscript was pretty ready.

I travelled to Ballarat at the end of November 2005, and in a few days of intensive work, we completed the manuscript.

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We submitted in December 2005 and Alex was the corresponding author.

At the beginning of 2006, Alex became ill. Because Alex was so very interested in this work, he wanted to continue as the corresponding author, in spite of his declining health. He only agreed to transfer the task of being the corresponding author to me after I insisted many times.

We received the referee reports in August 2006. He was very happy to learn that the reports were positive overall. Unfortunately, he was too ill at that time to participate in the rather minor revision, which I am sure would have been much better if I had had his guidance.

A strong, deep feeling of sadness and loneliness accompanied me during the whole revision process.

Fortunately the referees were satisfied with the revised version and the acceptance was sent to me in November 2006, just hours before my talk at the Fifth Workshop on Continuous Optimization in Ballarat, which was held in Alex's memory in November 2006. The content of this paper was the material of my talk.

Alex wanted the subject of abstract convexity to reach the traditional optimization community, and therefore he insisted that we should aim to publish our results in well-known optimization journals. I see this paper as a preliminary step in addressing Alex's wish.

Now it is our opportunity to continue the path he had so generously set for us, by taking up the ideas, enthusiasm, curiosity and love for mathematics he so skilfully fermented in those of us who had the immense gift to share his sweet, precious and unforgettable company.

Regina Burachik

GANSO Library

GANSO is a library of optimization solvers, developed at the University of Ballarat by the CIAO research group, and is available through the Victorian Partnership for Advanced Computing (VPAC).

GANSO implements a number of modern optimization methods to tackle the most difficult nonlinear programming problems, in which the objective function is non-differentiable and has multiple extrema. It also allows users to combine these methods in different ways (eg: to combine local and global search).

GANSO provides class and procedural interfaces to all the algorithms, and can be linked to programs written in C/C++ and Fortran, and also from other packages.

The library includes files and examples for uses, which can be found in the directory /usr/local/bin/ganso/ on the VPAC machines. The user manual, Matlab and maple toolboxes, as well as demonstration versions of GANSO for solving programs with up to 100 variables, can also be downloaded from the website at http://www.ganso.com.au.

CIAO would be interested to receive feedback about the use of the GANSO library in practical applications. You are invited to provide suggestions and comments, and report bugs to Dr Julien Ugon at j.ugon@ballarat.edu.au.

News from:

CIAO Research Groups

Combinatorics, Graphs & Network Topology (CGANT)

Group Leader:
Professor Mirka Miller
(pictured right)

Leverhulme Visiting Professorship

Congratulations to Professor Mirka Miller on winning a prestigious Leverhulme Visiting Professorship at Kings College, London.

The overriding criteria for selection were the academic standing and achievement of the visitor, and the ability of the receiving institution to benefit from the imported skills and expertise.

Professor Miller plans to visit Kings College for four months later in 2007, with eligible visiting periods being between three and ten months.

This is a real honour for Professor Miller, and brings publicity and recognition to the University of Ballarat and the School of ITMS.

For more details of these Visiting Professorships see:
http://www.leverhulme.ac.uk/grants_awards/grants/visiting_professorships/

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AWOCA becomes IWOCA in 2007
The Australasian Workshop on Combinatorial Algorithms (AWOCA) has been renamed the International Workshop on Combinatorial Algorithms (IWOCA).

The 18th meeting will be held at The Entrance, NSW, and will be organised by The University of Newcastle, with provisional dates being 18-12 June 2007. IWOCA 2008 will be held in Nagoya, Japan.

The Steering Committee for IWOCA, consisting of Professors Costas Iliopoulos (Kings College, UK), Mirka Miller (University of Ballarat), Bill Smyth (McMaster University, Canada), is currently engaged in re-structuring the Programme Committee and in organising an ongoing publisher for the Conference Proceedings.

ICTGIS 2007
The International Conference on Graph Theory and Information Security (ICGTIS 2007) was held in Bandung, East Java, on 10-13 February 2007. This conference was held to honour Professor Mirka Miller in her 57th year.

The proceedings of the conference will be published as a special issue of the Journal of Combinatorial Mathematics and Combinatorial Computing (JCMCC).

CGANT Meeting: 24 November 2006
Members of CGANT met to discuss current research, and ITMS Postgraduate Students also attended and gave short presentations about their research.

Data Mining & Informatics Research Group (DMIRG)

Group Leader:
Associate Professor
John Yearwood
(pictured right)

AI2006
Dr Peter Vamplew presented a paper titled “Compile Traces in Reinforcement Learning” at the Joint Conference on Artificial Intelligence (AI2006) in Hobart, Tasmania, at the end of 2006.

Associate Professor John Yearwood also attended AI2006, and presented a poster titled “A hybrid question answering schema using encapsulated semantics in lexical resources”. It was co-written by Mr Bahadorezza Ofoghi.

DMIRG Meetings
DMIRG’s regular meetings in 2006 included the following presentations:

- Associate Professor John Yearwood: Health Projects.
- Dr Rana Ghosh: CI Projects.
- Dr Andrew Stranieri: Intelligent Decision Support forE-Governance.
- Dr Peter Vamplew: Reinforcement Learning.
- Mr Bahadorreza Ofoghi: FRameNet.
- Mr Greg Simmons: Ontology and the Semantic Web

Distributed Simulation Laboratory (DSL)

Group Leader:
Dr David Stratton
(pictured right)

ADF Project nearing completion

The major effort in the DSL toward the Australian Defence Force Anthropometry Project is nearing completion. It is very clear that the major challenge in a project of this nature has been to represent real-world behaviour in ways that are sufficiently flexible to the nuances of the ever-adaptable person that seeks to fly the aircraft.

A strictly mechanistic approach to task completion and accommodation leads to recruitment guidelines that exclude many who, in reality, would find ways to fly. In this context, our contact with experienced pilots has been invaluable.

Virtual Seven Valleys at ACSW 2007

Mr Chris Nelson is head of the Computer Games Design Course at ITMS, and is also currently undertaken a Masters degree on the topic “Virtual Seven Valleys”.

Chris presented part of his computer art work project at the recent Australian Computer Science Week 2007, hosted by the School of ITMS.

ABC Radio Ballarat decided to visit ACSW 2007 and ran an online story about Chris (pictured right), which can be viewed at: http://www.abc.net.au/ballarat/stories/s1840601.htm

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Mathematical & Statistical Analysis Research Group (MASARG)

Group Leader:
Dr Adil Bagirov
(pictured left)

AMSI Meetings
On 13-14 February 2007, Dr David Yost attended meetings of the Australian Mathematical Sciences Institute in Melbourne.

Topology Without Tears
Prof Sid Morris has completed another 40 pages of his online book Topology Without Tears. The new material includes Chapter 10, which has rich topology results.

Readers of this book come from over 80 countries, and it is available from:
http://uob-community.ballarat.edu.au/~smorris/topology.htm

The latest additions include a small amount of material on topological groups. Later material on topological vector spaces, elementary algebraic topology, and deep fixed points theorems will be added.

Morris Groups
Kenneth Ross, one of the founders of the now highly studied subject, Abstract Harmonic Analysis, has chosen to name a certain class of groups "Morris groups". This is based on work Professor Sid Morris undertook in 1972.

Educational Research in Mathematics, IT and Statistics Cluster (CERMITS)

Cluster Leader:
Dr Phil Smith
(pictured right)

CERMITS Meeting
CERMITS held a Cluster meeting on Wednesday 14 February 2007. The group recognises that it is in a position to show leadership in maximising the benefits of new technologies.

A lot of interest has been shown in exploiting the new UB Virtual Reality facility for educational purposes. This expertise in technology is the area in which CERMITS has showed the most strength.

Ritemaths Annual Report 2006

In 2006, the members of the project team, at Ballarat, have made good progress in evaluating and re-designing a range of novel teaching activities, which use new technologies and involve real world contexts. We have strengthened the study of linear fuctions by collecting additional data from the Mt Clear, Ballarat Secondary and Westbourne Grammar. The data collection has involved pre and post tests, classroom observation and student interviews.

In addition, a range of data, related to students' understanding of the concept of rate of change, has been collected utilising computer simulations to stimulate students' discussion and reflection on their understanding of this concept. Students have been observed and video-recorded as they worked, in pairs, through a number of tasks related to the simulation provided by the animation software, JavaMathWorlds, developed by the SimCalc Project in the United States of America.

The year began with a two-day working meeting of teachers at our partners schools at Hepburn in February. This has been followed by three separate meeting days at the University of Melbourne. Teachers from Ballarat schools were transported to Melbourne in a university car so that they would benefit from the interaction with the Melbourne partner schools and the rest of the research team.

Ms Sandra Herbert continued as the Ballarat project officer throughout 2006, supporting the work of the research team and facilitating data collection at RITEMATHS schools. She has contributed to the development of curriculum materials and research instruments.

Ms Sandra Herbert (pictured right) has had her PhD candidature confirmed at the University of Ballarat with Principal Supervisor, Dr. Robyn Pierce and Associate Supervisor, Professor Kaye Stacey.

Data collection for this PhD has collected in the form of video-recorded phenomenographic interviews with individual students from all RITEMATHS partner scholls.

This data collection is now completed and will be followed by the transcription of the interviews including the non-verbal communications, captured by the videos, used by students to assist their explanations where their words alone were insuffient to express their thinking.

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2006 has seen the consolidation and refinement of tasks involving the use of technology, extensive data collection and some further analyis of data collected earlier in the project, resulting in the following publications.

This is the third and final year of the RITEMATHS project so our last reporting to the ARC, but we will keep you posted regarding further publications

Information Security Cluster (INSECT)

Cluster Leaders: Prof Mirka Miller and Prof Sid Morris (pictured L to R below)

INSECT is planning a research project in the following area:

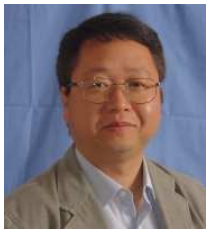
Efficient Security Schemes for Online Businesses

This will involve:

- Studying the application of list decoding to the protection of intellectual properties including digital copyrights, brand logo, trademarks.
- Improving the existing PKIs in terms of efficiency in electronic payments in various types of electronic commerce models, including secure Internet banking.
- Using crypto-algorithms, to develop new technical resolutions to the Internet frauds.
- Investigating new applications of existing decoding algorithms (including list decoding) in the security of data exchange systems.
- Studying PK algorithms with a high level of security and the small size of keys, and their applications to commercial and military systems (such as sensor networks), where efficiency is a key issue.
- Developing new data-hiding codes, and studying their applications.

Intelligent Finance Cluster (IFC)

Cluster Leader:
Dr Heping Pan
(pictured right)



China Visit: December 2006
Dr Pan visited the Centre for Forecasting Science (CFS) of the Chinese Academy of Sciences (CAS), Beijing, on 11 December 2006.

2nd Australia-China Joint Workshop on Forecasting and Risk Management
Dr Pan co-chaired the 2nd Australia-China Joint Workshop on Forecasting and Risk Management, and presented a talk on intelligent finance. This presentation created interest among the local post-graduate students who were present.

International Workshop on Forecasting and Risk Management (IWFRM)
Dr Pan was subsequently invited by CAS to be a Keynote Speaker for another larger conference – the International Workshop on Forecasting and Risk Management (IWFRM), held on 20-21 December 2006.

IWFRM provided a golden opportunity to undertake dialogue between mainstream econometrics and quantitative finance and the emerging intelligent finance.

Among the main speakers were Prof Arnold Zellner from the Graduate School of Business, University of Chicago, Prof Essie Maasoumi from the Southern Methodist University, and Prof William T. Ziemba from the Sauder School of Business, University of British Columbia, Canada.

Other principal speakers represented prestigious schools such as the London Business School, Beijing University Guanghua Management School, Xiamen University, Cornell University, and the Chinese Academy of Sciences.

Dr Pan made a Keynote presentation titled "From Quantitative Finance to Intelligent Finance – Financial Information Fusion, Multilevel Process Analysis and Dynamic Portfolio Management" at the Workshop. He received the Best Presentation Award for Outstanding Paper offered by the Workshop.

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Collaborative Centre for e-Health (CCeH)

Manager:
Mr Chris Lynton-Moll
(pictured right)

Projects currently in progress:

- ✓ Queensland Health - Development of electronic Ongoing Needs for Investigation (ONI) forms.
- ✓ Standards Australia - Development of 9 Draft Messaging Standards:

  Diagnostics HL7 v2.4
  Diagnostics HL7 v2.5
  Immunisation HL7 v2.5
  Prescriptions HL7 v2.5
  Referral & discharge HL7 v2.5
  Referral & discharge Handbook HL7 v2.4
  Location of digital signatures in healthcare messaging
  Archetypes representation in HL7 v2
  Harmonisation of EI & HD datatypes in HL7 v2

- ✓ Grampians Integrated Cancer Service (GICS) - Development of five year IT Strategic Plan.
- ✓ NEHTA - Structured document specification for pathology results.
- ✓ Broadband for Health – Barwon DGP - Barwon DGP Managed Health Network.
- ✓ ITOL Grant Application - Electronic ordering and monitoring of pharmacy prescriptions for aged care facilities.
- ✓ Tasmania Ambulance - Development of HL7 message specification for patient data from ambulance to emergency department.

Conferences & Seminars

Conference Report: Ms Kathleen Keogh

AAMAS Autonomous Agents and Multi-Agent Systems, Hakodate, Japan

Overview
My trip was very worthwhile and came at a very good time for me, in the lead up to PhD confirmation of candidature.

I attended the ATDM Agent Technology in Disaster Management Workshop, and the COIN Co-ordination Organisation, Institutions and Norms in Agents Workshop, followed by the main AAMAS conference.

I met some significant researchers who are doing work closely related to my own work, and I took part in stimulating discussions. I also presented my paper at the ATDM workshop.

Broad Impressions
The overall impression I took away from the ATDM workshop, was to value the knowledge and expertise I have available to me from:

- my Associate Supervisor Dr Wally Smith, Department of Information Systems, University of Melbourne, and
- Dr Mary Omodei, Psychology Lecturer, La Trobe University and collaborator, and her data.

A strong flavour of the discussions was that people had difficulty accessing real data, and that realistic simulations were extremely important.

A recurring theme is that disaster management domains provide problems in co-ordination and allocation problems that are well suited to multi-agent systems.

New contacts – broadening my international network
I was very pleased to meet with Nathan Schurr, whose work I had previously read. Nathan is working on a PhD with Milind Tambe (USA), and is doing simulation and collaboration work with the Los Angeles Fire Department.

Nathan is using the proxy agent architecture for team co-ordination and communications. His work is focusing on adjustable team authority – allowing different approaches to human/agent combinations in making decisions.

Professor John Yen – RCAST Project (USA)
Professor Yen presented a paper at the conference, which discussed cognitively inspired agents. He spoke about motivation in human-agent teams, and anticipating needs of team members by having a shared mental model (SMM).

His vision is to empower agents using SMM for team activities, to enable proactive helping and anticipation. The challenge is information overload and defining what is relevant**.**

He is using agents in human-agent collaboration: agents help humans as decision-making assistants, and support relevant information exchange.

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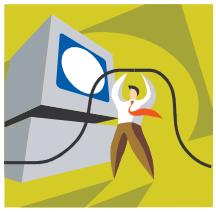
RoboRescue Simulator – a possible agent simulation test bed



I also met a student who used Roborescue as a simulation platform for his recently completed PhD work.

He was working on agents learning in terms of efficient allocation of resources to a fire. I asked whether RoboRescue would be a good simulator infrastructure for team co-ordination research.

He said that to play with team co-ordination, I would probably want to implement an agent communications layer and enable my agents to interact directly, rather than through the server.

Conference Presentations

✓ Dr Zhiyou Wu

Dr Wu attended the conference IEEE APCCAS 2006, in December 2006 in Singapore and presented a talk titled "Global Optimization Methods for Nonlinear Equations".

✓ Dr Prabhu Manyem

Dr Manyem presented a seminar on "Polynomial Time Maximization Classes – Syntactic Hierarchy" at the Mathematical Sciences Institute, Australian National University, Canberra on 13 November 2006..

Dr Manyem also gave the talk at North Carolina State University on 11 December 2006. Details can be found at: research.csc.ncsu.edu/colloquia/seminarpost.php?id=125

✓ Dr Joe Ryan

Dr Ryan gave an Invited Lecture on Algebra and Computer Science to an undergraduate class at Universitat de Lleida, Spain in September.

✓ Dr David Yost

Dr Yost attended the Forum "An investment in Australia's future: why the mathematical sciences matter" in Canberra on 7 February 2007. Further details can be found at http://www.review.ms.unimelb.edu.au/Forum.html.



Pictured above (L to R):
Dr Prabhu Manyem, Dr Joe Ryan, Dr David Yost

Conferences & Workshops: Organised by CIAO and CIAO members

Australian Computer Science Week 2007

ACSW 2007 was hosted by the School of ITMS at the University of Ballarat, from 30 January to 2 February 2007.

It was officially opened by the Vice Chancellor of the University of Ballarat, Professor David Battersby.

ACSW is an international multi-conference event for Computer Science professionals, researchers, and students, and occurs under the auspices of the Computing Research and Education Association (formerly the Computer Science Association).

ACSW 2007 included the 30th Australasian Computer Science Conference (ACSC), the premiere generalist forum for Australasian computer science academics.

In addition, it also involved the presenting of eight specialist conferences and workshops:

1. Australasian Computer Science Conference (ACSC)
2. Australasian Database Conference (ADC)
3. Australasian Symposium on Grid Computing and Research (AUSGRID)
4. Australasian Workshop on Health Knowledge Management and Discovery (HKMD)
5. Computing: The Australian Theory Symposium (CATS)
6. The Asia-Pacific Conference of Conceptual Modelling (APCCM)
7. The Australasian Information Security Workshop: Privacy Enhancing Systems (AISW)
8. The Australasian User Interface Conference (AUIC)

ACSW 2007 was preceded by a Doctoral Consortium, which took place on 29-30 January 2007, under the auspices of Australasian Computing Doctoral Consortium (ACDC).

ACDC provided an opportunity for doctoral students to describe their research topic and early results, and receive advice from research experts.

ACSW 2007 was a highly successful event, in which ITMS and CIAO were proud to play a leading role.

For more information please go to: http://acsw.ballarat.edu.au/

ACSW 2007

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Fifth Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications

This Workshop was held at the University of Ballarat on 28-30 November 2006, and was dedicated to the memory of the late Professor Alexander Rubinov.

Professor Rubinov and Professor Barney Glover were the founding organisers of the first Ballarat Workshop on Optimization in 1994.

Professor Rubinov organised the four subsequent workshops, and 2006 was the first without Alex.

The Workshop was officially opened by Professor David Battersby, Vice-Chancellor, University of Ballarat (pictured right).

The aim of the Workshop was to bring together experts from Australia, the Pacific region and around world in the areas of optimization theory, methods and applications to meet and exchange their recent research findings and to discuss possible joint projects.

Presentation topics included all areas of optimization, optimal control and their applications, however the emphasis of this workshop was on theory, numerical methods and applications of global and non-smooth optimization.

The workshop also incorporated a one-day event titled "Focussed Meeting on Global and Nonsmooth Optimisation Problems in Data Analysis and Engineering".

Keynote speakers were Professor Terry Rockafellar, University of Washington, USA, for the Workshop, and Professor Bulent Karasozen, Middle East Technical University, Turkey for the Focussed Meeting.

Workshop Invited Speakers were:

- Adil Bagirov (University of Ballarat)
- Gleb Beliakov (Deakin University)
- Leonid Churilov (Monash University)
- Bruce Craven (University of Melbourne)
- Regina Burachik (University of South Australia)
- Andrew Eberhard (RMIT)
- Jerzy Filar (University of South Australia)
- Masao Fukushima (Kyoto University, Japan)
- Vladimir Gaitsgory (University of South Australia)
- Phil Howlett (University of South Australia)
- Yalcin Kaya (University of South Australia)
- Alexander Kruger (University of Ballarat)
- Musa Mammadov (University of Ballarat)
- Juan Enrique Martinez Legaz (University Autonoma, Barcelona, Spain)
- Angelia Nedich (University of Illinois at Urbana-Champaign, USA)
- Iradj Ouveysi (University of Ballarat)
- Asuman Ozdaglar (MIT, USA)
- Jiri Outrata (CAS, Czech Republic)
- Marimuthu Palaniswami (University of Melbourne)
- Diethard Pallaschke (Karlsruhe University, Germany)
- Xiaoling Sun (Shanghai University, China)
- Peter Taylor (University of Melbourne)
- Gerhard-Wilhelm Weber (Middle East Technical University, Ankara, Turkey)
- Zhiyou Wu (University of Ballarat)
- Xiaoqi Yang (Hong Kong Polytechnic University, China)
- David Yost (University of Ballarat)
- Alberto Zaffaroni (University of Lecce, Italy)
- Liansheng Zhang (Shanghai University, China)

There were more than sixty participants from twelve different countries.

The Workshop was sponsored were IBM, the Australian Mathematical Sciences Institute (AMSI), and the Australian Research Council's Research Network on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP).

More information can be found at:
http://www.ballarat.edu.au/ard/itms/CIAO/Workshops/OTMA3.shtml

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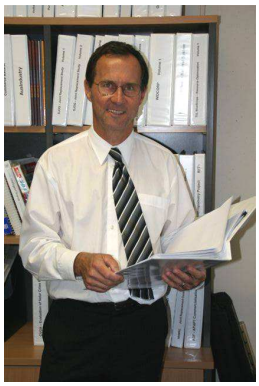
Commercial Projects

Business Development Manager
Mr Wayne Hurst
(pictured right)



Current Projects

VicSport – Database Management Project

VicSport have called for an assessment on the current status of database management tools used by Victorian State Sporting Associations (SSA).

The main task of the Project is to speak with leaders within each State Sporting Association, to determine their current membership management and reporting tools.

Status: The project is well underway.

CIAO personnel involved:
A Stranieri, Bob Bateman, E Nozohour, C Foale

Kann Finch Architectural – Development of Global Optimization Techniques for Office Design

This project deals with the efficient designing/planning of office space.

The main problem is to determine/evaluate the efficiency of the floor space for a given occupant in an office. This problem involves the study of the optimal planning/placement of workpoints.

Status: A number of workshops have been held with our project partners, and utility functions to describe workpoint and workspace have been defined.

CIAO personnel involved:
M Mammadov, Fusheng Bai, Jason Giri

Virtual Reality facility at UB

The Virtual Reality capability proposal is a new initiative and will involve the purchase of new technology. The VR capability will build on our multimedia & simulation expertise. It will allow research findings to be presented to participating organisations in an interactive and visual way. Areas of UB application include optimization scenarios, virtual design applications, data mining visualisation, virtual walk-through of localities, and in the area of health informatics, graphic representation of drug interactions and design.

Status: Building work has begun, and VR equipment and screen have been ordered through Swinburne University.

CIAO personnel involved: J Yearwood, P Vamplew

Information City Australia – ADRAC Commercialisation

This project will commercialise CIAO knowledge, the Adverse Drug Reaction (ADRAC) research through the development of a Business Plan involving the application of optimization and data mining techniques to determining suspected adverse drug reactions.

Status: Datascreen Pty Ltd is now registered as a company, an agreement to transfer intellectual property from researchers to UB has been signed, and workshops held.

CIAO personnel involved:
J Yearwood, M Mammadov, S Ivkovic, W Hurst

Ballarat ICT 2030

The final report for this important project was presented to the Board of cBallarat on 29 March 2007 by CIAO, CECC and CRIC (two research Centres of the School of Business).

The project involved reviewing the cBallarat IT2010 Strategy document, which was produced in 1993 for the City of Ballarat. Wide consultation was carried out at all levels of the local and business community.

The findings of this research were also presented at the Ballarat IT Specialists (BITS) Breakfast on 27 March 2007.

At the BITS Breakfast (L to R): Mr David Lynch (CRIC), Professor Julian Lowe (School of Business, UB), Associate Professor John Yearwood (CIAO), Mr Andrew Macleod (CECC).

Grants Awarded

Research Infrastructure Block Grants (RIBG)

Dr Peter Vamplew, Associate Professor John Yearwood and Dr Xinwen Wu have been successful in obtaining an RIBG.

A grant of $30,772 has been awarded to fund a Research Assistant for Data Mining and Information Security Projects.

Pictured above: Dr Peter Vamplew

Early Career Researcher Starter Grant: ECR Program 2006

Congratulations to the following researchers:

- ✓ Dr Sid Kulkarni: $7,000 for "Securing Australia with Biometric Techniques: Fingerprint Feature Extraction, Classification and Matching for Security Applications" Project.
- ✓ Dr Liping Ma: $7,460 for "Fishing for Phishers via Information Clustering" Project.
- ✓ Dr Peter Vamplew: $9,950 for "Faster, more accurate reinforcement learning of automated decision-making tasks" Project.
- ✓ Dr Julien Ugon: $5,000 for "A modelling approach to solving location-allocation problems through optimisation" Project.

Pictured above (L to R): Dr Liping Ma, Dr Julien Ugon

ITMS Colloquia & Seminars

ITMS Colloquia Series 2006-2007

Colloquia Co-ordinator:
Ms Katherine Heywood

The Colloquia Series continues to attract diverse speakers and a high level of professional expertise.

Recent speakers have included:

- Professor Claude Sammut, School of Computer Science and Engineering, University of New South Wales: "Robots for Search & Rescue".
- A/Prof Jeffrey Soar, Director, Collaboration for Ageing & Aged Care Informatics Research (CAAIR), University of Southern Queensland: "Ageing and aged-care enabled by innovative technology: the state-of-the-art and current research".
- Professor Philip Broadbridge, Director, Australian Mathematical Sciences Institute, University of Melbourne: "AMSI and Opportunities in the Mathematical Sciences"
- Mr Scott Hebbard, ITMS, University of Ballarat: "The Australian Skills Crisis - A Ballarat Case Study"

Staff News

Another new baby

Congratulations to Dr Nadia Sukhorukova (pictured below) and Dr Julien Ugon on the birth of their first child, a son named Ivan.

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Farewell to Dr Robyn Pierce

In January 2007 we farewelled Dr Robyn Pierce (pictured right), Deputy Head of the School of ITMS, who has been offered a Research Fellow position with the University of Melbourne.

Dr Pierce joined the University of Ballarat in 1989, and since then has taught mathematics and statistics to many hundreds of undergraduate students.

Her research has focused on mathematics education, statistics education, and multimedia and cognitive processes, resulting in numerous journal and conference publications.

In 2005, Dr Pierce created the RiteMaths Program, a collaborative project with the University of Melbourne and seven industry partners. This project was funded by an Australian Research Council Linkage Grant.

We wish her every success and happiness in her new role. As a parting gesture and in recognition of her considerable contribution to UB, Dr Pierce has been appointed as a Principal Research Fellow for a period of three years.

Post-Graduate News

New Student Representative

Our congratulations and thanks go to Ms Alyx Macfadyen, for taking on the role of Research Student Representative for the School of ITMS.

Alyx (pictured right) is currently researching her PhD on the topic “An Interaction framework for 3D environments using structured reasoning”.

She will be student representative until the end of 2007.

Thesis Examination Completed

Congratulations to Ms Moumita Ghosh. The three examiners of her PhD thesis, titled “Development of non-linear optimization techniques for production optimization”, have recommended that her thesis be approved.

Best Presentation Prize

Congratulations to PhD student Mr Daniel Morales Silva (pictured right), who won a prize for the Best Presentation at the University of Ballarat Annual Research Conference 2006.

Thesis Submission

The following students have submitted their theses for examination:

- Mr David Andrews, PhD: Sec Proxy: A Security Architecture for the HLA.
- Mr Darren Lierkamp, Master of Computing: Knowledge discovery and engineering for developing a fundamental investing expert.
- Mr Gary Saunders, PhD: Analysis of existing adverse drug reaction reports to establish key components for representation and indexing.



Pictured (L to R): David Andrews, Darren Lierkamp, Gary Saunders

Confirmation of Candidature

Student:	Mr Daniel Morales Silva
PhD Topic:	"G-coupling Functions and Properties of Strongly Star-Shaped cones"
Principal Supervisor:	Dr David Yost, School of ITMS
Assoc Supervisor:	Associate Professor Regina Burachik, University of South Australia
External Expert:	A/Prof Andrew Eberhard, RMIT, Melb

Best Paper Award

Congratulations to Ms Alyx Macfadyen on winning Best Paper Award at the Joint International Conference on CyberGames and Interactive Entertainment (CGIE) 2006.

Her paper is titled "An Interaction Framework for Scenario Based Three Dimensional Environments", and was co-written with Dr Andrew Stranieri and A/Prof John Yearwood. It will be published in ACM Computers in Entertainment.

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New research students arriving soon

Ms Gaylene Gravestocks will be welcoming a number of new post-graduate students to ITMS over the coming months.

Gaylene carries out an important liaison role for our 40+ post-graduate students, including arranging desks and equipment for new students, Confirmation of Candidatures, six-monthly reports to the University's Research and Graduate Office, and a myriad of other related tasks.

Pictured above: Ms Gaylene Gravestocks

New Research Co-ordinator

We are delighted to welcome Dr Andrew Stranieri to the position of Research Co-ordinator within the School of Information Technology and Mathematical Sciences.

Dr Stranieri joined ITMS in 1996, has a highly successful research and publication record, and will make a valuable contribution through this role.

Pictured: PhD student John Avery & Dr Andrew Stranieri (R)

Visitors to CIAO

Recent visitors include:

- ✓ Dr Roman I. Raikin,
  Altay State University, Barnaul, Russia

Dr Raikin works as Assistant Professor at the Department of Theoretical Physics and Deputy Dean of the faculty of Physics and Technics of the Altay State University.

His scientific interests are concentrated mostly in cosmic ray astrophysics and also in distant monitoring of the Earth's surface from space. In addition, he deals with developing modern informational technologies in education.

As a lecturer and university administrator with five years' experience as Deputy Dean, he expressed interest in learning how academic studies and scientific investigations carried out by students are organised in Australia.

We look forward to the visit of:

- ✓ Professor Costas Iliopoulos,
  Professor in Algorithm Design,
  King's College, London, University of London

Professor Iliopoulos has won a Royal Society Grant to visit Professor Mirka Miller for a short period in 2008.

Publications

Books: Accepted

Yearwood, J. & Mammadov, M., Classification Technologies: Optimization Approaches to Short Text Categorization, Idea Group Inc.

Book Chapters : Accepted

Keogh, K., Prospects for ECollaboration with artificial partners, in *Encyclopedia of ECollaboration*. Publication expected in 2007.

Book Chapters : Published

B. Verma and S. Kulkarni, Neural Networks for Content-based Image Retrieval, Book Chapter for the Book: Semantic-Based Visual Information Retrieval, Chapter 12, Idea Group Publishing, November 2006.

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Journal Papers : Submitted / Accepted

Bai, F.S., Wu, Z. Y. & Zhu, D.L. Sequential Lagrange multiplier condition of e-optimal solution in convex programming, *Optimization* (accepted).

Bagirov, A.M., Mason, T., Emelle, C., Kampas, F., Pinter, J.D. and van Berkel, J. Integrated Production System Optimization Using Global Optimization Techniques, Journal of Industrial & Management Optimization, Vol. 3, No.2, 2007.

Balbuena, C., Tang, J., Marshall, K., Lin, Y. Superconnectivity of regular graphs with small diameter, *Information Processing Letters* (submitted).

Balbuena, C., Jiang, T., Lin, Y., Marcote, X, Miller, M. A lower bound on the order of regular graphs with given girth pair, *Journal of Graph Theory* (accepted).

Dafik, Miller, M., Ryan, J. and Baca, M. On super (a,d)-edge antimagic total labeling of disconnected graphs, *Discrete Mathematics* (submitted).

Dafik, Miller, M., Ryan, J. and Baca, M. Antimagic labeling of union of stars, *Indian Journal of Pure and Applied Mathematics* (submitted).

Dafik, Miller, M., Ryan, J. and Baca, M., Super edge-antimagic total labelings of *mKn,n,n*, *Ars Combinatoria* (submitted).

Darby, J., Lynton-Moll, C. & Boyd, I. Electronic submission of reports for suspected adverse reactions to drugs and vaccines, *The Journal of Information Technology in Healthcare*, Vol.5, Issue 2, pp.116-122, 2007 (accepted).

Dvorak, Z., Kral', D., Teska, J. Toughness threshold for the existence of 2-walks in K_4-minor free graphs, *Discrete Mathematics* (submitted).

Gimbert, J., Lopez, N., Miller, M., Ryan, J. On the period and tail of sequences of iterated eccentric digraphs, *Discrete Mathematics* (submitted).

Herbert, S. & Pierce, R. An emergent model for rate of change. *International Journal of Computers for Mathematical Learning (submitted).*

Johnson, D., Malhotra, V. and Vamplew, P. More Effective Web Search using Bigrams and Trigrams, Webology (accepted).

Keogh, K. and Sonenberg, E.A., Keeping the patient asleep and alive: Towards a computational cognitive model of disturbance management in anaesthesia, *Cognitive Systems Research* (accepted).

Lin, J-Y, Manyem, P. and Sheu, R-L. Performance Estimations of First Fit Algorithm for Online Bin Packing with Variable Bin Sizes and LIB constraints", *Pacific Journal of Optimization* (accepted).

Filar, J., Manyem, P., Panton, D. and White, K. A Model for Adaptive Rescheduling of Flights in Emergencies (MARFE), Journal of Industrial and Management Optimization, Vol. 3, No.2, May 2007, pp. 335-356 (accepted).

Pineda-Villavicencio, G., Gómez, Miller, M., Pérez-Rosés, H. New largest known graphs of diameter 6, *Networks* (submitted).

Tang, J., Lin, Y., Balbuena, C., Miller, M. Calculating the extremal number ex(v;{C3,C4,…,Cn}), *Discrete Applied Mathematics* (submitted).

Ugon, J., Kouhbor, S., Mammadov, M., Rubinov, A. & Kruger, A. Facility location via continuous optimisation with discontinuous objective functions, *ANZIAM Journal* (accepted).

Wu, Z.Y., Lee, W.H.J, Bai, F.S. & Yang, Y.J. A filled function method for constrained global optimization. *Optimization* (accepted).

Wu, Z.Y. Sufficient Global Optimality Conditions for Weakly Convex Minimization Problems, *Journal of Global Optimization* (accepted).

Wu, Z.Y., Li, D., Zhang, L.S., Yang, X.M. Peeling off a nonconvex cover of an actual convex problem: hidden convexity, *SIAM on Optimization,* (accepted).

Wu, Z., Mammadov, M., Bai, F. and Yang, Y. A Filled Function Method for Nonlinear Equations, *Applied Mathematics and Computation*, (accepted).

Journal Papers : Published

Bagirov, A.M. and Beliakov, G., Nonsmooth optimization methods for computation of conditional values-at-risk and portfolio optimization, *Optimization,* 55 (5-6): 459-479 Oct-Dec 2006.

Filar, J.A., Manyem, P., Panton, D.M. & White, K. A Model for Adaptive Rescheduling of Flights in Emergencies (MARFE), *Journal of Industrial and Management Optimization*, vol.3, no.2, May 2007, pp.335-356.

Jeyakumar, V., Rubinov, A.M., Wu, Z.Y. Generalized Fenchel's Conjugation Formula and Duality for Abstract Convex Functions, Journal of Optimization Theory and Applications, 132(1), 2007.

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Pierce, R. & Stacey, K. (2006) Enhancing the image of mathematics by association with simple pleasures from real world contexts. *Zentralblatt für Didaktik der Mathematik. 38*(2) 214-225.

Pierce, R., Stacey, K., and Barkatsas, A. (2007). A scale for monitoring students' attitudes to learning mathematics with technology. *Computers & Education, 48*(2), 285-300.

Rubinov, A. & Sharikov, E V (2006). Subdifferentials of convex along-rays functions", *Optimization*, Vol.55, Iss. 5-6.

Rubinov, A.M., Yang, X.Q. & Zhoum Y.Y (2007). A Lagrange penalty reformulation method for constrained optimisation, Optimization Letters, Vol.1, No.2, March 2007.

Wu, Z.Y. and Zhang, L.S. The Approximate Global Optimal Solution for Some Constrained Programming Problems, O.R. Transaction, 11(1), 2007.

Conference Papers : Submitted

Mofakharul Islam, John Yearwood and Peter Vamplew, Unsupervised Color Textured Image Segmentation with Spatially Constrained Mixture Model Using Markov Random Field, IEEE Symposium on Computational Intelligence in Image and Signal Processing (CIISP 2007).

Adam Berry and Peter Vamplew, Extending The Mak_Tree - Efficient, Powerful and Flexible Bi-Objective Optimisation Archiving, IEEE Symposium on Computational Intelligence in Multicriteria Decision Making (MCDM '07).

Peter Vamplew, Reducing the Variance of Temporal Difference Updates Via Compiled Eligibility Traces, IEEE Symposium on Approximate Dynamic Programming and Reinforcement Learning (ADPRL 2007).

Conference Papers : Published

Bagirov, A. Max-min separability, *The 5th Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications*, 28-30 Nov 2006, University of Ballarat.

Bagirov, A.M. and Mardaneh, K., Modified global k-means algorithm for clustering in gene expression datasets. The 1st Workshop on Intelligent Systems for Bioinformatics, 4 December 2006, Hobart, Tasmania.

Bai, F. A Filled Function Method for Constrained Nonlinear Integer Programming, *The 5th Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications*, 28-30 Nov 2006, University of Ballarat.

Kruger, A. About Stationarity and Regularity in Variational Analysis, *The 5th Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications*, 28-30 Nov 2006, University of Ballarat.

Mammadov, M. A New Approach to Data Classification and its Applications, *The 5th Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications*, 28-30 Nov 2006, University of Ballarat.

Morales Silva, D. Properties of strongly star-shaped cones, *The 5th Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications*, 28-30 Nov 2006, University of Ballarat.

Nazari Ganjehlou, A. A hybrid discrete gradient and simulated Annealing method for global optimization, *The 5th Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications*, 28-30 Nov 2006, University of Ballarat.

Sukhorukova, N. Uniform approximation by polynomial splines of the highest defect: necessary and sufficient optimality conditions and their generalisations, *The 5th Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications*, 28-30 Nov 2006, University of Ballarat.

Ugon, J. Optimization approach to clustering: the choice of a similarity function, *The 5th Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications*, 28-30 Nov 2006, University of Ballarat.

Wu, Z.Y. Global Optimality Conditions for Some Programming Problems, *The 5th Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications*, 28-30 Nov 2006, University of Ballarat.

Wu, Z.Y., Mammadov, M. and Bai, F.S. A Filled Function Method for Box-constrained System of Nonlinear Equations, Proceedings of conference: 2006 IEEE Asia Pacific Conference on Circuits and Systems, 623-626, 2006.

Wu, Z.Y. & Gu, Y.H. A Recursive Digital Filter Design using Global Optimization Technique, Proceedings of conference: 2006 IEEE Asia Pacific Conference on Circuits and Systems, 931-934, 2006.

Yost, D. My battle with the gyrobifastigium, *The 5th Ballarat Workshop on Global and Nonsmooth Optimization: Theory, Methods and Applications*, 28-30 Nov 2006, University of Ballarat.

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Research Reports : 2006/7

2006/01 Optimization solvers and problem formulations for solving data clustering problems, Julien Ugon, January 2006

2006/02 Constrained Nonlinear and Semismooth Equations and Global Optimization, Musa Mammadov, Liquin Qi and Fusheng Bai, January 2006

2006/03 Coverage in WLAN: Optimization Model and Algorithm, S. Kouhbor, J. Ugon, M. Mammadov, A. Rubinov and A. Kruger, February 2006

2006/04 Coverage in WLAN with Minimum Number of Access Points, S. Kouhbor, J. Ugon, A. Rubinov, A. Kruger and M. Mammadov, February 2006

2006/05 Nonsmooth Optimization for the Placement of Access Points to Enhance Security in WLAN, S. Kouhbor, J. Ugon, M. Mammadov, A. Rubinov and A. Kruger, February 2006

2006/06 Methods for global optimization of nonsmooth functions with applications, A M Rubinov, April 2006

2006/07 Abstract Convexity and Augmented Lagrangians, Regina Sandra Burachik and Alex Rubinov, April 2006

2006/08 Necessary Global Optimality Conditions for Quadratic Optimization Problems, A. M. Rubinov and Z. Y. Wu, April 2006

2006/09 Optimality conditions in global optimization and their applications, A. M. Rubinov and Z. Y. Wu, April 2006

2006/10 Best Approximation in a Class of Normed Spaces with Star-Shaped Cones, H. Mohebi, A. M. Rubinov and H. Sadeghi, April 2006

2006/11 Non-convex Quadratic Minimization Problems with Quadratic Constraints: Global Optimality Conditions, V. Jeyakumar, A. M. Rubinov and Z. Y. Wu. April 2006

2006/12 Subdifferentials of convex-along-rays functions, A. M. Rubinov and E.V. Sharikov, April 2006

2006/13 On the use of Abstract Convexity in set valued analysis, Regina Sandra Burachik and Alex Rubinov, April 2006

2006/14 Sufficient Global Optimality Conditions for Weakly Convex Minimization Problems, Z Y Wu, April 2006

2006/15 Lyusternik theorem and regularity of collections of sets, Andrei V. Dmitruk and Alexander Ya. Kruger, September 2006

2006/16 Curve clustering based on polynomial splines and nonsmooth optimization, Nadezda Sukhorukova & Bahadorreza Ofoghi, October 2006

2007/01 Uniform approximation by polynomial splines of the highest defect: necessary and sufficient optimality conditions and their generalizations, Nadezda Sukhorukova, February 2007

2007/02 Optimisation approach to clustering: the choice of a similarity function, A.M.Rubinov, N.Sukhorukova and J.Ugon, March 2007

2007/03 Some Indecomposable Polyhedra, David Yost, March 2007

All ITMS staff members and post-graduate students are encouraged to contribute to the CIAO Newsletter

Please send items to Elizabeth Matuschka (e.matuschka@ballarat.edu.au) by Wed 30 May 2007

Director of CIAO: Assoc Professor John Yearwood
Deputy Director of CIAO: Professor Mirka Miller

Founding Director of CIAO:
Professor Alex Rubinov (1940-2006)

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