



# CIAO Newsletter

Centre for Informatics & Applied Optimization

School of Information Technology & Mathematical Sciences

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## What's in this edition?

CIAO Reports	Page
<ul style="list-style-type: none"> <li>Collaborative Centre for e-Health (CCeH)</li> </ul>	2
<ul style="list-style-type: none"> <li>Combinatorics, Graphs &amp; Networks Technologies (CGANT)</li> </ul>	2
<ul style="list-style-type: none"> <li>Data Mining &amp; Informatics Research Group (DMIRG)</li> </ul>	3
<ul style="list-style-type: none"> <li>Distributed Simulation Laboratory (DSL)</li> </ul>	3
<ul style="list-style-type: none"> <li>Emerging Communication Technologies Cluster (ECT)</li> </ul>	4
<ul style="list-style-type: none"> <li>Intelligent Finance Cluster (IFC)</li> </ul>	4
<ul style="list-style-type: none"> <li>Mathematical &amp; Statistical Analysis Research Group (MASARG)</li> </ul>	5
<b>Conferences &amp; Presentations</b>	5
<ul style="list-style-type: none"> <li>First International Workshop on Intelligent Finance – IWIF1</li> </ul>	5
<ul style="list-style-type: none"> <li>Sixth International Conference on Optimization Techniques and Applications – ICOTA6</li> </ul>	5
<b>News</b>	1
<b>Publications</b>	
<ul style="list-style-type: none"> <li>Accepted Books, Chapters &amp; Papers</li> </ul>	6
<ul style="list-style-type: none"> <li>Books Published</li> </ul>	7
<ul style="list-style-type: none"> <li>Editorships</li> </ul>	7
<ul style="list-style-type: none"> <li>Papers Published</li> </ul>	7
<ul style="list-style-type: none"> <li>Research Reports</li> </ul>	11
<b>Students</b>	
<ul style="list-style-type: none"> <li>Summer Projects</li> </ul>	8
<ul style="list-style-type: none"> <li>Post-Graduate News</li> </ul>	9
<b>Tenders / Applications / Consultancies</b>	9
<b>Visitors to CIAO</b>	11

## News

### *Tsunami in Indian Ocean*

Everyone at CIAO was very concerned to hear about the earthquake and subsequent tsunami that occurred in the Indian Ocean on 26 December 2004.

We were immediately worried about the safety of our staff and students who have family and friends in the affected countries. Thankfully everyone that we are aware of is safe.

Since then we have participated in a number of local fundraising events in and around Ballarat for the Tsunami Relief Appeal, including a sausage sizzle and raffle generously organised by IBM, and a concert at the Caro Centre at Mt Helen Campus.

### *Research Network for a Secure Australia Launch.*

Professor Alex Rubinov attended the RNSA Launch that was held at Parliament House, Canberra on 24 February 2005.

RNSA is a multidisciplinary collaboration established to strengthen Australia's research capacity, to enhance the protection of the nation's critical infrastructure from natural, human-caused or accidental disasters, and terrorist acts.

Many members of RNSA attended the launch. Alex took part in some fruitful formal and informal discussions there.

### **ARC Centre of Excellence Applications**

UB is party to two recently submitted ARC Centre of Excellence applications:

- o ARC Centre for Excellence in Industrial Modelling and Optimization, led by Curtin University
- o ARC Centre for Aged Care Informatics – standards and intelligent technologies, led by University of Southern Queensland

We have just received news that both applications have been unsuccessful. This highlights the highly competitive nature of this Commonwealth Government funding.

### **Visit to Taiwan**

Dr Prabhu Manyem will be visiting Taiwan during the upcoming Easter break, 25 March to 10 April 2005, on a research visit.

He will be collaborating with Professor Ruey-Lin Sheu of National Cheng-Kung University, on "Manufacturing Networks". Prabhu's visit is fully funded by a grant from the Australian Academy of Science.

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## CIAO Reports

### **Collaborative Centre for e-Health (CCeH)**

CIAO/CCeH was a partner in a recent ARC Centre of Excellence in Aged Care Informatics application, which was unfortunately unsuccessful.

### **Combinatorics, Graphs and Networks Technology (CGANT)**

#### *New members*

CGANT Research Group welcomes new members Dr Prabhu Manyem and Dr Liping Ma from ITMS, and Dr Jiapu Zhang from CSIRO, Melbourne.

#### *Conferences*

The Australasian Annual Conferences ACSW'05, Newcastle, 31 January-5 February 2005, were attended by Professor Mirka Miller, Dr Joe Ryan, Ms Kathleen Keogh and Ms Wendy Rodgers. Please note that ACSW'06 will be organized by University of Tasmania and ACSW'07 by the ITMS and the University of Ballarat.

#### *IWOGL 2004*

The School of ITMS was one of the sponsors for IWOGL 2004 which was held in Batu, Jawa Timur, Indonesia, 6-9 December 2004. Professor Mirka Miller was a Co-Chair; Dr Joe Ryan an Invited Speaker.

Unfortunately they were unable to attend due to the political situation, but four joint papers were presented by coauthors Professor Martin Baca, and PhD students Kiki Sugeng and Yus Cholily.

Selected papers are now being reviewed; they will appear in a Special Issue of the international refereed journal JCCMCC, edited by Dr Edy Tri Baskoro and Professor Mirka Miller.

#### *IWOGL 2005*

IWOGL 2005 will be held in Kosice, Slovakia. Professor Mirka Miller is a Member of the Program Committee; Dr Joe Ryan is a Member of the Organising Committee; IWOGL 2006 will be organized by the Southern Illinois University, Carbondale, USA.

#### *PhD Examination for Czech Student*

In December 2004, Dr Joe Ryan was an examiner for the PhD thesis by Peter Kovar, whose topic was Magic Graph Labelling, with the Technical University Ostrava, Czech Republic. Dr Joe Ryan and Professor Mirka Miller were members of the Defense Jury for PhDs of Dr Peter Kovar and Dr Tereza Kovarova.

#### *International Workshops*

In 2005, CGANT will organize two international workshops:

- o AWOCA 2005 (16<sup>th</sup> Australasian Workshop on Combinatorial Algorithms), 18-21 September 2005; and
- o IWOON 2005 (International Workshop on Optimal Networks), in December 2005.

#### *AWOCA 2005*

An application to the Royal Society, UK for funding of a visit to CIAO by Professor Costas Iliopoulos was successful. Professor Costas Iliopoulos and his students will attend AWOCA 2005.

#### *ARC Discovery Grant Application*

An ARC Discovery Grant application "Security of e-Health Information Systems" has been submitted. The Chief Investigators are Dr Andrei Kelarev, University of Tasmania, and Professor Mirka Miller.

#### *Bilateral Linkage Grant*

An application for a bilateral linkage grant between CGANT and Laboratoire Recherche en Informatique, Universite Paris-Sud, is being prepared and will be submitted in March 2005. The Chief Investigators will be Professor Evelyne Flandrin and Professor Mirka Miller.

#### *CGANT Study Group*

CGANT Study Group will resume meetings on 18 March 2005. The current text being studied is N. Hartsfield & G. Ringel's "Pearls in Graph Theory".

Dr Joe Ryan will summarise the material studied in 2004; and Dr Zari Dzalilov will present a new chapter from the book.

The group will continue to meet fortnightly throughout first semester 2005. All welcome!

#### *CGANT Research Meeting*

The first CGANT Research Meeting in 2005 is planned for Friday 25 March 2005, 10am-4pm.

There will be several short presentations, including those by Dr Christopher Lenard, La Trobe University at Bendigo, Dr Prabhu Manyem, Ms Deval Patel and Mrs Kiki Sugeng. All interested parties are welcome to attend.

#### *2005 CGANT Research Meetings*

The provisional dates for CGANT Research Meetings in Semester 1 are:

- o 25 March 2005
- o 22 April 2005
- o 27 May 2005

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## **Data Mining & Informatics Research Group (DMIRG)**

### **Data Mining**

The ADRAAC project on discovering new approaches for detecting drugs responsible for adverse reactions and decision support is drawing to a close, with the three doctoral students all nearing completion.

Dr Musa Mammadov presented some of the work from this project recently at the *Sixth International Conference on Data Mining in Biomedicine*. This has triggered interest from a group of researchers from the University of Florida, who are collaborating to work in this area using data from the US Food and Drug Administration.

A new eResearch project co-ordinated by VPAC and involving CIAO, LaTrobe University, Deakin University, the Royal Children's Hospital and the Cystic Fibrosis Foundation is beginning. This project aims to data mine the Australian CF database, with the hope of discovering knowledge from both the clinical and genomic data that may help in the understanding and management of CF.

There will be a Workshop on Health Data Mining as part of the ARC Network in Data Mining held in Adelaide in May 2005. There will be good participation from CIAO.

### **Decision Support**

Work done with the ICU at Ballarat Health Services has modelled the knowledge that critical care nurses use for reasoning, when responding to a sudden low oxygen level in the patient.

Ballarat Health Services have found this valuable for use in the training of novice ICU nursing staff. This work has been jointly published and presented at international nursing and IT conferences. This has led to numerous publications, a tender response and additional research collaborations. There is opportunity for further work there.

### **Computational Intelligence & Artificial Neural Networks**

Work on the development of new neural learning algorithms based on CIAO developed optimisation techniques has produced good results, with many papers published in this area and much interest shown. Techniques in modular neural networks are being developed, and there is potential for these to be applied to water and environmental modelling, as well as many other areas.

Associate Professor John Yearwood attended the International Conference on Artificial Intelligence in Austria in February 2005, and presented some of this work. There is clearly scope for fsapplications in many areas.

A new research student working in the area of Speech Recognition has started with Dr. Rana Ghosh and Associate Professor John Yearwood as supervisors.

### **Ontology Engineering**

Work in this area is progressing well.

### **Text Categorization**

Mr Bahador Ofoghi has just arrived and will start work in this area with Associate Professor John Yearwood and Dr Rana Ghosh as his supervisors.

Mr Arun Banerjee will also be commencing his PhD in this area, with Dr Musa Mammadov and Associate Professor John Yearwood as his supervisors.

### **Health Informatics**

The application for an ARC Centre in Health Informatics – Ageing was unfortunately unsuccessful.

The book "Knowledge Discovery from Legal Databases" is in the final proof phase and will be released within the next two months.

A project with the Ballarat Base Hospital that involved the application of knowledge modeling to intensive care was completed recently.

The OTTE project is on track for a delivery of very innovative career advice web site by May 2005. The JustSys collaboration is proceeding well, with the spin-out employing two SITMS students in recent months.

A proposal to deliver a tutorial at an International Conference on Artificial Intelligence and Law has been successful.

A Linkage Grant application is in process for May 2005.

A new Masters student, Ms Alyx McFadden, has recently started research in the field of narrative.

## **Distributed Simulation Laboratory (DSL)**

### **DSTO - eXtensible Modelling and Simulation Framework (XMSF) Testbed**

The Distributed Simulation Laboratory (DSL) has been requested by the Department of Defence through its Defence Science and Technology Organisation (DSTO) -, Maritime Division, to submit a quotation for the development of an eXtensible Modelling and Simulation Framework (XMSF) Testbed.

Dr David Stratton, Tim Pokorny and Michael Fraser are keen

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to further their modelling knowledge on the challenges of this project.

This proposal calls for the development of a software product that shall allow web-service based access to an executing High Level Architecture (HLA) based simulation. The software product shall provide a mechanism for configuring, at design time, the web service interface it exposes. Using the Virtual Maritime System (VMS) as the HLA based simulation, two web service case studies/examples shall be developed to demonstrate the use of the developed software product.

The Virtual Maritime System (VMS) concept calls for simulation models of systems to be brought together to create a virtual representation of a maritime combatant, a process analogous to the construction of a physical platform.

The eXtensible Modelling and Simulation Framework (XMSF) is a new activity within the simulation community looking at the applicability of the web technologies in the development of simulations.

### **Emerging Communication Technologies (ECT) Cluster**

Dr. Wing Keung Tam (Research Fellow) visited UB from Hong Kong for a week, to work with the ECT Research Cluster on Bluetooth Electric Meter Reading and Health Care projects.

Dr Tam also gave a seminar on "Bluetooth Application for a Secure Electric Power Meter Reading" in SITMS, University of Ballarat on 09/02/2004.

### **Intelligent Finance Cluster (IFC)**

#### *IWIF1 Conference*

The Intelligent Finance Cluster (IFC) of CIAO has successfully founded and hosted the First International Workshop on Intelligent Finance (IWIF1, [www.iwif.org](http://www.iwif.org)), last December, at the fabulous Crown Promenade Hotel, Melbourne.

IWIF1 has marked the emergence of Intelligent Finance as a new discipline, integrating or unifying several distinct academic disciplines and professional schools of thought, including financial mathematics and statistics, financial econophysics, financial computational intelligence, game theory, technical analysis and fundamental analysis.

Strategic analysis has also been proposed to study the strategies and tactics used by active speculators and market movers.

Since our first appearance in June 2004 in international academic communities of mathematical and computational finance, the Cluster has published a number of leading-edge conference papers and submitted a few journal papers.

The Cluster has been established as the founder and a world-leading group on Intelligent Finance, winning respect from both academics and professionals. Many mainstream finance leaders, despite not having participated in IWIF1, have recognised that we are fortunate to have spotted a 'gold mine' in the interdisciplinary area between finance, applied maths, physics, artificial intelligence and business intelligence.

At the beginning of the 2005 academic year, the Cluster has the following steps planned:

- (1) The Cluster has two new PhD students, one new Master students and two new Honours students who will start from the first Semester. Their research topics include "Business Intelligence for Financial Market Surveillance", "Fundamental Analysis and Business Intelligence for Growth Stock Investment", "Technical Stock Market Filter", "Business Cycles and Sector Rotation of US, Australia and Other Industrial Countries", and "Multivariate Analysis for Stock Clustering". Two more PhD applicants are under consideration. Professor Julian Lowe, the Head of the School of Business, will serve as Associate Supervisor to the two new PhD students.
- (2) The Cluster has established close relationships with the Applied Mathematics Department, Wuhan University, and the Econophysics Group, University of Science and Technology of China. Collaborative research and joint supervision of PhD students with the two Chinese universities are under preparation.
- (3) A feasibility study project on predicting international stock market indices and stock market surveillance is under preparation together with the Australian CRC on Capital Markets, University of Sydney.
- (4) Deployment of the stock market prediction technology into real-money trading systems is under negotiation with a US-based trading firm.
- (5) Professor Kenneth Kortanek, University of Pittsburgh, US, is conducting a remote collaborative research with us to develop multimarket multiscale differential equations for stock index prediction and option pricing.
- (6) We are considering running IWIF as a biennial series. IWIF2 is likely to be run in China, and IWIF 3 will possibly be in France, together with one or more local universities in each case.
- (7) In order to run IWIF as a major international conference series on Intelligent Finance, and to<sub>4</sub>

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co-ordinate international research collaborations on prediction, modelling and optimization, steps have been taken to create an international research organisation since IWIF1, following advice from Professor Sidney Morris. This organisation is called "Swingtum Prediction Institute" (SPI) as suggested by Professor Kenneth Kortanek. There will be a number of international research leaders and PhD students involved in prediction, intelligent finance, modelling and optimization. to be co-ordinated by this Institute. [www.swingtum.org](http://www.swingtum.org) is being prepared as the official website of this Institute.

- (8) In 2005, the Cluster is likely to generate high-quality publications on global influence networks of international financial markets, intermarket influence analysis, probability ensembles of neural networks, comparative study on scale-space correlation and co-integration, computational fundamental analysis, business intelligence for stock market surveillance and market mover detection and tracking, as well as optimization problems in intelligent finance.

## **Mathematical & Statistical Analysis Research Group (MASARG)**

Dr David Yost contributed a talk entitled "Selections for Lipschitz multifunctions" to the Annual Meeting of the Australian Mathematical Society in Melbourne in September 2004.

Dr David Yost completed the long distance supervision of Haifa Al-Jebreen, the doctoral student from his previous institution, King Saud University. Haifa's thesis defence took place successfully in August 2004.

## **Conferences & Seminars**

### ***Sixth International Conference on Optimization Techniques and Applications – ICOTA 6***

The Sixth International Conference on Optimization Techniques and Applications (ICOTA6) was held from 9-11 December 2004, at the University of Ballarat. This prestigious international event attracted international keynote speakers and 260 participants from 31 countries including USA, China, Japan and Australia.

The conference attracted leading international optimization experts, including editors-in-chief of international optimization journals and members of their editorial boards, presidents and vice-presidents of some Operations Research and Optimization Societies, as well as PhD students, young researchers and staff members from UB. For three days, Ballarat was the optimization capital of the world!

ICOTA6 also provided the opportunity to run several additional workshops:

- Four Pre-Conference Workshops on Optimization, Hybrid Algorithms, Dynamic Programming, Optimal Control Computation, 8 December 2004
- ILOG Workshop : Understanding Best Approaches for your Optimization Needs, 9 December 2004
- Second Australia-China Workshop on Optimization (ACWO), 12-13 December 2004. Links with China have been strengthened, with plans for the third ACWO to be held in China in 2006.

ICOTA6 was a significant success because it attracted a large number of participants, forged stronger relationships between CIAO and international optimization experts, and provided a diverse range of high level presentations.

### ***First International Workshop on Intelligent Finance – IWIF1***

The First International Workshop on Intelligent Finance was hosted by UB in Melbourne on 13-14 December 2004, at the Crown Promenade Hotel.

This Workshop was a world first in establishing the new field of intelligent finance, which draws together the disciplines and cultures of financial mathematics, intelligent systems, and practical trading knowledge and expertise.

The event was highly successful with 70 participants from Australia, USA, Germany, France, Korea and Japan.

The concept of intelligent finance was conceived by ITMS Senior Lecturer Dr Heping Pan, and plans are in place to continue the Workshop as a series biennially.

### ***Research Seminar Series on Modern Optimization***

Three seminars were presented recently in the Research Seminar Series on Modern Optimization. The goal of this series is to discuss some new results in the area of numerical and theoretical optimization. The supervisor of this series is Dr Musa Mammadov.

Seminars were given by Dr Eldar Harjilarov, Dr Robert Orsi (ANU) and Mr Evgenii Sharikov. Dr Harjilarov discussed some interesting results obtained by Prof. Vladik Kreinovich, which have been accepted for publication in the Journal of Global Optimization.

Dr Orsi presented a survey of optimization problems in robust control, and Evgenii presented some results he had obtained. The next seminar will be given by Dr Alex Kruger.

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## Papers Presented

**Professor Mirka Miller** presented a paper titled "Sum graph labelling", at the Technical University, Ostrava, Czech Republic in December 2004.

**Dr Joe Ryan** presented a paper titled "Train marshalling problem", at the University of West Bohemia, Plzen, Czech Republic in January 2005.

**Professor Mirka Miller** presented a paper titled "Constructions of optimal networks", at the University of West Bohemia, Plzen, Czech Republic in January 2005.

**Dr Joe Ryan** presented a paper titled "Complexity of train marshalling", at the University of Newcastle in January 2005

**Professor Mirka Miller** presented a paper titled "Optimal networks", at the University of Newcastle in February 2005.

**Dr Musa Mammadov, Dr Rana Ghosh, Ms Moumita Ghosh and Associate Professor John Yearwood** presented a paper titled "Two level clustering using SOM and Dynamical Systems" at ICOTA6 in Ballarat in Dec 2004.

**Dr Musa Mammadov** presented a paper titled "A new global optimization algorithm based on dynamical systems approach" at ICOTA6 in Ballarat in December 2004.

**Dr Musa Mammadov, Dr Evan Dekker and Gary Saunders** presented a paper titled "An Optimization Approach to the study of drug-reaction relationships on the basis of ADRAC dataset: Neurological class of reactions" at ICOTA6 in Ballarat in December 2004.

**Dr Musa Mammadov and Associate Professor John Yearwood** presented a paper titled "Relationships between Different Australian Interest Rate Swap Markets" at ICOTA6 in Ballarat in December 2004.

**Dr Musa Mammadov, Professor John Yearwood, and L Aliyeva** presented a paper titled "Multi Label Classification and Drug-reaction Associations Using Global Optimization Techniques" at ICOTA6 in Ballarat in December 2004.

**Dr Musa Mammadov and Associate Professor John Yearwood** presented a paper titled "Relationships between Different Term Structures of Australian Interest Rate Swap Market" at IWIF1 in Melbourne in December 2004.

## Publications

### Accepted books, chapters & papers

**A.M. Bagirov and J. Yearwood:**

A new nonsmooth optimisation algorithm for clustering problems, *European Journal of Operational Research*.

**Adil M. Bagirov and Julien Ugon:**

An algorithm for minimizing clustering functions, *Optimization Journal*

Leonid Churilov, **Adil Bagirov**, Daniel Schwartz, Kate Smith and Michael Dally:

Combined use optimization techniques and self-organizing maps for improving risk grouping rules for prostate cancer patients, *Journal of Management Information Systems*

**Mr Keyurkumar J. Patel's** paper *Determinants of Investment and Accelerator Theory on National Income in the U.K.* has been accepted for the 58<sup>th</sup> International Atlantic Economic Conference, Chicago, Illinois.

**Professor Mirka Miller**, Yuqing Lin and Chris Rodger's paper *Edge connectivity of cages* has been accepted for publication in the *Journal of Graph Theory*.

**Professor Mirka Miller**, Edy Baskoro, Jozef Siran and Martin Sutton's paper *Complete characterization of almost Moore digraphs of degree three* has also been accepted for publication in the *Journal of Graph Theory*.

**Professor Mirka Miller**, Yuqing Lin and Camino Balbuena's paper *Improved lower bound for the vertex-connectivity of  $(\delta;g)$ -cages* has been accepted by *Discrete Mathematics* for publication.

**Professor Mirka Miller** and Rinovia Simanjuntak's paper *Graphs of order 2 less than the Moore bound* has been accepted for publication by *Discrete Mathematics*.

Minh Hoang Nguyen, **Mirka Miller** & Joan Gimbert's paper *On mixed Moore graphs* has been accepted for publication in *Discrete Mathematics*.

Martin Baca, Stanislav Jendrol, **Mirka Miller** & **Joe Ryan's** paper *On irregular total labelings* was accepted for publication by *Discrete Mathematics*.

**Robyn Pierce**, Kaye Stacey and Anastasios Barkatsas's paper *A scale for monitoring students' attitudes to learning mathematics with technology*, will appear in *Computers and Education Journal*

M. A. Lopez, **A. M Rubinov**, V. N. Vera de Serio's paper *Stability of semi-infinite inequality systems involving min-type functions*, will appear in *Numerical Functional Analysis & Optimization*.

**A. Rubinov**, Z.Y. Wu and D. Li, *Hidden Abstract Convex Functions*, is to appear in *Journal of Nonlinear and Convex Analysis*.

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M. A. Lopez, **A. M Rubinov**, V. N. Vera de Serio, Stability of the lower level sets of ICAR functions, to appear in *Numerical Functional Analysis and Optimization*.

H. Mohebi and **A.M. Rubinov**, Best approximation by downward sets with applications, to appear in *Analysis in Theory and Applications*.

The book "Continuous Optimization: Current Trends and Modern Applications" has been accepted for publication by Springer. It will contain approximately 20 chapters, many of which will be written by members of CIAO. V Jeyakumar and **Professor Alex Rubinov** will be the editors.

Martin Baca, Yuqing Lin, **Mirka Miller** & M.Z. Youssef have had a paper *Edge antimagic graphs* accepted for publication in *Discrete Mathematics*.

M.Baca, E.T. Baskoro, R. Simanjuntak and **K.A. Sugeng**, Super adge antimagic labelings of generalised Peteresen graphs  $P(n, (n-1)/2)$ , *Utilitas Mathematica*, in press.

Y. Lin and **K. A. Sugeng**, Face antimagic labelings of plane graphs  $P_n$ , *Ars Combinatoria*, in press.

**Yearwood, J. L. and Stranieri A.**, The Generic/Actual Argument Model of Practical Reasoning, *Decision Support Systems*.

## Books published

The Springer Law and Philosophy Series book, **Stranieri, A** and Zeleznikow, J, 2004.

## Editorships

**Professor Mirka Miller** was an editor (together with Professor Diane Donovan, UQ and Professor Costas Iliopoulos, Kings College, UK) of published papers from the Thirteenth Australasian Workshop on Combinatorial Algorithms, Fraser Island, Queensland.

Proceedings of the workshop were published in the *Journal of Automata, Languages and Combinatorics*, Vol 8 No 4, Otto-von-Guericke-Universitat Magdeburg.

**Professor Alex Rubinov** is currently guest co-editor for special issues of several journals including:

- ✓ Special issue of Pacific Optimization Journal dedicated to Terry Rockafellar  
Guest editors: **Prof Alex Rubinov** and Jie Sun. This is the first issue of this new journal (Vol.1, No 1, 2005)

- ✓ Special issue of "Optimization" dedicated to Vladimir Demyanov.  
Guest editors: Diethard Pallaschke, Franco Giannessi and **Prof Alex Rubinov**
- ✓ Special issue "Optimization in Data Mining" of the European Journal of Operation Research.  
Guest editors: Bulent Karasozen, **Prof Alex Rubinov** and Gerhard Wilhelm Weber.
- ✓ Special issue of Optimization Methods and Software with selected presentations at ICOTA6.  
Guest editors: **Dr Adil Bagirov and Prof Alex Rubinov**

## Papers published

### Dr Adil Bagirov:

Max-min separability. *Optimization Methods and Software*, Volume 20, Nos. 2-3, pp. 271-290.

### Dr Adil Bagirov and Professor A Rubinov:

On minimization of max-min functions, in: Qi, L., Teo, K. and Yang, X. (eds.), *Optimization and Control with Applications, Applied Optimization*, Vol. 96, Springer, Dordrecht, 2005.

### A. Kruger:

About stationarity and regularity of real-valued functions, *Proceedings of the 6th International Conference on Optimization: Techniques and Applications (ICOTA6)*, Alex Rubinov & Moshe Sniedovich (Editors), Ballarat, December 2004, Article index number 199, 6 pp. University of Ballarat, 2004, ISBN 1876851155.

### A.Kruger (2004):

Weak stationarity: eliminating the gap between necessary and sufficient conditions, *Optimization*, 53 (2004), 147-164.

### A.Kruger:

Stationarity and regularity of set systems, *Pacif. J. Optimization*, 1 (2005), 101-126.

### S. Kouhbor, J. Ugon, A. Kruger, A. Rubinov, P. Branch:

Optimization in wireless local area network, *Proceedings of the 6th International Conference on Optimization: Techniques and Applications (ICOTA6)*, Alex Rubinov & Moshe Sniedovich (Editors), Ballarat, December 2004, Article index number 212, 12 pp. University of Ballarat, 2004

### Dr Heping Pan (2004):

An Initial Theory of Super Bayesian Influence Networks - Nonlinear Dynamic Bayesian Networks of Probability Ensembles of Neural Network. Presentation and paper published in Proc. the International Conference on Computational Intelligence for Modelling, Control and

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Automation (CIMCA'2004), 12-14 July 2004, Gold Coast (a revised version submitted to a journal).

**Dr Heping Pan & Dr Nadia Soukhoroukova** (2004): Asymmetrical Correlation Test for Constructing Super Bayesian Networks for Financial Intermarket Influence Analysis. IBID.

**Dr Heping Pan** (2004): Super Bayesian Influence Networks for Modelling and Prediction of Financial Markets. Presentation and Abstract published in the Abstract Book of 3rd National Symposium on Financial Mathematics, 10-11 June 2004, Melbourne.

**Dr Heping Pan** (2004): A Swintum Theory of Intelligent Finance Integrating Technical, Quantitative and Fundamental Analysis of the Financial Markets. Presentation and Abstract published in the Abstract Book of the 24<sup>th</sup> International Symposium on Forecasting, Sydney, 4-7 July 2004.

**Dr Heping Pan, Dr Rana Ghosh & Associate Professor John Yearwood** (2004): An Ensemble of Overfitting Neural Networks for Generating Probability Distribution of Predictions.

F. Cabello Sanchez, J.M.F. Castillo, Y. Moreno & **D. Yost**, "Extension of  $L_\infty$ -valued operators under a twisted light", Functional analysis and its applications, 59--70, North-Holland Math. Stud., 197, Elsevier, Amsterdam, 2004.

J. Dutta, J.E. Martinez Legaz and **A.M. Rubinov**, Monotonic Analysis over cones II, *Optimization*, vol. 53, pp.529-547, 2004

W. Briec, C.D. Horvath and **A. Rubinov**, Separation in  $\mathbb{B}\mathbb{S}$ -convexity, *Pacific Journal of Optimization*, vol. 1, 13-30, 2005

**R. Ghosh, A. Rubinov** and J. Zhang, Optimization approach for clustering database with weights, *Optimization Methods and Software*, 2005

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## Students

### Summer Projects

During the 2004/2005 Summer break, Summer Projects at the School of ITMS were undertaken by nine students. Of these, three were students going from Year 2 to Year 3, two students going from MIT to Research Masters, and four were students going from Year 3 to Honours.

- Ms Sue Bolton supervised students Megan Hazendonk and Kim Redfern;
- Ms Marijke Heywood supervised student Kara van Doorn;
- Mr Greg Simmons supervised student Josh Stewart;
- Dr Andrew Stranieri supervised student Alyx Mcfadden;
- Dr Musa Mammadov supervised student Arunava Banerjee;
- Professor Alex Rubinov and Dr Adil Bagirov jointly supervised student Dean Webb;
- Dr Heping Pan and Dr Cameron Hurst jointly supervised student Tim Walsh
- Dr David Stratton and Dr Phil Smith jointly supervised Neal Corbett.

**Congratulations to the students and their supervisors on successful completion of the projects!**



# CIAO Newsletter

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## Post-Graduate News

New students who have recently arrived include:

- **Mr Arun Banerjee**, PhD, proposed topic: Global optimization and data mining
- **Ms Alyx MacFadyen**, Masters of IT, proposed topic: Extending the 3D game engine for conceptual analysis
- **Mr Vivek Mishra**, Masters of IT, topic: Continuous speaker independent speech recognition with large vocabulary using hybrid ANN-HMM
- **Mr Bahador Ofoghi**, PhD, proposed topic: Global optimization and data mining

**Mrs Kiki Sugeng** has transferred from The University of Newcastle, where they do not have a Confirmation process. Her Confirmation Seminar is scheduled for April 2005; she expects to submit her PhD thesis at the start of Semester 2, 2005.

**Ms Shahnaz Kouhbor** presented a paper titled "A New Algorithm for the Placement of WLAN Access Points Based on Nonsmooth Optimization Technique" at the 7th International Conference on advanced Communication Technology (IEEE/ICACT 2005) in Korea on 22 Feb 2005.

Off-campus PhD student, **Evgenii Sharikov** visited UB in early 2005 for one month. Evgenii was involved in regular meetings with his principal supervisor, Alex Rubinov. They discussed three papers that are at the preparation stage, two of them will be written jointly by Evgenii and Alex, and one will be written solely by Evgenii. The papers will be submitted to an international journal in March-April 2005. Evgenii also gave a talk at an optimization seminar.

**Ms Kim Marshall**, a PhD candidate, has transferred to UB from The University of Newcastle.

**Mr Dafik** from the University of Jember, Indonesia, arrived at the end of November 2004 to start his PhD candidature.

**Dr Eldar Hajilarov** has become Associate Supervisor for Mrs Deval Patel, and **Dr Joe Ryan** has agreed to be Associate Supervisor for Ms Kim Marshall and Mr Dafik.

**Congratulations** to the following scholarship winners:

- Mrs Deval Patel for winning a UB scholarship
- Mrs Yuliya Lenard for winning an APA scholarship

**Congratulations** to the following CIAO scholarship winners:

- Mr JianMin Tang
- Mr Sol Hart

- Mr Vivek Mishra
- Mr Wei Xie
- Mr Bahador Ofoghi

## Tenders / Applications / Consultancies

### OTTE TAFE Skills to Work

- This project's achievements to date have been very well received, with the potential for further collaboration.
- A further \$48,000 has been provided by OTTE for the development of more comprehensive documentation on the TAFE Skills to Work system.
- Project completion is planned for May 2005.
- Key personnel involved are Andrew Stranieri, Steve Mabbs and Cameron Foale.

### ADF Anthropometry

- Much energy is being channelled into this three-year, \$1.1m, anthropometric project with the Commonwealth Department of Defence, to achieve the desired outcome.
- Dr David Stratton has spent time in the United States with UGS, the supplier of the JACK software, in assisting in developing improved JACK modelling
- An additional validation trail is taking place in early March 2005, at which it is expected that the JACK modelling will be validated against actual physical measurements.
- Final completion of the project is early 2007.

### VPAC – Cystic Fibrosis

- CIAO was successful in a \$20,000 eResearch application through VPAC with Assoc Prof J Yearwood being the principle investigator of this collaborative effort several other universities.
- Other CIAO personnel involved are Rana Ghosh, Musa Mammadov and Ken Harvey.
- This project is due to commence on the 1 March 2005.
- The objective is to build an e-Research network within which specialist collaborators can develop predictive models, using longitudinal clinical and genomic data collected by the Royal Children's Hospital and the Cystic Fibrosis Foundation since 1974.

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- Additional funding of approximately \$30,000 will be provided by the Australian Cystic Fibrosis Foundation and VPAC.
- If successful, the application of this knowledge and technology can be applied to other similar areas, such as mongolism and phenylketonuria

## Pharmacy Guild - Dispensing and Monitoring of Drugs

- UB has been successful through the Collaborative Centre for eHealth (CCeH) in winning a major tender with the Pharmacy Guild of Australia and the Australian Government Department of Health and Ageing worth \$107,000
- They wish to develop dispensing and counselling protocols, including development of an appropriate fee for unit dose medication to patients who may be at risk from drugs with dependency properties (Schedule 4 & Schedule 8 drugs)
- This project seeks to develop a best-practice model and trial and evaluate this model with a number of community pharmacies.
- Illicit diversion and misuse of prescription S4 and S8 drugs, which have dependency properties has been recognised as a significant problem in Australia and overseas
- The project commenced in January 2005, involving key players Mr Chris Lynton-Moll and Ms Michelle O'Brien.

## FMP Bendix – Optimization of Pre-weigh

- CIAO has commenced discussion on a proposed project with FMP Bendix, a major producer of friction pads for the automotive and rail industries, in Australia.
- The project involves optimizing the placement of raw material hoppers in the Pre-Weigh area to achieve increased mix production.
- Discussions are currently developing a scope for the \*project and possible funding sources.
- Key persons involved are Professor Alex Rubinov, Dr Prabhu Manyem and Wayne Hurst.

## Transfield Services – SA Rail

- CIAO and Transfield Services are currently involved in discussion to scope a project which will improve key rail corridor maintenance.
- The proposed project plans to analyse rail inspection data currently being collected by TS with a view to

improving its contractual service to its client, the ARTC and to improve rail safety

- Transfield Services inspect and collect data on rail infrastructure, such as: rail wear, rail gauge, points and crossings and track geometry.
- CIAO researchers will analyse this data with a view to improving the maintenance regime.
- CIAO personnel involved in these discussions are: J Yearwood, A Rubinov, M Mammadov, Nadia Soukhoroukova, P Manyem and W Hurst.

## Ballarat Health Services – Knowledge Modelling

- CIAO and JustSys have been involved in a knowledge modelling exercise with the Ballarat Health Services (BHS). The project team consisted of specialists from BHS and the University of Ballarat
- The project involved the development of new software, which assists intensive care nurses in making decisions about a patient's level of oxygen in the blood while being ventilated.
- It is the first time that this type of program has been applied in the area of health, and it has attracted wide interest.
- Much credit must go to Sue Gervasoni and Sue Garner at BHS and John Yearwood, and Andrew Stranieri, as well as Associate Professor Cecil Dean from the School of Nursing.
- This project was completed in October 2004.
- Future plans are being discussed with the Ballarat Base Hospital for expanding the knowledge modelling into other critical care areas within the hospital.

## St John of God – Joint Replacement

- Discussions commenced in November 2004 with St John of God Hospital.
- The proposed project would improve the outcome of patients who have undergone a joint replacement procedure.
- Currently a Joint Replacement Network exists in Ballarat and surrounding Region, and its focus is on improving patient outcomes from joint-replacement surgery.
- The key aim of CIAO's involvement is to assist the Network to develop a knowledge based system.
- Project scope and funding arrangements are currently being discussed between key hospital management and CIAO personnel involving Associate Professor John Yearwood, Dr Andrew Stranieri and Wayne Hurst.

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## ARC Discovery Grant Applications : Feb 2005

- Dr Adil Bagirov has applied for a \$554,000 grant to research derivative free algorithms for large scale nonsmooth and global optimization and their applications.
- Dr Musa Mammadov: has applied for a \$222,000 grant to develop and investigate a new theoretical approach to global optimisation, using fast numerical algorithms that can be applied to a broad class of complex high-dimensional optimisation problems.

## Research reports

- 05/01 An Optimization Approach to the study of drug-reaction relationships on the basis of ADRAC dataset: Neurological class of reactions, M Mammadov, E Dekker & G Saunders, February 2005
- 05/02 Decomposability of Polytopes, Krzysztof Przeslawski & David Yost, February 2005

## Visitors to CIAO

### Dr Robert Orsi, Australian National University

Dr Robert Orsi visited UB recently to discuss a joint research project with Dr Musa Mammadov. Dr Orsi is an expert in the area of robust control. Many difficult to solve problems from this area can be converted to global optimization problems. Robert and Musa examined the efficiency of global optimization algorithms developed in our school in solving these problems. Using global optimization techniques developed by Musa, they improved the best known solutions for some well-known robust stabilization problems.

Looking back at 2004, we had a number of high profile overseas visitors including:

- Professor Martin Baca, Technical University, Slovaki
- Professor Camino Balbuena, UPC Barcelona, Spain
- Dr Kinkar Das, IIT Kharagpur, India
- Professor Vladimir Demyanov, St Petersburg State University, Russia
- Dr Joydeep Dutta
- Dr Albert Ferrar, UPC Barcelona, Spain
- Professor Frana Franek, McMaster University, Canada
- Professor Stano Jendrol, P.J. Safarik University, Slovakia
- Professor Ken Kortanek, University of Pittsburgh, USA
- Dr Jana Siagiova, University of Auckland, NZ
- Professor Jozef Siran, University of Auckland, NZ
- Dr Slamin, University of Jember, Indonesia
- Professor Michal Tkac, Economics University, Slovakia

All ITMS staff members and postgraduate students are encouraged to contribute to the next edition of the CIAO Newsletter

Examples of newsletter items are:  
projects in process, papers accepted, research in process, publications, grants, seminars, visitors to ITMS, visits, scholarships, reports from school research groups / centres, events, conferences, new discoveries, and general items of interest

All items should be received by Elizabeth Matuschka ([ematuschka@staff.ballarat.edu.au](mailto:ematuschka@staff.ballarat.edu.au)) no later than Fri 22 April 2005

### **Editor's Note:**

We have had a problem with this new newsletter template. For some reason it won't accept photos or clipart, however we are looking to rectify the problem in time for the April 2005 edition.