



# CIAO Newsletter

Centre for Informatics & Applied Optimization

School of Information Technology & Mathematical Sciences

Edition 11, December 2005

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## News

### New Staff Members

We welcome the following new staff members:

#### Dr Peter Vamplew

Dr Vamplew joins us from the University of Tasmania. He has significant experience including as Honours Co-ordinator and in unit development, and teaches and researches in computer games.

His professional interests include computer games, multimedia, artificial intelligence, simulation, virtual reality and programming and will also overlap the interests of some staff in the Arts Academy.

#### Mr Sunam Pradhan

Sunam is well-known to most ITMS staff, and is already highly respected for the academic leadership he provided as IT Program Manager at MIT.

He has a Bachelor in Computer and Mathematical Science from Victoria University, a Master of Information Technology (Client Server) from Swinburne University and a Diploma in Information Technology (software Development) from RMIT.

Sunam has previously worked as an analyst programmer in C++ and Java, and is planning to begin PhD studies soon. He also recently became a father.

#### Dr Xin-Wen Wu

Dr Wu joins us from the University of Melbourne, where he was a Research Fellow.

He received his PhD in 1995 from the Chinese Academy of Sciences in Beijing. Previously he received his Bachelors and Masters degree from the East Normal China University in Shanghai.

His research interests are centred around Information Security, in topics such as secure electronic commerce, cryptography, and error-control theory for wireless communication.

He has co-authored two textbooks, published 13 refereed journal papers and an equal number of refereed conference papers, and supervised students at Masters and PhD level.

#### Dr Zhiyou Wu

Dr Wu joins us from the University of New South Wales.

Her research interests are centred around global optimization, both numerical and theoretical aspects.

#### Transfield Service – Bluescope Project Win

Congratulations to Wayne Hurst, Alex Rubinov and his team who have won a \$30,000 project from Transfield Service - Bluescope. This is the first phase of a larger project, which we hope will also be won in due course.



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web: [www.ballarat.edu.au/ard/itms](http://www.ballarat.edu.au/ard/itms)

## ARC Fellowship – Dr Adil Bagirov

Congratulations to Dr Adil Bagirov for his recent success in gaining a five-year \$466,000 ARC Fellowship. Only two mathematicians in Australia have won such a fellowship.

This is a richly deserved recognition of Adil's achievements and future research potential.

## Early Career Research Grant

Congratulations to Dr Charlynn Miller for winning an Early Career Researcher Grant for \$9,711.

## Awards at UB Research Conference, November 2005

Congratulations to ITMS participants who received the following awards:

- ✓ Mr Gary Saunders: Best written full paper
- ✓ Ms Shanhaz Kohbour: 2nd prize - Best written full paper
- ✓ Mrs Sandra Herbert: 2nd prize - Best oral presentation.

Our thanks is also extended to the those ITMS staff and students who presented papers at this conference – thank you for participating.

## RiteMaths Report: ARC Discovery Grant

Good progress has been made in trialling a range of innovative teaching strategies, which use new technologies and involve real world contexts. We have developed several research instruments and honed procedures for further use.

Dr Robyn Pierce and Sandra Herbert have contributed to the dissemination of details of research progress to date, through presentations at:

- The Mathematics Education Research Groups of Australasia's annual conference (MERGA).
- The Annual Meeting of the International Group for the Psychology of Mathematics Education.

This resulted in fully referred publications in each of the conference proceedings. Robyn was also one of the editorial panel members for the MERGA conference.

In the second half of 2005, data has been collected at Ballarat Secondary College on the use of computer algebra capable calculators, a graphic approach to teaching linear functions (year 9) and exponential functions (extended year 9/10).

Sandra has also been using simulation software (JavaMath worlds) as a catalyst for exploring year 7 and year 9 students' understanding of speed. She uses video analysis software to extract data from pairs of students filmed while working on set tasks.



## Community Engagement with Local Entities

CIAO recently participated in two highly successful briefing sessions for important local entities:

1. The Committee for Ballarat.
2. Local Councils including representatives from Ballarat City Council, and the Shires of Moorabool, Hepburn and Pyrenees.

The briefing sessions included presentations from the following personnel:

- Professor Sid Morris: providing an overview of the School of ITMS.
- Dr Robyn Pierce: links with local and regional schools.
- Associate Professor John Yearwood: research undertaken within ITMS and CIAO.
- Lisa Moran: e-Health consultancies and projects of CCEH.
- Stan Jeffrey: University of Ballarat Technology Park, its history and current tenants.
- Mark Franklin, IBM: the collaborative relationship between IBM and ITMS.

This community engagement aims to build closer collaborative relationships within the Ballarat region.

## CIAO Reports

### Collaborative Centre for e-Health (CCEH)

#### Successful Tender: Barwon Division of General Practice

CCEH has recently been successful in winning a \$35,000 tender from the Barwon Division of General Practice. The project will develop the electronic transfer of Diabetes Management Plans.

#### Project: Pharmacy Guild of Australia Dispensing and Monitoring of Schedule 4 and Schedule 8 Drugs (with dependency properties)

This project involves the development of a best practice model for the dispensing and monitoring of Schedule 4 and Schedule 8 drugs (with dependency properties).

The project is currently in the trial stage and involves three pharmacies from Ballarat, one pharmacy from Darwin and three pharmacies from Sydney. The trials are due to finish at the end of December 2005, and will then proceed into an

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analysis of the data collected during the trial period. The project is due to be completed in April 2006.



## **Project:**

### **Australian Healthcare Messaging Laboratory (AHML)**

AHML was established by CCEH in 2000 as a message testing and certification facility, to undertake the online testing of messages generated by healthcare software products. This testing ensures conformance with existing and newly emerging local and international Healthcare Standards.

Recently a number of new test profiles have been added to AHML, including the Department of Human Services (DHS) Notifiable Infectious Diseases Surveillance (NIDS) Laboratory Data Transfer Implementers Specification and Australian Standard AS4700.6 2004, v2.3.1 Referral and Discharge Summary and the New South Wales Health Health-e-Link Implementers Specification.

AHML has also recently completed its first message certification for Medical Objects Pty Ltd for its *Medical-Objects HL7 Application Framework* against the Australian Standard AS4700.2 2004, v2.3.1 Pathology Orders and Results. AHML is currently certifying HL7 messages for Agfa against HL7 v2.3.1. These developments represent an important step forward for AHML.

AHML will be going through re-accreditation by the National Association of Testing Authorities (NATA) during December/January. AHML is accredited by NATA to ISO/IEC 17025 in the field of information technology for testing of healthcare messages.

## **Combinatorics, Graphs & Network Topology (CGANT)**

### **AWOCA 2005**

The sixteenth Australasian Workshop on Combinatorial Algorithms (AWOCA 2005) was held in Ballarat in September 2005.

Professor Kerry Cox was unable to attend, and instead welcomed delegates via a pre-recorded video.

The conference was dedicated to Professor Bill Smyth on the occasion of his 70<sup>th</sup> birthday.

Professor Sid Morris introduced Bill Smyth's conference dinner speech, which was entitled "Bill's erratic search for Hamiltonian path".

There were more than 70 participants from Australia, Japan, USA, UK, Hong Kong, Greece, Germany, India, Malaysia, China, Indonesia, Cuba, Vietnam, Canada, and the Czech Republic.

AWOCA 2005 Invited Speakers came from Australia, NZ, UK and Canada. Altogether, 50 Invited and Contributed Talks were presented at the conference.

A selection of the best papers will be published in a Special Issue of the Journal of Discrete Algorithms, edited by Professor Costas Iliopoulos and Professor Mirka Miller. For more information about AWOCA 2005, including photos, see <http://www.ballarat.edu.au/conferences/awoca2005/>

### **AWOCA 2006**

Next year's conference will be organized by Charles Darwin University and held at Uluru, in Central Australia.

It will be batched together with ACCMCC (Alice Springs) and Dry and Discrete workshop (King's Canyon).

The involvement of University of Ballarat in AWOCA will continue, with the Program Committee Co-Chairs being Professors Mirka Miller and Bill Smyth; editors of the refereed Proceedings Dr Joe Ryan, Professors Mirka Miller and Bill Smyth; and editors of the Special Issue of the journal *Fundamenta Informaticae* Professor Costas Iliopoulos, Professor Mirka Miller, and Professor Bill Smyth.



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

### **ADRAC – Adverse Drug Reactions Advisory Committee**

Outcomes of the ADRAC are being considered for commercialization. Robert Crompton has put a proposal to the Board of ICA for \$50,000 to initiate this.

### **Adelaide Workshop**

Professor Alex Rubinov, Dr Adil Bagirov and Associate Professor John Yearwood attended a Workshop in Adelaide at the School of Petroleum Engineering, University of Adelaide.

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The workshop was productive in terms of identifying the key elements of a proposal for funding to be put to the Game Changer section of Shell. All of the new projects will focus on the use of pattern recognition in the discovery and production of LNG (liquid natural gas) and oil.

## Decision Support

UB (CIAO & CCEH) with Permian and JustSys have tendered for a project to develop a real time decision support system, to be trialled in the Emergency Department at the Alfred Hospital in Melbourne.

## Computational Intelligence & Pattern Recognition

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.

## Ontology Engineering

Work in this area is progressing well, with a paper being accepted at the Australasian Ontology Workshop, and a submission to a special issue of the Journal of Human Compute Studies.

## Text Categorization

A text categorization workshop was held recently, to bring together the staff and students working in this area.

Presentations were made by John Yearwood, Liping Ma, Bahadorreza Ofoghi, Sol Hart, Arunava Banerjee and Wei Xie.

One paper in this area on Question Answering Systems has been accepted at Australian Computer Science Week 2006.

## Health Informatics

Work on the Joint Replacement project with St John of God Hospital has commenced. Ethics approval from UB and the Hospitals has been completed

## Grant Applications

Peter Vamplew, John Yearwood and Rana Ghosh have been having some discussions on a proposal for a Thinking Systems application. There has been interest from the School of Psychology at the University of Tasmania, and some interest from the School of Behavioural & Social Sciences & Humanities at the University of Ballarat.

## Distributed Simulation Laboratory (DSL)

### New Members

We welcome two new DSL members:

- Dr Long Jia: Long will particularly be looking at possibilities for collaboration with researchers in China.
- Mr Chris Nelson: Chris spearheads the computer games teaching in ITMS. The overlap, in research, between games and distributed simulation is one that we have a great interest in.

### Sinking battleships from your mobile phone!

The DSL/XMSF Tool chain project (\$85,000), which has now been completed, involved DSTO Adelaide, where the Australian Virtual Ship is based. The Virtual Ship is a large HLA-based model in which many aspects of naval warfare are simulated.

This project, conducted by Tim Pokorny and Michael Fraser of the DSL, set out to provide means by which this particular HLA simulation could be observed and controlled through web-connected devices. The mobile phone promise did not come to pass, but you can certainly use a PDA.

### ADF Anthropometry Project

This large project has absorbed a lot of attention in the DSL, but has led to some interesting research directions for Dr Philip Smith, described below.

### SISO Australia

SISO (Simulation Interoperability Standards Organisation) is the international American-based organisation that oversees the development of the standards such as HLA (high level architecture) that support distributed simulation.

In Australia the simulation industry, in a wider sense than only distributed simulation, is represented by the SIAA (Simulation Industry Association of Australia).

Over the past eighteen months, SIAA has negotiated the establishment of an Australian chapter of SISO, that will promote an Australian voice in the development of international simulation standards.

Dr David Stratton, on behalf of the DSL, has been appointed a member of the executive committee of this chapter. SISO Australia will oversee a variety of working groups, involved in various aspects of distributed simulation.



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## Human Modelling and HLA

The Human Modelling package – JACK - that is used in the ADF Anthropometry project is a mature and effective modeller of human beings.

There is significant interest from the vendors and many research partners, in the “use” of these humans in wider simulations.

This is exactly what the HLA is intended for, but making Jack into an HLA “federate” involves arranging for the programming language of Jack (tcl) to communicate with the HLA RTI (Runtime Infrastructure).

This particular language “binding” does not exist – Java, C++ and ADA are well-supported – but each new language requires potentially major efforts to support.

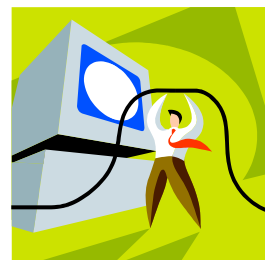
Philip Smith has developed a novel “language neutral” binding to the HLA, which can easily support users from any language that can read and write TCP sockets.

This binding is being evaluated for simulations that incorporate the Jack human model.

## DSL Students

- David Andrews, the first DSL PhD student, is writing up his thesis and planning to submit in mid to late 2006. He has applied for a six-month extension.
- Tim Pokorny, the second DSL PhD student, had his candidature confirmed in March 2004. He is an APAL student under the Linkage project, “Applying the Lessons of the Virtual Battlefield to Financial Modelling - Investigating Innovative use of Distributed Simulation”, with linkage partner Calytrix in Perth. Tim is repositioning his work to take account of developments in the field.
- Tim Pokorny was once again awarded the Best Student Paper award at the SimTecT 2005 Conference in Sydney earlier this year.
- Lance Burns has been awarded First Class Honours for his thesis on Collision Detection in HLA, and has applied to undertake a research degree.
- Neal Corbett has submitted his Honours thesis, in which he has investigated novel approaches to Data Distribution Management (DDM) in the CERTI Open Source RTI. DDM enables regional areas of interest to be enforced in a simulation – reducing global communication and processing.
- Adam Hassell has been awarded a scholarship and will commence his PhD in 2006 His ideas revolve around the Games/HLA nexus.

- Bruce Marshall is commencing part-time Honours. He is looking at the application of HLA to environmental modelling.



## Mathematical & Statistical Analysis Research Group (MASARG)

### New Member : Dr Prabhu Manyem

MASARG is pleased to welcome a new member, Dr Prabhu Manyem.

Prabhu's research interests include Combinatorial (Discrete) Optimisation, Computational Complexity, Approximability and Approximation Algorithms Logic Game Theory.

Prabhu has presented papers at two recent conferences:

- Syntactic Characterisations of Online Bin Packing With LIB Constraints, presented at the 49th Annual Meeting of the Australian Mathematical Society, held in Perth in September 2005.
- Online Bin Packing with Variable Bin Sizes and the LIB Constraint, presented at the 16th Australasian Workshop on Combinatorial Algorithms (AWOCA 2005), held in Ballarat, in September 2005. Prabhu was also a co-editor of the proceedings of the AWOCA conference.



### AWOCA 2005

MASARG was well represented at the recent AWOCA conference, held in Ballarat in September 2005, with many of the members attending and presenting papers, including:

- Eldar Hajilarov gave a joint presentation with Deval Patel entitled "Sum number of Disjoint Union of Complete Graphs"

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- Musa Mammadov presented two co-authored papers "An optimization approach identifying drugs responsible for adverse drug reactions" with Arun Banerjee, and "An optimization approach to the study of drug-drug interactions".

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

This new cluster held its first meeting in October 2005.

Many staff who have indicated interest in this cluster are new to educational research, but are motivated to engage in projects, with the aim of developing evidenced-based strategies for high quality teaching which may subsequently be published.

To this end, the group will initially explore and test best practice for the use of ICT software, such as WebCT, to support learning in Mathematics or IT or Statistics.

A review of current literature has commenced and an ethics application submitted.

## **Information Security Cluster (INSECT)**

### **Membership of INSECT**

Currently this new Cluster has a membership of six academic staff and five research students. New members are most welcome.

### **TAPAS Special Session at ISCOCO 2005**

Professor Mirka Miller and Dr Ljiljana Brankovic (Newcastle) are organising a Special Session called TAPAS (Trust, Access, Privacy and Security) at the Information, Security Communications and Computers (ISCOCO 2005) conference, which will be held in Tenerife, Spain in December 2005.

### **Seminars in Spain**

Professor Mirka Miller and Dr Joe Ryan have been invited to visit the research group CryptULL, to give an Information Security seminar each at the University of La Laguna, Tenerife, Spain, in December 2005.



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

### **Research**

Dr Heping Pan has started working on a Grand Unifying Theory of Finance for Pricing under Equilibrium, Near-Equilibrium, Non-Equilibrium and Far-from-Equilibrium Markets.

Recently a small number of leading researchers from quantitative finance, financial economics, econophysics and intelligent finance have realized that the mainstream academic finance theory of efficient market and technical analysis, as well as behaviour finance, may be unified naturally. This can be achieved using a framework of information flow through the heterogeneous market, very similar to fluid turbulence studied in physics and nonlinear science.

### **Research Collaborations**

Three new research collaborations have been established:

*Professor Peter Young, Director of Center for Research on Environmental Systems and Statistics, Institute of Environmental and Natural Sciences, Lancaster University, United Kingdom*

Professor Young has been a leading figure in the most advanced data-based mechanistic modelling of time series, using differential equations and signal processing principles.

His area of application is mainly in predicting climate change, and his models and thoughts may well be adaptable to modelling financial time series. He is currently working with us on dynamic harmonic regression models for foreign exchange time series and stock index time series.

*Professor Fawang Liu, from Queensland University of Technology and Xiamen University, China.*

Professor Liu is a leading mathematician on fractional-order differential equations and numerical solutions of partial differential equations.

Heping is visiting his group at Xiamen University, and working on developing multilevel differential equations, partly through joint supervision of PhD and MSc students.

*Professor Ersi Liu, from Yunnan University of Finance and Economics (YUFE), Kunming, China.*

Professor Liu is the director of two research Institutes and head of a Department of YUFE. We have started joint supervision of PhD and Masters students from YUFE in late 2005.

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## Seventh Engineering Mathematics and Applications Conference (EMAC2005), RMIT, Melbourne

Heping presented two talks at this Conference which was held in September 2005. The talks were titled:

1. *Multilevel Differential Equations for Modeling Multifractal Trends and Swings in Nonlinear Time Series*: this presentation has proposed Multilevel Differential Equations (MLDE) as a new type of dynamical process model and a new area of differential equations, which may have long-term multidisciplinary implications.
2. *Dynamical Influence Path Analysis of Two Nonlinear Time Series*: this presentation presents well-defined global optimization – least squares and least median of squares with time series constraints of time monotonicity and piecewise coherence. This problem has attracted attention from Alex Rubinov and Adil Bagirov.



## Conferences & Seminars

### La Trobe University Seminar

Alex Rubinov gave a seminar at a workshop entitled "Inequalities Day" at La Trobe University (Bendigo) on the topic: Abstract convexity with application to global optimization and inequalities.

### The International Workshop on Optimal Network Topologies IWONT 2005, Ballarat, 28 Nov – 2 Dec 2005

This Workshop was Co-Chaired by Professor Brendan McKay (ANU) and Professor Mirka Miller.

Plenary Speakers were Professor Charles Delorme, France, Professor Geoffrey Exoo, USA, Professor Jozef Siran, New Zealand, Professor Paul Hafner, New Zealand, and Professor Joan Gimbert, Spain.

Other Invited Speakers included Professor Evelyne Flandrin, France, Professor Zdenek Ryjacek, Czech Republic, Dr Sanming Zhou, University of Melbourne, and Dr Yus Cholily, Indonesia.

### Perth Conferences, September 2005

Professor Sid Morris, Professor Alex Rubinov, Dr Musa Mammadov, Dr Adil Bagirov, Dr Liping Ma, Dr Zari Dzalilov,

Dr David Yost and Dr Jason Giri attended the following conferences in Perth during September 2005:

- o MiniConference on Functional Analysis
- o The Australian Mathematical Society Annual Meeting
- o The 18th National Conference of Australian Society for Operations Research (ASOR)
- o Optimization Day Miniconference

CIAO was well represented at all meetings. At the Optimization Day there were eleven presentations, five of which were from CIAO members.

In particular, Dr Jason Giri presented a paper entitled "The comparative efficiency of a modified penalty function approach to nonlinear minimisation problems with a single constraint" at the ASOR Conference.

### Turkey Visit, October 2005

Dr Adil Bagirov delivered a series of lectures about numerical nonsmooth optimization at METU (Middle East Technical University). He also gave lectures at METU and Koc University.

Alex Rubinov presented lectures at METU, AkDeniz University, Yildyz University and Koc University. Adil and Alex discussed a possible collaboration between CIAO and Institute of Mathematics in METU.



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## Tenders / Consultancies / Grants

### Multimedia Victoria

ITMS has won a grant of \$31,450 from Multimedia Victoria (MMV), a State Government Department.

The grant is to be used for ITMS to advance its marketing of Industry Collaborative Programs, including our "Earn As You Learn" Program.

The Grant will be used to employ a Trainee to assist the EAYL Co-ordinator, the Projects Co-ordinator, and the Community Engagement Officer, and for marketing and advertising our industry related activities and courses.

Congratulations to Scott Hebbard from ITMS for winning this grant. Scott acted as the intermediary with MMV, came up with the idea for the grant, and wrote the application.

### JustSys – E-Ethics

This project involves the development of an internet-based electronic lodgement and decision support system, to streamline the ethics application process.

This on-line Ethics application system (E-Ethics Support System) supported by a knowledge base is expected to lead to productivity increases for universities, hospitals and government agencies.

The system will mean valuable staff (administration staff, ethics committee staff, and researchers) spend less time on each application.



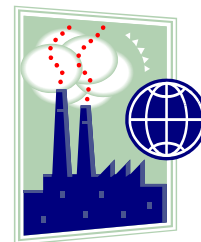
### Polytechnic University, Barcelona – Short and Long Term Electricity Generation Planning in a Liberalized Market Including Bilateral Contracts

A joint research team is developing models and optimization procedures for electric power generation. CIAO's Project Leader is Professor Alex Rubinov.

This project aims to create the simultaneous consideration of bidding power to the liberalized market, and of bilateral contracts (between a generation company and a consumer client), given the future elimination of the current regulations discouraging bilateral contracts.

It also aims to develop optimization procedures that are more efficient than those employed now to solve these problems.

This higher efficiency will allow more accurate modelling, and solve larger real problems in reasonable CPU time.



### University of New South Wales: Discovering Network Formations with Applications to Intelligence

Terrorism is one of the most serious challenges of this century.

More than 1400 terrorist attacks have occurred in the past 12 years alone, with an average of 6.88 and 20.75 people killed and injured per incident respectively.

This project will provide efficient techniques for discovering networks of potential suspects as they emerge. CIAO's Project Leader is Professor Alex Rubinov.

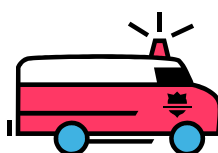
The project will capitalize on the multi-disciplinary expertise of the chief investigators, and leverage the expertise and work of the associate investigator, to establish a novel approach contributing to the area of intelligence and counter terrorism.

Outcomes will include refereed papers, strengthening intra ADFA and ADFA - Ballarat collaboration, and potentially industrial collaboration.

### RAV – Demand Management Project

This project, undertaken with Rural Ambulance Victoria (RAV) and UB School of Business, requires the analysis of RAV call out data and State population trends to determine the resources needed by RAV to meet future emergency and non-emergency demands.

The deliverable to RAV is a Report containing a literature review highlighting key emergency demand drivers, a statistical analysis of historical data and the development of predictive model for future demand forecasting.





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## VPAC - Cystic Fibrosis

This project involves the Royal Children's Hospital (RCH) and the Cystic Fibrosis Foundation of Australia.

The project involves data mining the Cystic Fibrosis database, to determine a new scoring system for rating the severity of the condition in patients.

## ITMS Colloquia & Seminars

### ITMS Colloquia Series 2005

The 2005 Colloquia Series continues to attract an interesting diversity of speakers and professional expertise.

Recent visiting speakers have included:

Professor Bala Srinivasan, Monash University, Melbourne, Securing Outsourced Databases

Associate Professor Jim McGovern & Associate Professor George Fernandez, RMIT, Melbourne, RMIT e-learning: experience, methods & tools

Professor Xiaofang Zhou, University of Queensland, Surface-based Spatial Query Processing

Professor Janet Aisbett, University of Newcastle, Using spatial representations in cognitive modelling

Professor Moshe Sniedovich, University of Melbourne, Development of online, web-based modules for Applied Mathematics subjects: the first 10 years

Professor Lynn Batten, Deakin University, Algebraic Attacks on Clock-Controlled Stream Ciphers

Michael Fraser (ITMS Staff Member) & Tim Pokorny (ITMS PhD Student), Sinking Battle Ships from the Comfort of Your PDA: VMSA and the XMSF

### ITMS Seminar Series 2005

Recent Seminar speakers have included:

Professor A Vladimirov, Russian Academy of Science, Laminar and turbulent modes in queueing networks

Dr Sukumar Chakraborty, CSIRO, Plant Pathology & ITMS – Working Together

Dr Ken Harvey, La Trobe University, E-Prescribing & E-Health: Current status & research possibilities



## Publications

### Accepted Books, Chapters & Papers

An English paper "Intelligent Finance – An Introduction" co-authored by Heping Pan, Didier Sornette (UCLA, CNRS) and Kenneth Kortanek (Pittsburgh), was translated by a team in China, and the translated paper will appear in the China Journal of Finance, Vol. 3, No. 3, 2005.

"A Computable Theory for Learning Bayesian Networks" co-authored by Heping Pan and Daniel McMichael (CSIRO, Adelaide), is accepted and will appear in the Proceedings of Artificial Intelligence 2005, Workshop on Learning Algorithms for Pattern Recognition, Dec 2005, Sydney.

Alex Kruger has submitted a paper, "About regularity of collections of sets" to Set-Valued Analysis. This paper was included in the University of Ballarat SITMS Research Report 2005/03.

Musa Mammadov has co-authored a paper with S.Aytar, and S. Pehlivan, "Statistical Limit Inferior and Limit Superior for Sequences of Fuzzy Numbers" which has been accepted for publication in Fuzzy Sets and Systems.

H. Mohebi and A.M. Rubinov, Metric projection onto a closed set: necessary and sufficient conditions for the global minimum, to appear in Mathematics of Operation Research.

### Published Books, Chapters & Papers

Pierce, R. (2005) Algebraic Insight underpins the use of CAS for modeling, The Montana Mathematics Enthusiast. 2(2) 107-117.

A. M. Bagirov, A. M. Rubinov and Jiapu Zhang, Local optimization method with global multidimensional search, Journal of Global Optimization, Vol. 32, pp. 161-179, 2005.



# CIAO Newsletter : Edition 11, December 2005

Tel: 03 5327 9949 Fax: 03 5327 9289

email: [e.matuschka@staff.ballarat.edu.au](mailto:e.matuschka@staff.ballarat.edu.au)

web: [www.ballarat.edu.au/ard/itms](http://www.ballarat.edu.au/ard/itms)

## Post-Graduate News

### Welcome to New Arrivals

We welcome the following new students to ITMS:

- ✓ Mr Daniel Morales Silva  
PhD topic: Scalarization and Nonlinear Scalar Duality for Vector Optimization  
Principal Supervisor: Prof Alex Rubinov  
Associate Supervisor: Dr David Yost
- ✓ Mr Jakub Teska  
PhD topic: Graphs with bounded degree  
Principal Supervisor: Prof Mirka Miller
- ✓ Mr Jibak Roy  
Masters topic: Properties of Star Shaped Sets  
Principal Supervisor: Prof Alex Rubinov



### Confirmation of Candidature

Congratulations to the following PhD students who have recently completed their Confirmation of Candidature:

- ✓ Mr JianMin Tang  
Topic: Modelling dynamic interconnection network  
Principal Supervisor: Prof Mirka Miller  
Associate Supervisor: Dr Ewan Barker
- ✓ Mr Evgenii Sharikov  
Topic: Conditions for global minimum through abstract convexity  
Principal Supervisor: Prof Alex Rubinov  
Associate Supervisor: Prof Sid Morris
- ✓ Ms Kim Marshall  
Topic: Investigating properties of dynamic networks  
Principal Supervisor: Prof Mirka Miller  
Associate Supervisor: Dr Joe Ryan
- ✓ Mr Dafik  
Topic: Study of graphs close to the Moore bound  
Principal Supervisor: Prof Mirka Miller  
Associate Supervisor: Dr Joe Ryan

### PG Seminar Series 2005

These seminars are proving to be a good way for ITMS staff and Post-Graduate students to get to know each other better. They are also an excellent opportunity for knowledge sharing.

Recent speakers have included:

Mr Jian Min Tang, ITMS PhD Student  
Topic: Hybrid Simulated Annealing and Genetic Algorithms for Degree/Diameter Problems

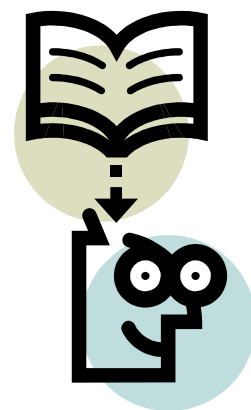
Mr Bahador Ofoghi, ITMS PhD Student  
Topic: A Semantic Approach to Question Answering

Ms Kiki Sugeng, ITMS PhD Student  
Topic: Edge magic labeling & its application

Mr Wei Xie, ITMS Masters Student  
Topic: Construction of Super Edge Magic Total Graphs

Mr Guillermo Pineda Villavicencio, ITMS PhD Student  
Topic: On Large Graphs with Given Degree and Diameter

Mrs Moumita Ghosh, ITMS PhD Student  
Topic: An Intelligent Fully Automated Offline Handwriting Recognition System



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## Enterprise Information Infrastructure (EII): PhD Spring School, Brisbane, October 2005

ITMS PhD Student Bahadorreza Ofoghi attended this Spring School at the recommendation of his Principal Supervisor, Associate Professor John Yearwood.

The school was founded by the ARC Research Network in Enterprise Information Infrastructure (EII), and organised by the University of Queensland in Brisbane.

The main aim of the School was to bring together knowledgeable PhD students from all over Australia, to share knowledge about their research topics, and assist them in their study paths.

A total of fifty students attended, and most were from Queensland and Victoria.

Subjects covered at the school were Sensor Networks, Moving Objects, and Stream Data Processing. Two other fundamental topics – Algorithm Complexity and Computational Geometry – were covered by invited lecturers.

The area of Sensor Networks, which could be better defined and realized as Wireless Sensor Networks (WSN), has lots of applications in monitoring space, things, and complex interactions between the things and the encompassing space.

This could be related to the work on Moving Objects, to the extent that different objects may have dynamic positions and statuses with respect to time and locations.

The Moving Objects concept aims to keep track of dynamic objects in a time varying database, with specific features and capabilities.

Some of the applications of this area of knowledge may be realized in Geometric Information Systems (GIS) and Transport Systems Controllers, where time-location-dependent information is of most interest and need.

Stream Data Processing involves the different perceptions and emerged mechanisms of an online stream of data, which has to be processed in a limited memory space and time.

The following experts provided enthusiastic lectures in their relevant field:

- Professor Rao Kotagiri, Dr Lars Kulik, and Dr Egemen Tanin (University of Melbourne): Sensor Networks
- Professor Peter Eades and Dr. Joachim Gudmundsson (University of Sydney and National Information and Communication Technology Australia (NICTA)): Computational Geometry
- Professor George Havas (University of Queensland): Algorithm Complexity

- Professor Ralf Hartmut Guting (University of Hagen in Germany): Moving Objects
- Professor Nick Koudas (University of Toronto in Canada): Stream Data Processing

More information can be found at:

<http://www.eii.edu.au/PhDSchool/course.html>



## Visitors to CIAO

- Professor Liu, International Dean of Yunnan University of Finance and Economics, Kunming, China.
- A delegation of representatives from Harbin Engineering University, China.

A number of experts in optimization have visited CIAO recently:

- Professor Jiri Outrata from the Czech Republic.
- Professor Hoang Tuy from Vietnam.
- Dr Abdel-Rahman Hedar from Japan.
- Dr Yalcin Kaya from the University of South Australia.



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## Research Reports : 2005

- 05/01 An Optimization Approach to the study of drug-reaction relationships on the basis of ADRAC dataset: Neurological class of reactions, Musa Mammadov, Evan Dekker and Gary Saunders, February 2005.
- 05/02 Decomposability of Polytopes, Krzysztof Przeslawski and David Yost, February 2005.
- 05/03 About Regularity of Set Systems, Alexander Kruger, May 2005.
- 05/04 Generalized Fenchel's Conjugation Formulas and Duality for Abstract Convex Functions, V Jeyakumar, A M Rubinov and Z Y Wu, May 2005.
- 05/05 Sufficient Global Optimality Conditions for Non-convex Quadratic Minimization Problems with Box Constraints, V Jeyakumar, A M Rubinov and Z Y Wu, April 2005.
- 05/06 Non-convex Quadratic Minimization Problems with Quadratic Constraints: Global Optimality Conditions, V Jeyakumar, A M Rubinov and Z Y Wu, May 2005.
- 05/07 A Syntactic Characterisation of Polynomial-Time Optimisation Classes, P Manyem, June 2005.
- 05/08 An optimization approach identifying drugs responsible for adverse drug reactions, M A Mammadov and A Banerjee, June 2005.
- 05/09 An optimization approach to the study of drug-drug interactions, M A Mammadov and A Banerjee, June 2005.
- 05/10 To be Fair or Efficient or a Bit of Both, Moshe Zukerman, Musa Mammadov, Liansheng Tan, Iradj Ouveysi and Lachlan Andrew, October 2005.
- 05/11 Multilevel Stochastic Dynamic Process Models and Applications in Global Financial Market Analysis and Surveillance, Heping Pan, November 2005.
- 05/12 Radiant and star-shaped functions, A.M. Rubinov and A.P.Shveidel, November 2005.
- 05/13 Colocality and Twisted Sums of Banach Spaces, F. B. H. Jamjoom, H. M. Jebreen and David Yost, November 2005.
- 05/14 Stationarity and Regularity of Real-Valued Functions, Alexander Kruger, November 2005.
- 05/15 Performance Estimations of First Fit Algorithm for Online Bin Packing with Variable Bin Sizes and LIB constraints, J.Y. Lin, P. Manyem and R.L. Sheu, December 2005.
- 05/16 Monotonic analysis, A M Rubinov, December 2005.
- 05/17 B-convex sets and functions, G.Adilov and A.M. Rubinov, December 2005.
- 05/18 Star-shaped separability with applications, A.M. Rubinov and E.V. Sharikov, December 2005.
- 05/19 Facility location via continuous optimisation with discontinuous objective functions, J.Ugon, S. Kouhbor, M. Mammadov, A. Rubinov, and A. Kruger, December 2005.
- 05/20 Mining feature value weights for structured reasoning inferences, Anthony Quinn & Andrew Stranieri, December 2005.
- 05/21 A derivative-free method for linearly constrained nonsmooth optimization, Adil Bagirov, Moumita Ghosh & Dean Webb, December 2005.
- 05/22 A Theoretical System of Intelligent Finance - Financial Information Fusion, Multilevel Dynamic Patterns, Total Risk Management and Financial Strategic Analysis, Heping Pan, December 2005.

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 progress, 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 sent to Elizabeth Matuschka ([ematuschka@staff.ballarat.edu.au](mailto:ematuschka@staff.ballarat.edu.au)) by Friday 24 February 2006



Happy Christmas  
&  
Merry Xmas