Centre for Informatics and Applied Optimization

C I A O Newsletter

http://www.ballarat.edu.au/itms/ciao.shtml

August 2003 Edition 3

CIAO Welcomes ....

The School of ITMS and CIAO would like to welcome aboard:

Dr David Yost who has been appointed to take up a position of Senior Lecturer in mathematics. David has an excellent research publication record in functional analysis, is the winner of the Lester R. Ford Award for mathematical exposition from the Mathematical Association of America and a former Queen Elizabeth II (research) Fellow at ANU and also Alexander Von Humboldt Fellow (in Berlin) . He brings to UB and ITMS a wealth of experience including experience gained at Edinburgh, Milan, Lyon and other universities. His teaching experience in Saudi Arabia adds to the internationalization of ITMS. David also brings new research strengths which may be applied in optimization in CIAO.

Dr Rana Ghosh as Lecturer in ITMS. Rana has just completed a PhD at Griffith University, and received an Academic Excellence Award for his PhD thesis. He also holds a Master of IT by research from Bond University and a Bachelor of Engineering (Computer Science and Engineering) from Bangalore University in India. His research interests include Evolutionary Learning Algorithms, Neural Network Architecture, Handwriting Recognition, Time Series Forecasting and Chaos Theory. He has researched in areas as diverse as forecasting tourist numbers in Australia, detection of chaos in hybrid trading systems, data mining applications in medical science and development of a robot control language. He has teaching experience in human computer interaction, databases, software development, Unix and C, evolutionary neural computing and emerging technologies, web application development, computational finance, business statistics, Law and IT, discrete mathematics, and introductory programming. He also has over a dozen journal articles and conference publications.

Mr Chris Nelson has been appointed Lecturer in ITMS. Chris holds a Bachelor of Applied Science (Computing) RMIT, Graduate Certificate in Research Methods (Computer Games and 3D Rendering) James Cook University. Chris's research interests include Creative realism in real-time rendering 3D game engines as a creative medium. Chris will commence his Master of Information Technology and Design. His project will be entitled 'Creating a Virtual Heritage Experience of the Bahai Temple in Sydney'. The application will be implemented in a 3D Game engine to run on a personal computer using a high-end commodity graphics card.

Visiting Research Fellow

Professor Hossein Mohebi from the Department of Mathematics, University of Kerman, Iran, will spend his sabbatical leave at the School of ITMS from 1st August 2003 until 1st August 2004. Dr Mohebi is an expert in the field of functional analysis including the theory of best approximation. He received his PhD from the University of Kerman in 1991. He has published 16 papers in international journals, supervised 13 M. Sc. theses and 2 PhD theses. Professor Mohebi will work with some CIAO members on problems related to the theory of best approximation.

Senior Research Fellow …

Dr Jack Harvey has accepted an invitation to become a Senior Research Fellow in ITMS. Jack has provided a new definition of retirement. He has been a key member of various teams which have won large tenders in very interesting areas and from which the University of Ballarat will benefit significantly. He has also assisted ITMS significantly by offering to our staff and research students of non-English speaking backgrounds workshops on English language, grammar and expression - which have been greatly appreciated by the relevant staff and students.

ORB and POP

ORB (Optimization Research Bridge) is an electronic newsletter for POP (The Pacific Optimization Research Activity Group). Professor Alex Rubinov is the Chairman of the ORB Committee (the Editor of ORB). POP was established in October, 2000, during the First Sino-Japan Optimization Meeting (SJOM 2000) in Hong Kong.

The ORB committee contains another member from the School of ITMS, Graeme Cowling, who is the ORB technician. To date 10 issues of ORB have been published and the next issue should appear on September 20, 2003.

The sole aim of POP is to promote optimization research activities in the Pacific Region.

POP has no membership fees. All those who are interested in further promoting optimization research activities in this region are welcome to join the Group. They may or may not live in the region. Young researchers and students are particularly encouraged to join the Group. POP now has 416 members from 40 countries.

In February 2002, the POP Board discussed with the ICOTA (The International Conference on Optimization: Techniques and Applications) Steering Committee and the SJOM (JSOM) (Sino-Japanese Optimization Meeting) Steering Committee separately to have a joint conference which will be an official conference series of POP. CIAO will host this conference, ICOTA, which will be held in Ballarat, December 2004.

It was agreed that these two conference series will be The POP working committee consisting of Liqun Qi (Chair, Hong Kong) . Alex Rubinov (Australia), Tamaki Tanaka (Japan) and Xiaoqi Yang (Hong Kong).

You can read about ORB on the SITMS website:

http://www.ballarat.edu.au/ard/itms/CIAO/ORBNewsletter/

CIAO Reports ….

Distributed Simulation Laboratory (DSL)

The last few months have been important in establishing the profile and mission of the DSL. Through consultation with DSL stakeholders the original objectives of the DSL have been summarised in the following mission statement:

> To foster the development and application of distributed simulation technology through research, education and standards.

The "home" of the DSL, both physically and virtually has been established. On the Web we can be found at dsl.ballarat.edu.au and the DSL office is now the shared office of Dr Philip Smith and David Stratton on the ground floor of the ITMS building. Visitors are welcome at both "homes"!

SimTect2003

SimTecT is the annual conference of the Simulation Industry Association of Australia of which the DSL is a member. The 2003 conference was held in Adelaide and by taking a booth at the conference trade show the DSL dramatically raised its profile in the Australian, and to a certain extent, international simulation industry.

The commercial pretext for the booth was to market our Short Course offerings but many important relationships have arisen from our presence.

DSL Director, David Stratton, gave a half-day "Introduction to HLA" workshop at the conference as well as presenting a refereed paper, co-authored with Dr Philp Smith and Dr John Wharington describing innovations in HLA pedagogy that have been developed to support our Short Courses.

The openRTI*

The RTI (Runtime Infrastructure) is the central communication component of an HLA simulation. The RTI is a significant piece of software that runs independently of the simulations themselves but orchestrates their inter-communication.

RTI software, essential to all HLA simulation activity, is available commercially and, until a year ago, was provided free-of-charge by the US Defence Modelling and Simulation Office (DMSO). The DMSO decision to revoke this free access has stimulated a world-wide interest in an ongoing free RTI version.

Evaluation of the potential for such a scheme, in part to be hosted by the DSL, is the subject of an internal University research grant proposal for $10,000 that has been approved. This grant will fund detailed survey work of current RTI usage in Australia and design an appropriate business model for an openRTI.

Short Course Offerings

The DSL Short Course offerings have been re-badged as two one-week courses – "HLA for non-programmers" and "Programming HLA Federates".
The non-programmer week was delivered to the Army Simulation Wing in Puckapunyal in late May. The class members had extensive involvement in simulation at all levels in defence, which made for the most stimulating delivery to date. Some of the pedagogical advances described in the SimTecT paper were trialled and proved to be effective in extending the hands-on activities available to non-programmers.

The two weeks have been delivered again in Ballarat, with the ITMS Honours students being accompanied by one paying guest.

Quotations are being given for various other offerings to outside organisations.

DSL Students

David Andrews, the first DSL PhD student, is confirming his candidature in September. Both David and Tim Porkorny expect their papers to be published.

Our two Honours students are progressing well and are now in the thesis-writing phase of their degrees.

Honours project leads to DSTO contract

The honours work of Tim Porkorny, which establishes an architecture for accessing normally private HLA simulations through open Web Services is the subject of a recent request for a small contract from the DSTO in Adelaide.

Mathematical and Statistical Analysis Research Group (MASARG)

Project
Professor Sid Morris and Professor Karl Hofmann are making progress on their book "Lie Theory and Structure of Pro-Lie Groups and Locally Compact Groups". Some of the authors' most recent results on abelian pro-Lie groups have been written up as a paper and submitted for publication. Sid plans to travel to Germany later this year to continue work on the book with Karl. See www.ballarat.edu.au/~smorris/loccocont.pdf for information on the current state of the book.

Invited Lecture
Professor Sid Morris has been invited to give a lecture at the joint Conference of the New Zealand Mathematical Society and the Israel Mathematical Union that is taking place at the

Victoria University of Wellington in New Zealand, from February 9th to 13th in 2004.

Topology Without Tears

The series of lectures given by **Professor Sid Morris** on this topic for staff and postgraduate students has continued throughout Semester 1. So far 150 pages of material has been covered from Sid's on-line book at http://uob-community.ballarat.edu.au/~smorris/topology.htm The lectures are often lively with staff and students expressing their own opinions on the material under discussion. The on-line book, which is used in many countries, is being progressively upgraded as the series of lectures continues.

Data Mining and Informatics Research Group (DMIRG)

Mr Shasa Ivkovic, **Associate Professor John Yearwood** and **Dr Andrew Stranieri**'s paper '*Visualising Association Rules for Feedback within Legal Systems*' was presented at the International Conference on Artificial Intelligence and Law in Edinburgh by Mr Shasa Ivkovic and was well received. Shasa found the conference interesting and sees other possibilities for the data mining and legal data.

Organisation, Knowledge and Group Memory
Mr John Avery and Associate Professor John Yearwood's paper 'dOWL: A Dynamic Ontology Language' has been accepted at the WWW/Internet Conference in Portugal. Mr Avery will attend the conference.

Work on a second paper for the Bio-informatics journal has commenced. Dr Rana Ghosh will now be working with Dr Adil Bagirov and Associate Professor John Yearwood. Gerry Marthe will be research assistant for this project.

GOANN
This is a new project looking at using global optimization techniques to build artificial neural networks. Work on this project commenced about six weeks ago and has involved Associate Professor John Yearwood, Dr Adil Bagirov, Ms Rachel Naus. The project will also now involve Dr Rana Ghosh and Mr Gerry Marthe.

Decision Support
The Knowledge Modelling project with the Intensive Care Unit (ICU) at Ballarat Health Services has finally obtained ethics approval and will be proceeding in a pilot form. Dr Andrew Stranieri, Associate Professor John Yearwood, Associate Professor Cecil Deans (Nursing), Ms Sue Garner (BHS) and Ms Sue Gervasoni (BHS) will be involved in developing a representation of knowledge and decision making processes used in intensive care with possibilities for assisting in training in ICU.

ADRAC project
There has been substantial work done on the development of new algorithms for discovering drug reaction relationships. Two papers have been submitted by Mr Gary Saunders and Dr Musa Mammadov. The first paper 'Knowledge Representation of Drug-Reaction Relations in the ADRAC Database' has been submitted to the conference on Artificial Intelligence in Perth' and the other 'Analysis of Cardiovascular Adverse Drug Reactions from the ADRAC Database' has been submitted to APAC' 03 at the Gold Coast.

Visitors to CIAO ....

Dr Caz McPhail from the University of Wooollongong visited CIAO for the month of July to work with Professor Sidney Morris to write material up for publication, a monograph on varieties of topological groups.

Tenders ....

Possible Tenders:

Dr Jack Harvey, Assoc Professor John Yearwood (University of Ballarat, School of ITMS), **Mr Ross Davey** (CCeH), **Mr Ian Montague** (University of Ballarat, Institute for Regional and Rural Research), **Mr Andrew Howard** (Ballarat & District Division of General Practice) and **Ms Janet Murray** (Ballarat & District Pharmacy Alliance) met to discuss a possible tender 'Community Pharmacy Medication Incident Reporting and Management System (CPMIRMS)'.

Department of Defence:
Dr Jack Harvey, School of ITMS and Professor Warren Payne, School of Human Movement and Sport Sciences met with Assoc Professor John Yearwood and Professor Sidney Morris to discuss another tender, more generally, the potential for ongoing research and associated commercial activity in this area.

These opportunities involve the development of broader capabilities which could potentially involve both Human Movement and Sport Sciences and CIAO, and which would require some investment from UB.

This has led to the submission of an Expression of Interest to the Department of Defence by a consortium of members from the University of South Australia and the University of Ballarat. The University of Ballarat team is being led by Professor Morris.

Submitted Tender:

VicParks
Mr Cameron Hurst in collaboration with members of the Centre for Environmental Management (Professor Martin Westbrook, Dr Michael Wilson, Ms Janet Laversha, Mr Matthew Gibson and Mr Jim O'May) have submitted a tender application to VicParks which will examine the effect of thinning in Box-Ironbark forests on the ecosystem as a whole, as well as the floristic, invertebrate and vertebrate assemblages. The project aims to examine the use of various thinning and felling techniques to attempt to return Box-Ironbark forests to a pre-European state.

DEST Higher Education Research Data Collection

Listed below is a summary of the DEST Higher Education Research Collection for 2002 for the School of ITMS:

		Calc Weight
Books	0	-
Book Chapters	2	1.33
Conference Publications	9	7.37
Journal Articles	27	20.44
	Total	29.14

Possible project with Swinburne University

On 19 June, the third Regional Broadband Forum (RBFIII), organised by the Australian Electronic Commerce Centre was formed in Ballarat. The purpose of the forum was for the participants to discuss the need of broadband, its current state, and barriers associated with its progress in the regional areas.

Representative of government organisations from different states, private companies, and international companies such as Cisco, Intel, Agilent, IBM, Corning, and Ericsson attended the forum. A session was allocated to educational sectors to inform the participants on their need for broadband in educational environments and also the progress that they have made so far. Associate Professor Grenville Armitage, Director of the Centre for Advanced Internet Architectures at Swinburne University spoke on two joint research programs that will be conducted between CIAO and Swinburne. The two projects titled "Mobile Internet" and "Lawful Interception of Mobile IP" will be tested on COLT (Collaborative Optical Leading Testbed) Research Testbed. Shahnaz Kouhbor represented CIAO and gave information on the projects that are conducted by CIAO in the area of "Optimisation in Telecommunications".

IBM GSA

Joint IBM and CIAO Research Laboratory
Mr Mark Gilroy and Ms Kerri- Anne Lunn from IBM met with Assoc Professor John Yearwood and Mr David Stratton to establish guidelines and operational framework for joint research projects. These proposals are at a draft stage. A first project involving Master Foods BOT Technology is being initiated and should be operational from the second half of 2003.

Early Career Researchers Program – An Excellent Opportunity

by Dr Robyn Pierce

The Early Career Researchers Program consisted of a series of interactive seminars and workshops addressing key issues related to building a long-term research career. Under the strategic leadership of John MacDonald, these

provided us with an understanding of practical issues, such as research funding, tenders, writing grant applications, writing for publication and developing a research profile. A number of active UoB researchers shared their experience and secrets of success – setting a model of what can be achieved in our environment. One of the bonuses of the program was the University wide network of links built over the course of meetings. Robyn Pierce, Chris Turville, Cameron Hurst and David Stratton are unanimous in their view that the time commitment involved was most worthwhile. We were informed, encouraged and often challenged.

Accepted papers....

A.M. Rubinov and **R.N. Gasimov**, Scalarization and nonlinear scalar duality for vector optimization with preferences that are not necessarily a pre-order relation, has been accepted to appear in the Journal of Global Optimization.

Z. Dzalilov, I. Ouveysi and **A. Rubinov**, A lifetime measure for telecommunication network: Theoretical aspects, to appear in Proceedings of The 11th IEEE International Conference on Networks (ICON 2003).

M. Obrien and **J. Yearwood** Insights into Consumer decisions surrounding adverse drug reactions: Some preliminary results to appear in the HIC 2003 conference (Combined conference Health Informatics and Royal Australian College of Genenral Practitioners Computer Group).

S. Dymkou, E. Rogers, M. Dymkov, K. Galkowski and **D. H. Owens,** Delay System Approach to Linear Differential Repetitive Processes: Controllability and Optimization to appear in the IFAC Workshop on Time-Delay Systems.

Jack T. Harvey, Christopher Turville and **Simon M. Barty,** Bayesian Data Mining of the Australian Adverse Drug Reactions Database to appear in the International Transactions of Operational Research.

R. Pierce, C. Turville and **J Giri** have had their paper Undergraduate Mathematics Curricula - A New Angle accepted for the Delta'03 Symposium on the Teaching of Undergraduate Mathematics. The reviews were very positive and recommended that the paper should be published in the NZ Journal of Mathematics.

H. Pan has had his paper A Joint Review of Technical and Quantitative Analysis of the Financial Markets towards A Unified Science of Intelligent Finance (divided into two papers in two different issues) accepted by the Journal of ATAA (Australian Technical Analysts Association).

Accepted Book Chapters ....

Sidney A. Morris and **Wayne Hudson** from Griffith University, have had their book chapter 'University Teaching and International Education' accepted to be published in A. J. Liddicoat, S. Eisenchlas and S.Trevaskes (eds) Australian Perspectives on Internationalising Education (Melbourne: Language Australia)

Published papers ....

The following papers have recently been published:

S. A. Morris, G.L. Itzkowitz and **V.V. Tkachuk**, Cardinalities of locally compact groups and their Stone-Cech compactifications, Bull. Austral. Math. Soc. 67 (2003) 353-364.

A.M. Rubinov, Distance to the solution set of an inequality with an increasing function, in Equilibrium Problems and Variational Models , (A. Maugeri and P. Daniele, ed.) Kluwer Academic Publishers, 2003

A.M. Rubinov and **Z. Dzalilov**, Abstract convexity of positively homogeneous functions, Journal of Statistics and Management Systems, 2003

This paper was submitted to appear in the special issue of JSMS (India) in March 2000 and was accepted in 2001. At last this paper has been published.

A.M. Rubinov and **R.N. Gasimov**, Strictly increasing positively homogeneous functions with application to penalization, Optimization 2003.

A.M. Bagirov, **A. M. Rubinov, N.V. Soukhoroukova** and **J. Yearwood,** Unsupervised and supervised data classification via nonsmooth and global optimization, TOP (Journal of Spanish Operations Research Society), 2003.

The editor of TOP requested that we prepare a large survey paper for this journal with presentation of main approaches to clustering and classification developed in CIAO. A 75 page survey paper was prepared by our team. The editor sent this paper to 5 experts in the field asking them to give their comments. The issue of journal contains 5 small articles with these comments and also the rejoinder prepared by the authors of the survey.

A. M. Rubinov, X.Q. Yang, A.M. Bagirov and **R. Gasimov**, Lagrange-type functions in constrained optimization, Journal of Mathematical Sciences, 2003.

This is a large survey paper (68 pages) with presentation of results obtained in CIAO and Hong Kong Polytechnic University in the area of optimization theory.

K.J. Patel and **F.L. Chen** have had their paper "Increasing cut surface quality with various cutting nozzle head oscillations for abrasive aquajet machining" published in the Proceedings of the Institution of Mechanical Engineers Vol 217 Part B: Journal of Engineering Manufacture (IMechE UK) 2003.

K.J. Patel and **F.L. Chen** have had their paper "Quantitative and comparative study of abrasive contamination in ductile and brittle material for abrasive aqua jet maching (AAJI)" published in the Proceedings of the 9th International Conference on Information Systems Analysis and Synthesis: ISAS '03.

K.J. Patel "Quantitative Study of Abrasive Contamination in Ductile Material During Abrasive Aqua Jet Machining (AAJI)" 2003 WJTA American Waterjet Conference to be held in August 2003.

Australian Computer Society

Keyur Patel was elected Member of the Australian Computer Society on the 17th June 2003.

Seminars and Workshops.....

Sasa Ivkovic attended a workshop on Forensic Statistics in Edinburgh, Scotland. The workshop took place at the Joseph Bell Centre for Forensic Statistics and Legal Reasoning from 1-3 July 2003. This workshop focused on skills in artificial intelligence, law and statistics in order to analyse, evaluate, interpret and present evidence in crime. Sasa presented his work, illustrating a new technique that finds similarities and differences between groups in data.

The 38th International Workshop: Variational Analysis And Applications was held at the G. Stampacchia International School of Mathematics at Erice in Italy. **Professor Alex Rubinov** presented two lectures at this workshop. "Monotonic Analysis: duality and converges", and "On minimization of max-min functions". The second lecture was based on a joint paper with Dr Adil Bagirov.

International Workshop - Small Sets In Analysis was held at Haifa, Israel. **Professor Alex Rubinov** was invited to give a lecture entitled "Sigma porous sets in monotonic analysis" at this workshop.

Both of theses workshops were well received. There were a number of people very interested in Alex's presentations and many interesting questions and discussions resulted.

An Internal Workshop on Intelligence Finance

Dr Heping Pan organized an internal workshop on Intelligence Finance in the School of ITMS.

Five speakers presented their ongoing research in the area of Intelligent Finance:

Elissa Hedwards, a fourth-year student from the School of Business, presented her records of paper trading in the MA558 unit of Technical Analysis of the Financial Markets, lectured by Dr Heping Pan. She has achieved 4/5 strike rate (stock selection correct) plus 16% return of paper trading during a period of 3 months, equivalent to 80% annual return.

Chandima Tilakaratne, a Masters student from the School of ITMS, presented her ongoing

research on a computational approach for predicting Australian stock market index using multilayer feedforward neural networks from the time series data of the target market and various interrelated markets.

Rachel Naus, a Research Assistant from the School of ITMS, presented her ongoing research on the feasibility of specialized and augmented decision tree induction algorithms for predicting Australian stock market index.

Darren Lierkamp, an Honours graduate from the School of ITMS, demonstrated the initial design of a fundamental investing expert system implementing Warren Buffett's methodology.

Dr Ranadhir Ghosh, a new Lecturer from the School of ITMS, reviewed his earlier MSc thesis work on stock selection and trading system development based on chaos theory and presented his ideas for further research in this direction.

The workshop was attended by Professor Sidney Morris, Professor Alex Rubinov and interested staff and students from the School and wider community. This Workshop was our first step in reporting well-focused research by a new Intelligent Finance team in CIAO.

Workshop on Continuous Optimization and Optimal Control with Applications

Last year CIAO organised two successful international optimization workshops. This year it will be an AMSI Funded workshop.

A workshop organised by CIAO (UB) and Department of Applied Mathematics (UNSW) will be held December 1-2, 2004. University of Ballarat is an associate member of Australian Mathematical Science Institute (AMSI). The workshop will be held in AMSI Premises at the University of Melbourne.

Aim:
The workshop aims to bring together about 20-30 eminent researchers and graduate students working in optimization and optimal control and their applications. Students will present their recent work, exchange information and ideas on their latest developments and will discuss applications of optimization techniques to emerging fields such as bio-informatics and data mining.

Organization of the Workshop:
The workshop will run for 2 days. On each of the days there will be one plenary lecture. The workshop will include a series of contributed lectures (40 minutes) by participants.

Program:
The list of topics, covered at the workshop, includes:

1. Global Optimization and Applications
2. Nonsmooth Optimization: Theory & Numerical Methods
3. Optimal Control Problems and Applications
4. Semi-infinite Optimization
5. Minimization of the potential energy function
6. Optimization Methods to Clustering and Data Classification

Plenary Lectures:
Two distinguished speakers will present lectures (50 minutes):

Professor Panos Pardalos (Florida, USA) will speak on global optimization and bio-informatics. Panos is the Editor-in-Chief of the journal Global Optimization and is a leading expert in continuous and discrete optimization.

Professor Miguel Goberna (Alicante, Spain) will speak on semi-infinite optimization. Miguel is a leading expert in semi-infinite optimization. He has co-authored two recent monographs on Semi-infinite Optimization and has published over 50 papers on the topic.

Workshop Speakers:
A. Bagirov (Ballarat)
L. Batten (Deakin)
R. Burachik (SA)
L. Caccetta (Curtin)
B. Craven (Melbourne)
A. Eberhard (RMIT)
J. Filar (SA)
V. Gaitsgory (SA)
P. Howlett (SA)
V. Jeyakumar(UNSW)
Y. Kaya (SA)
K. Lim (Deakin)
M. Mamedov (Ballarat)
C. Pearce (Adelaide)
A. Rubinov (Ballarat)
R. Womersley (UNSW)

The plenary speakers will be supported by University of Ballarat (Professor Pardalos) and UNSW (Professor Goberna). AMSI will cover travel expenses and accommodation for

Australian researches working at universities that are AMSI members.
In addition, two or three researchers from China are expected to participate at the workshop. They will be supported by the CHESI grant.

VPAC Workshop

On Monday 4th August, Mr David Bannon from VPAC conducted an introductory course on the VPAC services available to ITMS staff and postgraduate students. David mainly focused on VPAC's new 194 CPU Linux cluster named Brecca. 13 staff and postgraduates attended the course.

There will be a more advanced course and a University wide seminar at a date to be confirmed.

Forthcoming Seminars/Workshops ....

5/9/03
David Andrews – Logical Entity Abstracted Program Behaviour Modelling and High Level Architecture Security.

17/09/03
Stan Jeffery – New Business Creation

Conferences.....

Sasa Ivkovic, a postgraduate student in the School of ITMS attended ICAIL03 (International Conference in Artificial Intelligence and Law - 2003) Edinburgh, Scotland. The conference took place at the University of Edinburgh from June 23-28 2003 and was a huge success with well over 100 participants. There were discussions on how innovative computing techniques can help improve the practice of law. Sasa presented a paper, co-authored by Associate Professor John Yearwood and Dr Andrew Stranieri 'Visualizing Association Rules for feedback within the legal system' which illustrated that visual representation of grouped Association Rules can be used to provide feedback within the legal system and suggest hypotheses. Sasa met many known researchers in the field of Artificial Intelligence and Law, such as: Professor Trevor Banch-Capon, Professor Doug Walton, Dr Hanry Prakken and Dr John Zeleznikow.

Dr Robyn Pierce presented a paper Interactive animation provides a vehicle for exploring students understandings of derivatives at the **Mathematics Education Research Group of Australasia**, held at Deakin University Geelong. Robyn also chaired the special interest group on research in teaching algebra.

Dr Robyn Pierce presented a paper Recognising Equivalent Algebraic Expressions: An important component of algebraic expectation for working with CAS at the **International Group for the Psychology of Mathematics Education**, held at the Hawaii Convention Centre Honolulu.

5th International Congress on Industrial and Applied Mathematics, ICIAM 2003.

Professor Alex Rubinov, Mr Long Jia, Ms Nadia Soukhoroukova, Mr Julien Ugon, Ms Zari Dzalilov, Mr Jiapu Zhang and Mr Sergei Dymkaou attended the 5th International Congress on Industrial and Applied Mathematics, ICAM 2003. There were approximately 1900 presentations from 61 countries, six embedded meetings, and more than 40 parallel sessions in different fields of Mathematics.

The International Congress on Industrial and Applied Mathematics (ICIAM) is held every four years and is the most important general meeting, worldwide, for applied mathematicians. The Congress covers the full spectrum of research topics in applied mathematics and its industrial applications.

The Congress celebrates and describes the contributions of applied mathematics as an intellectual creation in its own right, as a foundation stone of technological development, and as an indispensable collaborative partner for other scientific disciplines. These aspects of applied mathematics have held true since the dawn of civilization. They will remain just as important in the new millennium.

The Congress is held under the auspices of the International Council for Industrial and Applied Mathematics, an international body consisting of approximately 20 professional applied

mathematical societies. Previous meetings have been held in

- Paris, 1987
- Washington, 1991
- Hamburg, 1995
- Edinburgh, 1999

ICIAM 2003 was held in Sydney, Australia and was a major scientific triumph.

The main venue was the Sydney Convention and Exhibition Center (www.scec.com.au), with some embedded meetings and parallel sessions held at the Haymarket Campus of the University of Technology, Sydney.

A message from the State Governor, Professor Marie Bashir:

** Mathematics is recognized as the language of high technology and the golden bolt of innovation. In a wider sense, mathematics is a supreme creation of the human spirit and a vital contributor in collaboration with many fields of human endeavor.

Applied mathematics, broadly interpreted to include related subjects such as statistics and operations research, has contributed significantly to many sectors of the Australian economy.

Despite these truths, mathematics in Australia is at an uncertain point. In particular, we have a challenging issue in regard to our human capital in that so many of our best mathematical minds are choosing to work overseas. Moreover, the public image of the mathematical sciences does not truly reflect its importance and effectiveness to our country.

ICIAM 2003 offers an opportunity to focus on these important issues and to promote the value of mathematics for our cultural and economic future**.

A message from the Chief Scientist of Australia, Dr Robin Batterham:

**I am fully aware of the beauty of mathematics and its richness as a fundamental science. Mathematical modeling is a topic that I hold dear. It is an absolute fact, even if not universally recognized, that mathematical technology plays an essential role in every industry sector. Moreover, within industry sectors, mathematical technology is required at every stage.

The mathematical sciences are essential -- from exploration through to mineral processing and metal production. To give examples from a long list, necessary mathematical technology includes inverse problems, geostatistics, optimization, computational fluid dynamics (with chemistry and thermodynamics) and control. At the practical level, some of the recent developments such as the HIsmelt process have been highly dependant on leading edge computational fluid dynamics.

There are both challenges and opportunities here. Among the challenges are to sustain the flow of mathematical inventions, to capture the benefits of this research for society, and to ensure that mathematics gets the recognition it deserves.**

Alex Rubinov and **Jason Zhang** (City University of Hong Kong) organised the Mini symposium " Optimization, Equilibrium and their Applications". Twenty talks were successfully presented at this Mini symposium and eight(!) of them were presented by the Ballarat team.

Dr Heping Pan attended the **2003 Hawaii International Conference on Statistics and Related Fields**, Honolulu, Hawaii, organized by the University of Hawaii 5-9 June, 2003. Heping presented two papers entitled "A Joint Review of Technical and Quantitative Analysis of the Financial Markets" and "Swingtum - A Computational Theory of Fractal Dynamic Swings and Physical Cycles of Stock Market in A Quantum Price-Time Space". He also chaired a session on econometrics.

After the Conference, Heping was invited by the conference organizer to serve as an Advisor for future conferences which may be extended to an International Conference on Statistics and Mathematics. Heping plans to run a one-day workshop, which most likely will be called "Intelligent Finance", in the future annual conferences of this series.

Honours Coordinator …

Dr Heping Pan has been appointed Honours Coordinator in the School of ITMS. He will replace Mr Greg Simmons who has commenced sabbatical leave.

Post Graduate News…..

Transfer from Probationary to Full PhD Candidature

Brent Ferguson transferred from Probationary Candidature to Full PhD Candidature. The title of Brent's talk was 'Modular neural network design using a rule extraction technique'. His supervisors are Associate Professor John Yearwood and Dr Andrew Stranieri.

Transfer from Masters to PhD

Jason Giri transferred from Masters to Full PhD Candidature. The title of Jason's talk was 'Non-linear Analogues of Lagrange Functions in Constrained Optimization'. Jason's Principal Supervisor is Professor Alex Rubinov and his Associate Supervisor Professor Sidney Morris.

New Student

Welcome to **Moumita Ghosh** who has commenced her PhD. Moumita has a Bachelor of Engineering in Computer Technology, she worked for a year with a software engineering company in India, then completed a BIT with first class Honours at Griffith University. She developed automatic marking and plagiarism detection software for student assignments, which is currently being copyrighted and used by Griffith University. She has a number of conference publications.

The title of Moumita's project is 'Development of non-linear optimisation techniques for production optimisation' her Principal Supervisor is Dr Adil Bagirov and Associate Supervisor Prof Alex Rubinov.

Postgraduate nomination for the Research Committee

Ms Diane Clingin from the Graduate Studies Office recommended to the University of Ballarat, Research Committee, that **Simon Barty** be nominated as the Post Graduate representative on this committee.

Forthcoming Confirmation of Candidatures…

Mr David Andrews' Confirmation of Candidature will take place on the 5th September 2003. The title of David's talk is 'Logical Entity Abstracted Program Behaviour Modelling and High Level Architecture Security'.

Research Reports

03/10	A framework for monitoring progress and planning teaching towards effective use of computer algebra systems	R. Pierce and K. Stacey	May 2003
03/11	Algebraic Expectation: the insight to accompany formal symbolic operations	R. Pierce and K. Stacey	May 2003
03/12	Recognising equivalent algebraic expressions: an important component of algebraic expectation for working with CAS	L. Ball, R. Pierce and K. Stacey	May 2003
03/13	Swingtum – A computational theory of fractual dynamic swings and physical cycles of stock market in a quantum price-time space	H. Pan	June 2003
03/14	A joint review of technical and quantitative analysis of financial markets towards a unified science of intelligent finance	H. Pan	June 2003
03/15	Offline handwriting recognition using evolutionary neural learning algorithm based on rule based over segmented data points	M. Ghosh and R. Ghosh	June 2003
03/16	Undergraduate Mathematics Curricula – A new angle	R. Pierce, C. Turville and J. Giri	July 2003
03/17	Interactive animation provides a vehicle for exploring students' understandings of derivatives	R. Pierce and L. Atkinson	July 2003
03/18	dowl: A dynamic ontology language	J. Avery and J. Yearwood	August 2003
03/19	Quantitative Study of Abrasive Containment in a Ductile Material during Abrasive Aqua Jet Machining (AAJM)	K. Patel and F. Chen	August 2003
03/20	Services for Third and Forth Generations: Technologies and Implications	K.J. Patel and V. Singh	August 2003
03/21	Increasing cut surface quality with various cutting nozzle head oscillations for abrasive aqua jet machining (AAJM)	K.J. Patel and F.L. Chen	August 2003

All IT&MS staff members and postgraduate students are encouraged to contribute to the next edition of the monthly CIAO Research Newsletter. Examples of newsletter items staff should consider are: projects in process, papers accepted, research in process, publications, grants, seminars, visitors, visits by ITMS staff and Post graduates, scholarships, reports from school research groups / centres, events, conferences, new discoveries, general items of interest, etc. All items should be received by Maxine Kingston no later than the 31st September 2003.

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