



Research Newsletter

JULY 2001

Edition 17

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Appointment of professor of Infomatics and Head of the School of Information Technology and Mathematical Sciences

On the 1 August 2001, the University Council appointed Professor Sidney Morris as Professor of Infomatics and Head of the School of ITMS. Professor Morris is expected to commence at the University of Ballarat at the beginning of November 2001.

Professor Morris completed a PhD Mathematics at Flinders University in 1970, one year after he graduated from the University of Queensland with a BSc with Honours in Mathematics and Statistics. He has held various positions around the world including chairs at the University of New England, the University of Wollongong and the University of South Australia. He has

published more than 100 research papers in high quality international journals, and three books, one of which has been translated and published in Russian. His latest book is an advanced graduate student and researchers' handbook of 835 pages.

Professor Morris comes to the University with very extensive and senior experience as a Research Worker and Academic Leader in Mathematics, Statistics, Computer Science, Information Systems and related areas as well as more generally in roles he has had at universities where his leadership spanned the entire academic spectrum (eg Deputy Chair of Academic Board and Dean of Faculty). His prodigious research record is driven both by curiosity and recognition of the importance of linking academic work

Congratulations

To Professor Alex Rubinov on the formation of The Centre in Applied Optimisation (CiAO).

The recommendation by Academic Board to the University Council to establish the Centre in Applied Optimisation (CIAO) was passed. The Centre in Applied Optimisation is one of two designated research centres in

the University. The other Centre, attached to the School of Science is the Centre for Environmental Management which is headed by Professor Martin Westbrook.

The Centre in Applied Optimisation will be focussed around the activities of Professor Rubinov and his many international collaborators. It will carry out basic research in optimisation, the development of new numerical and computational optimisation algorithms as well as the application of these techniques to problems in data mining, telecommunications networks, computational chemistry and decision support in many areas such as health and business. The Centre is now looking to appoint a post-doctoral fellow in this area.

Publications Improvement

The School received a grant of \$4,400 for funds under the University's Publication Improvement scheme for 2001. These funds will be used to assist with the conversion of some un-refereed conference papers and other preliminary research to journal publications.

VPAC - High Performance Computer Programming in Global Optimisation and Computational Chemistry

Marcello Bertoli commenced as the research assistant/programmer working on this project which aims to produce computational models to predict the structure of chemical molecules. The project is in collaboration with Deakin University and involves chemists and mathematicians from Deakin as well as computer scientists from Monash University.

The project is funded by a successful VPAC Expertise grant (Professor Alex Rubinov) by the University of Ballarat and a research

grant at Deakin University (Professor Lyn Batten).

Many thanks must go to Belinda Wallesz for dealing with the financial and human resource intricacies between Deakin and Ballarat to organise Marcello's position

Visit to Maningrida

David Stratton visited PhD student Glenn Auld in the remote aboriginal community of Maningrida where Glenn in investigating the use of state of the art multimedia technologies is teaching literacy in Njebbenna ("jebenna") - one of the 16 or so languages spoken in Maningrida. Although not officially one of Glenn's supervisors, Davids private travel plans took him within 500, very arduous, kilometers of Glenn so some useful supervisory contact was made.

Accepted papers....

A paper by **Jack Harvey** and his co-researcher **Dr Mitchel Langford** of the Midlands Regional Research Laboratory, University of Leicester, UK, has been accepted for presentation at the Urban 2001 IEEE/ISPRS Joint Workshop on Remote Sensing and Data Fusion over Urban Areas, in Rome, Italy in November 2001.

The paper, entitled "*The Use of Remotely Sensed Data for Spatial Disaggregation of Published Census Population Counts*" compares and evaluates various methods developed by the two authors for estimating small-area populations by combining census counts for larger spatial zones with more finely detailed information from satellite imagery. The test area was the county of Leicestershire, UK. Research assistance at the Ballarat end has been provided by Neroli Sawyer, with support from an ITMS summer scholarship and a UB research grant. Jack and Neroli, together with Chris Turville, are now undertaking a comparative analysis

using Australian data, and continuing to explore further methodological refinement.

Jack Harvey, has also had a paper accepted for the International Journal of Remote Sensing titled '*Estimating census district populations from satellite imagery: some approaches and limitations*'. This is the second in a series of papers derived from Jack Harvey's 1999 PhD thesis.

Phil Smith and Geoff Boyd have had a paper accepted for the South Eastern Conference for Small Colleges, Nashville Tennessee, titled 'Teaching OO Programming From a Class User Perspective'.

A.M. Bagirov and A.M. Rubinov, *Global optimization of marginal functions with applications to economic equilibrium*, to appear in the Journal of Global Optimization.

Yu.G. Evtushenko, A.M. Rubinov and V.G. Zhadan, *General Lagrange-type functions in constrained global optimization*.

Part 1: Auxiliary functions and optimality conditions, to appear in the Optimization Methods and Software journal

Yu.G. Evtushenko, A.M. Rubinov and V.G. Zhadan, *General Lagrange-type functions in constrained global optimization*.

Part 2: Exact Auxiliary Functions, to appear, Optimization Methods and Software

V. F. Demyanov, A.M. Bagirov and A. M. Rubinov, *A method of truncated codifferential with application to some problems of cluster analysis*, to appear in Journal of Global Optimization.

Published papers

The following papers have recently been published:

Adil Bagirov and Alex Rubinov's paper *Global Minimisation of Increasing Positively Homogeneous Functions over the Unit Simplex* by the international journal *Annals of Operation Research*, vol 98.

The Editors, Prof Louis Caccetta and Prof. Kok Lay Teo, indicated in the Preface: "This special Annals of Operation Research volume contains 18 papers, which are carefully selected from the 156 refereed papers published in the proceedings of the International Conference on Optimization: Techniques and Applications (Perth, 1998). Each accepted paper passed a stringent refereeing process with all referees' reports (at least 3) positive".

A. M. Rubinov and B. M. Glover's paper *Equilibrium with fixed budgets and superlinear connections*, has been published in *ANZIAM Journal*. This very old paper was submitted to publication in 1997 and was accepted for publication in 1998. However, the editor could not find a place for this paper for almost three years.

A. Rubinov, H. Tuy and H. Mays' paper *An algorithm for monotonic global optimization problems*, has been published in the international journal *Optimization*. The main part of this paper was prepared during a visit of Professor Hoang Tuy to Ballarat.

Robyn Pierce and Kaye Stacey's paper *Observations on students' responses to learning in a CAS environment* published in *Mathematics Education Research Journal* vol 13:1 pp28-46

Seminars

School of ITMS Seminar Program:

An electronic copy of the School seminar Program for 2001 has been placed in n:smc\docs\seminar program 2001.doc

The following seminars have been heard:

13/6/01 Honours Students

Brent Ferguson *'A comparative study of rule extraction techniques applied to a trained artificial neural network'*.

Sasa Ivkovic *'Exploring the Concept of "Interestingness" in Association Rules Derived from Large Legal Datasets'*.and

Rachel Naus *Investigating factors affecting the readability of text from screen.*

27/6/01 (ITMS lecturer)

Phil Smith *'Questions in Teaching Programming'*.

11/7/01 PhD Student

Heather Mays *'An Intelligent Diagnostic System for Algebra Based on a Taxonomy of Errors and a Computational Model of Mathematical Problem Solving'*.

25/7/01 PhD Students

Jason Giri *Lagrange and penalty function methods for optimization of functions with a single constraint*

Gary Saunders *Logic of Argumentation in the Legal and Biochemical Domains.*

Forthcoming Seminars

8/8/01 Honours Students: -

Kristopher Gardiner *'Computational simulation of the effects of Age Related Macular Degeneration'*.

Robyn Wilson *'A critical evaluation of the effectiveness of technical innovations on the acceptance of consumers to engage in financial transactions over the Internet'*

John Avery *'Models of autonomy and authority within a multi-agent system'*.

22/8/01 Staff ITMS:

David Stratton, David Andrews and Kris Gardiner *'Distributed Simulation and the High Level Architecture (HLA).'*

Research Seminars on Optimization and its Applications

A series of research seminars on optimization and its applications (mainly to data classification) has begun at the School of ITMS. The first two talks were presented by Alex Rubinov and Adil Bagirov. The next talk will be devoted to support vector machines technique, which is very popular in data classification. This talk will be delivered by Adil Bagirov.

Workshops....

On the 19th June the School hosted the **First Doctoral Decision Support Systems Workshop**. PhD students from the School of ITMS, LaTrobe University and the University of Melbourne presented the following talks:

Adil Bagirov

'Data Classification via non-smooth and global optimisation'.

Simon Barty and Jack Harvey

'Developing data mining techniques using a Bayesian Model of the Adverse Drug Reactions database'.

Elizabeth Deveney

'Unravelling practices of prescription: Introducing computerised decision support to the medical consultation'.

Zari Dzalilov

'Creating a system for control problems with medicine is the main aim of the "Adverse Drug Reaction" problem'.

Jean Hall

'Evaluating Legal Knowledge-Based Systems'.

Musa Mammadov

'The Fuzzy Derivative and its applications to Data Classification'.

Tunde Meikle

'Towards a method for guiding decision support system design and development for the domain of law'.

Michelle O'Brien

'Adverse drug reactions improved decision support'.

Gary Saunders

'Argumentation as a basis for a DSS for prediction of Tertiary Structure of Proteins'.

Dennis Wollersheim

'How Can I Help You? Computer Implemented Guidelines for Doctors'.

Conferences.....

Alex Rubinov attended the **International Workshop on High Performance Algorithms and Software for Nonlinear Optimization** in Italy from June 30 till July 8. He presented a talk "*Cutting angle method in constrained global optimization*".

Alex Rubinov also attended the International Workshop on Optimization and Control with Applications from July 9 till July 17 in Italy where he gave an invited lecture "*Data classification through global optimization*".

Many outstanding experts have attended these workshops and Alex had some very important meetings.

John Yearwood, Andrew Stranieri and **Tunde Meikle** attended the 8th International Conference on Artificial Intelligence and Law (ICAIL) 2001 held in St Louis Missouri – May 2001.

Two papers were presented:

System Development a la MODDE by **Tunde Meikle** and **John Yearwood** and

Tools for World Wide Web based legal discussion Support Systems by **Andrew Stranieri, John Yearwood** and **John Zelezinkov**.

John Yearwood demonstrated the Argument Developer software (a shell for developing knowledge-based systems) and **Andrew Stranieri** demonstrated the Web Shell software. Both demonstrations attracted strong interest.

John Yearwood presented *An Argumentation Shell for Supporting the Development Drafting of Legal Documents* at the **Third International Symposium on Judicial Decisions Support Systems** at Chicago Kent Law School in Chicago.

Andrew Stranieri presented *Data Mining in Law with Association Rules* at the **Third International Symposium on Judicial Decisions Support Systems** at Chicago Kent Law School in Chicago.

Tunde Meikle presented on *Discretion* and at the **Third International Symposium on Judicial Decisions Support Systems** at Chicago Kent Law School in Chicago *Legal Knowledge Based Systems*.

Andrew Stranieri presented a paper by **John Yearwood and Andrew Stranieri** on *Knowledge as arguments for facilitating eCommerce Dialogue* at the **Second Workshop on Norms and Institutions in Multi-Agent Systems** at the **5th International Conference on Autonomous Agents, Montreal, Canada** May 28 – June 1 2001.

Lyn Roberts attended the Third Southern Hemisphere Symposium on Undergraduate Mathematics. (Warthog DELTA 2001 conference) in Kruger National Park, South Africa in July. She presented a joint paper with **Robyn Pierce** *Using Web-based Resources to Teach Taylor Series*.

Robyn Pierce attended MERGA-24 Mathematics Education Research Group of Australasia Annual conference. June 30-July 4 2001 at the University of Sydney

The two papers with which Robyn was associated "*Assessing Algebraic Expectation* and "*A Framework for Algebraic Insight*" were both well received and the paper she presented "*A Framework for Algebraic Insight*" had been selected for 'teachers day' which meant there was a larger audience. As a consequence of this presentation she has been asked to submit a paper on the same topic to the Australian Senior Mathematics Journal. The conference provided good opportunities to renew and make contacts with others working on research in mathematics education.

Meeting

A meeting of the **Computation Chemistry Group** was held at Deakin University (Rusden campus) on June 14th. The group is concerned with applications of new methods for global optimization to some problems of theoretical chemistry, which are studied at Deakin University. The new optimisation methods were developed at the University of Ballarat. Further developments of these methods were proposed at Deakin. The meeting was attended by **Alex Rubinov, Zari Dzalilov, Adil Baghirov, Nadia Sukhorukova** and **Marcello Bertoli** all from the University of Ballarat, Kai Ming Ting, Manzur Murshed (Monash) and Kieran Lim, Gleb Beliakov, Thanh Tran, Lynn Batten from Deakin University. The main goal of the meeting was to discuss the global algorithm and how to best apply a parallelisation process. It was noted that we also need to work on speeding up of the serial Processes. Some ideas related to local methods also were presented.

Post Graduate News.....

The School welcomes :

Faezeh Afshar who will be engaged in the study of Automating Knowledge acquisition for the Generic/Actual Argument Model.

Simon Barty who will be engaged in the study of Data Mining the Adverse Drug Using Bayesian Statistical Methods.

Jia Long who will be engaged in the study of Global Optimisation.

Scholarships/Awards

Aspect Computing scholarships were awarded to the following Students:

Naomi Loxton awarded the 'Top final year student studying a Bachelor of Information Technology degree'.

Adam Arnel awarded the 'Top final year student studying a Bachelor of Computing degree' and

Deanna Osman awarded the 'Top final year female student'.

Research Reports

01/10	Abstract Convexity and Nonsmooth Analysis. Global Aspects	A.D. Ioffe and A.M. Rubinov	May 2001
01/11	A trust region method for minimizing twice codifferentiable functions*	Mikhail Andramonov	May 2001
01/12	A Pixel-based Approach to Small-area Population Estimation Using Satellite Imagery (Part 1)	Jack Harvey	June 2001
01/13	Fuzzy Derivative and its Applications to Data Classification	Musa Mammadov	June 2001
01/14	A New Approach to Fuzzy Derivatives with Applications to Data Classification	M.A. Mamedov, A.M. Runinov and Musa Mammadov	June 2001
01/15	Sequential Separation of Sets and its Applications to Data Classification	M.A. Mammadov, A.M. Rubinov and J. Yearwood	June 2001

All IT&MS staff members and postgraduate students are encouraged to contribute to the next edition of the monthly ITMS 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 10th September 2001.



University of Ballarat



School of Information Technology & Mathematical Sciences, University of Ballarat.