



Research Newsletter

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A Few Words from the School Research Coordinator.....

Congratulations

Alex Rubinov is now a member of the editorial board of the international journal "Optimization", which is published in Germany.

Successful Grants...

The University of Ballarat has just been notified of its success in relation to its Australian Research Council SPIRT (Strategic Partnership with Industry - Research and Training) grant applications for 2001.

From the School of ITMS the following applications were successful:

Prof A Rubinov Optimisation of Capital and Operational Expenditures for a Telecommunication Network to the value of \$70,000. The industry partner is Telstra.

Prof A Rubinov, Dr J Yearwood and Dr J Harvey Enhanced Prescribing Decision Support: Data Mining the Australian Adverse Drug Reactions Database and Providing On-line Access to Information \$230,000. The

project involves the Ballarat and District Division of General Practice, Therapeutic Goods Administration, Global Health, Medical Software Industry Association and Therapeutic Guidelines Limited.

Dr. Ken Harvey from the School of Public Health at LaTrobe University is Team Leader for the project, which was originally conceived a follow on to his successful SPIRT project in "Pharmaceutical Decision Support".

Ross Davey, executive manager of the Collaborative Centre for eHealth (CCeH), played a key role in providing and organising connections to the Industry partners and facilitating the development of the project. It is hoped that the project will fit under an (ADRAC) umbrella of projects that Ross has been developing at CCeH. Ross will also be an associate investigator in one of the 3 APA(I)s in the ADRAC project. The project strengthens the connection between CCeH and ITMS.

It is also worth noting that according to Dr Gordon Smyth of the University of Queensland, who maintains a website which monitors many aspects of professional statistical activity in Australia, this SPIRT grant was one of only seven nationwide classified as "Statistics".

Projects in Progress.....

Joint Research Project

Prof. L. Batten, Dr. G. Belyakov and Dr. Kai Ming from Deakin University visited our school on September 27 to discuss a possible joint research project with **Alex Rubinov, John Yearwood and Zari Dzalilov**.

This project will be developed by a team bringing together researchers from the University of Ballarat (SITMS) and Deakin University, who are experts in mathematics, computer sciences and chemistry. The main goal of this team is to prepare an application for a Discovery (former Large) ARC grant for the next round of applications (March 2002). The team is concerned with applications of new methods for global optimization developed at the University of Ballarat over the last three years to some problems of theoretical chemistry, which are studied at Deakin University.

Dr. Xiao Qi Yang from Hong Kong Polytechnic University invited **Alex Rubinov** to spend a week in Hong Kong for joint research in the area of optimization. Xiao Qi and Alex had joint papers devoted to nonlinear analogues of Lagrange-type functions, and will extend their research in this area.

During his visit Alex had some very useful discussions with Xiao Qi, which allowed both of them to clarify many "fuzzy" points. X.Q. Yang is one of more than 60 Australian mathematicians, who left Australia in the last five years. Many other former Australian experts in optimisation also have positions at various Hong Kong universities.

Robyn Pierce has made links (limited because of time) with Patricia Cretchley at University of Southern Queensland who is looking at students involvement in choosing

assessment. She has collected some data but has not had time to follow this through. Lyn Roberts and Robyn have been collecting data on student and staff experience of teaching statistics on-line. An abstract for a paper from this work will be submitted for the 3rd Southern Hemisphere conference on teaching undergraduate mathematics to be held in 2001.

Ballarat and District Division of General Practice has received funding for a project to develop online delivery of a Graduate Certificate of Practical Dermatology offered by Monash University. The project team includes **Assoc Prof Lyn Roberts** and **Dr Jack Harvey** of ITMS, together with colleagues from the **UB Centre for Rural and Regional Health and from Monash University**. Lyn will provide the IT expertise for the development of the online instructional environment, and Jack will be responsible for project evaluation. Ms Wendy Borowiak has been appointed as part-time project officer.

Dr Jack Harvey has commenced a joint research project with **Dr Mitchel Langford** of the Department of Geography at the University of Leicester, UK, in "dasymmetric mapping", which involves the use of ancillary information (in this case remotely sensed imagery) to spatially redistribute census population figures and hence produce population estimates for smaller areas than those published by the census agency. This is important work because publication of such figures by census agencies is precluded by confidentiality restrictions, and yet there is a great demand for them by geographers, planners, epidemiologists etc.. The joint work involves comparing the results of a new method of population estimation developed by Jack Harvey in his doctoral thesis with earlier approaches developed by Mitch Langford and his colleagues.

Seminars and Workshops.....

Seminars

Alex Rubinov and **Zari Dzalilov** visited Deakin University (Rusden campus) on September 5. Alex presented a talk and discussed the cutting angle method in global optimization and its possible applications with colleagues from Deakin.

John Yearwood visited the Donald Berman Laboratory for Information Technology and Law at LaTrobe University on December 18 and met with a small group working in the area of artificial intelligence and law. Of particular interest was the talk by Dr. C. Combrink from the Centre for Computers and Law at Erasmus University, Rotterdam, The Netherlands. John presented a talk on "Knowledge-based Software in Discretionary Legal Domains"

Workshops

Alex Rubinov attended "The international workshop on **Optimization with High Technology Applications** (OHTA 2000)" in Hong Kong (October 23-25, 2000). This workshop brought together more than 30 researchers from Europe, USA, China, Japan and Australia who are working in the area of optimization and its applications to industry, data mining and other fields. Alex presented a paper written jointly with Adil Bagirov on 'The cutting angle method in Global Optimisation'. He also participated in some fruitful discussions relating to global optimization and its applications to data mining and computational chemistry.

Jack Harvey recently attended two workshops devoted to cutting edge biostatistical methodologies: *Analysis of Longitudinal/Repeated Measures Data in Health Studies* at Coolangatta; and *BUGS Down Under* at Brisbane. The latter was an

introduction to BUGS (Bayesian Analysis Using Gibbs Sampling) software, which has enabled computer-intensive modelling solutions to many problems involving large sparse multivariate datasets or data correlated in time or space, which are intractable using traditional statistical methods. Jack sees great potential for the use of these methods in his own work and that of his postgraduate research students in the areas of: spatial analysis of remote sensing data (joint project with geographers at the University of Leicester, UK); datamining of an adverse drug reactions database (SPIRT project); diagnosis and management of constipation in elderly institutional residents (collaboration with Ballarat Health Services team); epidemiological mapping of air pollution and respiratory disease (with Masters student Dora Pearce); and multivariate time series analysis (with PhD student Michael Gathercole).

Meetings

As a part of the contact with University of Melbourne for PhD supervision **Robyn Pierce** meet with their Technology in Mathematics Education Research group. As a result of this she has been asked to act as support/adviser to the staff at Ballarat Grammar who are taking part in the trial of CAS use for VCE mathematics teaching and assessment. This project is funded by a \$500,000 SPIRT grant.

Alex Rubinov and **Zari Dzalilov** attended 'The first **Sino-Japan Optimization meeting**' which was held in Hong Kong immediately after the OHTA workshop (October 26-28). Besides Chinese and Japanese experts, the meeting was attended by many experts from Europe, America and Australia. Alex presented two talks (one of them jointly with Zari).

During meetings in Hong Kong '**The Pacific Optimization Research Activity Group**'

(POP) was organized. Alex was invited to be the Australian representative of the working committee of this group. The main function of the working committee is to urge people, who are interested in the optimization research activity in this region to join POP and submit research and news to the POP website when it is established

Adil Bagirov and **Musa Mammadov** visited Deakin University on November 16 to discuss with mathematicians problems relating to a possible joint project between the two Universities. The joint project on applications of the cutting angle method in global optimization and problems of computational chemistry.

Conferences.....

AAMT Virtual Conference 2000

The Australian Association of Mathematics Teachers have recently completed their annual 'virtual conference'. **Robyn Pierce** was invited to contribute a paper to the graphics calculator section. Her paper was titled '**Is what you see what they get?**' and raised the issue of the difference between the way mathematics teachers and their students interpret screen output for mathematics.

ALTC – 2000 Conference

Lyn Roberts attended the Association for Learning Technologies Conference in Manchester in September. This was an opportunity to see the extent of on-line delivery in the UK. While the use of synchronous technology (learnlinc) at ITMS is at the forefront of world practice, we are behind the British in the level of between institution cooperation and government funding for special projects. Lyn was able to make personal contact with people with whom she is collaborating in an on-line writing team on the topic of virtual tutoring.

4th International DERIVE T192-89 Computer algebra in Mathematics Education conference

Robyn Pierce presented paper Algebraic insight and students' use of derive to the 4th International DERIVE T192-89 Computer algebra in Mathematics Education conference in Liverpool UK (co-authored with Prof. Kaye Stacey, DSME University of Melbourne).

In addition to the conference Robyn met with Josef Bohm, Austria – chair of the DERIVE user group, Neil Challis and Harry Gretton, UK who report on the use of CAS in teaching undergraduate students and Prof John Berry, Plymouth, editor of the International Journal of Computer algebra in Mathematics Education.

Second International Association for Science Technology and Development, Conference on Law and Technology (LawTech'2000).

John Yearwood attended LawTech'2000 in San Francisco and presented a paper "An Argumentation Shell for Knowledge Based Systems". The conference was an interesting mix of Law and Technology papers with many focusing on IP aspects of the new technologies.

ColleCTeR'2000 Conference

John Yearwood attended the ColleCTeR conference in Brisbane on December 13-14 and presented a paper co-authored with Andrew Stranieri, "Knowledge as Arguments for Facilitating E-commerce Dialogue".

Papers accepted

Robyn Pierce has had *Observations on students' responses to learning in a cas environment* accepted for the Mathematics Education Research Journal, subject to changes requested by the editor (which have been done and returned). Co-authored with Prof **Kaye Stacey**, DSME University of Melbourne.

Jack Harvey, Lyn Roberts, and Barry Kentish of the School of Science, together with former ITMS Honours student **Jason Ross** have had their paper "Multivariate statistical analysis of songs of the male Common Blackbird (*Turdus merula*): an example from western Victoria, Australia" accepted for publication in the journal *The Emu : official organ of the Royal Australasian Ornithologists' Union*.

Pilot Study:

Lyn Roberts and **Robyn Pierce** have conducted a pilot study on students' response to the use of applets, available on the Web, to aid understanding of mathematics concepts. They are exploring issues like 'Is what experts see what novices see'. An abstract for a paper from this work will be submitted for the 3rd Southern Hemisphere conference on teaching undergraduate mathematics to be held in 2001.

Post Graduate News.....

New PhD student

New PhD student **Musa Mammadov** began his work at ITMS. Musa was born in Azerbaijan. His project relates to applications of different optimization

methods and fuzzy sets technique to data mining.

Applications for Honours

To date there has been 10 applications from second year students wishing to commence Honours in 2001.

BREAKING NEWS!

Congratulations to the following ITMS staff who were successful with their 2001 University of Ballarat Research Grant applications:

Dr Jack Harvey has been allocated \$10,000 towards one or other, or a combination of both projects: **Small-area population estimation by disaggregation of published census counts using ancillary information derived from orbitally acquired remote sensing imagery** (application 1) and **Application of spatial regression models to the problem of estimating small-area populations from orbitally acquired remote sensing imagery** (application 2).

Dr John Yearwood has been allocated \$10,000 for his project **eTourism: an application of dialogue based argumentation for tourism**.

Professor Alex Rubinov has been allocated \$10,000 for his project **Adapting the Cutting Angle method of Global Optimisation for some problems of Computational Chemistry**.

Research Reports ...

00/17	On some classes of abstract convex functions ¹	A.M. Rubinov and A.P. Shveidel	September 2000
00/18	Incorporating GUI Builders into Introductory Programming Courses	David Stratton and Philip Smith	September 2000
00/19	General Lagrange-Type Functions in Constrained Global Optimization ¹ Part I: Auxiliary Functions and Optimality Conditions	Yu. G. Evtushenko, A.M. Rubinov, V.G. Zhadan	September 2000
00/20	The use of a geographical information system (GIS) in a historiographical research context	Jack Harvey	September 2000
00/21	Predictive Accuracy of Regression Models Utilising Transformed Dependent Variables: Some Issues Regarding the Coefficient of Determination	Jack Harvey	September 2000
00/22	Estimating the Population of Census Collection Districts Using Aggregated Satellite Remote Sensing Data: Some Approaches and Limitations	Jack Harvey	September 2000
00/23	Topical and sub-topical functions, downward sets and abstract convexity	A.M. Rubinov and I. Singer	October 2000
00/24	Downward sets and their separation and approximation properties	J.-E. Martinez-Legaz, A.M. Rubinov and I. Singer	October 2000
00/25	A Problem of Modal Control in a Linear Neutral System	Anatoli F. Ivanov and Denys Ya. Khusainov	October 2000
00/26	A global optimisation approach to classification in medical diagnosis and prognosis*	Adil Bagirov, Alex Rubinov, John Yearwood and Andrew Stranieri	November 2000
00/27	An argumentation shell for knowledge based systems	John Yearwood and Andrew Stranieri	November 2000
00/28	Knowledge as Arguments for Facilitating E-commerce Dialogue	John Yearwood and Andrew Stranieri	November 2000
00/29	Further generalizations of the Perron-Frobenius theorem*	P.E. Kloeden and A.M. Rubinov	November 2000

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 20th June 1999.



University of Ballarat



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