



# Research Newsletter

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

This semester has been unusually busy with the School running the Short course in Distributed Simulation and the High Level Architecture during February and then having to face the teaching semester as well as meet the deadlines for ARC Discovery and Linkage grant applications. Nevertheless, three discovery application were submitted as well as 2 Linkage applications. This is a great effort from all involved as well as those who spent time developing applications but were unable to get industry partners in time.

The School has formalised its Seminar programme so that there is a seminar every fortnight according to the schedule at [http://www.ballarat.edu.au/itms/seminar\\_timetable.shtml](http://www.ballarat.edu.au/itms/seminar_timetable.shtml) For further information contact Dr. John Yearwood

## Congratulations ....

Congratulations to **Alex Runinov** as the proposal for the establishment of the University Research Centre, the Centre for Applied Optimisation (CIAO) went through Research Committee and Academic Board for the Vice Chancellor to take to Council.

Work on the successful VPAC (Victorian Partnerships in Advanced Computing) application has been proceeding. The work will look at parallelising the global optimisation algorithms developed at the University of Ballarat by Alex Rubinov and Adil Baghirov. These parallel algorithms will then be applied to problems of Computational Chemistry and Data Mining. The work with computational chemistry models is being undertaken jointly with Professor Lynn Batten and Gleb Bailakov from Deakin University. The two universities have pooled research grant funds to employ a research assistant/programmer to implement the algorithms on the VPAC 64 processor Compaq cluster computer. It is hoped that some large companies in the chemical industry can be convinced to invest in the technology.

## Staff Exchange to SUNY Oswego...

During semester two 2000, Dr Ewan Barker was involved in an academic exchange with Dr Philip Downum from SUNY Oswego. Phil came to Ballarat and taught Engineering Mathematics and other classes that Ewan would normally take, and Ewan taught four courses at the State University of New York, Oswego campus.

Oswego is in upstate New York, on Lake Ontario, a long way, both physically and in terms of lifestyle, from New York City. It is a town of about twenty thousand people, although it feels smaller as it is only about forty minutes from the larger city of Syracuse. The university campus is in many ways quite similar to the University of Ballarat. It developed out of a nineteenth century institution that was for most of its history a teachers college. It is a liberal arts four year college that has masters programs, but does not grant PhDs. Like Ballarat, it prides itself on the friendly and personal relationship it has with its students, and, also like Ballarat, it has a high teaching load for its staff members. Ewan took a normal semester load of four courses, each in class sized groups. He had two classes of a Discrete Math unit, which is aimed to be the students' first introduction to real mathematical thinking; a class of Management Science, based around using Excel to solve linear programming and other optimization problems, with the emphasis on setting up the problems and interpreting the results, rather than on the mathematical details of the algorithms; and a class of "Business Calculus".

Ewan found the experience of teaching American students to be, on the whole, very enjoyable. They were friendly and willing to work quite hard, although they did like more specific guidance and spread out assessment than our students here.

The Mathematics Department there did not have the sense of community that our School has, but individual staff members were very friendly. The campus is older than ours and some of its facilities are rather worn out. There does not seem to be too much money around for refurbishing infrastructure, but it does have a wonderful location on the shores of Lake Ontario.

Ewan's wife, Heather MacLeod, accompanied him, and although she did not work in Oswego, she spent some time looking at the Oswego support services for

international students and students in general. Amongst our nonacademic activities, Ewan played the recorder in two events associated with the Music Department at Oswego: a performance of Britten's "Noye's Fludde" and a Renaissance Banquet.

In all, it was a very positive and useful experience to teach in another country, and it makes Ewan keen to consider further possibilities of academic exchanges in the future.

### **Published Book .....**

The book *Optimization and related topics* was published by Kluwer Academic Publishers (Series *Applied Optimization*, vol. 45) in December 2000. This book is edited by Alex Rubinov and Barney Glover. The book, comprised predominantly of survey chapters, is a collection of recent results in various fields of theoretical and applied optimization and related topics. It contains survey papers on second order non-smooth analysis, based on subjects, multiplicative programs and C-programming, optimal algorithms in emergent computation, the extremal principle and its applications, Turnpike property for variational problems, asymptotic behavior of random infinite products of some operators, inequalities for Riemann-Stieltjes integral. Other topics covered include non-smooth analysis and analysis of linear operators and set-valued mappings, numerical methods and generalized penalty functions, applied optimal control problems and Markov decision processes, optimal *estimation of signal parameters and the problem of maximal time congestion*.

*Audience:* Specialists in optimization, mathematical programming, convex analysis, non-smooth analysis, engineers using mathematical tools and optimization techniques, specialists in mathematical modelling.

The editors are very thankful to School of Information Technology and Mathematical Sciences, University of Ballarat for providing the facilities for the preparation of a camera-ready copy. The editors are also very thankful to Adil Bagirov, who prepared this copy.

## **A special issue of The Journal of Global Optimization.**

A special issue of the international **Journal of Global Optimization (JOGO)** dedicated to the 65th anniversary of Professor Naum Shor, an outstanding expert in the area of numerical methods for nonsmooth and global optimization, will be published next year. The editor-in-chief of JOGO invited Alex Rubinov to act as a guest editor for this issue.

### **Published papers**

The following papers have recently been published:

**A.M. Bagirov, A.M. Rubinov, A. Stranieri and J. Yearwood**, A global optimization approach to classification in medical diagnosis and prognosis. *Proceedings of Hawaii International Conference on System Sciences: HICSS-34*, 2000

**A. M. Rubinov and I. Singer**, Best approximation by normal and conormal sets, *Journal of Approximation Theory*, vol. 107 (2000), 212-243.

### **Accepted papers.....**

The following papers have been accepted for publication:

**A.A. Vladimirov and A.M. Rubinov**, Dynamics of positive multiconvex relations, to appear in international *Journal of Convex Analysis*. The significant part of this paper

was prepared during Sasha Vladimirov's visit to Ballarat in 1998.

**H. Tuy, A.M. Bagirov and A.M. Rubinov**, Clustering via D.C. Optimization, to appear in the volume: *Convex Analysis and Global Optimization*, N. Hadjisavvas and P. Pardalos- eds., Kluwer Academic Publishers. This paper has been prepared during the second visit of Professor Hoang Tuy to Ballarat (January 2000).

**A.M. Bagirov and A.M. Rubinov**, Modified versions of the cutting angle method, to appear in the volume *Convex Analysis and Global Optimization*, N. Hadjisavvas and P. Pardalos- eds., Kluwer Academic Publishers.

**A.M. Rubinov and A. Uderzo**, On global optimality conditions via separation functions, to appear in international *Journal. Optimization Theory and Applications*.

**A.M. Rubinov and Z. Dzalilov**, Abstract convexity of positively homogeneous functions, to appear in international *Journal of Statistics and Management Systems*.

**A.M. Rubinov and I. Singer**, Topical and sub-topical functions, downward sets and abstract convexity, to appear in international *Journal Optimization*. The main part of this very large paper was prepared during the visit to Spain.

**P.A. Smith and G. Boyd** have had their paper 'Introducing OO Programming from a class user perspective' accepted for the CCSC:SE conference Nashville Tennessee.

**Yearwood, John and Stranieri, Andrew**. An Argumentation Shell for Knowledge Based Systems. In *Proceedings of the Second International Association for Science Technology and Development, Law and Technology, LawTech*, 2000.

**Yearwood, John and Andrew Stranieri**, Knowledge as Arguments for facilitating E-

Commerce Dialogue, *Proceedings of the Sixth COLLECTeR Conference on Electronic Commerce, COLLECTeR'2000*, 2000.

**Tunde Meikle** and **John Yearwood**, Supporting Discretion in Decision Making, *Proceedings of The Twentieth SGES International Conference on Knowledge Based Systems and Applied Artificial Intelligence*, ES2000, 2000.

## Seminars and Workshops.....

### Seminars

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:

**John Avery** (Summer scholarship recipient) gave a talk 'A Document Drafter for Legal experts';

**Tunde Miekle** (PhD student) gave a talk 'Capturing the MODDE of legal decision making';

**Neroli Sawyer** (Summer scholarship recipient) gave a talk 'Small-area population estimation by disaggregation of published census counts using ancillary information from orbitally required remote sensing imagery' and

**Steve Cleve** (Summer Scholarship recipient) gave a talk 'Java servers for teaching Network Protocols and Services'.

On the 9<sup>th</sup> May 2001 **Dr Hussein A Abbass** from University of New South Wales, Australian Defence Force Academy Campus (guest of Prof. A Rubinov) gave a seminar 'Biologically Motivated Autonomous Multi-agent Systems for Peace and War'

### Seminars coming up ....

The next seminar will be on the 16<sup>th</sup> May 2001. **Adil Bagorov** (PhD student) will give a talk on 'Data classification via nonsmooth and global optimisation' **Steven Kennedy** (Summer Scholarship recipient) will give a talk about 'Naïve Bayes Text Classification Algorithms and **Skye Johnson** (Summer Scholarship recipient) will also give a talk '3D Java program visualisation'.

### conferences.....

**John Yearwood** presented a paper "Knowledge as Arguments for facilitating E-Commerce Dialogue", at the Fifth COLLECTeR Conference on Electronic Commerce, Brisbane in December 2000. The conference was a specialised affair after the ISIS Conference in Brisbane, but seemed to be dominated but an information systems bent.

**John Yearwood** also attended the Hawaii International Systems Conference on the island of Maui in January to present a paper on work with Adil Baghirova and Alex Rubinov in Data Mining in Health care. The conference is one of the major conferences in System Sciences. Apart from being a significant conference in information systems and data mining it is also excellent for Web engineering, eCommerce and Document Computing. A highlight of the conference was a keynote address by Professor Lotfi Zadeh from Berkeley (fuzzy sets) who spoke about his thoughts on the future of computing and in particular computing with words.

**John Yearwood** and **Tunde Meikle** will travel to St. Louis and Chicago in May to present papers at The International Conference of Artificial Intelligence and Law (St Louis) and the third Judicial Decision Support Systems Workshop.

**Meikle, T. and Yearwood, J.** (2001) System Development a La MODDE, In

*Proceedings of the International conference on Artificial Intelligence and Law (ICAIL), 2001.*

Stranieri, A., Yearwood, J. and **Zeleznikow, J.** Tools for placing legal decision support systems on the World Wide Web, *In Proceedings of the International conference on Artificial Intelligence and Law (ICAIL), 2001.*

**David Stratton** will present a half-day tutorial on the **HLA** (High Level Architecture) at the SIMTECH conference in Canberra.

### **Robyn Pierce ...**

In December 2000 Robyn Pierce presented papers at the following conferences:

*Effective use of Computer Algebra Systems* at University of Melbourne, Faculty of Education, Post-graduate students conference. This was an encouraging day with helpful feedback from students working on related projects.

*Real data – real learning* to the MAV 37<sup>th</sup> Annual conference at Monash University (co-authored with Chris Turville). The participant in this workshop were enthusiastic and seemed to enjoy the experience of collecting and analysing data in the class room. The presentation was less than we hoped for as the globe in the roof mounted projected died just as we started but Chris can draw excel fast on a white board and the minties were a hit!

*Exploring functions with a super-calculator* to the MAV 37<sup>th</sup> Annual conference at Monash University (Co-authored with Margaret Kendal, DSME University of Melbourne). This session attracted teachers who had no experience of CAS. The participants were keen to try the technology and ask questions about relevant teaching issues.

*Choosing models to fit the data and the situation* to the Technology In Mathematics Education conference in Auckland N.Z. Paper authored by John Dowsey and David Tynan, DSME, University of Melbourne. Presenting other people's work seems like an odd thing to do but since I was too late to submit a paper and they had a paper accepted but could not go to the conference this seemed like a good idea. Presenting someone else's work proved quite different to reporting on their work. It was more difficult than I had expected but an interesting learning experience for me in that it meant looking at a familiar topic from a different perspective.

### **Workshops ....**

A Workshop *Making use of the web in the teaching of regression: on-line workshop* was presented at the Australian Conference on Teaching Statistics at Swinburne University (authored by Robyn Pierce and co-authored by Lyn Roberts). This workshop was presented with Chris Turville and was most positively received by the 35 participants. We were able to give them the opportunity to experience both Learnlinc and LearningSpace from a student perspective and to share our experience of using this style of technology to teach students. Lyn Roberts delivered a Learnlinc lesson remotely from Perth.

### **Post Graduate News.....**

#### **New PhD Students:**

The School welcomes the following Post Graduate Research students:

**Jason Giri**, who is a mathematics lecturer in the School of ITMS and will be engaged in the study of "Constructing non-linear analogues of Lagrange functions". Supervisor – Professor Alex Rubinov.

**Jia Long**, from Beijing will arrive later in May. Supervisor Alex Rubinov

**Michelle O'Brien** who worked in the health and IT industries and will now be engaged in the study of decision support in prescribing in the context of adverse drug reactions. Michelle is also engaged in projects with CCEH relating to Adverse drug reactions. Supervisor – John Yearwood

**Yalcin Ozturk**, who has completed his Bachelor of Engineering (Mechanical) at Melbourne University and is now engaged in the study of "Optimization of capital and operational expenditures for a telecommunication network". Supervisor - Alex Rubinov

**Gary Saunders** who will be engaged in the study of "An application of the Logic of Argumentation framework in Clinical Biochemistry. Supervisor – John Yearwood.

**Nadezhda Sukorukova** will be engaged in the study of "Applied Optimisation". Supervisor – Alex Rubinov

In total we will have 14 post graduate students for the year 2001.

### **Confirmation of Candidature ...**

**David Stratton** was recommended for full candidature in his Doctor of Information Technology on Thursday 22 February. David presented a comprehensive and well structured 40 minute seminar "A Program Visualisation Meta-Language" to an audience of 15 staff and research students including the confirmation panel.

### **Honours Students ...**

For the year 2001 the School has enrolled seven new honours students:

David Andrews, John Avery, Christopher Halliday, Kylie Pegg, Wendy Rodgers, Amy Turnbull, and Robyn Wilson. This makes a total of 13 honours students for 2001.

### **Scholarships/Awards ....**

**Michelle O' Brien** received an *ARC SPIRT APAI scholarship* to assist with her PhD studies. Michelle's area of interest: the study of decision support in the medical industry.

Congratulations to **John Watts** and **Stephen Fuller** who were each awarded an *IBM Global Services Australia* major scholarship.

Congratulations to **John Avery**, **Steven Kennedy**, **Skye Johnson**, **Neroli Sawyer** and **Steve Cleve** who each received an *ITMS Summer Scholarships* to the value of \$2,400. All of these students have produced excellent work over the summer and found the experience very rewarding.

Congratulations to **Kris Gardiner** and **David Andrews** who were each awarded an *ITMS Winter Scholarships* to the value of \$2,400. David and Kris will be working on developing the HLA code from the Summer Short course into a demonstration distributed simulation.

**Aspect Computing Pty Ltd** will offer four awards, each valued at \$500 to the top final year computing students, based on their first and second year results. The awards will go to the top final year students in: Bachelor of Computing; Bachelor of Information Technology; double degree in either Computing and Management/Commerce or Computing and Engineering; and final year female student in any of the above areas.

## Research Reports ....

01/1	Distance to the solution set of an inequality with an increasing function	A.M. Rubinov	January 2001
01/2	A heuristic algorithm for feature selection based on optimization technique <sup>1</sup>	AM. Bagirov, A.M. Rubinov and J. Yearwood	January 2001
01/3	Hadamard Type Inequality for Quasiconvex Functions in Higher Dimensions	A.M. Rubinov and J. Dutta	January 2001
01/4	A global optimization approach to classification <sup>1</sup>	A.M. Bagirov, A.M. Rubinov and J. Yearwood	February 2001
01/05	Solving problems with min-type functions by disjunctive programming	Mikhail Andramonov	February 2001
01/06	Algorithms for maximizing increasing convex along rays functions	Mikhail Andramonov	March 2001
01/07	A Review of the SITMS Introductory Programming Units	Philip A Smith & Geoffrey Boyd	March 2001
01/08	Nonlinear penalty functions with a small penalty parameter	A. M. Rubinov and X. Q. Yang	April 2001
01/09	Increasing positively homogeneous functions defined on $\mathfrak{R}^n$	J.E. Martinez-Legaz and A.M. Rubinov	May 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 1/8/01



**University of Ballarat**



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