

Centre for Informatics and Applied Optimization

C I A O Newsletter

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

February 2004

Edition 5

Successful Tender....

RAAF Anthropometry The University has been successful in being selected, as part of a consortium, to provide leading edge technology to the RAAF. The tender is worth approximately \$1,100,000 to UB. See page 3 for details.

Successful Grant....

Associate Professor John Yearwood, Dr Musa Mammadov and Dr Adil Bagirov were successful in obtaining a VPAC Expertise Grant totalling \$10,937 for his application titled "Multi Label Classification and Drug-reaction Associations Using Global Optimisation Techniques."

Welcome to

Professor Mirka Miller will commence with UB on March 1. Mirka joins us from the University of Newcastle, where she has been for the last eleven years and as Associate Dean has had responsibility in the Faculty for over 200 research students. We are extremely lucky to have attracted Mirka to UB. Her forte is doing research and supervising research students. She has published over 100 research papers in the areas of computer security, graph theory, and health informatics. In addition she has supervised a large number of PhD students. Mirka has developed excellent links into Indonesia, from where many of her research students have come from. Through her, UB will be co-sponsoring a conference in Indonesia this year. Mirka also has excellent links into Europe, especially the Czech Republic and Spain.

Dr Joe Ryan has joined ITMS as Lecturer in Information Systems and Mathematics. Joe joins us from the Graduate School of Business at the University of Newcastle. He has been teaching at tertiary level since 1989 in mathematics and information systems at all undergraduate levels and in postgraduate programs at the University of Wollongong, University of New England and University of Newcastle. In addition he has chaired

various conference sessions around the world. He is a founding member of the Centre of Information Technology Applications of the University of Newcastle.

Dr Des Robbie has joined ITMS as a Principal Research Fellow and Principal Teaching Fellow. Des is lecturing two units this semester and will be researching in the area of topological algebra. Des began his teaching career in Rainbow Secondary College.

CIAO Reports

Distributed Simulation Laboratory (DSL)

Students

The cohort of research students connected with the DSL continues to grow. Tim Pokorny is scheduled for confirmation in March and the two current honours students have applied for SIAA (Simulation Industry Association of Australia) scholarships. Everyone has been busy writing papers for the up-coming SIAA SimTecT conference in Canberra in May.

It looks as if the second ever DIT candidate may be enrolled soon.

The anticipated growth in DSL research students will put pressure on the supervisory resources available (Phil and David) and we are beginning to strategise for a third academic staff member in the DSL.

FedWS

Fed stands for "federation" - the term used in the HLA for a complete distributed simulation. WS stands for Web Services - the emerging Microsoft, but also open-standard, means to access complex network services through standard web protocols.

Federations usually exist, for security reasons, on private networks but the ability to "export" selected aspects of a running federation through the Internet is much sought after and Tim Pokorny's honours project developed the prototype of such a system.

A subsequent DSTO research contract has enabled FedWS to be refined to the point where it is now the

first DSL "product" - downloadable from dsl.ballarat.edu.au

Linkage hopes

The DSL submitted an ARC Linkage Project grant application in the second round of 2003 entitled "Fitting the Virtual Tyre to the Virtual Car - Investigating the use of Distributed Simulation in the Automobile Industry". The partner was Holden. We await the result of this application.

Applications for ARC Discovery Grants

The following ARC Discovery Grants have been submitted and are awaiting approval.

Nonlinear Dynamic Bayesian Networks of Neural Network Ensembles for Multivariate Time Series Prediction.

Participants: H Pan, S Morris, J Yearwood, R Ghosh.

Development and Application of Graph Labellings to Help Solve problems in Radio Channel Assignment, Graph Storage and Other problems that can be Modelled as Graphs.

Participants: M Miller, N Slamin - University of Jember

Asymptotical Stability of Optimal Trajectories with Applications to Global Optimization.

Participants: M Mammadov

A Novel Adaptive Neural Learning Algorithm for Feedforward Neural Networks.

Participants: R Ghosh, Central Qld Uni; B. Verma

Stationarity and Regularity of Sets and Mappings with Applications to Optimization and Control Investigators.

Participants: A Kruger, D Yost, Inst of Information Theory, Prague; J V Outrata

ARC Research Networks – New Initiative

ARC Research Networks is a new program designed to encourage collaborative approaches to research in inter-disciplinary settings.

ARC Research Networks are platforms for generating new knowledge in areas that span traditional disciplinary boundaries. Networks link researchers, research groups and others involved in innovation; nationally and internationally.

CIAO is involved in the applications for the following networks:

1. *ARC Network for Mathematics in Science and Society (MASS)*;
2. *ARC Research Network for a Secure Australia*
3. *ARC Network on Control, Dynamics & Systems*
4. *ARC Research Network on Intelligent Sensors, Sensor Networks and Information Processing.*
5. *ARC Research Network on Data Mining*

Further information can be obtained from the following website:-

http://www.arc.gov.au/apply_grants/research_networks.htm or by contacting Professor Alex Rubinov or Associate Professor John Yearwood.

Joint Projects

ANZ International Bank

A preliminary meeting was held on the 3rd February 2004 with Dr Dzung Le, Global Head of Quantitative Applications, Global Capital Markets, ANZ Investment Bank, Sydney and Intelligent Finance Cluster members: Professor Alex Rubinov; Assoc Professor John Yearwood; Dr Heping Pan; Dr Musa Mammadov; Mr Cameron Hurst and Dr Rana Ghosh.

A report is to be provided with preliminary findings from ANZ Bank's old and new data, including problems, numbers, graphs and preliminary conclusions and suggestions. If ANZ decides to proceed then possibly three consecutive projects will commence:

Influence patterns

Predictions

Trading strategies.

Transfield

At a meeting with Transfield on 4 Feb discussions took place in exploring potential opportunities for collaboration.

Telstra Research Laboratories.

A meeting with Dr Iradj Ouveysi and Dr Bruce Ratcliff from Telstra Research Laboratories was held on February 6. CIAO members present were Prof A Rubinov, Assoc. Prof J. Yearwood, Dr A Kruger and PhD students Z Dzalilov, L Jia and S Kouhbor. Discussion centred on the current joint projects with TRL and possible new initiatives.

Telecommunications and IT Research Institute at University of Wollongong

Professor Farzad Safaei, Managing Director, Telecommunications and IT Research Institute at University of Wollongong visited CIAO on January 9, 2004. Prof Alex Rubinov and Dr Adil Bagirov

discussed with Prof Safaei the possibility of undertaking some joint projects.

Tenders

RAAF Anthropometry

The University of Ballarat, through CIAO is an integral part of a consortium collaborating with the University of South Australia (UniSA), the Australian Sports Commission (ASC), and Sinclair Knight Merz (SKM) to deliver to the RAAF an anthropometry exercise (study of the measurements of the human body) in relation to crewstation (cockpit) fit. UniSA is the prime contractor in the relationship, holding subcontracts with the other consortium members.

The tender solution involves:

- 3D scanning of crewstations
- 3D whole-body scanning of aircrew and a sample from the target recruitment population
- Development of algorithms allowing best fit of personnel to crewstations with a high degree of accuracy
- Establishment of a Centre for Applied Anthropometry with research, government and industry links.

The consortiums main strength is its ability to work collaboratively to bring together expertise, to provide the best possible outcomes for the RAAF. The proposed solution is designed to provide the opportunity to create a reservoir of Australian expertise in 3D anthropometry. The project will involve both technology transfer, and research into new areas and new application, driven by the establishment of a Centre for Applied Anthropometry in Adelaide. Once established the Centre will seek industry partners to apply the new technology of 3D whole-body scanning to a range of commercial application, such as mass customisation of apparel, furniture and workplace design.

CIAO will be responsible for Phase 3 of the project (fitting bodies into crewstations). This third phase is the most complex, and involves integrating the scanned crewstations (SKM) and the extracted body measurements (UniSA) in an interactive modeling program, to determine fit, reach and comfort. This part of the project will also create a common user interface for the RAAF.

The project is expected to take three years and will provide for a common software interface which allows RAAF personnel to call up extracted measurements on any scanned member of existing aircrew or of the target recruitment population along with a scan of any crewstation, and interactively place the body in the crewstation, assessing for fit, reach and comfort as the body performs a series of automated tasks.

A Contract between UniSA and UB is currently being drawn up and will be signed as soon as possible. In conjunction, sub-contracts and agreements are also required for signing with Permian and for leasing of floor space at Greenhill Centre.

Evaluation Methodology for Electronic Decision Support System in the Clinical Environment (EDSS).

Sought by the Department of Health and Ageing. The project requires the development of evaluation techniques applicable to a clinical environment which is now typically utilising cutting edge technologies in electronic decision support systems. Due to the speed of their development, EDSS have outpaced effective evaluation techniques. This tender was submitted in January and the University is currently awaiting the outcome of the selection process.

Australian Museums and Galleries Online

The Australian Department of Communications, Information Technology and the Arts (DCITA) sought to contract an organisation in the cultural sector to reposition and rebrand the Australian Museums and Galleries On Line (AMOL) website to provide a sustainable basis for enabling small to medium collecting institutions to expand into the online environment in an effective manner and facilitate collaboration between archives, galleries, libraries and museums. CIAO received official notification in January that it was unsuccessful in its tender bid. The successful tenderer was The Museum of Applied Arts and Sciences who were the current provider.

Meat & Livestock Victoria, Optimising Risk Control and Productivity Improvements.

A proposal to address three strategic issues, Animal control at stun, sticking/hala slaughter and shakling, OHS problems encountered during slicing and boning, designing more effective personal protective clothing and equipment. UB has been advised verbally by MLA that they have withdrawn the tender totally. MLA is reviewing its strategic priorities, so there is a possibility that we might get a second chance. UB is awaiting an official response.

Office of Training and Tertiary Education, TAFE Skill to Work Online Service

The tender proposal called for an online service for students, prospective students, the general public and other interested groups. It provides a skill matching process to identify gaps in competencies and addresses these gaps by providing educational options through a knowledge based system. The tender was originally submitted in June 2003 but due to Government Department changes became bottlenecked. Thanks to Professor Wayne Robinson

who intervened and eventually had UB selected as the preferred tenderer.

Published Books, Chapters and Papers

Book

A. Rubinov and X. Q. Yang, "Lagrange-type functions in constrained non-convex optimization" published by Kluwer Academic Publishers in series Applied Optimization in October 2003.

Chapters and Papers

Z. Dzalilov, I. Ouveysi and A. Rubinov, "A lifetime measure for telecommunication network - Theoretical aspects, Proceedings" of The 11th IEEE International Conference on Networks (ICON 2003), p. 75-79, 2003

A.M. Bagirov and A.M. Rubinov, "Cutting angle method and a local Search", Journal of Global Optimization, vol. 27, pp.193-213, 2003

G. Beliakov, K. M. Ting, M. Murshed, A. Rubinov and M. Bertoli, "Efficient Serial and Parallel Implementations of the Cutting Angle Method, High Performance Algorithms and Software for Nonlinear Optimization", G. Di Pillo and A. Murli, eds., Kluwer, Academic Publishers, 2003

A.M. Bagirov, A.M. Rubinov, N.V. Soukhoroukova and J. Yearwood, "An algorithm for clustering based on non-smooth optimization technique" International transactions in Operational Research} vol. 10, pp. 611-618, 2003.

A.M. Rubinov, "Monotonic Analysis: convergence of sequences of monotone functions", Optimization, vol. 52, pp. 673-692, 2003

Accepted Books, Chapters and Papers

B. Verma, R. Ghosh, "A novel approach for combining genetic algorithm and least square based methods for MLP", Neural Information Processing: Research and Development, Springer-Verlag, December, 2003 (In press).

S. Chakraborty, R. Ghosh, M. Ghosh, A. K. Maji, N. White, C.D. Fernandesc, M.J. Charchar, C. R. Ramesh and S. Kelemu, "Weather dependency of anthracnose and risk mapping" in the book "Pathogenic and genetic diversity in Colletotrichum gloeosporioides at centers of utilization in Australia, China and India" In: Chakraborty S (ed). High

yielding anthracnose resistant Stylosanthes for Agricultural systems. ACIAR" (In press)

A. M. Bagirov, A. M. Rubinov and Jiapu Zhang, "Local optimization method with global multidimensional search for descent", Journal of Global Optimization.

J. Dutta, J.E. Martinez Legaz and A.M. Rubinov, "Monotonic Analysis over cones", Optimization.

S. Chakraborty, R. Ghosh, M.Ghosh, C.D. Fernandez, M.J. Charchard and S. Kelemu, "Weather based prediction of anthracnose severity using artificial neural networks models", Journal of plant pathology

R. Ghosh, A. Rubinov and Z. Zhang, "Optimization approach for clustering database with weights", Optimization methods and Software(Accepted).

R. Ghosh and M. Ghosh, "An intelligent offline handwriting recognition using evolutionary neural learning algorithm and rule based over segmented data points", Journal of Research & Practice in IT.

R. Ghosh, "Connection topologies for combining genetic and least square method for neural learning", Journal of Intelligent Systems.

Conference Publications

M. Ghosh, R. Ghosh and J. Yearwood, "An evolutionary neural learning algorithm for offline cursive handwriting words with hamming network lexicon", FLAIRS'2004 in collaboration with Americal Association of Artificial Intelligence (Accepted).

B. Ferguson, R. Ghosh and J. Yearwood, "Task decomposition and ensembling using artificial neural network for large task", IEA / AIE 2004, CANADA (Accepted).

R. Ghosh, M. Ghosh and J. Yearwood, "A Modular Framework for Multi category feature selection in Brest Cancer recognition", European Symposium for Artificial Neural Network, ESANN'04, Belgium' 2004 (Accepted).

R. Ghosh, " Finding optimal architecture and weights for ANN : A combined hierarchical approach", Australian Conference on Artificial Intelligence, 2003: 857-865.

H.P. Pan, R. Ghosh and J. Yearwood (2004): *An Ensemble of Overfitting Neural Networks for Generating Probability Distribution of Predictions*. Accepted for oral presentation, ibid'2004, Sydney.

Seminars and Workshops....

Lecture Series

Optimization - Professor Alex Rubinov will be presenting a weekly lecture series commencing Friday 5 March in the ITMS meeting room. The series is designed to present the concept of optimization by Pictures (for the non-expert).

Forthcoming Seminars

Post Graduate Seminar - each Friday at 2:30pm, commencing 12 March in the ITMS meeting room. Each week one of our Post Graduate students will present an overview of their Thesis topic or part thereof. The convenor for this series is David Yost.

CIAO Seminars - each Monday afternoon, commencing 15 March in the ITMS meeting room. Group and Cluster members will present current research topics. The seminars will also include presentations from visitors of other institution.

Topology of Interconnection Networks - 1 April at 3:30pm in T126. Presented by Mr Yuqing Lin of the School of Electrical Engineering and Computer Science at The University of Newcastle. The speaker will present an overview of the study of network topology for both static and dynamic networks.

Conferences....

VIC2004

Professor Alex Rubinov, Dr Alex Kruger, Zari Dzalilov, Dr David Yost and Professor Sid Morris participated in the VIC2004, a joint mathematics conference between the New Zealanders and the Israel Mathematical Union. Game Theory. Optimization and Functional Analysis featured at the conference. Impressive plenary talks were given by Hugh Woodin and Fields medalist Vaughan Jones. Dr David Yost, Dr Alex Kruger Professor Sid Morris and Professor Alex Rubinov gave talks. The presence of UB was felt.



Conference Dinner – David Yost, Dany Leviatan

AMSI Summer School of Mathematics

The school was held at University of New South Wales from 27 January 2004 to 20 February 2004. Around 130 participants from different universities attended the courses, mostly honours and postgraduate students in the mathematical sciences. A variety of courses (mostly in pure mathematics) was proposed to the participants. All courses received sufficient interest to run at the Summer School.

University of Ballarat representatives were N Soukhoroukova, J Ugon and J Zhang.

Alexander von Humboldt Foundation, German Academic Exchange Service and the German Research Foundation presented a joint information session on the 27 January at Melbourne University. Dr David Yost attended these sessions and indicated that they were of interest to Post Doctorate research staff. These organisations grant research fellowships and research awards to highly qualified scholars and scientists of all nationalities not resident in Germany, enabling them to undertake periods of research in Germany. Websites are www.avh.de, www.daad.de, www.dfg.de

Post Graduate News....

Completion of Post Graduate Studies

Nadejda Soukhoroukova has completed her PhD. Her Principal Supervisor was Professor Alex Rubinov and her Associate Supervisor was Associate Professor John Yearwood. The title of Nadejda's thesis was 'Data classification through nonsmooth optimization'.

Sasa Ivkovic has been awarded the degree Master of Information Technology. The title of Sasa's project was *Visual Grouping of Association Rules for Hypotheses Suggestion*. His Principal Supervisor was Assoc Professor John Yearwood and his Associate Supervisor was Dr Andrew Stranieri.

Confirmation of Candidatures

Tim Pokorny's Confirmation of Candidature is to be held on 26th March 2004. The title of Tim's talk is 'Applying the Lessons of the Virtual Battlefield to Financial Modelling- Investigating Innovative use of Distributed Simulation'. Tim's Principal Supervisor is Dr Philip Smith and his Associate Supervisor is Dr David Stratton.

John Avery's Confirmation of Candidature is to be held on the 30th April 2004. The title of John's talk is "Managing Evolving Ontologies: Capturing the Semantics of Change. John's Principal Supervisor is

Associate Professor John Yearwood and his Associate Supervisor is Dr Leila Alem from CSIRO.

Shanaz Kouhbor is scheduled for her Confirmation of Candidature on the 31st March.2004. The title of Shanaz's talk is 'Optimal Placement of Network Infrastructure in Wireless Networks'. Her Principal Supervisor is Professor Alex Rubinov and her Associate Supervisor is Dr Philip Smith.

Anirban Das has commenced a Masters degree. His project will be on HLA Security. His Principal Supervisor is Dr Philip Smith and his Associate Supervisor is Dr David Stratton.

Honours Students ...

Professor Mirka Miller has been appointed Honours Co-ordinator from March 22, 2004 - taking over from Heping Pan.

New Honour Students

Bachelor of Computing

- Lance Burns – HLA – Dr Phil Smith
- Nicholas Booth – Wireless Security - Mr Sasa Ivkovic
- Charles Esson - Neural Networks - Dr Rana Ghosh
- Bruce Le Marshall - HLA -Dr Phil Smith
- Anthony Quinn – Data Mining - Dr Andrew Stranieri

Bachelor of Applied Science

- Thu Vuong - Reducible Convex Sets - Dr David Yost
- Colin Easton - Adverse Drug Reaction - Dr Musa Mammadov

Existing Honours Students:

Bachelor of Computing (Honours) CC8

- Sally Firmin - Does information technology improve student learning? - Dr Robyn Pierce
- Michael James - Colour Matching in the Brewing Industry - Marcello Bertoli
- James Miller - Generic 3D Visualization of High Level Architecture Simulation - Dr David Stratton
- Michael Fraser - General Purpose Visualisation Architecture for Distributed Simulations - Dr David Stratton
- Raymond Brand - Terrain Mapping - Dr A Stranieri
- Cameron Tudball - PVML .NET Visualization Target - Dr David Stratton

Bachelor of Information Technology

- Edward Jackman - User profile development and learning styles - Mr Scott Hebbard

Research Reports

04/01	Weak Stationarity: Eliminating the Gap between Necessary and Sufficient Conditions	Alexander Kruger	January 2004
04/02	Best approximation by downward sets with applications	H. Mohebi and A.M. Rubinov	January 2004
04/03	A method for mathematical modelling of complex systems and its applications to data classification	M.A. Mammadov	February 2004
04/04	A new global optimization algorithm based on a dynamical systems approach	M.A. Mammadov	February 2004
04/05	Multipliers and general Lagrangians	Jean-Paul Penot and Alexander M. Rubinov	February 2004
04/06	On Global Stability of a Stochastic Differential Delay Equation	Anatoli F. Ivanov and A.V. Swishchuk	March 2004
04/07	MPI techniques: numerical experiments	Nadejda Soukhoroukova	March 2004

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 or Wayne Hurst no later than the 30th April 2004.



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