The 12th Asia-Pacific Symposium

on

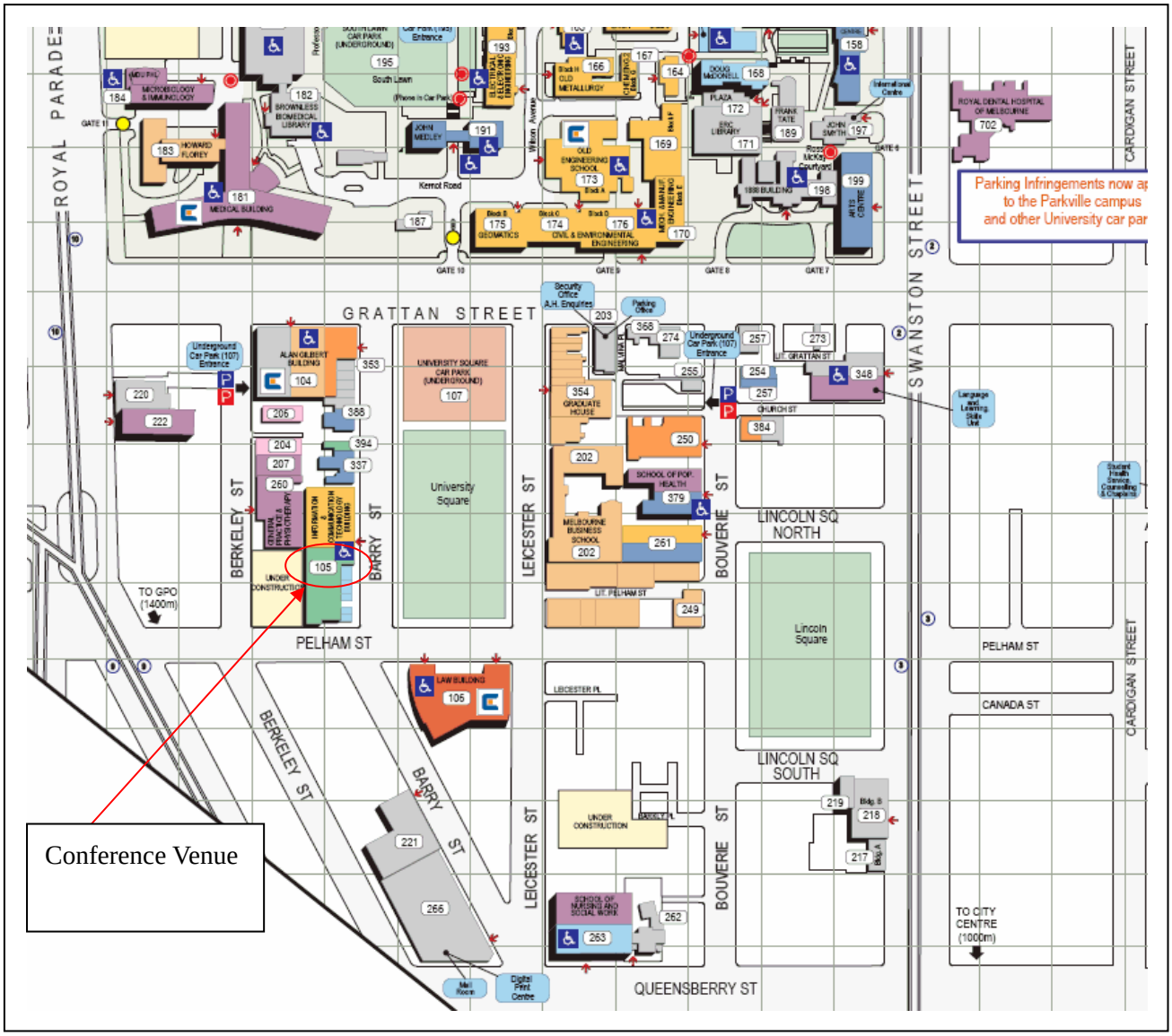
Intelligent & Evolutionary Systems (IES'08)

The University of Melbourne, Melbourne, Australia

7 - 8 December 2008

Conference Program

Map of Parkville Campus



General Information

Registration Time and Place

Registration will be opened at 9.00 am on Sunday 7th December 2008.

Registration will take place in the Ground Foyer of the ICT Building (105) located at 111 Barry Street, University of Melbourne, Melbourne, Australia.

Important Instructions for Presenters

Each presenter will be given 20 minutes for presentation (including, 15 min. of presentation and 5 min. of questions).

We kindly ask all presenters to observe their time and not to exceed the time limit.

Internet Access

This service is available to all Conference participants in computer lab (ICT UG09).

Discussion Workshop/Lunch

A Discussion Workshop and Lunch will be provided for IES'08 participants at 12.25 on Monday 8th December 2008 in Lecture Theatre 2.06, ICT Building.

Welcome Reception

The Welcome Reception will be held in the Ground Foyer of the ICT Building (105) located at 111 Barry Street, University of Melbourne, Melbourne, Australia at 18.30 on Monday 8th of December 2008.

Please note the reception is NOT included in the registration fee for IES'08 delegates. If you wish to attend this function, please purchase your admission ticket either online or at the registration desk.

Conference Proceedings (CD only)

Every registered delegate will receive a copy of the proceedings on a CD. Additional copies of the Proceedings (CD) can be purchased at the registration desk for $10 each (GST inclusive).

Outline Conference Program

Date / Time	Sunday 7 December 2008
09.00 – 10.10	Registration
10.10 – 10.50	Coffee Break
10.50 – 11.20	Introductory Address
11.20 – 12.40	Evolutionary and Dynamical Systems *(Session 1)*
12.40 – 14.00	Break
14.00 – 15.40	Theoretical and Computational Aspects of Intelligent Systems *(Session 2)*
15.40 – 16.10	Coffee Break
16.10 – 17.30	Applications of Genetic Algorithms *(Session 3)*

Date / Time	Monday 8 December 2008
09.00 – 09.40	SEAL'08 Opening Ceremony
09.40 – 10.40	Keynote Address 1
10.40 – 11.10	Coffee Break
11.10 – 12.10	Applications of Learning Systems *(Session 4)*
12.10 – 12.25	Short Break
12.25 – 13.25	Discussion Workshop/Lunch
13.25	Conference Closed
18.30	Welcome Reception

Day 1: Sunday 7th December 2008

Session / Time	Opening Ceremony IES'08 Lecture Theatre 2.06, ICT Building
10.50 – 11.20	***Introductory Address***

Session / Time	Session 1: Evolutionary and Dynamical Systems Lecture Theatre 2.06, ICT Building
11.20 – 11.40	**Title:** ***An EnKF Framework for the Assimilation of Disease Spread Data into Agent Based Models.*** **Author:** David Newth, CSIRO, Centre for Complex Systems Science, CSIRO Marine and Atmospheric Research, PYE Laboratory, Canberra, ACT, Australia. **Abstract:** The ensemble Kalman filter (EnKF) is an adaptive multivariate sequential data assimilation method that has been widely studied in the fields of meteorology and oceanography. The EnKF framework is extremely general, and can be applied easily to any continuous dynamical system. As yet, there has been no attempt to couple the EnKF framework to discrete systems such as agent based models. In this account we aim to: (1) outline the general framework behind EnKF; (2) demonstrate that it is possible to use the EnKF as a way of assimilating data into agent based models. (3) show how the EnKF can be used to track the spread of an infectious disease.
11.40 – 12.00	**Title:** ***Evolution of Neutral Memeplexes in a Spatially Explicit Agent-Based Model*** **Author:** Suzanne Sadedin, Clayton School of Information Technology, Monash University, Clayton, VIC, Australia **Abstract:** Neutral memeplexes are aggregations of beliefs and opinions whose value and veracity are not easily judged. Such systems may be susceptible to memetic evolution. However, there are significant differences between memetic and biological systems. Strong social support may occur between adherents of the same memeplex. Human hosts of memeplexes may refuse participation in memeplex transmission-related interactions, for example by refusing to talk about memeplex-related topics, and memeplex content may encourage such refusal via secrecy. In addition, horizontal (peer-to-peer) transmission of memeplexes is often very low relative to vertical (parent-to-offspring) transmission. These factors were varied in an agent-based spatially explicit simulation. Social support, low transmission rates and potential refusal by memeplexes or agents to interact were all found to inhibit directional evolution of memeplexes in the model. Thus, the results show that conditions for memetic evolution may be restrictive compared with genetic evolution.

12.00 – 12.20	**Title:** ***Adaptive Modelling of Sustainable Architectural Design in Entropy Evolution.*** **Authors:** Yan Gu[1] and John Frazer[2], Melbourne School of Design, Faculty of Architecture, Building & Planning, University of Melbourne, Melbourne, VIC, Australia[1]; School of Design, Faculty of Built Environment & Engineering, Queensland University of Technology, Brisbane, QLD, Australia[2]. **Abstract:** This paper argues a model of adaptive design for sustainable architecture within a framework of entropy evolution. The spectrum of sustainable architecture consists of efficient use of energy and material resource in the life-cycle of buildings, active involvement of the occupants into micro-climate control within the building, and the natural environment as the physical context. The interactions amongst all the parameters compose a complex system of sustainable architectural design, of which the conventional linear and fragmented design technologies are insufficient to indicate holistic and ongoing environmental performance. The latest interpretation of the Second Law of Thermodynamics states a microscopic formulation of an entropy evolution of complex open systems. It provides a design framework for an adaptive system of building environmental performance. Following the method of entropy evolution in open systems, this adaptive system evolves for the optimization of building environmental performance. The paper concludes that adaptive modeling in entropy evolution is a design alternative for sustainable architecture.
12.20 – 12.40	**Title:** ***Moving Out of Turn: The Asynchronous Iterated Prisoner's Dilemma.*** **Authors:** David Newth[1] and David Cornforth[2], CSIRO Centre for Complex Systems Science, CSIRO Marine and Atmospheric Research, PYE Laboratory, Canberra, ACT, Australia[1]; CSIRO Energy Technology, Mayfield, NSW, Australia[2] **Abstract:** There are many situations in which biological organisms cooperate despite obvious incentives to do otherwise. Such situations are commonly modelled using the game "prisoner's dilemma." Previous studies have shown that if players can make probabilistic choices, only taking into account their opponent's previous action, a strategy known as "Generous Tit-For-Tat" dominates the long-term behaviour of the population. Almost all of these studies have assumed that individuals make their decisions in unison, which in many biological situations is an unrealistic assumption. In this account, we show that the timing of decisions and the reward for cooperation are critical in determining the strategy which will dominate the long term dynamics of the

	population. In situations where the potential for exploiting your opponent is high and the temptation for doing so is also high, the Always Defect is the dominant strategy; while when the reward for cooperation is high, Generous Tit-For-Tat is the dominant strategy. Simulations show there is a sharp transition between these two behaviours. However, this threshold is higher for asynchronous model. This study demonstrates that as the assumption of synchrony is relaxed, less reactive and more generous strategies such as Firm-But-Fair dominate the long-term population dynamics.
12.40 – 14.00	**Break**

Session / Time	**Session 2: Theoretical and Computational Aspects of Intelligent Systems** **Lecture Theatre 2.06, ICT Building**
14.00 – 14.20	**Title:** ***Analysis of the Influence of Telops on Viewers' Interpretation*** **Authors:** Hidetsugu Suto[1], Hiroshi Kawakami[2] and Osamu Katai[2], Department of Computer Science & Systems Engineering, Muroran Institute of Technology, Hokkaido, Japan[1]; Graduate School of Informatics, Kyoto University, Kyoto, Japan[2] **Abstract:** The influence of text information, known as "telops," on the viewers of television programs is discussed. In recent television programs, textual information, i.e., captions and subtitles, is abundant. Production of a television program is facilitated by using telops, and therefore, the main reason for using this information is the producers' convenience. However, the effect on audiences cannot be disregarded when thinking about the influence of media on humans' lives. In this paper, channel theory and situation theory are introduced, and channel theory is expanded in order to represent the mental states and attitudes of an audience. Furthermore, the influence of telops is considered by using a scene of a quiz show as an example. Some assumptions are proposed according to the considerations, and experiments are carried out in order to verify the assumptions.
14.20 – 14.40	**Title:** ***Dual Phase Evolution in Natural and Artificial Computational Systems*** **Author:** Greg Paperin, Clayton School of Information Technology, Monash University, Clayton, VIC, Australia **Abstract:** Complex adaptive and evolutionary systems exhibit a sustained diversity, far-from-equilibrium dynamics, and permanent novelty and adaptation

	in the absence of a global controller. Previous work shows that many such systems can be represented as networks of interacting components. These networks are typified by certain complex topologies. Insights into the processes behind the emergence of complex network structures and into the effects of such structures are necessary for an understanding of properties that characterise adaptive and evolutionary systems. Dual Phase Evolution (DPE) is a widespread natural process in which networks underlying complex systems adapt and self-organise by switching alternately between two phases: a phase of global interactions and a phase of local interactions. Each phase is characterised by specific global connectivity and interaction patterns. Here, I present ongoing work on DPE in complex evolutionary systems. I show how DPE processes can give rise to a wide variety of complex network topologies. In particular, this includes the emergence of scale-free degree distributions fixed-size networks, as well as modular structures. I also show how DPE can be responsible to the continuous novelty observed in many natural and artificial evolutionary systems.
14.40 – 15.00	**Title:** ***Hybrid Particle Swarm Optimization with Evolutionary Programming*** **Authors:** Guangming Lin[1], Ruhul Sarker[2], Lishan Kang[3] and Xin Yao[4], Shenzhen Institute of Information Technology, Shenzhen, China[1]; School of Information Technology & Electrical Engineering, University of New South Wales, Australian Defence Force Academy (ADFA),Canberra, ACT, Australia[2]; School of Computer Science, China University of Geoscience, Wuhan, China[3]; School of Computer Science, University of Birmingham, Birmingham, England, UK[4] **Abstract:** The Classical Evolutionary Programming (CEP) relies on Gaussian mutation, where Fast Evolutionary Programming (FEP) selects the primary mutation search operators based on the Cauchy distribution. The Improve FEP (IFEP) is based on mixing different mutation operators. IFEP generates two offspring from each parent, one by Cauchy mutation and the other by Gaussian. The better one is then chosen as the offspring. In this paper, we combine Particle Swarm Optimization (PSO) with EP to form two new algorithms namely PSOEP and SAVPSO. The basic idea is to introduce the local and global search ability to the mutation operator of EP to guide the individual at a faster convergence rate. All of these algorithms are compared to each other with respect to the similarities and differences of their basic components, as well as their performances on seven benchmark problems. Our experimental results show that PSOEP performs much better than all other version of EPs, and SAVPSO performs much better than PSO for the benchmark functions.

15.00 – 15.20	**Title:** ***Gaussian Mixture Models in Estimation of Distribution Algorithms: Implementation Details and Experimental Analysis*** **Authors:** Naveen Kumar and Marcus Gallagher, School of Information Technology and Electrical Engineering, University of Queensland, QLD, Australia. **Abstract:** Estimation of Distribution Algorithms (EDAs) is a relatively recent class of metaheuristic optimization algorithms based on using probabilistic modelling techniques to control the search process. Within the general EDA framework, a number of different probabilistic models have been proposed for both discrete and continuous optimization problems. This paper focuses on continuous EDAs based on Gaussian Mixture Models with parameter estimation performed using the EM algorithm. To date, this type of model has only received preliminary attention in the literature. We discuss in detail the steps involved in the implementation of a Gaussian mixture model-based EDA, including the setting of algorithm parameters. We implement and evaluate the algorithm on a set of commonly used benchmark test functions and compare results with those previously reported. From the results we identify, from a practical point of view, the key features and issues involved applying mixture model-based EDAs to challenging optimization problems.
15.20 – 15.40	**Title:** ***Exemplar-based Learning Classifier System: Towards a Generalization of Expert Knowledge*** **Authors:** Hiroyasu Matsushima and Keiki Takadama, The University of Electro-Communications (UEC), Chofu, Tokyo, Japan. **Abstract:** This paper proposes Exemplar-based Leaning Classifier System LCS (ECS) that extracts usual exemplars (*i.e.*, good rules) from a lot of them to generalize exemplars. Through intensive simulations to validate the effectiveness of ECS, the following implications have been revealed: (1) ECS derives the good performance with fewer exemplars than cases of using efficient numbers of exemplars and randomly selected exemplars; (2) ECS has the appropriate ratio of the range in the match selection between *exploration* and *exploitation* phases; (3) the integration of three mechanisms (*i.e.*, covering, deletion, and subsumption) in ECS is critical to improve the generalization and performance of ECS. Keywords: learning classifier system, exemplar, generalization, direct policy search, cargo layout problem.
15.40 – 16.10	**Coffee Break**

Session / Time	Session 3: Applications of Genetic Algorithms Lecture Theatre 2.06, ICT Building
16.10 – 16.30	**Title:** ***A Decision Support System for Solving Job-Shop Scheduling Problems Using Genetic Algorithms*** **Authors:** S. M. Kamrul Hasan, Ruhul Sarker and Daryl Essam, School of Information Technology and Electrical Engineering, University of New South Wales, Australian Defence Force Academy (ADFA), Canberra, ACT, Australia **Abstract:** The primary objective of this research is to solve the job-shop scheduling problems by minimizing the makespan. In this paper, we first developed a genetic algorithm (GA) for solving JSSPs, and then improved the algorithm by integrating it with three priority rules. The performance of the developed algorithm was tested by solving 40 benchmark problems and comparing their results with that of a number of well-known algorithms. For convenience of implementation, we developed a decision support system (DSS). In the DSS, we built a graphical user interface (GUI) for user friendly data inputs, model choices, and output generation. An overview of the DSS and the analysis of experimental results are provided.
16.30 – 16.50	**Title:** ***Application of Genetic Algorithm to Traffic Signal Control and Reduction in Search Time Using Estimated Average Travel Time Distribution*** **Authors:** Junji Suzuki[1], Hiroshi Mochizuki[1], Sei Takahashi[1], Hideo Nakamura[1] and Hiroshi Kazama[2], Department of Electronics and Computer Science, College of Science and Technology, Nihon University, Chiba, Japan[1]; Kyosan Electric Mfg. Co. Ltd., Kanagawa, Japan[2] **Abstract:** In order to minimize average travel time (ATT) in traffic, we focused on one traffic parameter, offset, and attempted to optimize the offset pattern using a genetic algorithm (GA). Since the actual traffic conditions constantly change, the optimum offset pattern also changes. Therefore, the search time should be as short as possible. If we have a known ATT distribution for a particular offset, the search time can be reduced because we can define a target ATT at which searching is stopped. Therefore, we observed ATT distribution characteristics by varying traffic parameters, and we attempted to derive an estimation equation. In addition, we examined the effectiveness of our approach in reducing the search time in a case study, and we report the results here.
16.50 – 17.10	**Title:** ***Application of a Genetic Algorithm for Blocking Time Reduction of Level Crossings***

	Authors: Keita Ueda, Hiroshi Mochizuki, Sei Takahashi and Hideo Nakamura, Department of Electronics and Computer Science, College of Science and Technology, Nihon University, Chiba, Japan. **Abstract:** The blocking time of level crossings influences traffic on roads that cross rail lines. The purpose of this study is to reduce the blocking time of level crossings by optimising the railroad schedule. We propose an optimal schedule obtained by varying the running pattern of each train between each station from the time of the planned schedule. Since there are many trains on a heavily trafficked rail line, the number of combinations will be enormous. We used a genetic algorithm (GA) to search for an optimal railroad schedule. Variation of the running pattern of each train between each station is used as a gene value. The fitness value is the total blocking time of all level crossings on the model rail line. Results of computer simulation show that our optimal railroad schedule gives a shorter total blocking time compared with the planned schedule.
17.10 – 17.30	**Title:** ***Evaluating and Organizing Companion Plants by Balance Theory and Genetic Algorithm*** **Authors:** Daisuke Kobayashi, Osamu Katai, Hiroshi Kawakami, Sigueo Nomura, and Katsuji Yoshida, Graduate School of Informatics, Kyoto University, Kyoto, Japan **Abstract:** This study defines an evaluation index for nature systems structured by various creatures to realize symbioses of human beings and nature. Focusing on nature from an agricultural viewpoint, symbiosis is interpreted as a state of balance in a system. This paper focuses on companion plants from Permaculture for a nature system and on a balance theory known as a conventional cognitive consistency theory for evaluating a state of balance. Employing the evaluation index as a fitness function, a genetic algorithm generates novel companion plants.

Day 2: Monday 8th December 2008

Time	Opening Ceremony & Keynote Address ICT Theatre 1, ICT Building
09.00 – 09.40	**SEAL'08 Opening Ceremony**
09.40 – 10.40	**Keynote Address:** ***Future of Intelligent Systems is Non-Dominance,*** Professor Hussein Abbass, University of New South Wales, Sydney, Australia **Abstract:** Multi-objective search normally results in a set of efficient solutions

	called the non-dominated set. Research has focused on inventing new algorithms and heuristics to find this set- with a myriad of evolutionary-based heuristics invented on this topic alone. However, many practitioners wonder: why do we need to generate a set of efficient solutions when at the end of the day, any traditional decision making process would require a single solution? So why do we need to generate many when we only need one? In this talk, I argue with evidence that there are many application areas in intelligent and complex systems where all non-dominated solutions are needed. This will be demonstrated through four different application areas. The first is concerned with the advantages of combining the non-dominated set into an ensemble of learning machines [4]. The second demonstrates the use of non-dominance as a measure for complexity in evolutionary robotics and embodied cognition [3]. The third uses the non-dominated set to explore the fitness landscape of conflict in wargaming [2]. The fourth demonstrates the use of the non-dominated set for risk assessment and conflict detection in air traffic management [1].
10.40 – 11.10	**Coffee Break**

Time	**Session 4: Application of Learning Systems** **Lecture Theatre 2.06, ICT Building**
11.10 – 11.30	**Title:** ***Performance Prediction of Software Design Phase Using Artificial Neural Networks*** **Authors:** Ajit K Verma, Anil R. and A. Srividya**,** Interdisciplinary Programme in Reliability Engineering, Indian Institute of Technology Bombay, Mumbai, India **Abstract:** The increase in demand for software products due to the strong world economy has contributed to the increase in competition among the software developing organizations to provide high quality software in shorter time and low cost. Also, the complexity of software is increasing day by day. To deliver this, software services organizations have adopted the practice of the project management concepts defined in the project management body of knowledge along with the usage of various software engineering process models such as capability maturity model (CMM), capability maturity model integration (CMMI), ISO 9001:2000, etc. However, proper performance prediction in the early stages of the development is required to sustain in the market. During performance prediction one must consider the environmental factors which affect the performance of the organization along with the other technical and process parameters. In this paper, the authors are discussing on an artificial neural network based model which utilizes the environmental parameters like the process compliance index, the maturity of the organization

	and the project risk index along with the process parameters to predict the software performance prediction during the software design phase.
11.30 – 11.50	**Title:** ***Exploiting Non-Dominance in Multi Agent Systems: An Artificial Immune Algorithm for Distributed and Complex Problem Solving Environments*** **Authors:** Mahmoud Efatmaneshnik and Carl Reidsema, School of Mechanical & Manufacturing Engineering, The University of New South Wales, Sydney, NSW, Australia **Abstract:** An ideal Multi Agent System is flat and has no dominant hierarchy. Multi agent computational and problem solving environments have been advocated for their ability to deliver overall solutions that are innovative and creative. There is however a significant threat to the coherence of Multi Agent Systems; chaos. This paper poses a new vision to the control and immunisation of the Multi Agent Systems against chaos. Employing a complexity measure of the problem and its lower and upper bounds, and monitoring the complexity of the problem solving agents' interactions, we propose the holistic control of the Multi Agent Systems that leads to immunisation of the system against chaos. The control however is not central and appears in the form of the agents' common knowledge and determines their tendency to proactively communicate.
11.50 – 12.10	**Title:** ***Fuzzy Logic Based Project Risk Index for Software Development*** **Authors:** Ajit K Verm, Anil R. and A. Srividya, Interdisciplinary Programme in Reliability Engineering, Indian Institute of Technology Bombay, Mumbai, India **Abstract:** Risk management is a vital step in project management. An unattended or ignored risk may result even to catastrophic failures in the project. In software projects, the risk parameters are often mentioned in linguistic terms while quantifying it. Considering the linguistic or imprecise nature of the software risk parameters, a fuzzy based project risk evaluation for risk management of software projects is proposed in this paper. This paper presents the underlying concepts along with a case study using the proposed model.
12.10 – 12.25	**Short Break**

Time	**Workshop IES'08** **Lecture Theatre 2.06, ICT Building**
12.25 – 13.25	**Discussion Workshop/Lunch**
13.25	**Conference Closed**