Plenary talker:

Professor
Hussein Abbass

PT1 The Pareto Operating Curve for Risk Minimization in Life and Robotics

Hussein Abbass

School of Information Technology and Electrical Engineering,
University of New South Wales,
Canberra, Australia

The use of non-dominance in multi-objective search has traditionally focused on generating the set and choosing an element of this set to implement. In this talk, I will show the richness of the non-dominated set when the objectives (in the multi-objective search problem) represent complexity measures. I will present the concept of Operating Curves, whereby a robot configuration or an artificial life system operates along these operating curves based on the complexity they encounter in the environment. Key fundamental capabilities these systems have are robustness and the ability to adapt in different environment.

Education:
- B.A. degree from Cairo University, Egypt
- B.S. degree from Cairo University, Egypt
- Postgraduate Diploma, Operations Research from Cairo University, Egypt
- Masters in Constraint Logic Programming, Cairo University, Egypt
- Masters in Science (Non-symbolic Artificial intelligent), University of Edinburgh, UK
- PhD. in Computational Intelligence, QUT, Australia

Professional Training and Employment:
- Professor and Chair of Information Technology at the School of Information Technology and Electrical Engineering, University of New South Wales, the Australian Defense Force Academy in Canberra, Australia
- Fellow of the Australian Computer Society
- Chair of the Australian Computer Society National Committee on Complex System
- Chair of the IEEE-CIS task force on Artificial Life and Complex Adaptive System
- Advisory Professor at Vietnam National University, Ho-Chi Minh, Vietnam

Professor
Kazuyuki Aihara

PT2 Mathematical Modelling of Complex Systems and its Possible Applications

Kazuyuki Aihara

Institute of Industrial Science,
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and
Aihara Complexity Modelling Project,
ERATO, JST,
Tokyo, Japan

In this plenary talk, I review our studies on mathematical modelling of complex systems and its possible applications, which have been carried out by the Aihara Complexity Modelling Project, ERATO, JST (Japan Science and Technology Agency). In this research project, we have been developing mathematical theory and analysis methodology for modelling complex systems in general, and simultaneously applying such modelling to individual real-world complex systems. The applications include (1) dynamical information processing of biological systems like neural networks and genetic networks, (2) a new kind of computation by complex systems and its hardware implementation, and (3) modelling of diseases like new influenza and prostate cancer.

Education:
- In 1977, B.E. degree in Electrical Engineering from the University of Tokyo, Japan
- In 1979, M.E. degree in Electronic Engineering from the University of Tokyo, Japan
- In 1982, Ph.D. degree in Electronic Engineering from the University of Tokyo, Japan

Professional Training and Employment:
- Apr.1998-2003 and Apr.2008-present, Professor, Graduate School of Engineering, the University of Tokyo
- Apr.1999-present, Professor, Graduate School of Frontier Sciences, the University of Tokyo
- Apr.2003-present, Professor, Graduate School of Information Science and Technology, the University of Tokyo
- Oct.2003-present, Professor, Institute of Industrial Science, the University of Tokyo

PT3 Graph Based Semi-supervised Learning

Professor Changshui Zhang

Changshui Zhang, Fei Wang

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Tsinghua University,
Beijing, China

Graph is a natural structure for modeling both the data entities and relationships. In this talk, I'll present some approaches for graph based semi-supervised learning, where some nodes on the graph are assumed to be labeled, and the rest are unlabeled. The goal is to predict the labels of the unlabeled points. Specifically, we propose (1) a linear neighborhood propagation approach to propagate the labels from the labeled data to unlabeled data automatically; (2) a multilevel scheme to accelerate the graph based semi-supervised learning process; (3) a physical generalized point charge model to unitilize graph based semi-supervised learning. The experiments on semi-supervised image segmentation, text classification and digits recognition will be presented, which demonstrate the effectiveness of our methods.

Education:
- In 1986, B.S. degree in Mathematics from Peking University, Beijing, China
- In 1992, Ph.D. degree in the Department of Automation from Tsinghua University, Beijing, China

Professional Training and Employment:
- July.1992-Dec.1994, Lecturer, Department of Automation, Tsinghua University
- Jan.1995- Aug.2000, Associate Professor, Department of Automation, Tsinghua University
- Sep.2000-present, Professor, Department of Automation, Tsinghua University