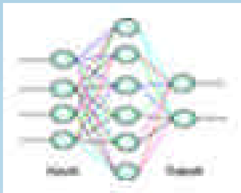
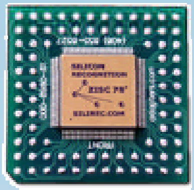
Neuro-Computing Colloquium & Workshop (NCC&W'02)

30-31 October, 2002

Auckland, New Zealand





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Preface

The New Zealand Colloquium and Workshop on Nerocomputing - NCC&W'02 is in a sense a continuation of the series of the International Conferences on Artificial Neural Networks and Expert Systems (ANNES) held from 1993 till 2001 at the University of Otago, but the emphasis now is on the application and the commercialisation of the Neurocomputing methods, tools and systems to facilitate the growth of the New Zealand knowledge economy.

Neurocomputing is an area of computer science and engineering concerned with the development, the implementation, the realisation and the application of computational models that mimic the functioning of the brain in its main functions of adaptive learning, predictive generalisation, knowledge accumulation and knowledge discovery. Applications span across all the disciplines of Science, Business, Engineering, Medicine, Health, Environment and Social Sciences.

The NCC&W'02 includes presentations on: perspectives of neuro-computing; opportunities for the IT sector and the business sector in New Zealand; social aspects of introducing intelligent information systems; new systems for human computer interaction that enable people with disabilities to use computers effectively; introductory tutorials to the basics of neuro-computing; hands-on neuro-system design based on ZISC and other contemporary technologies; various applications of neuro-computing systems for business decision support systems, medical decision support systems, horticulture and agriculture, environment, strategic planning, speech recognition and language processing, image and video processing, multi-modal information processing, adaptive mobile robots, process control, bio-informatics and biotechnology, brain study, cognitive engineering, sport.

The NCC&W'02 is organised by the Knowledge Engineering and Discovery Research Institute – KEDRI – AUT, and sponsored by the Foundation for Research Science and Technology, NZ, The Faculty of Business at the Auckland University of Technology, Silicon Recognition Ltd. (USA), and the Technology Park at AUT. I would like to thank the sponsors, the organising committee of NCC&W'02 and KEDRI's staff members for their excellent work and most of all - the administrative organiser of this event Mrs Joyce D'Mello and the technical support research assistant Peter Hwang.

I hope that the NCC&W'02 will help to further develop the area of Neurocomputing both in theoretical and a practical aspect and will become an important forum for academics and practitioners to discuss their progress and success in the future. It will also help graduate students and young researchers to gain more knowledge and skills and apply them in their study and practice in the future.

Welcome to the NCC&W'2002 – the 2002 gathering of the NCC&W annual meetings.

Professor Nikola Kasabov,
NCC&W'02 Conference Chair
October 2002

Programme for the Neuro-Computing Colloquium & Workshop – NCC&W'02

30th October 2002

9:00-9:10 Welcoming address

General Topics:

9:10 - 9:40 "Neurocomputing perspectives for New Zealand": Prof. Nik Kasabov
9:40 –10:10 "IT opportunities in New Zealand": Prof. Stephen Macdonell
10:10-10-40 "Business opportunities in New Zealand": Des Graydon

10:40-11:00 **Coffee break**

Smart Computer Systems: Development and Social Impact

11:00-11:30 "Total access to computers based on Neurocomputing technologies": Neil Scott (Stanford University, USA)
11:30-12:00 "Social implications of Intelligent Information Systems in Japan": Prof. Monte Cassim (Ritsumeikan University, Japan)

12:00-13:30 **Lunch (provided), poster session, demonstrations**

Neuro Computing Implementations:

13:30 - 14:00 "Self-organising Neurocomputing systems": Prof. Takeshi Yamakawa (KIT, Japan)
14:00 – 14:30 "ZISC Neurocomputing technologies": Remi Vespa (Silicon Recognition, USA)
14:30-15:00 " Evolutionary computation and hybrid systems": Prof. Tim Hendtlass, (Swinburne University, Australia)

"Evolving connectionist systems ECOS" – N. Kasabov and Dr Qun Song (poster)

"Weightless neural networks" – Dr. George Coghill (University of Auckland) and D.Zhang (poster)

"Fuzzy neural networks and image processing with applications": Dr.Kapila Gunetilike and Prof. R.Hodgson (Massey University) (poster and demonstrations)

15:00-15-10 **Coffee break**

Business and Industrial Applications:

15:10 -15:30 "Business applications of Neurocomputing": Assoc. Prof. Brett Collins
15:30 -15:50 "Perspectives in Robotics": Prof. Albert Yeap
15:50- 16:10 "Industrial applications of Neurocomputing": Dr David Tuck (Industrial Research Ltd)
16:10 –16:30 "Neurocomputing in Horticulture": Brendon Woodford (University of Otago)

Decision Support Systems/ Medical Applications/ Sport:

"Data integration and neurocomputing modelling in Bioinformatics": Liang Goh, Nik Kasabov and Stephen Macdonell (poster)
"Data mining and intelligent decision support systems based on Neurocomputing for medical decision support systems": Praveen Sagar, Qun Song, Peter Hwang, Nik Kasabov, Stephen Macdonell, Richard Walton (Pacific Edge Biotech Ltd), Glenn Farrant (Auckland Hospital) (poster)

"A general connectionist development environment for sport data indexing and analysis - a case study on Tennis": Boris Bacic

"A small scale speech recognition system" Dr. Waleed Abdulla (University of Auckland) (poster and demonstration)

Speech & Image Processing:
16:30 -16:45 "Neurocomputing for speech and language processing of English and Maori": Dr. Mark Laws and Dr Richard Kilgour (NAVMAN NZ Ltd)
16:45 – 17:00 "Neurocomputing for image and video data analysis": Brendan Dobbs

"A generic speech data analysis and speech recognition development environment for neurocomputing implementations" Akbar Ghobakglou, David Zhang, and N.Kasabov (poster)

17:00 – 18:00 Cocktail, posters, demonstrations

31st October 2002 – Neurocomputing Technology Workshop

Introduction to Evolving Neurocomputing and ZISC Technologies:

9:00-9:20 "Introduction to evolving, adaptive neurocomputing systems: N. Kasabov
9:20-11:00 "A Tutorial on ZISC Technology and Applications": Remi Vespa (Silicon Recognition, USA)

11:00 – 11:20 Coffee break

Software and Hardware Realisations:

11:20-12:00 "Embedded systems for real-time applications on ZISC hardware – methodology and demonstrations" – Andrew Bridger (Paragon Software)

12:00-13:00 **Lunch** (provided), posters, demos

13:00-13:30 "Software and hardware systems for ZISC": D. Zhang and P. Hwang
13:30-14:00 "New software development for ZISC computers- rule extraction, time series prediction, and parameter optimisation": Q. Song

Applications:
14:00-14:30 “Developing image and video recognition systems in a ZISC environment”: Brendan Dobbs
14:30-15:00 “Speech recognition systems”: Akbar Ghobakhlou & David Zhang
15:00-15:30 “Multi-modal interfaces” Stephen Reed

“Intelligent decision support systems for palm computers” Peter Hwang (poster and demo)

15:30-15:50 Coffee break

15:50 – 17:00 Hands-on experience – optional

17:00-18:00 NNC&W’2002 closing session and cocktail

Neurocomputing: Perspectives in New Zealand

Prof. Nikola Kasabov

Director, Knowledge Engineering and Discovery Research Institute, Auckland University of Technology,
nkasabov@aut.ac.nz, http://www.kedri.info

The paper presents some basic notions of Neurocomputing (NC), applications and future directions in the New Zealand context.

Creating methods and systems that posses elements of intelligence and acquire new ones is the main goal of Artificial Intelligence in general and of Neurocomputing in particular. Some basic notions of knowledge engineering, Neurocomputing and knowledge discovery are first given below:

- Knowledge Engineering is concerned with representing and processing human knowledge in (computer) systems
- Learning systems are information systems that learn from data and improve their performance over time
- Neurocomputing systems (connectionist systems, or artificial neural networks, ANN) are computational models and systems based on principles of the human brain; learning and generalisation are the main features of NC.
- Knowledge discovery – this is the case when learning systems facilitate the extraction of new associations, rules, and relationships from data that are interpreted by humans

ANN can learn from existing data and make generalisation over new data. ANN are universal computational models [1,2].

One particular type of ANN are knowledge-based ANN – these are ANN that combine both learning and rule extraction. They combine the strengths of different AI techniques, e.g. ANN and rule-based systems or fuzzy logic. An example of such system is the fuzzy neural network FuNN [1]. An exemplar set of rules is given below:

R1: IF x1 is Small (DI11) and x2 is Small (DI21) THEN y is Small (CF1),
R2: IF x1 is Large (DI12) and x2 is Large (DI22) THEN y is Large (CF2).

Contemporary intelligent information systems should help trace and understand the dynamics of processes, learn continuously, automatically detect rules that may change in time. This broad requirement inspired the notion of *evolving intelligence (EI).* This is an information system that learns from data and develops its structure and functionality in a continuous, self-organised, adaptive, interactive way from incoming information, possibly from many sources, and acquires intelligence in an incremental, life-long mode. EI facilitates modeling of evolving processes. We talk about evolving processes when the process is unfolding, developing, revealing, changing over time in a continuous way. Evolving are the main processes in living organisms at the cell level, at the brain level, and at the level of evolutionary development. Evolving processes in engineering and business are processes in adaptive control, speech recognition, mobile robots, stock market, etc. The evolving connectionist systems (ECOS) paradigm is a new group of methods [2] and systems that learn in a "life-long" learning mode from data, learn through interaction with the environment, create and evolve their own structure and functions based on the data that has been presented to them, are self-programmable systems, are knowledge-based, e.g. rules can be extracted.

NC implementations include: Software simulators; Hardware realisations of ANN, such as the ZISC chip [3]; Complex embedded systems. Different types of ANN are RBF, MLP, SOM, ESOM, Bayesian NN, ART, etc.

Other information processing methods related to NC are: Statistical and probabilistic modeling; Hidden Markov Models; Support Vector Machines (SVM); Example-based (prototype-based) learning and case-based reasoning; Logic systems (e.g. fuzzy logic, interval logic); Agent-based systems; Finite automata; Self-reproducing automata.

The applications of NC are numerous. The following is a short list of them that are realized partially in New Zealand: Speech recognition; Image and video processing; Multi-modal information processing; Brain study and cognitive engineering; Bioinformatics and Biotechnology; Medical decision support systems; Business decision support; Adaptive mobile robots; Process control; and many more.

Some of the future directions in NC relate to building large neuro-computing systems for general and specific applications such as biotechnologies, business, engineering, science, arts, medicine. There are good opportunities in New Zealand for NC to be developed in collaboration with international partners and to target international markets. This is because of the following: (1) Skilled and creative people are here; (2) The IT industry is saturating and needs a “boost”; (3) There is a need for more intelligent products to be produced and they be better placed on the market; (4) NC are ubiquitous and are applicable to many domains.

[1] Kasabov,N. Foundations of Neural Networks, Fuzzy Systems and Knowledge Engineering, The MIT Press, CA, MA, 1996.
[2] Kasabov, N., *Evolving connectionist systems: Methods and Applications in Bio-informatics, Brain Study and Intelligent Machines,* Springer, London, 2002
[3] ZISC Manual, 2001, Silicon Recognition Ltd (www.silirec.com)

About the speaker

Professor Nikola K. Kasabov is the Director of the Knowledge Engineering and Discovery Research Institute at the Auckland University of Technology, New Zealand. Previously he held a position of a Professor and Personal Chair at the University of Otago, Associate Professor at the Technical University in Sofia, Bulgaria, and a Senior Lecturer at the University of Essex, UK. He received MSc degrees in Computer Science and Applied Mathematics, and a PhD degree in Mathematical Sciences from the Technical University in Sofia. He has published over 250 works, among them 10 books, 75 journal papers, and 25 patents in the area of intelligent systems, connectionist and hybrid connectionist systems, fuzzy systems, expert systems, speech recognition, data analysis, bioinformatics, brain-like computing. Kasabov is a Past President of APNNA – the Asia Pacific Neural Network Assembly, and a member of its Governing Board. He is a Senior Member of IEEE. He is a Fellow of the Royal Society of New Zealand and a Fellow of the NZCS. In 1991 he was awarded the RSNZ Silver Medal for Science and Technology. He was the general chairman of series of ANNES International Conferences on Artificial Neural Networks and Expert Systems (1993-2001), and ICONIP’97, and a co-chair of ICONIP’99 and IJCNN’2002.

IT Opportunities in New Zealand

Professor Stephen MacDonell
Head of the School of Information Technology at AUT

As a nation New Zealand has long been recognised for its rapid adoption of new technologies and its innovative approach to problem-solving. In recent years this enthusiastic approach to technology has been constrained as a result of a change in funding models and the more recent downturn (or rather correction) in the information technology sector. However, we are now on the cusp of an exciting period of growth in the technology sector, as the government, industry and research groups move to a more sustainable model of funding and support for investigation, innovation and commercialisation. Further development along these lines will enable New Zealand to re-establish a position of strength in research and development in information and communications technologies. In particular, developments in mobile wireless technologies and in intelligent adaptive systems, under the umbrella of autonomic computing, would appear to be likely avenues of substantial research and development activity in the next five to ten years.

About the speaker

Stephen MacDonell is the Head of the School of Information Technology at AUT, an appointment he has held since the middle of 2002. He is also Professor of Software Engineering, and the Deputy Director of AUT's Knowledge Engineering and Discovery Research Institute (KEDRI). Prior to joining AUT Stephen held several appointments at the University of Otago, after starting there as a Postdoctoral Fellow in 1993. He was Head of the Department of Information Science at Otago from 1999 to 2001.

Stephen teaches mainly in the areas of information systems development, project management, software engineering and software measurement, and information technology research methods. He undertakes research in software metrics and measurement, project planning, estimation and management, software forensics, and the application of statistical, machine learning and knowledge-based analysis methods to complex data sets, particularly those collected in relation to software engineering.

Stephen also has a strong interest in the form and nature of software engineering – is it a discipline, a science, a profession? With Andrew Gray, Stephen recently authored a chapter on software engineering management in the Guide to the Software Engineering Body of Knowledge (SWEBOK).

Business opportunities in New Zealand

Des Graydon
Dean of the Faculty of Business
Auckland University of Technology

As New Zealand enters the twenty-first century our economic, political, social and business structures leave us well placed to take advantage of the global economy. Our relatively short history, coupled with the radical economic and social reforms of the last two decades have made New Zealand a dynamic business environment with one of the highest technological take-up rates in the world and a bias toward innovative and new thinking.

New Zealand's economy is now based on the government attempting to work in a Public Private Partnership role in order to attract increased levels of foreign direct investment. These policies are all aimed at maximising the benefits to New Zealand of our highly educated labour force and relatively efficient and cost effective infrastructure.

About the speaker

Des Graydon has been Dean of the Faculty of Business at AUT since 1990. During his time as Dean, Des has been responsible for the transformation of the Faculty from, a departmental-based polytechnic controlled from Wellington teaching a national diploma curriculum, to a University Faculty offering two undergraduate, four postgraduate degrees and PhD. The Bachelor of Business was introduced in 1992 and now has 2000 students and ten majors and is recognized as a leading business degree in New Zealand and internationally. Over this time the profile of academic staff has been changed through recruitment and development. The faculty now has twelve professors and 50 research active staff. There are three Research Institutes within the Faculty established in the last two years. The faculty is looking forward to further growth in students, academic staff and research. The Faculty has a strong international focus, with student and staff exchange programmes, research collaboration and other international projects.

Total access to computers based on Neurocomputing technologies

Director, The Archimedes Project
Center for the Study of language and Information
Cordura Hall, Stanford University
Stanford, CA 94305-4115
USA

This talk will describe the new Intelligent Total Access System (iTAS) that provides universal access to Information Technology devices in work, home, and educational situations for individuals with disabilities and other limitations caused by aging, and low literacy. An extension of an earlier patented Total Access System (TAS), iTAS is more responsive to individual needs and compatible with a wider range of target IT devices. As in the original TAS, the iTAS groups access functions into two major components; accessors that handle the interface to the user and determine user intent, and Intelligent Total Access Ports (iTAPs) that provide standardized interfaces to target IT devices. The iTAS incorporates an automated RF wireless system in place of the serial cable that connected accessors and TAPs in the original TAS. The iTAS also eliminates the need for accessors to contain interfacing information about target IT devices that might be accessed. In contrast, the iTAS implements a new distributed Natural Interaction Processor (NIP) that (i) uses neural processing and distributed agent technologies to extract user intent within each accessor, (ii) determines the capabilities of each connected device without exchanging private information, and (iii) merges commands and text from multiple accessor within individual targeted iTAPs.

The capabilities of the iTAS open up potential applications that go far beyond the disability focus of the original TAS. I will conclude the talk with a summary of new application areas we envision for the iTAS.

About the speaker

Neil Scott directs the Archimedes Project at Stanford University's Center for the Study of Language and Information. He was a founding member of the Archimedes Project in 1992. His current work is focused on adding artificial intelligence to the Total Access System which provides universal access to computers and other electronic devices using technologies such as speech recognition, head tracking, and eye tracking. The Total Access System invented by Scott was selected as one of the five top innovations in computer hardware in the 1997 Discover Magazine awards. Prior to immigrating to the United States in 1986, Scott was Dean of the School Physics, Electronics and Electrical Engineering at Wellington Polytechnic, Wellington, New Zealand, where he was heavily involved in setting up educational and training applications of computers. After his arrival in the U.S., in 1986, he spent two years as a disability access consultant in San Francisco, followed by five years at Cal State University, Northridge, where he developed and ran the one of the first major Computer Access Labs for students with disabilities. Scott has extensive experience with speech recognition and has been applying it to the needs of individuals with disabilities since 1987. U.S. Patent 6083270 was awarded for the

Total Access System in July 2000. The lead article in the January 2000 edition of San Francisco magazine featured Neil Scott as one of fifteen Bay Area futurists who will shape the way people live, think, work and play in the new millennium. He is a founding member of AARTI, a new non-profit organization established to increase the availability of access solutions and the Archimedes Foundation that is being established to attract funding for ongoing research. He has been a member of numerous White House and Federal Government committees on access issues and is a regular member of peer review panels for National Science Foundation grants.

Current activities involve: ongoing development of the Intelligent Total Access System (iTAS); collaborating in the development of standards for human-centered interfaces to computers; developing new technologies to assist individuals with disabilities, people coping with problems due to aging, and people who are disadvantaged by illiteracy; developing intelligent human-centered interfaces for smart houses and appliances; and establishing a global network of researchers, developers and manufacturers to bring practical and affordable accessibility solutions to individuals all around the world.

For the past three years, Scott has been making regular trips to New Zealand for conference presentations and to run seminars and workshops informing New Zealand companies of opportunities for establishing new high value technology-based exports. As part of this initiative, the CEOs of several innovative U.S. technology companies have traveled to New Zealand to present workshops about technologies that could give New Zealand companies a competitive edge.

In September, 2002, Neil Scott was named as one of five finalists in a Global Tech Award that recognizes leadership in developing technologies that equalize opportunities for people all around the world. The winner of the award will be announced in November, 2002.

Contrast Enhancement of an Image Data employing the Self-organizing Relationship (SOR) Network with Personal Intuitive Evaluation

Takeshi Yamakawa
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The user intuition of an image is very important factor to evaluate the image. In this paper, the new image enhancement method, which provides the enhanced image satisfying the intuitive evaluation of the user, is proposed. The self-organizing relationship(SOR) network proposed by the authors is employed in order to obtain the relationship, which reflects the user intuition, between intensity histogram of an original image and intensity mapping curve. The SOR network can construct the relationship, which corresponds to the arbitrary evaluation, between input vector and output vector by the learning. Employing the user intuition as the evaluation, the relationship corresponding to the user intuition is obtained. The intensity histogram of original images and the intensity mapping curve are employed as the input vector and the output vector of the SOR network, the relationship between them is constructed by SOR network. The intensity histogram of an image is applied to the SOR network after the learning, the intensity mapping curve of which reflects the user intuition is generated.

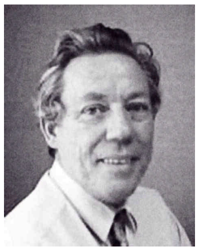
The experimental results show that images enhanced by the proposed method accord with the user intuition better than the images enhanced by the other methods.

About the speaker

Prof. Takeshi Yamakawa is a professor of Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology (KIT), Japan. He established a foundation, Fuzzy Logic Systems Institute (FLSI), in Japan in 1990 in order to promote the international collaboration on fuzzy logic, neural networks and other soft computing, which are the new paradigms to realize the advanced intelligent systems. He is also the chairman of FLSI. His main research interest lies on hardware implementation of fuzzy systems, fuzzy neural networks, and chaotic systems.

Prof. Yamakawa plays Karate (Japanese traditional martial arts) and possesses a black belt (5th Dan). And he likes swimming, horse riding and monocycle as well. His interest also lies on Shakuhachi and Sangen, which are Japanese traditional musical instruments.

Evolutionary computation and hybrid systems.



Tim Hendtlass,
Centre for Intelligent Systems and Complex Processes,
Swinburne University of Technology,
Australia.

Evolutionary computing has been used for many years in the form of evolutionary algorithms (EA) - often mistakenly called genetic algorithms. Normally used for optimisation, EAs suffer from one serious drawback – they are slow. The need for large populations and many generations means that considerable time (and computing resources) are required to solve serious problems adequately.

Techniques that 'force' evolution to happen faster will be mentioned and then a technique developed at Swinburne will be described that can speed evolution significantly when fitness evaluation is the major time consuming element in the evolutionary process.

There will always be, however, a limit to the improvements that can be made within standard EC and alternate approaches have had to be developed for particularly hard problems. These often involve the encapsulation of information learned within a generation so that it can be used by succeeding generations, thus providing the algorithm with more direction than selection pressure alone provides. A method developed at Swinburne that involves the keeping of historic (Akashic) records for later use will also be described.

Developing good intra generational learning techniques is of limited use unless intra generational learning is passed on to later generations. Once techniques for the transfer of knowledge between generations are used, the choice of intra generational learning technique becomes important. Particle swarm optimisation (PSO) can be a good intra generational learning technique and can be readily combined with evolution to give a superior result to that obtained from either technique alone.

Some sample results will be given to support these claims.

About the speaker.

Tim Hendtlass obtained his BSc(Hons) and MSc degrees from Otago University and his PhD from Massey University, both in New Zealand. H,e moved to Australia and became an academic firstly at RMIT and then at Swinburne University, both in Melbourne, Australia. He established the Centre for Intelligent Systems and Complex Processes at Swinburne in 1994 and is currently Director of this Centre while simultaneously fulfilling the positions of Deputy Head and Research Director in a School with 115 academics. A model railway enthusiast, he regrets the fact that he never seems to have time to indulge in it.

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Fuzzy Neural Networks for image processing applications

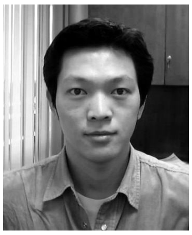
Dr.Kapila Gunetilike and Prof. R.Hodgson
Massey University

Neural networks are networks of artificial neurons with a high degree of connectivity. Knowledge is captured and accumulated in the weights of the interconnections between these neurons. The network "learns" this knowledge through and iterative training process. Generally prior to training, the weights of the network are initialised with small random numbers. This form of initialisation has no relationship to the problem to be solved. Random initialisation of the weights of the network prior to training may result in long training times and possibly the convergence to a non useable solution. A methodology has been developed that maps problem knowledge to the weights of a fuzzy neural network prior to training. This form of initialisation leads to reduced training times and convergence of the network to a useable solution. The effectiveness of the methodology is demonstrated by its application to real world image processing problems.

Weightless Neural Networks

Dr George Gunn Coghill
BSc, BA, PhD, MIEE, MIEEE
University of Auckland, New Zealand

David Zhang
Auckland University of Technology
New Zealand



This presentation takes a look at the very real possibility of applying a specific class of neural networks, Weightless Neural Networks (WNN's) to intelligent embedded systems. We begin by looking at existing learning methods and find out why applications are so rare in industry. The best performing neural network, the Multi-Layer Perceptron (MLP) is very slow to train, requiring thousands of passes through the training set and cannot learn incrementally on-line. In the New Zealand situation, the realization of embedded neural networks is difficult. MLP's require analogue weight storage and large amounts of silicon real estate to implement the many necessary multiply accumulate operations.

Since we are unable to fabricate integrated circuits in New Zealand, industry tends to rely on high-performance microprocessors and DSP's. This has been augmented recently by the additional resources of Field Programmable Gate Arrays (FPGA's). These devices are a very exciting prospect. They currently come with millions of reprogrammable gates on one chip and high-level design software. The future looks very bright as the storage densities continue to increase.

FPGA's are a natural route for the implementation of WNN's as they are RAM based systems. They also train in a single pass through the data. There is one snag. Until now their generalization capabilities were feeble. Generalization is the ability of a neural network to learn the underlying function implicit in the data set. This is what the MLP is so good at. Very recently, we have enhanced the performance of a specific class of WNN's and early results show that it can compete with the MLP when applied to some well-known benchmark problems.

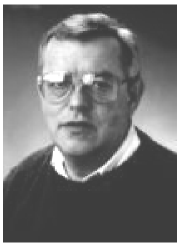
In this talk we introduce the concepts of WNN's and show how they have evolved over the past fifteen years, or so. We also present some results of learning and compare them with some other possible candidates for embedding intelligence. Finally, we discuss what sort of application areas could be tackled with this approach.

About the speaker

Dr. George Coghill, Born in Scotland in 1946, early experiences included training as an apprentice electronics technician with a company called Ferranti. This was followed by studies for an Electrical Engineering Degree at the Heriot-Watt University in Edinburgh. After some interesting times as a marine instrumentation engineer, a PhD was pursued in the area of Interactive Knowledge Manipulation using multiple microprocessors. This was followed by six years on the academic staff of the Electrical Engineering Department at Edinburgh University. Eventually, it became apparent that the climate in Scotland was not often balmy and so the Coghill family set off, in the mid 1980's, to a faraway place called New Zealand. After joining the Department of Electrical and Electronic Engineering, at the University of Auckland, the emerging field of Artificial Neural Networks (ANN's) seemed to fit well with previous interests. This research began with a study of some theoretical aspects of ANN's and the possibility of using them in an industrial setting, looked very interesting. Currently this work is targeted at embedding intelligence into electronic systems. Dr Coghill is a member of the governing board of the Asia Pacific Neural Network Assembly.

David Zhang is a part-time research officer at Knowledge Engineering and Discovery Research Institute (KEDRI) and currently pursuing his PhD at AUT under the supervision of Prof. Nik Kasabov and Senior Lecturer Dr. George Coghill (Auckland University). David's interests are in Artificial Intelligence and speech and image recognition with neural network technology.

Business Applications of Neuro-computing



Dr Brett A Collins
Associate Professor, Postgraduate Program Leader
Faculty of Business, Auckland University of Technology

Business applications of neuro-computing are classification, forecasting and optimisation across the core areas of marketing, finance and operations. Brief examples of these generic tasks are described. Following a survey of neuro-computing from a business perspective, alternative computational practices are evaluated. Key business problems where these modelling techniques have a distinct advantage are identified, and areas for future applied research that will have significant impact on their adoption are discussed.

About the speaker

Brett works with the Postgraduate Academic Group in AUT's Business Faculty. After 20 years experience in line management and general management with several international firms, he joined the Graduate School of Management in Melbourne Australia. He has taught on Executive, MBA and postgraduate programs in Asia and Australasia. His main teaching and research interests are centred on marketing strategy, value-based management, and theory development using computer based techniques. Brett is a member of ANZMAC Executive and serves on the editorial board of a number of international journals. He has published across disciplines in European Marketing Journal, Journal of the Institute of Actuaries, Labour Economics and Productivity, Australasian Marketing Journal, European Management Journal, The Investment Analyst and Journal of Business Finance and Accounting.

Perspectives in Robotics

Professor Albert Yeap, Professor of IT
Director of the Institute of IT Research at AUT

This short presentation will highlight the Institute's interests in robotics and language research and point to the possible collaborative work in the future with KEDRI.

About the speaker

Professor Albert Yeap is a Professor of IT and Director of the Institute of IT Research at AUT. Professor Yeap's major research interests include the development of computational theories for large-scale space perception and natural language understanding.

Industrial Applications of Neuro-Computing

Dr David Tuck
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Phone (09) 373 8655 Email D.Tuck@irl.cri.nz

Applications of neuro-computing before the early 1990's had been mainly focussed in the military and research sectors. Neuro-computing is the realisation of artificial neural networks in a computer environment. It can be implemented by modelling the problem purely from the data collected. Motivation for the development of this tool came from the study of neuro-science which has provided the human-like capability of this technology.

In this presentation I will describe my experiences with only one general paradigm for implementing neuro-computing ie. Multi-layered feed-forward neural networks. Before 1992 most R & D concentrated on applications in pattern recognition and classification, and in solving optimisation problems. However, around this time applications began to broaden more into the manufacturing and processing industries.

Over the last 10 years this has now changed significantly! Neuro-computing has been applied in many more sectors of industry, and has gained a strong reputation, for solving otherwise intractable or non-deterministic problems. Today multi-layered feed-forward and fuzzy neuro-computing is well accepted and used in about 90% of the recorded applications. A general field of industrial applications include:-

- Soft sensors;
- Modelling systems;
- Process controllers;
- Pattern recognition;
- Image processors.

Our own R & D involvement in neuro-computing over the past 12 years at Industrial Research Limited, has been to demonstrate many successful industrial applications involving the interpretation of sensor data in many areas. These have required minimal developmental costs and achieved results that were generally insoluble by any other artificial intelligence techniques. By way of example some of these developments have been for:-

- Carcass meat fat thickness measurement;
- Robotic sensory visualisation and trajectory planning;
- Modelling of open-circuit coaxial probes;
- Corrosion pitting and crevice detection;
- Fish fillet packing;
- Timber moisture measurement
- Bandsaw blade diagnostics (cracking detection);
- Pattern recognition in images;
- Water utility supply demand prediction;
- On-line robotic arm path planning;
- Data fusion for adaptive learning and decision-making.

About the speaker

David has a BE & ME Hons (Electronic Engineering) from the University of Auckland, NZ and a PhD (Biomedical Engineering) from the University of London, Imperial College, UK. He was first employed as a research engineer with the DSIR in 1970, and since 1992 by Industrial Research Limited. His more recent research and development work has involved the management of the Sensor Fusion Methodologies for Industrial Applications project. The project aim is the identification and development of tools and methodologies for industrial applications using neurocomputing and other supervised machine learning techniques. More recently David has been investigating the application of other new intelligent computing technologies such as Support Vector Machine Classifiers.

Application areas for intelligent computing currently include machine vision and microwave sensing, multi-sensor decision making, sensor measurement improvement, information extraction from data-sources, process outcome prediction, and face detection in images.

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Neurocomputing n Horticulture

Brendon J. Woodford
Department of Information Science, University of Otago
New Zealand

New Zealand's main export earnings come from the primary producing area. One of the major contributors in the area of horticulture is the production of quality export grade fruit, specifically apples. In order to maintain a competitive advantage, the systems and methods used to grow the fruit are constantly being refined and are increasingly based on data collected and analysed by the orchardist who grows the produce.

To support this process of data analysis and the resulting decision-making process require tools and methods that can benefit the grower .Therefore this presentation describes the methods and the techniques of Connectionist-Based Intelligent Information Systems (CBIIS) for Image Analysis and Knowledge Discovery using advanced nuerocomputing techniques that have been developed to address specific problems in the horticultural domain. Two examples of systems that employ these techniques are described and demonstrated

The first is the Integrated Pest Management Expert System (IPMES), a system that was developed by the Department of Information Science and HortResearch. This system applies advanced neurocomputing learning techniques and a new methodology for building intelligent systems to create an application that integrates the disparate sources of data that describe the process of growing apples. It combines these data sources to perform adaptive decision-support for the orchardist. IPMES was designed for use by ENZAFruit New Zealand (International) (ENZA), HortResearch, the packhouses, and the growers/orchardists themselves.

The second system extends IPMES to include on-line and real-time identification of pest damage in apple orchards by analysing images of this damage taken by a digital camera. It combines advanced image analysis methods and adaptive neurocomputing models to create a fast and robust image recognition system that not only can identify what pest cause the damage but also allows for decision-support for the orchardist. The other interesting aspect of this application is that is also has the ability to incrementally increase its classification accuracy as more images are taken of the damaged fruit.

Both systems described also posses the ability for knowledge discovery by rule extraction and rule insertion that can be used to validate the results produced by the systems and also allow the users to gain insight into what aspects of the data collected contribute to the development of quality fruit.

About the speaker

Brendon J. Woodford is Senior Member of the Knowledge Discovery Laboratory and Senior Teaching Fellow at the Department of Information Science, University of Otago. He received his BSc in 1994, DipSci in 1995, and MSc in 1998 degrees in computer science from the University of Otago and is currently pursuing a PhD in the area of applying Connectionist-Based Intelligent Information Systems for Knowledge Discovery in horticulture. He has published more than ten conference papers, a book chapter, a journal article, and co-edited the proceedings of ANNES'2001. He has also sat on several programme and organising committees including ICONIP’97, FUZZ-IEEE'2001, and ANNES'2001. His current research interests include image processing and image recognition, knowledge discovery from connectionist-based systems, fuzzy systems development and design, data mining, and advanced data visualisation techniques. Mr Woodford is an Associate Member of the New Zealand Computer Society, Member of the IEEE Computer Society, Affiliate of the IEEE, and associate member of KEDRI.

Data Integration and Neurocomputing Modelling in Bioinformatics: a Case Study on Gene Expression

Liang Goh
Lecturer
Auckland University of Technology

With the advent of DNA microarray, gene expression in an organism can be examined on a genomic scale, allowing the transcription levels of many genes to be measured simultaneously. The level of expression of many genes and its effects on diseases or human body can then be modelled.

A classification/prognosis model was developed based on Evolving Fuzzy Neural Network (EfuNN) with pre-selected 11 inputs (the expression of 11 genes) and two outputs (cured and fatal). The model was trained and tested with leave-one-out method on the 58 data samples. 81% prognosis accuracy was achieved.

The same data set of 58 data samples was integrated with data from clinical prognostic model, International Prognostic Index (IPI). IPI was developed to identify Diffuse large B-cell lymphoma (DLBL) patients who are unlikely to be cured with standard therapy. The factors are age, performance status, stage, number of extranodal sites and serum lactage dehydrogenase, which are likely surrogate markers for the intrinsic molecular heterogeneity in this disease. The model was trained and tested as before. A prognosis accuracy of 87% was achieved.

Conclusion: Integration of data from multiple sources can enhance the data model and yield higher prognosis accuracy. With optimization methods on the datasets, it is possible to achieve higher prognosis accuracy. Further work of integration would involve linking the genes identified in the model to the gene database and thereby identifying genes, which are significant contributors to the disease.

About the speaker

Liang is a lecturer at AUT and currently pursuing her PhD under the supervision of Prof. Nik Kasabov and Prof. Stephen MacDonell. Liang's interests are in Artificial Intelligence and Bioinformatics. Her current research involves integration of multiple sources of molecular biology data for the purpose of disease profiling. Outside of work, Liang is fond of music and tramping.

Neuro-computing for medical decision support systems

Praveen Sagar
Master student
Auckland University of Technology

Nik Kasabov, Qun Song, Peter Hwang,
Richard Walton, Glenn Farrant, Murray Brennan

When a patient seeks medical attention, the physician interacts with the patient through the constructs of the medical Models. Until a definitive diagnosis is established about the presenting problem. The physician deals with a working diagnosis. The modern interaction between the physician and the patient is often supplemented, especially in hospital practice, by testing systems (e.g body fluid analysis, imaging, electrical signal analysis). Testing systems deal with uncertainty and are used most often as part of the differential diagnosis (to increase or decrease the likelihood of a disease process)and to monitor treatment. If the patient is healthy or the diagnosis and prognosis are known, then no testing need be done. Even if a definitive diagnosis (e.g. myocardial infarction) is established, the natural history(i.e., how the illness unfolds over time) is often uncertain for any patient. Thus, there is a need for systems to deal with the uncertainty in the diagnosis and management of patients. The research is focused on issues such as accuracy, adaptability, intelligent interface, scalability, knowledge discovery etc.. With the introduction of Evolving Connectionist Systems(ECOS) the above issues can be dealt with.

About the speaker

Praveen Sagar Mudumba presently studying Masters in Information Technology at Auckland University of Technology. Previously done his Bachelors of Sciences (Osmania University, India), Post Grad. Dip in Clinical Perfusion Cardio-Thoracic and Vascular Surgery (Nizams's Institute of Medical Sciences, India), Post Grad. Dip in Computer Applications (Indira Priyadirshini University, India). Research interests are exploring ways of " Integrating Information Technology in Clinical Medicine". Presently working on developing and Intelligent Medical Decision Support Systems in Medicine using AI and neural networks.

<u>A General Connectionist Development Environment for Sport Data Indexing and Analysis – A Case Study on Tennis</u>

Boris Bacic (Boris.bacic@aut.ac.nz) and
Nikola K. Kasabov (nkasabov@aut.ac.nz)

Introduction

This project aims to make a contribution in automating sports data indexing and analysis for Tennis as a case study. The main goal is to develop an environment which enables data analysis, modelling, and discovery of sports activity data for a single player.

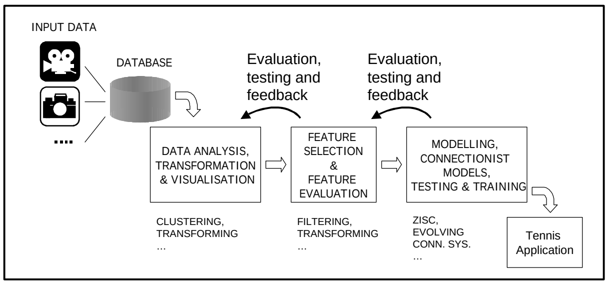
Today's technology allows sports professionals to use their expertise and software (eg. SportsCode, SportCAD, Silicon COACH etc) for video indexing and analysis, to facilitate visual feedback to the trainee or learner.

Using the proposed system would reduce human computer interaction, and minimise and automate low-level tasks for the user.

Existing systems' limitations:

- They must be operated exclusively by sport professionals – experts
- Lack of adaptability (ie. No adaptive learning)
- Lack of automated cataloguing and indexing
- Lack of automated explanations and reasoning which would include cause and consequences description.

General connectionist based development environment for sports data analysis indexing and modelling



Research directions

The project involves addressing and researching several problem areas:

- Data acquisition
- Data analysis
- Data filtering
- Feature extraction
- Information clustering
- Constructing human body representation as "stick player"

- Motion analysis
- Motion patterns
- Indexing, searching and analysis
- Identifying important areas from stills
- Software packages for computer assisted coaching
- Usability and Human-computer interaction studies.

Preliminary experiments with Tennis Data using ZISC technology

Using ZISC technology, it is possible to diagnose Tennis strokes and to build an index for future referencing.

Conclusion and Future Directions

At present available tools for computer assisted coaching require to be operated by experts who would be able to interpret captured data.

Computing the incomputable

While traditional systems fail to compute humanlike “commonsense knowledge” the proposed system should be able to interpret large amount of ambiguous data, learn how to interpret it, apply sport professional’s commonsense knowledge and provide meaningful feedback to the users.

Preliminary experiments presented in this poster shows encouraging results in demonstrating that the training the system works and is able to extract data and interpret information in a specific context.

Further work would involve developing and implementing the general environment, and applying common approaches used in the Tennis study to other case studies (ie. Making the approach applicable to other case studies). The system would also be able to support areas in sports medicine, diagnostics, injury prevention, biomechanics, and physiotherapy.

System development should not restrict input data to still images and video only. The use of digital video may be replaced with more accurate xyz space positioning sensors (obtrusive experimenting). The system should also have the ability to manipulate data using traditional movement analysis algorithms.

Neurocomputin g for Speech and Language Processing of English and Maori: A preliminary study to model the emergence of bilingual acoustic clusters

Dr. Mark R. Laws (DipGrad, MSc, PhD - Otago)

Richard I. Kilgour NAVMAN, New Zealand Ltd,
Designers and Manufacturers of GPS,
Communication, and Marine

This presentation outlines some preliminary results of an original case study to model the emergence of bilingual acoustic clusters of both New Zealand English (NZE) and New Zealand Maori (NZM) speech. This is performed using true on-line learning in a connectionist architecture. The study applied bilingual data as training examples to a connectionist-based evolving clustering method. The method evolves a connectionist structure representing acoustic clusters that could be used for both gaining understanding of the commonality between the two languages and the way they can be efficiently learned, and as a foundation for future speech classification systems. The experiments are based on the notion that approximately 75% of the phonological units in the two languages occupy similar acoustic space, they sound the same, and therefore they can be used to classify new unknown speech units or words. The study looked at the problem to model both NZE and NZM speech into acoustic clusters. The first part presents data analysis constructed into two working models that can be used as the foundation for future speech recognition or classification systems. The analysis focused on the word segments extracted from speech examples from the two languages; this determined a baseline model. The second section discusses a novel approach to collectively label both languages with an arbitrary notation called 'minimal acoustic segments' (MAS). This approach will be presented as an alternative to the traditional linguistic nomenclature. The next section will briefly describe a hybrid connectionist-based approach, and the 'evolving clustering method' algorithm (ECM). The final section reports on the initial results of the experimental connectionist-based 'bilingual speech clustering' model.

About the Speaker

Mark's research and professional speciality is Mäori speech data analysis, namely speech recognition and synthesis, bilingual human computer interfaces, speech database management and translation systems, and computational linguistics in phonology.

Mark has won two Tüäpapa Pütaiao Mäori Fellowships from the Foundation of Research, Science and Technology (FRST). The first was awarded for his MSc in 1997 and the second for his Ph.D in 1998. Mark was the Inaugural South Island winner of the Foundation's "FiRST Awards" in 1999 and has just been announced as the 2002 Inaugural Computing and Mathematics Winner of the Mäori Academic Excellence Awards hosted by the University of Waikato.

In January 2002, Mark was contracted to the Royal Society of New Zealand and the National Association of Mäori Mathematicians, Scientists And Technologists (NAMMSAT) to work on Mäori issues relating to the Science Communicators, Mentoring and the Teacher Fellowships Program, including the RS&T funding with the Ministry of Research, Science & Technology.

Mark has just been awarded a 3 year Post-Doctoral fellowship from FRST to be undertaken with the Auckland University of Technology and the University of Hawaii. He will integrate selected Polynesian languages using similar data models and language frameworks developed for the Mäori language in his PhD. This will provide the foundations for further research into languages, linguistics and computing. Mark's primary research goal will be to piece together selected Polynesian language and linguistic elements to build a speech and language database management system. This database will contain the lexical, phonological and phonetic frameworks which will provide the core components for a Polynesian speech and language database translation system.

Mark is currently the Associate Director of the Research Laboratory for English and Mäori Translation Systems, and a Project Leader with the NERF funded research programme on Connectionist Based Intelligent Information Systems based at KEDRI, AUT.

Richard Kilgour graduated from the University of Auckland with a BSc in Psychology and Computer Science in 1994.
His researching in neural networks and speech recognition lead to a MSc in Cognitive Science from the University of Otago. He recently submitted his PhD, also University of Otago. Currently he is working for NAVMAN NZ Ltd., performing research and development for hand-held and in-car personal navigation systems.

Neuro-computing for image and video analysis

Brendan Dobbs
Senior Researcher,
Software Engineering Research Laboratory (AUT)

Prior to applying an automated image or video recognition system to a task it is important to understand some key concepts about the implementation. Before investing time and money into an image recognition application we need to know the capabilities and value that this system will provide.

The key question is "What is the advantage in using an image recognition system?"

We will address the value in an image recognition system and look at its key components.

Image and Video recognition systems

There are many tasks that can be replaced by an image recognition system. These tasks are generally based on counting, tracking, and identifying objects and can be applied to medicine, military defence, sports analysis, security, robotics, part inspection as well as many other domains. We look at applications and demonstrations within some of these domains and identify other areas where these systems might be useful.

About the speaker

Brendan Dobbs is a Senior Researcher at the Software Engineering Research Laboratory (AUT) under the supervision of Professor Philip Sallis. He is also a Masters of Information Technology student. Brendan completed a Bachelor of Science in Computer Science at Otago University before working on several software development projects. He also worked as a Software Engineer for a commercial software development company affiliated with the University of Otago. Since working at the Software Engineering Research Laboratory research projects have included: voice recognition systems (for the visually impaired), intelligent agents, knowledge management systems, mobile applications, application performance and usage analysis, and more recently image recognition and pattern classification.

Embedded ZISC systems and FPGA design flow – methodology and demonstrations

Andrew Bridger (Paragon Software LTD), New Zealand

The first section of this presentation shows how the ZISC chip could fit into an embedded system. A key strength of the ZISC chip is its high speed (data throughput) and small size, potentially making it well suited for embedded applications. However, due to its high data throughput and relatively simple processing capabilities, other components are required to build a complete ZISC system. FPGA or DSP components are required to pre-process the source data and keep the ZISC network fed with vectors. A CPU would perform any post-processing on the results returned from the ZISC network, and perform any user interface tasks. Calculations are also presented that indicate what image frame rates are possible and the bandwidth required by various components.

The second part of the presentation will cover the FPGA design process, with particular reference to Silicon Recognition's 'Wizard' embedded development kit and the USB adapter board developed by Paragon Software. Design for FPGA does not appear to be well understood, often VHDL is regarded as 'just another software language'. In the presenter's opinion it is not, design for FPGA is largely digital logic design. The USB adapter module and Wizard board will be demonstrated.

The presentation will end with a brief demonstration of an application Paragon Software have developed that simulates the ZISC chip. It has been implemented in Python and uses the TkInter GUI library. The application will be used to show how ZISC might be used for Optical Character Recognition.

About the speaker

Andrew Bridger – Born 18/04/1977 Lower Hutt, New Zealand. Andrew is a VHDL and software engineer who graduated with a first class honours BE degree from Canterbury University in 1998, having gained four scholarships during his university career. The next two years were spent as a Hardware engineer for Paragon Solutions, a contract design and development business based in Lower Hutt, New Zealand. Paragon Solutions was then acquired by Turnstone Systems forming a New Zealand based engineering division for this US based company. During his time with Turnstone, Andrew was involved with the specification, design and testing of products to automate DSL service rollout. Due to the downturn in the telecommunications sector in the US, Turnstone New Zealand was closed in 2001. Subsequently, 7 ex-Turnstone New Zealand employees formed a new company called Paragon Software, to offer embedded software and hardware design and development services to the New Zealand and US markets.

New software development for ZISC computers- rule extraction, time series prediction, and parameter optimisation

Dr. Qun Song,
Auckland University of Technology, New Zealand

ZISC is a fully integrated, digital implementation of the RBF-like neural network model and it can be used for high-speed and complex recognition and classification. ECOS models can associated with ZISC technology to solve prediction, identification and process control problems. The ZISC(s) in an ECOS tool will perform input space partitioning, input vector mapping and rule nodes mapping. The ZISC can also be used for extracting rules from the data.
The presentation will introduce some methods that use ZISC technology to extract several kinds of fuzzy rules, such as Mamdani, Takagi-Sugeno or Generalized fuzzy production rules, from the data in on-line or off-line models. Especially, an example will show a DENFIS model with ZISC for on-line prediction and rule extraction. In this example, a benchmark time series data set, Mackey-Glass data, will be used for demonstration. The presentation also shows the result of GA for ZISC parameter optimisation.

About the speaker

Qun Song obtained his Bachelor's degree, Master's degree and PhD degree from Textile University of China, Tokyo University of Mercantile Marine, Japan and Otago University, New Zealand respectively. He is working at KEDRI, Knowledge Engineering & Discovery Research Institute, AUT as a senior research officer and the research fields he specialises in are AI systems, neuro-networks, fuzzy systems and their applications in prediction, control and image processing.

Multimodal Interfaces

Mr. Stephen Reed
Auckland University of Technology
New Zealand

The growing interest in multimodal interface design is inspired by the goals of supporting more transparent, flexible, efficient, and powerfully expressive means of human-computer interaction than in the past. Multimodal interfaces are expected to support a wider range of diverse applications, be usable by a broader spectrum of the average population (everyone), and function more reliably under realistic and challenging usage conditions. Optimism is growing that the near future will witness rapid growth in human-computer interaction using voice. System prototypes have recently been built that demonstrate speaker-independent real-time speech recognition, and understanding of naturally spoken utterances. Already, computer manufacturers are building speech recognition subsystems into their new product lines.

The goal for multimodal interfaces is to free human computer interaction from the limitations and acceptance barriers due to rigid operating commands and interfaces such as keyboards and mice. By using multimodal interfaces all available human communication modalities can be involved and utilised. These human modalities include Speech, Gesture and Pointing, Eye-Gaze, Lip Motion and Facial Expression, Handwriting, Face Recognition, Face Tracking, and Sound Localization. Some examples of multimodal applications range from map-based and virtual reality systems for engaging in simulations and training, to field medic systems for mobile use in noisy environments, to web-based transactions and standard text-editing applications that will reshape daily workflow and have a significant commercial impact. Such multimodal interfaces are expected to provide more flexible, natural and productive communications between humans and computers. Because of its pervasive presence, voice recognition will be focused on in this discussion and the way in which it can be used within a multimodal interface design.

About the speaker

Stephen is currently working on a Masters in Information Technology at AUT. His interests lie in voice recognition applications and project management and he is looking at ways to combine these to improve workflow within the office environment. His thesis will focus on enabling visually impaired users to access such systems as email, calendar and tasks via voice recognition, with a goal that everyone could use the application to increase workflow.

Stephen has recently spent 10 weeks at Stanford University working on a summer program in which graduate students using breakthrough technology built prototypes that give persons with disabilities alternative ways to access computers and information appliances. The rigorous, ten-week curriculum was designed to enable completion of an Archimedes Demonstration Suite and Test Bed that has been requested by universities and industry to facilitate their own research, design, and testing of accessible user interfaces. Stephen's role in the project was to work through issues concerning the interface of multimodal inputs into the system (voice, pointing, sensors) and the integration management of these inputs with the target devices (PCs, ATM, Home Automation).

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Adaptive Speech Recognition Development Environment

Akbar Ghobakhlou
Research Officer
Auckland University of Technology

This project provides an environment for developing an adaptive speech recognition system. It consists several modules, including, signal processing, design neural network model, validation of the model and adaptation of the model.

The signal processing module includes most common techniques used in speech processing (eg. FFT, MSCC, DCT). Evolving connectionist systems such as ECoS or ZISC can be used to construct an architecture for an adaptive speech recognition system. The recognition engine is adaptable to new speakers and can expand its output domain (ie. vocabulary expansion).

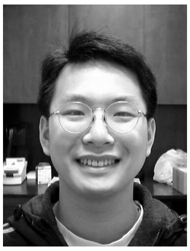
A graphical user interface is designed to allow interaction with the various modules of the system. It facilitates visualisation modules within this project. The environment enables users to build their own customised speech recognition system.

About the speaker

Akbar Ghobakhlou obtained his BSc with Honours in 1997 from the University of Otago. He is a research fellow and group leader in the Knowledge Engineering and Discovery Research Institute at the Auckland University of Technology. His current research interests include speech recognition, signal processing, image & video data and evolving neural networks.

Neural Network Based Decision Support System on Pocket PC

Peter Hwang
Research Officer
Auckland University of Technology



The goal for this project is to create an adaptive online intelligent decision support system that is easily accessible, fast, and up to date. The system should continuously train itself base on the data it retrieved from various organisations through Internet, hence provide the most accurate prediction.

In addition to the powerful decision support system that runs on a fast computer, we would like to make it available for people in the profession that are frequently on the move and need accurate onsite prediction.

About the speaker

Peter is a research officer at Knowledge Engineering and Discovery Research Institute (KEDRI), currently completing his Master of Commerce degree at Otago University. He is also the project leader of the Intelligent Pocket Computer Systems project at KEDRI. His interests are in software internationalisation, agent communication and decision support systems with neural network.