



Welcome to our new Newsletter summarising some of our recent activities. As you can see the CCI is very active in a number of areas and I believe we are going from strength to strength. I would like to draw your attention in particular to our successes on the funding front with significant income from EPSRC, Lachesis and the DTI. This is extremely important as it builds our infrastructure and is evidence of industrial impact of our work. We have also made significant progress on publications with some outstanding journal articles. All our publications appear on the CCI web site which is now, in my opinion, one of the best research group sites around and we should congratulate Simon Coupland on his endeavours.

- From Professor Bob John

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Activities of CCI Members

Journal Editorial Board

Professor Bob John, the Director of CCI, is a Member of the Editorial Board of the following international journals:

- *International Journal of Cognitive Neurodynamics,*
- *International Journal of Computational Intelligence,*

- *International Journal for Computational Intelligence and Information and Systems Sciences.*

Additionally, Professor John is a Vice-chairman of the Fuzzy Technical Committee (FTC) of the IEEE Neural Networks, and a Member of EPSRC College in the UK.



Professor John (3rd from right) and Dr. Chiclana (2nd from right) at the *Second International Workshop of Artificial Intelligence*, Pamplona, Spain, 30 November ~ 2 December 2005



Activities of CCI Members

Conference organisation and committee members



Professor Bob John presented a proposal to hold the FUZZ-IEEE conference in UK, the most important conference in the fuzzy logic community, then as a part of a national team (with the Universities of Essex, Aberystwyth and Bristol) that has been awarded the right. He is now a co-general chair of the FUZZ-IEEE conference in London in 24-26 July, 2007 (www.fuzziee2007.org).

Since October 2005 (the last issue of Newsletter published), many CCI members have been actively participating in committees for conference organisations and programmes. Professor John was a Chair of the Organising Committee for Evolutionary Fuzzy Systems 2006, and a Member of Program Committee of the 2006 International Conference on Parallel Problem Solving From Nature (PPSN: <http://ppsn2006.raunvis.hi.is/>) in Reykjavik, Iceland on 9-13 September, 2006. The PPSN has been one of the most respected high-quality international conferences in Natural Computing since 1990. He is also a Programme Committee Member of 2007 IEEE Symposium Series on Computational Intelligence and 2006 IEEE International Conference on Granular Computing.

Dr. Francisco Chiclana is chairperson of a Special Session on Fuzzy Approaches in Preference Modelling, Decision Making and Applications for 2007 FUZZ-IEEE Conference in London. Additionally, he is a Programme Committee Member of the following conferences:

- *The XIII Spanish Conference on Fuzzy Logic and Technology, Ciudad Real, Spain, September 2006.*
- *International ADIS e-Commerce 2006*

Conference, Barcelona, Spain, 9-11 December 2006

- *The 6th International Conference on Recent Advances in Soft Computing (RASC), Canterbury, UK, 10-12 July 2006*
- *The 2006 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE 2006), Sheraton Vancouver Wall Centre, Vancouver, BC, Canada, July 16-21.*
- *The First IEEE Symposium on Computational Intelligence in Multi-Criteria Decision-Making (MCDM 2007), Honolulu, Hawaii, April 1-5, 2007.*
- *The 8th International Conference on Electronic Commerce and Web Technologies - EC-Web '07, Regensburg, Germany 3-7 September 2007*
- *The EUROFUSE 2007, New Trends In Preference Modelling and Applications, University of Jaén (Spain) April 11-13, 2007.*
- *The WCE 2007, World Congress on Engineering, London, UK, 2-4 July 2007.*

Dr. Yingjie Yang is a Program Committee Member of The Fourth International Symposium on Neural Networks (ISNN2007 <http://www.acae.cuhk.edu.hk/~isnn2007>).

Dr Simon Coupland will co-chair (with Prof. Jerry Mendel) a Special Session on the Type-2 Fuzzy Logic Theory for 2007 FUZZ-IEEE Conference in London.

Dr Aladdin Ayesh will be chairing a Special Session on Computational Intelligence in Cognitive Agents for Gaming for 2007 FUZZ-IEEE Conference in London.

Dr. Shang-Ming Zhou was invited to be a Member of Programme Committee for IEEE Conference on Systems, Man and Cybernetics 2007 (IEEE SMC07: <http://www.smc2007.org>)

"So far as the laws of mathematics refer to reality, they are not certain. And so far as they are certain, they do not refer to reality."

- Albert Einstein



Pioneer 2 robot



Activities of CCI Members

Home collaborations

Collaborating with ASAP group at University of Nottingham, Professor John has been awarded an EPSRC project titled "Towards a Framework for Modelling Variation in Automated Decision Support" (EP/C542207/1). Moreover, Professor John is a CEO of Data Perspective Ltd.

International collaborations

In this year, Professor Bob John internationally collaborated with Professor Mendel from University of South California, which has led to the publication of a paper in *IEEE Transactions on Fuzzy Systems* 14(6) 2006. Additionally, Professor John is an active member in the Spanish National Network in Decision Making (REDEMAP II - TIN2004-21700-E: Preference Modelling and Aggregation) for the period 2005-2006.

Dr. Francisco Chiclana had close research collaborations with the following international units:

Soft Computing and Intelligent Information Systems Group (SCI2S)
 Department of Computer Science
 and Artificial Intelligence (DECSAI)
 University of Granada
 SPAIN

Intelligent Systems Research Group
 Department of Computer Science
 University of Jaen
 SPAIN

Dipartimento di Informatica e Studi Aziendali
 University of Trento
 ITALY

During this period, two Spanish research visitors, Mr Miguel Pagola

(lecturer from the Public University of Navarra in Spain) and Dr Francisco Mata (lecturer from the University of Jaen in Spain), spent 3 months conducting collaborative research with members of the CCI. From 20th June 2006 to 20th September 2006, as a research visitor, Mr Miguel Pagola carried out research toward his PhD thesis in the field of "Type-2 Fuzzy Logic and Image Processing" in collaboration with Prof. Bob John, Dr. Simon Coupland and the CCI members. From the 1st July 2006 to 30th September 2006, as a research visitor, Dr Francisco Mata carried out research in the area of linguistic preference modelling, and consensus reaching in group decision making in collaboration with Dr Francisco Chiclana.

Mr Eric Goodyer internationally collaborated with UKE Hamburg for mapping the Visco-Elastic properties of the human vocal fold, Wisconsin University Hospital for tissue engineering by genetic transfection, and UCLA for reinnervation as a therapy for vocal fold paresis.

Plenary presentations in conferences

Professor Bob John was invited to give a plenary talk at the prestigious World Congress on Computational Intelligence on 16-21 July, 2006, Vancouver, Canada (<http://www.wcci2006.org/>). He was also invited to give talks on type-2 fuzzy logic to staff and students at the University of Granada in Spain, a premier fuzzy logic group in Spain, and on type-2 fuzzy logic at the University of Pamplona in Spain.

Dr. Francisco Chiclana was invited to give a presentation at *the Second International Workshop of Artificial Intelligence*, University of Pamplona, Pamplona, Spain 30 November ~ 2 December 2005.



AIBO robot

*"As complexity rises,
 precise statements lose
 meaning and meaningful
 statements lose precision."*

- Lotfi Zadeh



Activities of CCI Members



PeopleBot Robot

In addition, an invited research talk given by Dr. Chiclana to PhD students took place at Department of Computer Science, and Artificial Intelligence (DECSAI), University of Granada, SPAIN, in May 2006.

Dr. Aladdin Ayesb was invited to give a plenary talk at the Second Jordan International Conference on Computer Science and Engineering, 5-7 December, 2006.

Seminars

The CCI organises regular seminars. Dr Huseyin Seker is in charge of the seminar organisations in the CCI.

Beginning the 30th November, 2006, the Fuzzy Logic Group within the CCI held a series of 5 seminars on type-2 fuzzy logic including:

- Dr. Jenny Carter:
"What Is Type-2 Fuzzy Logic?"
- Prof. Bob John:
"Type-2 Fuzzy Logic: Past, Present and Future"
- Dr. Shang-Ming Zhou:
"New Types of OWA Operators for Aggregating Type-1 Fuzzy Sets and Type-2 Fuzzy Sets in Decision Making"
- Mrs. Sarah Greenfield:
"Generalised Type-2 Fuzzy Inferencing Systems: The Search for Speed"
- Dr. Simon Coupland:
"Geometric Type-2 Fuzzy Sets and Applications."

Reviewers

During this period, the CCI members were invited to review papers for international journals and conferences including

International Journals:

- *IEEE Transactions on Fuzzy Systems* (Professor Bob John, Dr. Francisco Chiclana, Dr. Shang-Ming Zhou, Dr. Simon Coupland)
- *IEEE Transactions on Signal Processing* (Professor Bob John)
- *IEEE Transactions on Neural Networks* (Professor Bob John, Dr. David Elizondo)
- *IEEE Transactions on Systems, Man and Cybernetics-Part A* (Professor Bob John, Dr. Francisco Chiclana, Dr. Shang-Ming Zhou)
- *IEEE Transactions on Systems, Man and Cybernetics-Part B* (Professor Bob John, Dr. Francisco Chiclana, Dr. Shang-Ming Zhou)
- *IEEE Transactions on Systems, Man and Cybernetics-Part C* (Professor Bob John)

(Alphabetically)

- *American Journal of Mathematical and Management Sciences* (Dr. Shang-Ming Zhou)
- *Expert Systems: The International Journal of Knowledge Engineering and Neural Networks* (Dr. Shang-Ming Zhou)
- *European Journal of Operational Research* (Dr. Francisco Chiclana)
- *Fuzzy Sets and Systems* (Dr. Francisco Chiclana, Dr. Shang-Ming Zhou)
- *IMA Journal of Management Mathematics* (Dr. Francisco Chiclana)
- *Information Fusion* (Dr. Francisco Chiclana)

"The usefulness of fuzzy subsets of type II (type-2) is that it enables us to extend membership grades to linguistic values."

- Didier Dubois and Henri Prade



Activities of CCI Members

- *Information Sciences* (Dr. Francisco Chiclana, Dr. Shang-Ming Zhou)
 - *International Journal of Artificial Intelligence in Medicine* (Dr. Francisco Chiclana)
 - *International Journal of Computer Mathematics* (Dr. Shang-Ming Zhou)
 - *International Journal of Information Technology & Decision Making* (Dr. Francisco Chiclana)
 - *International Journal of Systems Science* (Professor Bob John)
 - *Journal of Intelligent and Fuzzy Systems* (Dr. Francisco Chiclana)
 - *Journal of the O.R. Society* (Professor Bob John)
 - *Neurocomputing* (Dr. David Elizondo, Dr. Shang-Ming Zhou)
 - *IEEE International Conference on Systems, Man and Cybernetics (IEEE SMC 2006)* (Dr. Shang-Ming Zhou)
 - *IEEE International Conference on Systems, Man and Cybernetics (IEEE SMC 2007)* (Dr. Shang-Ming Zhou)
 - *ICC 2007 Computer and Communications Network Security Symposium* (Dr. Francisco Chiclana)
 - *The 2nd IFAC International Conference on Modeling and Design Control Systems in Agriculture 2007* (Dr. Shang-Ming Zhou)
 - *The Fourth International Symposium on Neural Networks (ISNN2007)* (Dr. Simon Coupland, Dr. Shang-Ming Zhou)
 - *IEEE Symposium on Foundations of Computational Intelligence (FOCI 2007)* (Dr. Francisco Chiclana, Dr. Shang-Ming Zhou)
 - *The 11th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems Conference (IPMU2006)* (Dr. Francisco Chiclana, Dr. Simon Coupland).
- International Conferences** (Alphabetically):
- *FUZZ-IEEE 2005* (Professor Bob John, Dr. Francisco Chiclana)
 - *FUZZ-IEEE 2006* (Professor Bob John, Dr. Simon Coupland))
 - *FUZZ-IEEE 2007* (Professor Bob John, Dr. Simon Coupland)

Promotion and New Staff

Dr. Francisco Chiclana was promoted to the principal lecturer in August 2006.

Dr. Shang-Ming Zhou joined the CCI as a research fellow on 1st June 2006 to work on an EPSRC project titled "*Towards a Framework for Modelling Variation in Automated Decision Support*" (EP/C542207/1). His research interests include: 1) fuzzy logic systems (type-1 and type-2) and applications, particularly to decision making; 2) model interpretability and transparency

in neurofuzzy systems; 3) kernel machine learning (including support vector machines) with fuzzy computing; 4) artificial neural networks and pattern recognition; 5) intelligent signal and image processing.

Mr. Simon Bennett joined the CCI as a Visiting Industrial Research Fellow at the start of November. Mr. Bennett is an Enterprise Architect in the Corporate IT Department of Celesio AG, a German-owned, European pharmaceu-



Lego Mindstorm kits for Teaching



Khepera robot



Promotion and New Staff



tical distributor and retailer that owns companies in 16 countries in Europe. Mr. Bennett will initially be researching business rules and how to organise rules in a way that reflects the architecture of the software system in which they will be used. He is a co-author of two books on UML and worked at De Montfort University from 1990 to 1999. He was a principal lecturer in the Department of Information Systems and a member of the CCI in its early days. He was principal investigator on an EPSRC

project on knowledge management and vehicle scheduling. He left De Montfort University in 1999 to join Ericsson Intracom as an Information Systems Consultant. At Ericsson Intracom he led projects to implement a knowledge management system for the Engineering Department and a new manufacturing system in the Production Department. In his current role at Celesio he is part of a team that sets the technology strategy for the group of companies and provides support on major projects.

PhD Students

- Mrs Rukia Abdulle
- Mr Mousa Al Akhras
- Mr Muna Al Harazi
- Mr Suhail Al Humoud
- Mr Hasan Al Serhan
- Mr Abdul Aldobhani
- Mr Isse Ali
- Mr Shihadeh Alqrainy
- Mr Will Blewitt
- Mr David Fletcher
- Mrs Sarah Greenfield
- Mr Andreas Huemer

- Mr Sabir Hussain
- Mr. Youdthachai Lertworaprachaya
- Mr Andy Mbah
- Mr Hans Prueller
- Mr Manaf Rasol
- Mr Serein Ratrout
- Mr Abdul Saleh
- Mr Mark Simpson
- Mr Roland Stelzer
- Mr. Ganesh Swaminadha
- Mr Joaquim Viana

"Artificial neural systems, or neural networks, are physical cellular systems which can acquire, store, and utilize experiential knowledge."

-Jacek M. Zurada

New MSc Programme

A new MSc programme run by CCI - MSc in Intelligent Systems (IS) has been successfully validated by the panel with only one minor condition. As a distance learning version of the successful MSc in Computational Intelligence & Robotics (CIR), this new programme will run in part time mode. During the application, Dr. Jenny Carter worked hard to put this proposal together and CCI team worked diligently to get

material in place and actively supported Dr. Carter. The panel were very complimentary about the proposal and the team and gave a number of commendations. We hope to attract students who are unable to move to Leicester to study the MSc in CIR and as such the marketing of the new course will target businesses in the UK as well as potential overseas applicants. The programme is due to start in September 2007.



New Grants

Project grants

Professor Bob John (CEO of [Data Perspective Ltd.](#)) has won £1/4m of Venture Capital from the Lachesis Fund to develop patented technology for perspective-based data search and enterprise contact management.

Professor Bob John (Principal Investigator) and Dr. Francisco Chiclana won an EPSRC project: "Towards a Framework for Modelling Variation in Automated Decision Support" (EP/C542207/1) with £145K. This is a jointly funded project with the University of Nottingham (who also receive £145K) investigating intra-expert and inter-expert variations in consensus modelling.

Professor Bob John has recently been awarded a DTI project titled "Improving customer demand and cost forecasting methods" (TP/5/DAT/6/1/H0254E) worth £1.1m. This project is joint with Dave Stockton in Engineering and is aimed at using AI techniques (fuzzy logic, neural networks and evolutionary computing) to improve both costing and demand forecasting in a variety of industries.

Mr Eric Goodyer, collaborating with Thorlux, has won a DTI funded KTP project with £108,448 to develop a telematic system that enables users to interrogate the status of emergency lighting via a dynamic website. Most recently Mr Goodyer received a £29k grant from the Royal Society to develop a dynamic tissue tensiometer, and a £15.7k grant from the EPSRC to collaborate with UCLA who are investigating reinnervation therapy as a means to cure vocal fold paresis.

As a co-investigator, Dr. Francisco Chiclana, collaborating with Dr. Luis

Martínez López (Principal Investigator, University of Jaén - Spain), has been awarded a research project: "Decision Models with uncertainty in Heterogeneous contexts. Application to Evaluation Processes in On-line Environments" sponsored by Spanish Department for Education and Culture with €50,450 from January 2007 to December 2009.

Dr. Francisco Chiclana joined a Research project: "Project of Excellence: Development of WEB Information Access Systems Based on Artificial Intelligence Techniques (SAINFOWEB)" sponsored by Consejería de Innovación Tecnológica (Junta de Andalucía - SPAIN) with €50K from December 2005 – July 2008. Dr. E. Herrera-Viedma from University of Granada, Spain is the Principal Investigator of this project.

Additionally, Dr. Francisco Chiclana joined a Research project: "An information system for the quality of aerial transportation based on artificial intelligence techniques and oriented towards the citizen" sponsored by Ministerio de Fomento (Spain) with €96K for the period of December 2005 to June 2008. Dr. E. Herrera -Viedma from University of Granada, Spain is the Principal Investigator of this project.

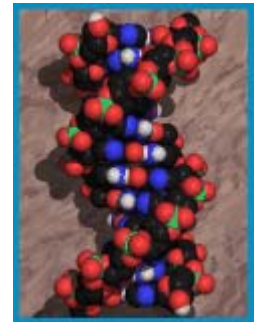
Dr. Simon Coupland has won an Innovation Fellowship grant funded by HIRF worth £16,028 for hardware implementation of type-2 fuzzy logic systems.

Conference grants

Professor Bob John also recently was awarded a Royal Society grant for an incoming researcher from Granada which has led to some fundamental developments in preference modelling.

Bioinformatics

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"Computer programs that 'evolve' in ways that resemble natural selection can solve complex problems even their creators do not fully understand ."

-John H. Holland



Conference grants

Dr. Francisco Chiclana was awarded a Royal Society grant in £790 to present and disseminate research

findings at The 11th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems Conference (IPMU2006) held in Paris in July 2006.

Publications

2007 (recent)

Journals:

- Alonso, S., E. Herrera-Viedma, F. Chiclana, F. Herrera, "A Consensus Model for Group Decision Making with Incomplete Fuzzy Preference Relations," *IEEE Transactions Fuzzy Systems* (Accepted for publication)
- Alonso, S., F. Chiclana, F. Herrera, E. Herrera-Viedma, J. Alcalá-Fernández, C. Porcel, "A Consistency Based Procedure to Estimate Missing Pairwise Preference Values," *International Journal of Intelligent Systems* (Accepted for publication)
- Chiclana, F., E. Herrera-Viedma, F. Herrera, S. Alonso, "Some Induced Ordered Weighted Averaging Operators and Their Use for Solving Group Decision-making Problems Based on Fuzzy Preference Relations," *European Journal of Operational Research* (Accepted for publication)
- Coupland, S. and R. I. John, "Geometric Type-1 and Type-2 Fuzzy Logic Systems," *IEEE Transactions on Fuzzy Systems* (Accepted for publication)
- Herrera-Viedma, E., F. Chiclana, F. Herrera, S. Alonso, "A Group Decision-Making Model with Incomplete Fuzzy Preference Relations Based on Additive Consistency," *IEEE Transactions on Systems, Man, and Cybernetics Part B: Cybernetics* (Accepted for publication)
- Zhou, S. -M. and J. Q. Gan, "Constructing parsimonious fuzzy classifiers based on L2-SVM in high-dimensional space with automatic model selection and fuzzy rule ranking," *IEEE Transactions on Fuzzy Systems*, 2007 (In press).
- Chiclana, F., E. Herrera-Viedma, S. Alonso, R.A. Marqués Pereira, "Preferences and Consistency Issues in Group Decision Making," In: *Fuzzy Sets and Their Extensions: Representation, Aggregation and Models. Intelligent Systems from Decision Making to Data Mining, Web Intelligence and Computer Vision*. H. Bustince, F. Herrera, J. Montero, editor, 2007.
- Coupland, S., "Type-2 Fuzzy Sets: Geometric Defuzzification and Type-Reduction," In *Proc. FOCI 2007*, Honolulu, Hawaii, USA., 2007.

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Journals:

- Algrainy, S. and A. Ayesh, "Developing a Tagset for Automated POS Tagging in Arabic," *WSEAS Transactions on Computers* 5(11): 2787-2792, 2006.
- Elizondo, D., "The Linear Separability Problem: Some Testing Methods," *IEEE Transactions on Neural Networks*, 17(2):330-344, March 2006.
- Goodyer, E. N., F. Muller, B. Bramer, D. Chauhan, M. Hess, "In Vivo Measurement of the Elastic Properties of the Human Vocal Fold," *European Archives of Oto-Rhino-Laryngology*, 263(5):445-462, May 2006.
- Goodyer, E. N., F. Muller, M. Hess, "In Vivo Measurement of the Shear Modulus of the Human Vocal Fold - Interim Results from 8 Patients," *European Archives of Oto-Rhino-Laryngology* (In Press) 2006.
- Hertegård, S., Å. Dahlqvist, E. Goodyer E, Maurer, "Viscoelastic Measurements After Vocal Fold Scarring In Rabbits," *Acta Oto-Laryngologica*, 126(7):758-763, July 2006.
- Hess, M., F. Muller, J. B. Kobler, S. Zeitels, E. N. Goodyer, "Measurements of Vocal Fold Elasticity

Book Chapters and Conferences:



Publications

- Using The Linear Skin Rheometer," *Folia Phoniatrica*, 58(3):207-216, April 2006.
- Mendel, J. M., R. I. John and F. Liu, "Interval Type-2 Fuzzy Logic Systems Made Simple," *IEEE Transactions on Fuzzy Systems*, 14(6) 2006.
 - Yang, Y., R.I. John, "Roughness Bounds in Rough Set Operations," *Information Sciences*, 176:3256--3267, 2006.
 - Zhou, S. -M. and J. Q. Gan, "A new fuzzy relaxation algorithm for image enhancements," *International Journal of Knowledge-Based & Intelligent Engineering Systems*, 10(3):181-192, 2006.
 - Zhou, S. -M. and J. Q. Gan, "Constructing accurate and parsimonious fuzzy models with distinguishable fuzzy sets based on an entropy measure," *Fuzzy Sets and Systems*, 157(8):1057-1074, 2006.
 - Alonso, S., E. Herrera-Viedma, F. Chiclana, F. Herrera, F.J. Cabrerizo, "An Interactive Support System to Aid Experts to Express Consistent Preferences," *7th International Fuzzy Logic and Intelligent technologies in Nuclear Science Conference (FLINS2006)*.
 - Alonso, S., E. Herrera-Viedma, F. Herrera, F. Chiclana, "Dealing With Ignorance Problems in Decision Making Under Fuzzy Preference Relations," *13th Spanish Conference on Fuzzy Logic and Technologies (ESTYLF2006)*.
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 - Coupland, S., M. Gongora, R. I. John, K. Wills, "A Comparative Study of Fuzzy Logic Controllers for Autonomous Robots," In *Proc. IPMU 2006*, pages 1332-1339, Paris, France, 2006.
 - Coupland, S. and R. John, "An Investigation into Alternative Methods for the Defuzzification of an Interval Type-2 Fuzzy Set," In *Proc. Fuzz-IEEE 2006*, pages 7196-7203, 2006.
 - Elizondo, D., R. Birkenhead, and R. Taillard, "Generalisation and the Recursive Deterministic Perceptron," In *IEEE International Jointed Conference on Neural Networks*, Vancouver, Canada, July 2006.
 - Gan, J. Q. and S. -M. Zhou, "A new fuzzy membership function with applications in interpretability improvement of neurofuzzy models," In *Proc. of International Conference on Intelligent Computing (ICIC)*, Lecture Notes in Computer Sciences (LNCS)/Lecture Notes in Artificial Intelligence(LNAI), Springer, Kunming, Yunnan Province, China, August 2006, Springer.
 - Gongora, M.A., and W. Ashfaq, "Analysis of Passenger Movement at Birmingham International Airport," *CEC 2006*
 - Goodyer, E., S. Hemmerich, F. Mueller, A. -K. Licht,
- Book Chapters and Conferences:**
- Alonso, S., E. Herrera-Viedma, F. Chiclana, F. Herrera and C. Porcel, "Strategies to Manage Ignorance Situations in Multiperson Decision Making Problems In Modeling Decisions for Artificial Intelligence," *Third International Conference, MDAI 2006*, Lecture Notes in Computer Science Volume 3885
 - Alonso, S., E. Herrera-Viedma, F. Chiclana, F. Herrera, F.J. Cabrerizo, "A Decision Aid System to Provide Consistent Linguistic Preference Relations," *6th International Conference on Recent Advances in Soft Computing (RASC 2006)*
 - Alonso, S., E. Herrera-Viedma, F. Herrera, F. Chiclana, "A General Procedure to Estimate Missing Values for Incomplete Fuzzy Preference Relations," *11th International Conference on Information Processing and Management of Uncertainty in Knowledge-based Systems (IPMU 2006)*, Presentation funded by the "Royal Society - Conference Grants Scheme."



Publications

M. Hess, "Characterisation of the Elasticity of the Human Vocal Fold using Electromechanical Measurement Techniques," In *7th International Conference Advances in Quantitative Laryngology, Voice and Speech Research*, University Medical Center Groningen, October 2006.

- John, R. and S. Coupland, "Extensions to Type-1 Fuzzy: Type-2 Fuzzy Logic and Uncertainty," in Gary Y. Yen and David B. Fogel, editor, *Computational Intelligence: Principles and Practice*, 5, pages 89 - 102, IEEE Computational Intelligence Society, 2006.
- John, R., J. Mendel, and J. Carter, "The Extended Sup-Star Composition for Type-2 Fuzzy Sets Made Simple," In *Proc. FUZZ-IEEE*, pages 7212 - 7216, 2006.
- Seker, H., "Multiple Clustering Models and SVD-QR-based Method for Reliable Gene Expression Profile Analysis," *Proc. IPMU 2006*, Paris, France, 2006.
- Yang, Y., R.I. John, "Roughness Bounds in Set-oriented Rough Set Operations," *Proc. FUZZ-IEEE 2006*, pages 1461 - 1468, 2006.
- Yang, Y., D. Gillingwater and C. Hinde, "Soft computing in geographical Information Systems," In S. Rana and J. Sharma, editor, *Frontiers of Geographical Information technology*, Springer, 2, pages 47--62, 2006.
- Zhou, S. -M. and J. Q. Gan, "Multiple objectives learning for constructing interpretable Takagi-Sugeno fuzzy model," in Yaochu Jin(ed), *Multi-Objective Machine Learning*, Studies in Computational Intelligence, pages 385-403, Springer-Verlag (Invited), 2006.



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We're on the Web!

<http://www.cci.dmu.ac.uk>

The Centre for Computational Intelligence conducts research into these main areas:

Type-2 Fuzzy Logic and Fuzzy Systems

Type-2 Fuzzy Logic is a growing area and we are a leading group in the development of theoretical and application issues. We also research into the use of fuzzy logic in human decision making problems. For example, we investigate the applications of fuzzy logic to solve difficult problems of medical diagnosis based on image interpretation and symptom analysis. Another application field is fuzzy user modelling for personalized systems.

Reasoning, Agents and Mobile Robots

Knowledge Representation and Reasoning as applied to mobile robotics and autonomous agents. Current research includes:

- Emotion and Perception Based Reasoning
- Collaborative behaviour and multi-agent systems

In addition, we investigate motion control and tracking using stereo vision. As a result of this work we have developed an approach for real time map generation.

Sub-groups within the CCI

[Bio-Health Informatics](#)

The Bio-Health Informatics research group is a multi-disciplinary research team at the Centre of Computational Intelligence in the School of Computing, De Montfort University. This group is dedicated to developing the state-of-the art, accurate and reliable computer-based tools for computational decision making in biology and healthcare. The group supports MSc Bioinformatics programme and offers MPhil and PhD studies in various computational biology and health related subjects.

[Fuzzy Logic](#)

The Fuzzy Logic Group is a world leading group in the area of type-2 fuzzy logic. This group is dedicated to making a significant contribution to the theoretical foundations and real world applications of uncertainty models, including fuzzy sets, rough sets and grey systems.

[Mobile Robotics and Creative Computing](#)

Intelligent Mobile Robots and Creative Computing (IMRCC) Group came about as a result of expansions in the Centre for Computational Intelligence (CCI) and in our robotics portfolio. This portfolio expanded from a single undergraduate module in mobile robotic systems to a range of undergraduate and postgraduate modules and programs supported by increase in number of PhD students and substantial investment by the University in mobile robots.

