

Curriculum Vitae

July 2007

1 Personal Information

NAME Joshua D. Knowles

WORK ADDRESS

School of Computer Science
University of Manchester
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NATIONALITY British & Australian (dual citizenship).

MAIN RESEARCH INTERESTS Evolutionary computation, multiobjective optimization, combinatorial optimization, memetic algorithms, ant algorithms, meta-learning in optimization, and computational biology applications.

QUALIFICATIONS BSc (Hons) Physics with Mathematics, University of Reading (1993); PGCE, University of Reading (1994); MSc (Dist'n) Information Systems Engineering, University of Reading (1997); PhD, University of Reading (2002).

2 Current Appointment

Oct 2006 —: Career Development Fellow, School of Computer Science, The University of Manchester, UK. Duration: 60 months, becoming permanent.

Oct. 2003 —: BBSRC David Phillips Fellow, School of Chemistry / Manchester Interdisciplinary Biocentre (MIB), The University of Manchester, UK. Duration: 60 months, value: £399k. Title: Interactive evolutionary search for post-genomic knowledge discovery and prediction.

3 Awards

IEEE Transactions on Evolutionary Computation Outstanding Paper Published in 2003 Award.

Joshua Knowles and David Corne. Properties of an adaptive archiving algorithm for storing nondominated vectors. Vol 7, Number 2, 2003.

For details, see: <http://iee-cis.org/awards/>

4 Previous Fellowships and Studentships

Jul. 2003 Chargé de recherches du FNRS — Belgian National Research Fellowship (declined).

Sep. 2001 — **Sep. 2003** European Commission Marie Curie Post-Doctoral Fellowship, hosted at IRIDIA, Université Libre de Bruxelles, Belgium.

Jul. 1997 Short-term research fellowship, British Telecommunications, plc., BT Labs, Martlesham Heath, Ipswich, UK (6 weeks, full-time).

Oct. 1997 — **Oct 2001** PhD Studentship, British Telecommunications, plc., hosted at the Dept. of Computer Science, University of Reading, UK.

5 Recent and Ongoing Research (since 2006)

NB: References are for publications listed in section 13.1. Grant codes refer to grants listed in section 6.

In collaboration with Prof Doug Kell and Dr Julia Handl, plus UMIP and business partners, forming a spin-off company related to the work of Handl, Knowles and Kell on multiobjective machine learning [3].

Editing and contributing to a book [1, 7], which explains how evolutionary multiobjective optimization is now being used to solve single-objective problems (with Prof David Corne and Prof Kalyanmoy Deb).

Applying multiobjective evolutionary algorithms to the problem of weighting alternatives in the analytical hierarchy process (AHP) of decision making (with Dr Ludmil Mikhailov).

Developing performance assessment software tools for stochastic multiobjective optimizers (with Prof Carlos Fonseca, Prof Lothar Thiele and Dr Eckart Zitzler) for the PISA framework (served by ETH Zurich <http://www.tik.ee.ethz.ch/sop/pisa/?page=assessment.php>)

Developing methods for protein structure prediction with multiobjective force field models (with Dr Simon Lovell and Dr Julia Handl in Faculty of Life Sciences), work funded by an MRC fellowship for Handl.

Reviewing the literature on methods for expensive optimization (with Prof Hirotaka Nakayama of University of Kobe, Japan) in multiobjective optimization. Resulted in a book chapter [6] in forthcoming major book on multiobjective optimization and decision making.

Developing an ant colony optimization algorithm for NMR structure elucidation (with Caroline Farrelly and Prof Doug Kell, School of Chemistry), a project with Astra Zeneca.

Scheduling of assays, and optimization of instruments [11] for BBSRC grant BB/C5190381, a collaboration with AZ and GSK.

Investigating how performance of multiobjective optimizers is affected by the number of objectives (with Prof David Corne) [9, 10].

Designing and running evolutionary computing algorithms for ‘evolving’ protein aptamers on bespoke microarray chip technology provided by Combimatrix (with Kell Group, School of Chemistry) for BBSRC grant BB/D017432/1.

6 External Grants

6.1 Funded

BB/E016065/1 Co-Investigator on BBSRC Grant, Target practice: informatic and metabolomic assessment of biological network changes and of drug-cell interactions, Mar. 2007 – Feb. 2010. £1,287,697.

BB/D017432/1 Co-Investigator on BBSRC Grant, A novel strategy for microarrays of selective binding agents: closed loop aptameric directed evolution (CLADE), Mar. 2006 – Feb. 2009. £646,875.

BB/C007158/1 Co-Investigator on BBSRC Grant, Constrained optimisation of metabolic and signalling pathway models: towards an understanding of the language of cells, Jul. 2005 – Aug. 2008. £353,607.

BB/C008219/1 Co-Investigator on BBSRC Grant, The Manchester Centre for Integrative Systems Biology, Oct. 2005 – Sep. 2010. £6,312,984.

BB/C5190381 Co-Investigator on BBSRC Grant, The human serum metabolome in health and disease, May 2005 – May 2009. £1,083,262.

EP/D013615/1 Co-Investigator on EPSRC Grant, A convergent strategy for high efficiency quantitative proteomics, Oct. 2005–Sep. 2008. £1,249,267.

7 Teaching

7.1 Previous experience

A qualified secondary school teacher in physics with two years of full-time experience of teaching to A' level. Experience in University Lecturing (30 hours) in previous positions.

7.2 Training and Continuing Professional Development

Signed up for the Faculty New Academics Programme, commencing October 2007.

7.3 Postgraduate Taught and Postgraduate Research Courses

Plan to co-write an MSc module on optimization with Dr Jonathan L. Shapiro.

Supervision:

1. MSc Dissertation Supervisor of Alex Wong, 2007.
2. MSc Dissertation Supervisor of Yining Zhao, 2007.
3. PhD Co-supervisor of Caroline Farrelly, 2004 –.
4. PhD Co-supervisor of Julia Handl, 2004 – 2006. Dr Handl is now working in the Faculty of Life Sciences, supported by a Fellowship from the Medical Research Council.
5. PhD Co-supervisor of Yisu Jin, 2005 (during her stay at Manchester from Changsha, China).
6. MSc Dissertation Supervisor of Oliver Purcell, 2005 (passed with distinction).
7. MSc Dissertation Supervisor of William Rowe, 2005 (passed with distinction).

8 Invited Talks and Panel Discussions

1. Invited member of the panel in a panel discussion on Evolutionary Multi-Objective Optimization (EMO) at the IEEE World Congress on Computational Intelligence (WCCI-2006), Vancouver, Canada, July 2006.
2. Invited 'semi-plenary' speaker at the Seventh International Conference on Multi-Objective Programming and Goal Programming, Tours, France, June 2006.
3. Invited tutorial speaker at the Third International Conference on Evolutionary Multiobjective Optimization, Guanajuato, Mexico, April 2005.

9 Invitations to Scientific Meetings

1. Invited to the 2006 Dagstuhl Seminar on Practical Approaches to Multiobjective Problem Solving, Dagstuhl, Germany, November 2006. Attendance by invitation only.
2. Invited to the 2004 Dagstuhl Seminar on Practical Approaches to Multiobjective Problem Solving, Dagstuhl, Germany, November 2004. Attendance was by invitation only.

10 Professional Activities

1. Member of the EPSRC Peer Review College, 2006–2009.
2. External examiner for MSc dissertation of Madeleine Davis Moradkhan, University of Reading, 2005.
3. External assessor for technical reports written at Cranfield University, 2005–.

11 Journal Editing

1. Associate Editor, Swarm Intelligence Journal, 2006–.
2. Editorial Board, Evolutionary Computation Journal, 2007–.
3. Associate Editor, IEEE Computational Intelligence Magazine.
4. Member, Technical Committee on Soft Computing, IEEE Transactions on Systems, Man and Cybernetics.
5. Referee for numerous journals including:
 - Royal Society Journal Interface
 - IEEE Transactions on Evolutionary Computation
 - IEEE Transactions on Systems, Man and Cybernetics
 - Evolutionary Computation
 - European Journal of Operational Research
 - Foundations of Computing and Decision Sciences
 - Journal of Global Optimization
 - Journal of Machine Learning Research
 - Artificial Intelligence Communications.

12 Conference Organization

12.1 Technical and Programme Chair

1. Technical and Program Chair of the 10th online World Conference on Soft Computing (WSC10), The Internet, September 2005.

12.2 Workshop Organizer and Chair

1. Co-organizer and co-chair of the Workshop on Evolution of Natural and Artificial Systems at GECCO 2007, London, UK.
2. Co-organizer and co-chair of Special Session on Evolutionary Computation Approaches to Expensive Optimization Problems at WCCI 2006, in Vancouver, Canada.
3. Co-organizer and co-chair of the Workshop on Multiobjective Problem Solving from Nature at the IXth International Conference on Parallel Problem Solving from Nature, Reykjavik, Iceland, September, 2006.
4. Organizer and chair of the Workshop on Multiobjective Problem Solving from Nature at the VIIth International Conference on Parallel Problem Solving from Nature, Granada, Spain, September, 2002.
5. Organizer and chair of the Workshop on Multiobjective Problem Solving from Nature at the VIth International Conference on Parallel Problem Solving from Nature, Paris, France, September, 2000.

12.3 Special Session Chair

1. Organizing Co-chair of the Special Session on Evolutionary Computation for Expensive Optimization Problems, at the IEEE World Congress on Computational Intelligence, Vancouver, Canada, July 2006.

12.4 Publicity Chair

1. Publicity Co-chair of the 2006 IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology, Toronto, Canada, September 2005.

12.5 Conference Programme Committee Memberships

1. The Genetic and Evolutionary Computation Conference: 2003, 2004, 2005, 2006, 2007.
2. International Conference on Parallel Problem Solving from Nature: 2004, 2006.
3. IEEE Congress on Evolutionary Computation: 2003, 2004, 2005, 2006, 2007.
4. IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology: 2006, 2007.
5. International Workshop on Memetic Algorithms: 2002, 2003.
6. International Workshop on Evolutionary Combinatorial Optimization: 2004, 2005, 2006, 2007.
7. International Conference on Evolutionary Multi-Criterion Optimization: 2001, 2003, 2005, 2007.
8. International Workshop on Ant Algorithms: 2003, 2004, 2006.
9. International Conference on Hybrid Metaheuristics: 2005, 2006, 2007.
10. International Conference on Hybrid Intelligent Systems: 2007.
11. International Workshop on Stochastic Local Search: 2007.

13 Publications

13.1 Selected Recent and Forthcoming Publications (Autumn 2006–)

- [1] **J. Knowles**, D. Corne, and K. Deb, editors. *Multiobjective Problem Solving from Nature*. Springer Natural Computing Series. Springer, 2007. Forthcoming.
- [2] A. Tiwari, **J. Knowles**, E. Avineri, K. Dahal, and R. Roy, editors. *Applications of Soft Computing: Recent Trends*. Springer, 2006.
- [3] J. Handl and **J. Knowles**. An evolutionary approach to multiobjective clustering. *IEEE Transactions on Evolutionary Computation*, 11(1):56–76, 2007.
- [4] J. Handl, D. Kell, and **J. Knowles**. Multiobjective optimization in computational biology and bioinformatics. *IEEE Transactions on Computational Biology and Bioinformatics*, pages 279–292, 4(2).
- [5] Y. Jin, **J. Knowles**, L. Hongmei, L. Yizeng, and D.B. Kell. The landscape adaptive particle swarm optimizer. *Applied Soft Computing*, 2007.
- [6] **J. Knowles** and H. Nakayama. Meta-modeling in multi-objective optimization. In K. Miettinen, K. Deb, and R. Slowinski, editors, *Multi-objective Optimization - Interactive and Evolutionary Approaches*. Springer, 2007. Forthcoming.
- [7] J. Handl and **J. Knowles**. Modes of using multiobjective optimization and the effect on decision making. In *Multiobjective Problem Solving from Nature*, Springer Natural Computing Series. Springer, 2007. Forthcoming.
- [8] N. Ludtke, S. Panzeri, M. Brown, D. Broomhead, **J. Knowles**, M.A. Montemurro, and D.B. Kell. Information-theoretic sensitivity analysis: a general method for credit assignment in complex networks. *Journal of the Royal Society Interface*, 2007. In press.
- [9] D. Corne and **J. Knowles**. Techniques for highly multiobjective optimisation: Some nondominated points are better than others. In *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO)*, LNCS. Springer, 2007. In press.
- [10] **J. Knowles** and D. Corne. Quantifying the effects of objective space dimension in evolutionary multiobjective optimization. In *Evolutionary Multi-Criterion Optimization*, volume 4403 of LNCS, pages 757–771. Springer, 2007.

- [11] S. O'Hagan, W.B. Dunn, **J.D. Knowles**, D. Broadhurst, R. Williams, J.J. Ashworth, M. Cameron, and D.B. Kell. Closed-loop, multiobjective optimization of two-dimensional gas chromatography/mass spectrometry for serum metabolomics. *Analytical Chemistry*, 79(2):464–476, 2007.
- [12] H. Yue, M. Brown, **J. Knowles**, H. Wang, D.S. Broomhead, and D.B. Kell. Insights into the behaviour of systems biology models from dynamic sensitivity and identifiability analysis: a case study of an nf- κ b signaling pathway. *Molecular Biosystems*, 2(12), 2006.