CURRICULUM VITAE

February 2011

Name	Dr. Alberto Moraglio
Date of Birth	14/12/1972
Nationality	Italian
E-mail	a.moraglio@cs.bham.ac.uk
Web page	http://www.cs.bham.ac.uk/~moraglia/

SUMMARY OF EDUCATION, TEACHING & RESEARCH

1/9/2009 - present	*Post-doctoral Research Associate* at the School of Computing, the University of Kent, UK. Investigating the Theoretical Foundations of Genetic Programming and of other Evolutionary Algorithms. Published 14 papers plus 3 under review since September 2009. Editorial work on a book I am co-editing on bridging theory and practice in Evolutionary Computation (due Summer 2011) and working towards publishing my PhD thesis as a monograph. Writing a grant proposal involving the University of Essex, the University of Coimbra and the University of Kent to pursue an ambitious research programme based on my previous research. Given and organized seminars, fostering collaborations, attended conferences, reviewing journal and conference papers, interacting with local researchers and mentoring PhD students, exploring and developing new ideas, and planning research ahead.
1/9/2007 – 30/8/2009	*Assistant Professor* at the Department of Informatic Engineering, the University of Coimbra, Portugal. Teaching (in English) as course director the postgraduate course "Databases and Data Mining" (new course) and the undergraduate courses "Informatic Systems" (large course with more than 150 students) and part of the teaching team for "Introduction to Artificial Intelligence" (large course with more than 200 students). Supervising a PhD student, final projects of Master students and a number of group projects of undergraduate students. Member of the Evolutionary and Complex System research group. Research on theory and applications of Evolutionary Algorithms. Member of examination boards of Master theses and external examiner of PhD theses.
1/9/2008- 1/3/2009	*Visiting Academic* at School of Computing, the University of Essex, UK (research leave): - Initial work on a grant proposal with Prof. Riccardo Poli for a project aimed at developing practical applications of a theoretical framework for the analysis and design of evolutionary algorithms. - Initial work on two books: (i) a book on bridging theory and practice in

1

	Evolutionary Computation co-edited with Dr. Yossi Borenstein; (ii) a book based on my PhD thesis.
	- Research on extending the above theoretical framework to other algorithms including Particle Swarm Optimization, Differential Evolution, Estimation of Distribution Algorithms and Supervised Machine Learning.
2006	*Research Assistant* for the project "Recombination Operators for Finite State Machine" at University of Essex, UK.
2003 - 2004	*Graduate Teaching Assistant* for the course "Genetic Programming and its Applications" at the University of Essex, UK.
2003	*Teaching Assistant Qualification* from the University of Essex, UK
2003 – 20/11/2007	*PhD student* in Computer Science at the University of Essex, UK. PhD thesis: "*Towards a Geometric Unification of Evolutionary Algorithms*". This thesis presents a formal and practical geometric framework for the analysis and principled design of search operators for new optimisation problems based on pre-existing and new solution representations. Supervisor: Prof. R. Poli.
2002	*Gap Year,* Backpacking in South America
2000 – 2001	*Researcher* at Hewlett Packard research laboratories (HP Labs) in Bristol, UK, working in the European project "Market Managed Multi-service Internet". In charge of developing a distributed simulator with learning agents and analysing their behaviour.
1992 - 2000	Laurea (*Master and Bachelor degrees*) in Computer Engineering at Polytechnic University of Turin, Italy, with score 104/110.
1998	Master thesis of research: "Genetic Local Search for Job Shop Scheduling Problem" at the Technical University of Eindhoven, The Netherlands.
1996	Courses of Computational Economics and Computational Finance at Faculty of Economics, Turin, Italy.
1991	High school Diploma of Accountant and Programmer.

Research Focus

My current research is on establishing a geometric framework for the analysis and design of search algorithms developed in my PhD study and in post-doctoral research by:

1) Extending the geometric framework to algorithms other than Evolutionary Algorithms (including Machine Learning algorithms)

2) Using this framework to design search and learning algorithms and bring a practical design methodology with strong theoretical foundations to maturity
3) Working on a theory based on statistical inference to prove that the search algorithms built according to this framework perform provably well on average

Publications

Authored and Edited Books (3)

A. Moraglio, "Geometric Theory of Representations for Evolutionary Algorithms", publication agreement with Springer.

Y. Borenstein, A. Moraglio (Editors), "Theory and Principled Methods for the Design of Metaheuristics", due 2010 (confirmed), Springer.
Book webpage: http://privatewww.essex.ac.uk/~yboren/book/default.html

L. Vanneschi, S. Gustafson, A. Moraglio, I. De Falco, M. Ebner (Editors), "Genetic Programming: 12th European Conference", EuroGP 2009 Tübingen, Germany, April, 15-17, 2009, Springer.

Journal Articles (6)

A. Moraglio, J. Togelius, S. Silva "Geometric Differential Evolution for Combinatorial and Programs Spaces", Evolutionary Computation Journal, 2011 (accepted for publication)

H-Y. Kim, Y. Yoon, A. Moraglio, B-R. Moon "Geometric Crossovers for Real-coded Genetic Algorithms", Information Sciences Journal, 2010 (accepted for publication)

Y. Yoon, Y.-H. Kim, A. Moraglio, B.-R. Moon, "Geometric Interpretation of Genotype-Phenotype Mapping and Induced Crossovers", Theoretical Computer Science Journal, 2010 (accepted for publication)

A. Moraglio, R. Poli "Topological Crossover for the Permutation Representation", Italian Journal Intelligenza Artificiale, 2010 (accepted for publication)

A. Moraglio, C. Di Chio, J. Togelius, R. Poli "Geometric particle swarm optimisation", Journal of Artificial Evolution and Applications, online article ID 143624, 14 pages, Volume 2008, 2008

A. Moraglio, H-Y. Kim, Y. Yoon, B-R. Moon "Geometric Crossovers for Multiway Graph Partitioning", Evolutionary Computation Journal, volume 15, issue 4, pages 445-474, 2007

Book Chapters (2)

A. Moraglio, Y. Borenstein "A Gaussian Random Field Model of Smooth Fitness Landscapes" in "Theory and Principled Methods for the Design of Metaheuristics", Y. Borenstein, A. Moraglio (editors), Springer, 2010 (to appear)

A. Moraglio, H-Y. Kim, Y. Yoon, B-R. Moon "Geometric Crossovers for Multiway Graph Partitioning", in "Theory and Principled Methods for the Design of Metaheuristics", Y. Borenstein, A. Moraglio (editors), Springer, 2010 (to appear)

Conference Papers (39)

A. Moraglio, S. Silva "Geometric Nelder-Mead Algorithm on the Space of Genetic Programs", GECCO 2011 (to appear)

A. Moraglio, H-Y. Kim, Y. Yoon "Geometric Surrogate-Based Optimisation for Permutation-Based Problems", GECCO 2011 (to appear)

A. Moraglio, A. Kattan "Geometric Generalisation of Surrogate Model Based Optimisation to Combinatorial Spaces", European Conference on Combinatorial Optimisation, 2011 (to appear)

A. Moraglio "Abstact Evolutionary Convex Search", Workshop on the Foundations of Genetic Algorithms, 2011 (to appear)

A. Alentorn, A. Moraglio, C. G. Johnson "Binary Nelder-Mead Algorithm for Market Neutral Portfolio Optimization", IEEE UK Conference on Computational Intelligence, 2010 (to appear)

A. Moraglio "One-Point Geometric Crossover", Proceedings of Parallel Problem Solving from Nature 2010 (to appear)

A. Moraglio, J. Togelius "Geometric Nelder-Mead Algorithm for the Permutation Representation", Proceedings of IEEE World Conference on Computational Intelligence 2010 (to appear)

A. Moraglio, F. Otero, C. Johnson "The ACO Encoding", Proceedings of International Conference on Swarm Intelligence, pages 528-535, 2010

A. Moraglio, S. Silva "Geometric Differential Evolution on the Space of Genetic Programs", Proceedings of European Conference on Genetic Programming, pages 171-183, 2010 **(Best Paper Award)**

A. Moraglio, C. Johnson "Geometric Generalization of Nelder-Mead Algorithm", Proceedings of European Conference on Evolutionary Computation in Combinatorial Optimisation, pages 190-201, 2010 **(Candidate for Best Paper Award)**

A. Moraglio, J. Togelius "Geometric Differential Evolution", Genetic and Evolutionary Computation Conference, pages 1705-1712, 2009

A. Moraglio, J. Togelius "Inertial Geometric Particle Swarm Optimization", IEEE Congress on Evolutionary Computation, pages 1973-1980, 2009

A. Moraglio, Y. Borenstein "A Gaussian Random Field Model of Smooth Fitness Landscapes", Workshop on Foundations of Genetic Algorithms, pages 171-182, 2009

J. Togelius, R. De Nardi, A. Moraglio "Geometric PSO + GP = Particle Swarm Programming", IEEE Congress on Evolutionary Computation, pages 3594-3600, 2008

M. Graff, R. Poli, A. Moraglio "Linear Selection" , IEEE Congress on Evolutionary Computation, pages 2598 – 2605, 2007

C. Di Chio, A. Moraglio, R. Poli "Geometric Particle Swarm Optimization on Binary and Real Spaces: from Theory to Practice", Particle Swarms: the Second Decade – Genetic and Evolutionary Computation Conference workshop, 2007 (**Selected for Journal Publication**)

A. Moraglio, J. Togelius "Geometric PSO for the Sudoku Puzzle", Genetic and Evolutionary Computation Conference, pages 118 - 125, 2007

R. Poli, M. Graff, A. Moraglio "Linear Selection", Genetic and Evolutionary Computation Conference, page 1513, 2007

Y. Yoon, H-Y. Kim, A. Moraglio, B-R. Moon "Geometric Crossover for Real-Vector Representation", Genetic and Evolutionary Computation Conference, page 1539, 2007

A. Moraglio, C. Di Chio, R. Poli "Geometric particle swarm optimisation", European Conference on Genetic Programming, pages 125-136, 2007 (**Candidate for Best Paper Award**)

A. Moraglio, R. Poli "Inbreeding Properties of Geometric Crossover and Non-geometric Recombinations", Foundations of Genetic Algorithms, pages 1-14, 2007

A. Moraglio, H-Y. Kim, Y. Yoon, B-R. Moon, R. Poli "Cycle Crossover for Permutations with Repetitions: Application to Graph Partitioning", Evolutionary Algorithms: Bridging Theory and Practice **-** Parallel Problem Solving from Nature workshop, 2006 (**Selected for Journal Publication**)

A. Moraglio, R. Poli "Geometric Crossover for Sets, Multisets and Partitions", Parallel Problem Solving from Nature, pages 1038-1047, 2006

A. Moraglio, R. Poli "Product Geometric Crossover", Parallel Problem Solving from Nature, pages 1018-1027, 2006 (**Best Student Paper Award**)

A. Moraglio, R. Poli "Inbreeding Properties of Geometric Crossover and Non-geometric Recombinations", Evolutionary Computation Workshop - European Conference on Artificial Intelligence, 2006

R. Seehuus, A. Moraglio "Geometric Crossover for Protein Motif Discovery", Workshop on Adaptive Representations - Genetic and Evolutionary Computation Conference, 2006

A. Moraglio, R. Poli, R. Seehuus "Geometric Crossover for Biological Sequences", Workshop on Adaptive Representations - Genetic and Evolutionary Computation Conference, 2006

A. Moraglio, J. Togelius, S. Lucas "Product Geometric Crossover for the Sudoku Puzzle", IEEE Congress on Evolutionary Computation, pages 470-476, 2006

A. Moraglio, H-Y. Kim, Y. Yoon, B-R. Moon, R. Poli "Generalized Cycle Crossover for Graph Partitioning", Genetic and Evolutionary Computation Conference, pages 1421-1422, 2006

H-Y. Kim, Y. Yoon, A. Moraglio, B-R. Moon "Geometric Crossover for Multiway Graph Partitioning", Genetic and Evolutionary Computation Conference, pages 1217-1224, 2006

A. Moraglio "Geometric Unification of Evolutionary Algorithms", European Graduate Student Workshop on Evolutionary Computation – European Conference on Genetic Programming, 2006

A. Moraglio, R. Poli, R. Seehuus "Geometric Crossover for Biological Sequences", European Conference on Genetic Programming, pages 121-132, 2006

A. Moraglio, R. Poli "Topological Crossover for the Permutation Representation", Italian Workshop on Evolutionary Computation - Italian Association of Artificial Intelligence Conference, 2005 (**Selected for Journal Publication**)

A. Moraglio, R. Poli "Geometric Landscape of Homologous Crossover for Syntactic Trees", IEEE Congress on Evolutionary Computation, pages 427- 434, 2005

A. Moraglio, R. Poli "Topological Crossover for the Permutation Representation", Workshop on Theory of Representations - Genetic and Evolutionary Computation Conference, 2005

A. Moraglio "Geometric Unification of Evolutionary Algorithms", British Colloquium for Theoretical Computer Science, page 251, 2005

A. Moraglio, R. Poli "Topological Interpretation of Crossover", Genetic and Evolutionary Computation Conference, pages 1377-1388, 2004

A. Moraglio "Evolving User Strategies for a Priority-priced Network" Multi-Service Networks Workshop, 2001

A. Moraglio, H. ten Eikelder, R. Tadei "Genetic Tabu Search for Job-shop Scheduling Problem", Annual Conference of the Italian Operations Research Society, pages 52-53, 1999

Journal and Conference Papers under Review (2)

A. Moraglio, H-Y. Kim, Y. Yoon "Geometric Surrogate-Based Optimisation for Permutation-Based Problems", EA 2011 (submitted)

A. Moraglio, A. Kattan "Geometric Surrogate Model Based Optimisation for Genetic Programming: Initial Experimentations", EA 2011 (submitted)

Selected Technical Reports and Miscellaneous (13)

H-Y. Kim, Y. Yoon, A. Moraglio, B-R. Moon , "A Mathematical Unification of Geometric Crossovers Defined on Phenotype Space", Technical Report, Kwangwoon University, South Korea, 2008

J. Cervantes, A. Moraglio, "Pure Crossovers: definition, their relation to Geiringer's theorem for finite populations and practical value", Technical Report, Universidad Autónoma Metropolitana, Mexico, 2008

Y. Yoon, H-Y. Kim, A. Moraglio, B-R. Moon "Geometric Crossover for Real-Vector Representation", Technical Report CSM-466, University of Essex, UK, 2007

Y. Yoon, H-Y. Kim, A. Moraglio, B-R. Moon "Quotient Geometric Crossover", Technical Report CSM-467, University of Essex, UK, 2007

A. Moraglio, H-Y. Kim, Y. Yoon, B-R. Moon, R. Poli "Cycle Crossover for Permutations with Repetitions", Technical Report CSM-454, University of Essex, UK, 2006

A. Moraglio, H-Y. Kim, Y. Yoon, B-R. Moon, R. Poli "Geometric Crossover for Permutations with Repetitions: Application to Graph Partitioning", Technical Report CSM-448, University of Essex, UK, 2006

A. Moraglio, R. Poli "Product Geometric Crossover", Technical Report CSM-447, University of Essex, UK, 2006

A. Moraglio, H. ten Eikelder, R. Tadei "Genetic Local Search for Job Shop Scheduling Problem", Technical Report CSM-435, University of Essex, UK, 2005

A. Moraglio, R. Poli "Geometric Landscape of Homologous Crossover for Syntactic Trees", Technical Report CSM-430, University of Essex, UK, 2005

A. Moraglio, R. Poli "Abstract Geometric Crossover for the Permutation Representation", Technical Report CSM-429, University of Essex, UK, 2005

A. Moraglio, R. Poli "Topological Crossover for the Permutation Representation", Technical Report CSM-408, University of Essex, UK, 2004

A. Defaweux, T. Grosche, M. Karapatsiou, A. Moraglio, A. Shenfield "Automated Concept Evolution", Italian Summer School on Evolutionary Computation and Technical Report, Vrije Universiteit Brussel, Belgium, 2003 **(Best Paper Award)**

A. Moraglio "Chris Stephens' invited talk at EuroGP 2003 - EC Theory: A tale of Elephants, Blind Men and Soup!", Feature Article, Online EvoWeb Repository, 2003

Theses

PhD thesis: "*Towards a Geometric Unification of Evolutionary Algorithms*", 2007

Master thesis: "*Genetic Local Search for Job Shop Scheduling Problem*", 2000

Research Projects

"A Geometric Framework for Evolutionary Algorithms" (To be submitted to the EPSRC in 2011) as a *Co-Investigator and Researcher* (in preparation)

"Reasoning About Evolving Computer Programs" (Funded by the Centre for Rasoning, 2009) at the University of Kent as a *Researcher*

"Multi-objective Extension of Ant Colony Optimization" (Acções Integradas DAAD / CRUP, 2010) at the University of Coimbra as a *Co-Investigator and Researcher*

"Connectedness and Local Search for Multi-objective Combinatorial Optimization" (Acções Integradas DAAD / CRUP, 2009) at the University of Coimbra as a *Co-Investigator and Researcher*

"Advanced Evolutionary Methods for Learning Finite State Machines" (Funded by RPF of Essex University, 2006) at the University of Essex as a *Named Research Assistant*

"Project M3I - Market-Managed Multi-service Internet" (European Union's Fifth Framework Programme Project, 2001) at Hewlett-Packard Laboratories (UK) as a *Researcher*

Invited Seminars

"Geometric Generalisation of Surrogate Model Based Optimisation to Combinatorial Spaces" - University of Kent, UK, 2011

"The Science of Design: Creating the Artificial" – Centre for Reasoning, UK, 2010

"Geometric Nelder-Mead Algorithm" – University of Birmingham, UK, 2010

"Reasoning About Evolving Computer Programs" – Centre for Reasoning, UK, 2009

"Geometric Unification of Evolutionary Algorithms" – University of Kent, UK, 2009

"Geometric Unification of Evolutionary Algorithms" – University of Osaka Prefecture, Japan, 2008

"Evolutionary Algorithms for Solving Sudoku" – University of Osaka Prefecture, Japan, 2008

"Geometric Particle Swarm Optimization" – University of Coimbra, Portugal, 2007

"Geometric Unification of Evolutionary Algorithms" – University College London, UK, 2007

Schools

EvoNet summer school on Evolutionary Computation, Parma, Italy, 2003 (**best paper, best presentation, most innovative solution awards).** This work was reported in the popular science and technology magazine "Focus", winter 2003.

ESWI XVIII winter school on Meta-heuristics, Lac Noir, Switzerland, 2000

Reviewer

Journals (including)

"Journal of Artificial Evolution and Applications", 2007, 2008

"IEEE Transactions in Evolutionary Computation", 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010

"IEEE Transactions on Systems, Man, and Cybernetics", 2005, 2006, 2008, 2009

"Journal of Natural Computing", 2008

"Computational Optimization and Applications Journal", 2008

"Journal of Scheduling", 2009, 2010

"Journal of Genetic Programming and Evolvable Machine", 2009, 2010

"Theoretical Computer Science", 2010

"Evolutionary Computation Journal", 2010, 2011

"Journal of Heuristics", 2009, 2010

Conferences (including)

IEEE CIG 2007, IEEE CIG 2010

ECAI 2006

PPSN 2006, PPSN 2008, PPSN 2010

IEEE CEC 2006, IEEE CEC 2007, IEEE CEC 2008, IEEE CEC 2009, IEEE CEC 2010

GECCO 2003, GECCO 2004, GECCO 2007, GECCO 2009

EvoStar 2008, EvoPhD 2008, EvoTheory 2008, EvoStar 2010, EvoGame 2010, EvoStar 2011

Workshop on Experimental Algorithmics 2008

META 2010

Chairing and Help in Conferences

Invited Tutorial on "The Geometry of Evolutionary Algorithms" at GECCO 2011

Publication Chair of EuroGP 2009

Session Chair at FOGA 2011, IEEE WCCI 2006, ECAI 2006, GECCO 2004

Volunteering in the organization of IEEE CEC 2005, IEEE CIG 2005, EuroGP 2003

Teaching

Teaching the courses "Introduction to Artificial Intelligence" and "Informatic Systems" at the Faculty of Informatic Engineering of the University of Coimbra, 2008/2009

Teaching the courses "Databases and Data Mining" and "Informatic Systems" at the Faculty of Informatic Engineering of the University of Coimbra, 2007/2008

Graduate teaching assistant for the course "Genetic Programming and its Applications" at the University of Essex, 2003/2004

Students Supervision

Supervising a PhD student in the area of "Representations for Machine Learning" at the University of Coimbra, Portugal

Supervising 5 Master students' final year internship at University of Coimbra, Portugal (all successful)

Supervising many undergraduate and Master students course project at University of Coimbra, Portugal

Mentoring research students at University of Essex, UK, and University of Kent, UK

Examiner

External examiner of the PhD exam of Massimo Bernava of University of Milan, Italy

Member of the examining board of more than 20 final exams for Master and Bachelor degrees

Examiner for undergraduate and master students

Grants

Acções Integradas DAAD / CRUP grant 2010

Acções Integradas DAAD / CRUP grant 2009

University of Essex research student scholarship

Erasmus student scholarship (master thesis)

Student travel grants, including: GECCO 2006, 2005, 2004, EuroGP 2006, CEC 2005, BCTCS 2005, EURO grant (winter school), EvoNet grant (summer school)

University Education Overview

General Profile

- Strong and widespread background in Computer Engineering and Computer Science
- Strong Mathematical Background
- Background in related Information Technology fields:
  Electronics, Telecommunications, Automation
- Majors: Software Engineering, Operations Research and Optimization, Artificial Intelligence

Major Practical Works

- *Software Engineering*: Writing specification and high-level design of a distributed object-oriented system for telecommunications. Experiences: collaboration with CSELT telecommunication research laboratories; strong emphasis on teamwork, project timing management, presentation of the results to the client; informal and formal specification.
- *Economic Simulation and Time Series Forecasting Projects at the Faculty of Economics*: Modelling artificial worlds by means of interacting agents using neural networks and cellular automata; analysis of the emerging properties and their economical interpretation. Development and presentation of a new learning technique for interacting agents. Presentation and demonstration of functioning of the "Tierra" artificial life system. Application of genetic algorithms to time series forecasting.
- *Decision-Making Support Systems and Information Systems at the Department of Management Science*: Analysis and definition of the decisional processes involved in a viability study concerning a software for educational support. Analysis of the information flows in a real organisational system: the "Politecnico di Torino" system. Design of a software for monitoring the quality of teaching by means of strategic health indices. Experiences: Working in team as group-leader; managing human and technological resources as a whole; reasoning in terms of processes and quality; identification of functions, components and information flows in a real organisation.
- *Control System Design and Hardware Design*: Modelling a thermodynamic system and design of a thermo-regulator (both analogue and digital); analysis of the stability of the system in presence of perturbations. High and low levels design and test of a simple pocket calculator using hardware simulation tools.
- *Other various Computer Programming tasks*: database design and management, game strategy programming, client-server architecture design, language parser and interpreter development, graph-problem solver and optimiser development, low-level peripheral programming.

Computer Languages

- Java, C, C++, Concurrent C under Unix, Python, Assembly, Perl, Unix Shell Scripting, Basic, Pascal, Mathematica, Prolog, Smalltalk, R, Cobol, SQL, VHDL

Referees

Professor Riccardo Poli, University of Essex, UK. E-mail: rpoli@essex.ac.uk (PhD supervisor)

Professor Ernesto Costa, University of Coimbra, Portugal. E-mail: Ernesto@dei.uc.pt (Head of Department and Research Collaborator)

Dr. Colin Johnson, University of Kent, UK. E-mail: C.G.Johnson@kent.ac.uk (Manager at current institution). *Please, do not contact him prior to interview.*