

# Andrea Degasperi

---

**University address:** School of Computing Science, University of Glasgow,  
**E-mail address:** Andrea [dot] Degasperi [at] glasgow [dot] ac [dot] uk  
**Web page:** <http://www.dcs.gla.ac.uk/~andrea/>

## Personal Profile

- During the last five years, in Edinburgh and in Glasgow, I have been working full time in the field of Computational Systems Biology.
- I studied, developed and applied techniques for modelling the dynamics of biochemical systems based on ordinary differential equations, partial differential equations, stochastic models, process algebras and Petri-Nets.
- I modelled several biochemical pathways and networks, some of which figure in my publication record.
- In my theoretical research I have been interested in the relationship between deterministic models based on differential equations and stochastic models based on continuous time Markov chains or simulations of the chemical master equation.
- My background includes statistics, probabilistic models, numerical analysis, global and local optimisation, performance evaluation and notions of biology and standard measurement technologies used in laboratory.

## Education

**2007 to September 2011, Doctoral Researcher** at the School of Computing Science of the University of Glasgow.

- Thesis: *Multi-Scale Modelling of Biological Systems in Process Algebra with Multi-Way Synchronisation*. In a few words: I developed a formal approach to the multi-scale modelling of biological systems, which permits to design, compose and compare models of biological spatial scales, such as molecules, cells and tissues, under the same mathematical framework.
- Supervisors Prof. Muffy Calder, Dr. Alice Miller, Computing Science (University of Glasgow).

**2005-2007, European Masters in Informatics (EuMI)** - Life Science specialization.

- Double degree program with first year attended at the University of Trento (Italy) and second year at the University of Edinburgh (Scotland - UK).
- Earned both the “Laurea Specialistica in Informatica” from the University of Trento (with full marks and honour) and the Master in Informatics with Distinction from the University of Edinburgh.
- Thesis: *Sensitivity Analysis of Models of Biochemical Reactions*.
- Supervisors: Prof. Paola Quaglia (University of Trento) and Dr. Stephen Gilmore (University of Edinburgh).

**2002-2005, Bachelor Degree in Informatics** at the University of Trento (Italy).

- Graduated with the mark of 110/110 with dissertation topic *An Analysis of the Local Search Algorithm Affine Shaker*.
- Supervisors Prof. Roberto Battiti (University of Trento) and Prof. Marco Brunato (University of Trento).

## Scholarships

**2007-2011** Lord Kelvin / Adam Smith PhD Scholarship, University of Glasgow.

**2006-2007** Scholarship for the European Master in Informatics (EuMI) awarded by the University of Trento (Italy).

## Publications

### Book chapters:

[1] A. Degasperi and S. Gilmore. Sensitivity Analysis of Stochastic Models of Bistable Biochemical Reactions. *SFM 2008, LNCS 5016*, pages 1–20, Springer, 2008.

### Journals:

[2] F. Ciocchetta, A. Degasperi, J. Heath, J. Hillston. Modelling and Analysis of the NF-kappaB pathway in Bio-PEPA. *Transactions on Computational Systems Biology XII, LNBI 5945*, pages 229–262, Springer, 2010.

### Conferences/Workshops:

[3] A. Degasperi and M. Calder. Multi-Scale Modelling of Biological Systems in Process Algebra with Multi-Way Synchronisation. *CMSB 2011, to appear on ACM Digital Library*, 2011.

[4] A. Degasperi and M. Calder. Process Algebra with Hooks for Models of Pattern Formation. *CS2Bio2010, ENTCS 268*, pages 31-47, Elsevier, 2010.

[5] A. Degasperi and M. Calder. Relating PDEs in Cylindrical Coordinates and CTMCs with Levels of Concentration. *CS2Bio2010, ENTCS 268*, pages 49-59, Elsevier, 2010.

[6] A. Degasperi and M. Calder. On the Formalisation of Gradient Diffusion Models of Biological Systems. *PASTA Workshop 2009*, unreviewed, 2009.

[7] O. Akman, F. Ciocchetta, A. Degasperi and M.L. Guerriero. Modelling Biological Clocks with Bio-PEPA: Stochasticity and Robustness for the Neurospora Crassa Circadian Network. *CMSB 2009, LNCS 5688*, pages 52–67, Springer, 2009.

[8] F. Ciocchetta, A. Degasperi, J. Heath, J. Hillston. Modelling and Analysis of the NF-kappaB Pathway in Bio-PEPA. In R. Breitling, D.R. Gilbert, M. Heiner and C. Priami eds. Formal Methods in Molecular Biology. Number 09091 in Dagstuhl Seminar Proceedings, Dagstuhl, Germany, Schloss Dagstuhl Leibniz-Zentrum fuer Informatik, Germany, unreviewed, 2009.

[9] F. Ciocchetta, A. Degasperi, J. Hillston, M. Calder. Some investigations concerning the CTMC and the ODE model derived from Bio-PEPA. *FBTC 2008, ENTCS 229(1)*, pages 145-163, Elsevier, 2008.

### Technical Reports:

[10] A. Degasperi and M. Calder. Process Algebra with Hooks for Models of Pattern Formation. University of Glasgow, Department of Computing Science Technical Report, 2010.

### In Preparation:

[11] R. M. Mackenzie, I. P. Salt, W. H. Miller, A. Logan, A. Degasperi, C. A. Hamilton, M. P. Murphy, C. Delles and A. F. Dominiczak. Mitochondrial Reactive Oxygen Species Enhance AMPK Activation in the Endothelium of Patients with Diabetes.

#### Posters:

[12] A. Degasperi and M. Calder. Multi-Scale Modelling of Biological Systems in Process Algebra. Presented at *SICSA Workshop on Systems Medicine*. May 11th 2011, Dundee, Scotland.

[13] A. Degasperi and M. Calder. Relating Reaction-Diffusion Models at Different Levels of Abstraction in Process Algebra. Presented at *ICSB2010*, Edinburgh, October 11th 2010.

[14] A. Degasperi, C. Delles, A. Dominiczak and M. Calder. Theoretical Computer Science for Improving Mathematical Modelling of Reactive Oxygen Species. Presented at the *BHF GCRC Site Visit*, December 1st 2008.

## Research experience

**2007-2011, modelling of Reactive Oxygen Species regulation in oxidative stress**, in collaboration with the BHF Glasgow Cardiovascular Research Centre. My contribution has been to develop a mathematical model of adenosine monophosphate-activated protein kinase (AMPK) activity under oxidative stress in blood vessels, that can reproduce trends of experimental data measured in their laboratory. The model is part of the mathematical supplement of a paper currently under review. More in general, the research aims at determining causes of cardiovascular diseases and their relationship with diabetes.

**2007-2011, SIGNAL**, member of the SIGNAL project, involving Universities of Glasgow and Edinburgh and Beatson Institute for Cancer Research. The aim of the project is to develop, improve and apply stochastic process algebra and other computational approaches for biochemical signalling pathways analysis. I contributed to the project with publications and posters as single author or in collaboration with other researchers.

<http://signalproject.org.uk/>

**From February to August 2005, Internship**, internship at the NetMob research group of the University of Trento (now LION lab: machine Learning and Intelligent OptimizatioN). Supervisor Prof. Roberto Battiti, Information and Communication Technologies Department. The internship was about analysis and development of global and local optimization, algorithms to find global and local minima of generic multidimensional functions.

## Software development

- OpenDizzy simulator of biochemical reactions: implementation of the sensitivity analysis tools for ordinary differential equations and stochastic simulations. OpenDizzy is a sourceforge project.

## Reviewer for

- SICSA PhD Conference 2010. June 9th - 11th 2010, Edinburgh, Scotland.

## Teaching

- 2009/10, tutoring CS1P, first year Computing Science Course at the University of Glasgow.
- 2008/09, tutoring CS1P and CS1Q, first year Computing Science Courses at the University of Glasgow.

## Languages

**Italian:** mother tongue.      **English:** fluent.      **German:** basic.

## Computer Skills

- **Operative Systems:** Linux, Windows.
- **Languages and technologies:** Java, C++, OCaml, Latex, HTML, PHP, SQL, MySQL, EJB, JSP, XML.
- **Tools:** R, Matlab, JBuilder, Eclipse, EPE (Edinburgh Pathway Editor), COPASI, Prism.

## Other interests

- Football, I played eleven and five-a-side in local amateur leagues.
- Music, I played saxophone in a local street band and now guitar in free time.
- Theatre, I was acting in a local amateur dramatic society.

## References

Available upon request.