

# Frederick Ducatelle's Curriculum Vitae

(September 2011)

## Personal details

Name: Frederick Ducatelle  
Address: Via Generale Guisan 9  
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Switzerland  
E-mail: [frederick@idsia.ch](mailto:frederick@idsia.ch)  
Homepage: <http://www.idsia.ch/~frederick>  
Date of birth: 12-NOV-1977  
Place of birth: Gent, Belgium  
Nationality: Belgian  
Civil status: Married

## Education

- 2002-2007 **PhD in Computer Science** at Istituto Dalle Molle di Studi sull'Intelligenza Artificiale (IDSIA), at the Università della Svizzera Italiana (USI), in Lugano, Switzerland  
Dissertation: *Adaptive Routing in Ad Hoc Wireless Multi-hop Networks*  
Committee: Prof. L.M. Gambardella, Prof. Dr. P. Thiran, Prof. Dr. A. Carzaniga, Prof. Dr. A. Murphy  
Remark: Received the **Best Paper Award at PPSN VIII**
- 2006-2006 **Internship at Deutsche Telekom Labs** in Berlin, Germany. Aim: Implementing probabilistic routing under Linux for the Magnets mesh testbed
- 2000-2001 **Master of Science in Artificial Intelligence**  
Institute: University of Edinburgh  
Results: Distinction (82% on taught part, 96% on the dissertation)  
Modules: Programming in Java, Genetic Algorithms, Intelligent Sensing and Control, AI Programming, Learning from Data 1 and 2, Practical Reasoning Methodologies and Probabilistic Modelling and Reasoning  
Dissertation: *Ant Colony Optimisation for Bin Packing and Cutting Stock Problems*  
Supervisor: Dr. John Levine  
Remark: Received the **Xerox Prize for best dissertation**
- 1995-2000 **Master in Commercial Engineering in Management Informatics**  
Institute: Catholic University of Leuven in Belgium  
Dissertation: *Een datamining project in de praktijk* (in Dutch) – Including a data mining project for NURTouristic, a major company in the Belgian travel industry.  
Supervisor: Prof. Dr. Jacques Vandenbulcke  
Details per year:
  - First year Candidate: 78.3% (magna cum laude) – 6<sup>th</sup> out of 303  
Main topics: economics, advanced mathematics, physics, informatics, ...
  - Second year Candidate: 82.0% (magna cum laude) – 1<sup>st</sup> out of 146  
Main topics: economics, statistics, advanced mathematics, banking and finance, ...
  - First year Master: 76.2% (cum laude) – 3<sup>rd</sup> out of 33  
Main topics: operations research, physics, database management, file organisation and search techniques, production and inventory management, corporate finance, ...
  - Second year Master: 80.7% (magna cum laude) – 2<sup>nd</sup> out of 31  
Main topics: data communication and computer networks, system analysis, database management, software engineering, operating systems, artificial intelligence, ...  
Including Erasmus stay at the University of Edinburgh
  - Third year Master: 80.2% (magna cum laude) – 3<sup>rd</sup> out of 30  
Main topics: macroeconomic analysis, applied operations research, knowledge based systems, simulation theory and applications, ...

- 1998-1999      **Erasmus stay** at the University of Edinburgh
- 1989-1995      **High school diploma** at the Onze-Lieve-Vrouwe College Oudenaarde  
Result final year: 82%  
Main topics: Latin and Maths

## Work Experience

- 09/2011-...      **Research engineer** and **analytical consultant** at VADIS, a **data mining** company in Anderlecht, Belgium.
- 04/2010-08/2011      **Researcher** at the Istituto Dalle Molle di Studi sull'Intelligenza Artificiale (IDSIA) in Lugano, Switzerland.
- 09/2007-03/2010      **Postdoctoral researcher** at the Istituto Dalle Molle di Studi sull'Intelligenza Artificiale (IDSIA) in Lugano, Switzerland. Topic: **swarm robotics**.
- 04/2006-07/2006      **Internship** at **Deutsche Telekom Labs** in Berlin, Germany. Topic: making a Linux implementation of **probabilistic routing** for the MagNets mesh testbed.
- 11/2002-09/2007      **PhD researcher** at Istituto Dalle Molle di Studi sull'Intelligenza Artificiale (IDSIA) in Lugano, Switzerland. Topic: **adaptive routing** in ad hoc networks.
- 10/2001-02/2002      **Research Assistant** at the University of Edinburgh, UK. Topic: preparing a **data mining course**, for Prof. Dr. Chris Williams
- 10/1999-01/2000      **Internship** at **NURTouristic**, Gent, Belgium. Topic: working out a **data mining project** in the tourist sector
- August 1998      Student job at the helpdesk of Alcatel Micro-electronics

## Honours

- **Best Poster Award** Reina A., Di Caro G., Ducatelle F. and Gambardella, L. M. (2011). Distributed motion planning for ground objects using a network of robotic ceiling cameras. Proceedings of the 12th conference Towards Autonomous Robotic Systems (TAROS), Sheffield, UK, August 2011.
- **Best Video Award** A video demonstrating the results of the Swarmanoid project won the best video award at the Twenty-Fifth Conference on Artificial Intelligence (AAAI-11), San Francisco, US, August 2011.
- **Best Paper Award** Di Caro, G., Ducatelle, F. and Gambardella, L. M. (2004). AntHocNet: an Ant-Based Hybrid Routing Algorithm for Mobile Ad Hoc Networks. Proceedings of the 8th International Conference on Parallel Problem Solving from Nature (PPSN VIII), Birmingham, UK, September 2004.
- **Xerox Prize for best dissertation** Ducatelle, F., Ant Colony Optimisation for Bin Packing and Cutting Stock Problems, *Master of Science in Artificial Intelligence*, University of Edinburgh, 2001.

## Research Topics

- Ant Colony Optimization for combinatorial optimization, in particular for Bin Packing and Cutting Stock Problems.
- Survivable routing in IP-over-WDM networks in the context of the Swiss Hasler Foundation project DICS-1830 "Failure Location, Restoration and Resilience in Optical and Ad-Hoc Networks".
- Routing in Mobile Ad Hoc Networks, in particular using algorithms based on the Ant Colony Optimization framework, in the context of the project "BISON: Biology-Inspired techniques for Self Organization in dynamic Networks" of the FET unit of the European Commission.
- Collective and swarm robotics, in the FET OPEN project Swamanoid, which aims to create a collective system consisting of heterogeneous, dynamically connected, small autonomous robots.

## Publications

### International Journals

- Dorigo, M., Trianni, V., Floreano, D., Gambardella, L.M., Mondada, F., Nolfi, S., Baaboura, T., Birattari, M., Bonani, M., Brambilla, M., Brutschy, A., Burnier, D., Campo, A., Christensen, A.L., Decugnière, A., Di Caro, G., Ducatelle, F., Ferrante, E., Martinez Gonzales, J., Guzzi, J., Longchamp, V., Magnenat, S., Mathews, N., Montes de Oca, M., O'Grady, R., Pinciroli, C., Pini, G., Rey, F., Rétornaz, P., Roberts, J., Rochat, F., Sperati, V., Stirling, T., Stranieri, A., Stützle, T., Tuci, E., Turgut, A.E., and Vaussard, F. (2012). Swarmanoid: a novel concept for the study of heterogeneous robotic swarms. Accepted to: IEEE Robotics and Automation Magazine, To appear in 2012.
- Ducatelle, F., Di Caro, G., Pinciroli C., and Gambardella, L. M. (2011). Self-organized Cooperation between Robotic Swarms. *Swarm Intelligence*. Volume 5, Issue 2, 2011.
- Ducatelle, F., Di Caro, G., and Gambardella, L. M. (2010). Principles and Applications of Swarm Intelligence for Adaptive Routing in Telecommunications Networks. *Swarm Intelligence*. Volume 4, Issue 3, 2010.
- Babaoglu, O., Canright, G., Deutsch, A., Di Caro, G., Ducatelle, F., Gambardella, L. M., Ganguly, N., Jelasity, M., Montemanni, R., Montresor, A., and Urnes, T. (2006). Design Patterns from Biology for Distributed Computing. *ACM Transactions on Autonomous and Adaptive Systems (TAAS)*, Volume 1, Number 1, September 2006.
- Di Caro, G., Ducatelle, F., Gambardella, L. M., and Rizzoli A. (2006). Building Blocks from Biology for the Design of Algorithms for the Management of Modern Dynamic Networks. *ERCIM News*, Number 64, January 2006.
- Di Caro, G., Ducatelle, F. and Gambardella, L. M. (2005). AntHocNet: An Adaptive Nature-Inspired Algorithm for Routing in Mobile Ad Hoc Networks. *European Transactions on Telecommunications (ETT), Special Issue on Self Organization in Mobile Networking*, Volume 16, Number 5, Pages 443-455, September-October 2005.
- Ducatelle, F. and Gambardella, L. M. (2005). Survivable Routing in IP-over-WDM Networks: An Efficient and Scalable Local Search Algorithm. *Optical Switching and Networking*, Volume 2, Pages 86-99, September 2005.
- Ducatelle, F., Di Caro, G. and Gambardella, L. M. (2005). Using Ant Agents to Combine Reactive and Proactive Strategies for Routing in Mobile Ad Hoc Networks. *International Journal of Computational Intelligence and Applications (IJCIA), Special Issue on Nature-Inspired Approaches to Networks and Telecommunications*, Volume 5, Number 2, Pages 169-184, June 2005.
- Levine, J. and Ducatelle, F. (2004). Ant Colony Optimisation and Local Search for Bin Packing and Cutting Stock Problems. *Journal of the Operational Research Society, Special Issue on Local Search*, Volume 55, Number 7, Pages 705-716, July 2004.

### National Journals

- Di Caro G., Ducatelle F. and Gambardella L. M. (2005). Project description: BISON: Biology-Inspired techniques for Self-Organization in dynamic Networks. *Zeitschrift Künstliche Intelligenz, Special Issue on Swarm Intelligence*, November, 2005.

### Book Chapters

- Di Caro G., Ducatelle F. and Gambardella L. M. (2009). Routage dans les réseaux mobiles ad hoc en environnement urbain (in French). In: *Fourmis artificielles, des bases algorithmiques aux concepts et réalisations avancés*, eds. N. Monmarché, F. Guinand and P. Siarry, Edition HERMES-LAVOISIER, To appear in 2009.
- Di Caro G., Ducatelle F. and Gambardella L. M. (2008). Theory and practice of Ant Colony Optimization for routing in dynamic telecommunications networks. In: *Reflecting Interfaces: The Complex Coevolution of Information Technology Ecosystems*, eds. N. Sala, F. Orsucci, Idea Group Inc., April 2008.
- Ducatelle F., Gambardella L. M., Kurant M., Nguyen H. X. and Thiran P. (2006). Algorithms for failure detection in large IP-over-Fiber and Wireless Ad Hoc Networks. In: *Dependable Systems: Software, Computing, Networks*, eds. J. Kohlas, B. Meyer, A. Schiper, Lecture Notes in Computer Science 4028, Springer, 2006.

## International Conferences

- Ducatelle F., Di Caro G.A., Pinciroli C., Mondada F. and Gambardella L. M. (2011). Communication assisted navigation in robotic swarms: self-organization and cooperation. Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), San Francisco, US, September 2011.
- Pinciroli C., Trianni V., O'Grady R., Pini G., Brutschy A., Brambilla M., Mathews N., Ferrante E., Di Caro G. A., Ducatelle F., Stirling T., Gutierrez A., Gambardella L. M. and Dorigo M. (2011). ARGoS: a Modular, Multi-Engine Simulator for Heterogeneous Swarm Robotics. Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), San Francisco, US, September 2011.
- Nagi J., Ducatelle F., Di Caro G.A., Ciresan D., Meier U., Giusti A., Nagi F., Schmidhuber J. and Gambardella L.M. (2011), Max-Pooling Convolutional Neural Networks for Vision-based Hand Gesture Recognition. Proceedings of the 3rd IEEE International Conference on Signal & Image Processing and Applications (ICSIPA). Kuala Lumpur, Malaysia, November, 2011.
- Reina A., Di Caro G., Ducatelle F. and Gambardella, L. M. (2011). Distributed motion planning for ground objects using a network of robotic ceiling cameras. Proceedings of the 12th conference Towards Autonomous Robotic Systems (TAROS), Sheffield, UK, August 2011. Remark: this work received a **Best Poster Award**.
- Foerster A., Foerster A., Leidi T., Garg K., Puccinelli D., Ducatelle F., Giordano S. and Gambardella L.M. (2011). MOTEL: Towards Flexible Mobile Wireless Sensor Network Testbeds. Extended abstract, Proceedings of the 8th European Conference on Wireless Sensor Networks (EWSN), Bonn, Germany, February 2011.
- Ducatelle F., Di Caro G. and Gambardella L. M. (2010). Mobile stigmergic markers for navigation in a heterogeneous robotic swarm. Proceedings of the 7th International Conference on Swarm Intelligence (ANTS), Brussels, Belgium, September 2010.
- Ducatelle F., Di Caro G. and Gambardella L. M. (2010). Cooperative Stigmergic Navigation in a Heterogeneous Robotic Swarm. Proceedings of the 11th International Conference on Simulation of Adaptive Behavior (SAB2010), Paris, France, August 2010.
- Ducatelle F., Di Caro G. and Gambardella L. M. (2010). Cooperative Self-Organization in a Heterogeneous Swarm Robotic System. Proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2010), Portland, Oregon, July 2010.
- Reina, A., Di Caro, G., Ducatelle, F., Gambardella, L.M. (2010). A distributed approach to holonomic path planning. In Proceedings of the Workshop on Motion Planning: From Theory to Practice, at Robotics: Science and Systems (RSS), June 2010
- Ducatelle F., Foerster A., Di Caro G. and Gambardella L. M. (2009). Supporting Navigation in Multi-Robot Systems through Delay Tolerant Network Communication. Proceedings of the IFAC Workshop on Networked Robotics (NetRob 2009), Golden, Colorado, October 2009.
- Ducatelle F., Foerster A., Di Caro G. and Gambardella L. M. (2009). New task allocation methods for robotic swarms. Proceedings of the 9th IEEE/RAS Conference on Autonomous Robot Systems and Competitions, Castelo Branco, Portugal, May 2009.
- Di Caro G., Ducatelle F. and Gambardella L. M. (2009). Wireless communications for distributed navigation in robot swarms. Proceedings of the Sixth European Workshop on the application of Nature-inspired techniques to Telecommunication Networks and other Connected Systems (EvoCOMNET2009), Tübingen, Germany, April 2009.
- Ducatelle F., Di Caro G. and Gambardella L. M. (2008). Robot Navigation in a Networked Swarm. Proceedings of the International Conference on Intelligent Robotics and Applications (2008ICIRA), Wuhan, China, October 2008.
- Ducatelle F., Di Caro G. and Gambardella L. M. (2008). A New Approach for Integrating Proactive and Reactive Routing in Mobile Ad Hoc Networks. Proceedings of the fifth IEEE International Conference on Mobile Ad Hoc and Sensor Systems (MASS), Atlanta, Georgia, USA, September-October 2008.
- Ducatelle F., Di Caro G. and Gambardella L. M. (2008). An evaluation of two swarm intelligence MANET routing algorithms in an urban environment. Proceedings of the IEEE Swarm Intelligence Symposium (SIS), St. Louis, Missouri, USA, September 2008.

- Di Caro G., Ducatelle F. and Gambardella L. M. (2008). A simulation study of routing performance in realistic urban scenarios for MANETs. Proceedings of the sixth International Workshop on Ant Colony Optimization and Swarm Intelligence (ANTS2008), Brussels, Belgium, September 2008.
- Ducatelle F., Roth M. and Gambardella L. M. (2007). Design of a user space software suite for probabilistic routing in ad-hoc networks. Proceedings of the Fourth European Workshop on the application of Nature-inspired techniques to Telecommunication Networks and other Connected Systems (EvoCOMNET2007) (poster presentation), Valencia, Spain, April 2007.
- Ducatelle F., Di Caro G. and Gambardella L. M. (2006). An analysis of the different components of the AntHocNet routing algorithm. Proceedings of the Fifth International Workshop on Ant Colony Optimization and Swarm Intelligence (ANTS2006), Brussels, Belgium, September 2006.
- Di Caro G., Ducatelle F. and Gambardella L. M. (2006). AI Approaches for Next Generation Telecommunication Networks. Extended abstract. The 50th Anniversary Summit of Artificial Intelligence, Monte Verita, Switzerland, July 2006.
- Babaoglu O., Canright G., Deutsch A., Di Caro G., Ducatelle F., Gambardella L. M., Ganguly N., Jelasity M., Montemanni R. and Montresor A. (2005). Design Patterns from Biology for Distributed Computing. Proceedings of the European Conference on Complex Systems (ECCS), Paris, France, November 2005.
- Carrillo L., Guadal C., Marzo J.-L., Di Caro G., Ducatelle F. and Gambardella L. M. (2005), Differentiated Quality of Service scheme based on the use of multiple classes of ant-like mobile agents. Student Workshop at the CoNEXT Conference, Toulouse, France, October, 2005.
- Di Caro G., Ducatelle F. and Gambardella L. M. (2005). Swarm Intelligence for Routing in Mobile Ad Hoc Networks. Proceedings of the 2005 IEEE Swarm Intelligence Symposium (SIS), Pasadena, CA, USA, June 2005.
- Ducatelle, F., Di Caro, G. and Gambardella, L. M. (2005). Ant Agents for Hybrid Multipath Routing in Mobile Ad Hoc Networks. Proceedings of the Second Annual Conference on Wireless On demand Network Systems and Services (WONS 2005), St. Moritz, Switzerland, January 2005.
- Ducatelle, F. and Gambardella, L. M. (2004). FastSurv: A New Efficient Local Search Algorithm for Survivable Routing in WDM Networks. Proceedings of the IEEE Global Communications Conference (GLOBECOM), Dallas, TX, USA, November 2004.
- Ducatelle, F. and Gambardella, L. M. (2004). A Scalable Algorithm for Survivable Routing in IP-over-WDM Networks. Proceedings of BroadNets 2004 - First Annual International Conference on Broadband Networks, San Jose, CA, USA, October 2004.
- Di Caro, G., Ducatelle, F. and Gambardella, L. M. (2004). AntHocNet: an Ant-Based Hybrid Routing Algorithm for Mobile Ad Hoc Networks. Proceedings of the 8th International Conference on Parallel Problem Solving from Nature (PPSN VIII), Birmingham, UK, September 2004. *Remark: This paper received the **PPSN VIII Best Paper Award**.*
- Levine, J. and Ducatelle, F. (2003). Ants Can Solve Difficult Bin Packing Problems. Proceedings of the 1st Multidisciplinary International Conference on Scheduling: Theory and Applications (MISTA 2003), Nottingham, UK, August 2003.
- Ducatelle, F. and Levine, J. (2001). Ant Colony Optimisation for Bin Packing and Cutting Stock Problems. Proceedings of the UK Workshop on Computational Intelligence (UKCI-01), Edinburgh, September 2001.

## Dissertations

- Ducatelle, F., Adaptive *Routing in Ad Hoc Wireless Multi-hop Networks*, PhD thesis, Università della Svizzera Italiana, Istituto Dalle Molle di Studi sull'Intelligenza Artificiale, 2007.
- Ducatelle, F., *Ant Colony Optimisation for Bin Packing and Cutting Stock Problems*, Master of Science in Artificial Intelligence, University of Edinburgh, 2001.
- Ducatelle, F., *Een datamining project in de praktijk* (in Dutch), Master in Commercial Engineering in Management Informatics, Catholic University of Leuven, 2000.

## Projects

- 2010-2014 “National Centre of Competence in Research (NCCR) Robotics”, Swiss nation-wide project with the objective of developing new, human-oriented robotic technology for improving quality of life
- 2007-2008 “Routing Problems with Objective Functions of Increasing complexity”, a Swiss national Science Foundation project.
- 2006-2010 “Swarmanoid: Towards Humanoid Robotic Swarms”, a Future and Emerging technologies (FET-OPEN) project funded by the European Commission.
- 2002-2006 “BISON: Biology-Inspired techniques for Self Organization in dynamic Networks”, a FET (Future and Emerging Technologies Program), IST project funded by the European Commission.
- 2002-2005 “Failure Location, Restoration and Resilience in Optical and Ad-Hoc Networks”, a Swiss Hasler Foundation DICS project.
- 1999-2000 Data mining project for NURTouristic, a major company in the Belgian travel industry.

## Conference Organization and other

- GECCO 2010: Session chair of the session on ACO-SI, Best Paper Nominees Ant Colony Optimization.
- Swarm Intelligence Symposium 2008: Organizer of a special session on Swarm Intelligence for Wireless Ad Hoc Networks

## Referee Activities

### Journals

- IEEE Communications Magazine
- IEEE Computer Communications
- IEEE Transactions on Vehicular Technology
- IEEE Transactions on Evolutionary Computation
- IEEE/ACM Transactions on Networking
- ACM Transactions on Autonomous and Adaptive Systems
- Wireless Networks
- Swarm Intelligence
- Kluwer Journal of Mathematical Modelling and Algorithms
- International Journal of Applied Mathematics and Computer Science
- Wireless Networks
- Arabian Journal for Science and Engineering

### Conferences, Program Committee

- IEEE CEC 2010, the IEEE Congress on Evolutionary Computation
- ICINCO 2010, 2011: the International Conference on Informatics in Control, Automation and Robotics
- ANTS 2010, the 7th International Conference on Swarm Intelligence
- EvoCOMNET 2010, the 7th European Workshop on the application of Nature-inspired techniques to Telecommunication Networks and other Connected Systems
- IEEE CEC 2009, IEEE Congress on Evolutionary Computation
- EvoCOMNET 2009, the 6th European Workshop on the application of Nature-inspired techniques to Telecommunication Networks and other Connected Systems
- EvoCOMNET 2008, the 5th European Workshop on the application of Nature-inspired techniques to Telecommunication Networks and other Connected Systems
- EvoCOMNET 2007, the 4th European Workshop on the application of Nature-inspired techniques to Telecommunication Networks and other Connected Systems

### Conferences, other referee activities

- SIS 2008: IEEE Swarm Intelligence Symposium, St. Louis, Missouri, USA, 2008.
- WCNC 2007: IEEE Wireless Communications and Networking Conference
- IJCAI 2007: International Joint Conference on Artificial Intelligence

- ANTS 2006: Sixth International Workshop on Ant Colony Optimization and Swarm Intelligence, Brussels, Belgium, 2006
- ANTS 2004: Fourth International Workshop on Ant Colony Optimization and Swarm Intelligence, Brussels, Belgium, 2004
- Workshop on Hybrid Metaheuristics (HM 2004) at the sixteenth European Conference on Artificial Intelligence (ECAI), Valencia, Spain, 2004
- First International Workshop on Biologically Inspired Approaches to Advanced Information Technology (BIO-ADIT), Lausanne, Switzerland, 2004
- Eighteenth International Joint Conference on Artificial Intelligence (IJCAI), Acapulco, Mexico, 2003

PhD theses:

- Foreign expert for the thesis “A Bee-inspired Power Aware Routing Protocol for Wireless Ad Hoc Sensor Networks” by Muhammad Saleem, under the supervision of Dr. Muddassar Farooq (2010).

## Teaching

- Teaching assistant for “Object Oriented Programming 2” in the bachelor program at the Scuola Universitaria Professionale della Svizzera Italiana (SUPSI), Lugano, Switzerland (2008-2010).

## Computer skills

Programming languages: C, C++, Java, Perl, Pascal, Delphi, SQL, Prolog

Software Packages: Microsoft Office, Clementine data mining software, Weka data mining software, Latex, Arena (simulation), QualNet (computer network simulation), ...

Operating Systems: Microsoft Windows, Linux.

## Languages

Dutch: Mother tongue

English: Speaking, listening, reading and writing: excellent  
(Computer-based TOEFL test: 283/essay rating: 5.0)

French: Speaking, listening, reading and writing: very good

Italian: Speaking, listening and reading: good. Writing: basic

Spanish: Speaking, listening and reading: good. Writing: basic

German: Basic

## Hobbies

Sports: football (soccer): champion Ticino 3<sup>rd</sup> league 2009-2010

squash, badminton, cycling, skiing, snowboarding, running, swimming, hiking, ...

Travelling, socialising, watching movies.