Curriculum Vitae

Nicolas Macris
EPFL, School of Computer and Communication Sciences, http://people.epfl.ch/macris, http://ipg.epfl.ch

Present position: Maître d'enseignement et recherche, Senior Scientist.

Education: 1990 Dr ès Sciences Physique, 1986 Dipl. Ing. Physicien EPFL.

Research fields: *Graphical models in Coding and Computer Science* (2005-present). Probabilistic analysis of large graphical systems, error correcting codes, estimation, constraint satisfaction, connections to statistical mechanics of spin glasses. *Mathematical and Statistical Physics* (past). Coulomb systems, quantum statistical mechanics, lattice models of electronic correlations, random magnetic Schrödinger operators.

Academic positions:
- PRESENT - 2005: Communication Theory Laboratory, School of Computer and Communication Sciences.
- 2005 - 1994: Institute for Theoretical Physics, School of Basic Sciences EPFL.
- 1994 - 1991: Department of Mathematics, Rutgers University, NJ - USA.

Research grants:
- *Phase Diagrams and Algorithms for Inference and Learning.* SNSF grant no 175541, 1 April 2018 - 31 Mars 2021 (SNSF-ANR bilateral collaboration with F. Krzakala and G. Semerjian ENS Paris).
- *Spatial Coupling of Graphical Models in Communications, Signal processing, Computer Science and Statitical Physics.* SNSF grant no 156672, 1 October 2015 - 31 Mars 2018 (co-investigator with R. Urbanke).
- *Probabilistic Analysis of Sparse Graphical Coding and Information Systems.* SNSF grant no 140388, 1 April 2012 - 31 Mars 2015 (principal investigator).
- *Probabilistic Analysis of Sparse Graphical Coding and Information Systems.* SNSF grant no 121903, 1 April 2009 - 31 March 2012 (principal investigator).
- *Statistical Mechanics of Linear Error Correcting Codes.* SNSF grant no 113412, 01 November 2006 - 31 October 2008 (principal investigator).
- *Statistical Mechanics of Linear Error Correcting Codes.* SNSF grant no 105604, 01 November 2004 - 31 October 2006 (principal investigator).
- *Localization in Magnetic Fields and Quantum Coulomb Systems.* SNSF grant no 65026, 01 October 2001 - 31 March 2004 (co-investigator with Ph. A. Martin).
- *Localization in Magnetic Fields and Quantum Coulomb Systems.* SNSF grant no 55654, 01 Avril 1999 - 30 September 2001 (principal investigator).

Participation in research networks: *Groupement de Recherche Européen* - Mathematics and Quantum Physics, local coordinator 2000-2004, member 2004-2008. *Forbairt International Collaboration Program* - 1996-2000 visiting program with Univ College Dublin.

PhD students:
- Clément Luneau - 2016 - present.
- Eric Chun Lam Chan - 2015 - present.
- Mohamad Dia - 2014 - present.
- Rafah ElKhatib - *Analysis of Spatially Coupled Systems using the Potential Functional with Applications to Coding Theory*, EPFL thesis no 7358 (2016). Now in ING Bank London.
- Andrei Giurgiu - *Sparse Probabilistic Models: Phase Transitions and Solutions via Spatial Coupling*, EPFL thesis no 6625 (2015). Now in Google Zürich.
- Marc Vuffray - *The Cavity Method in Coding Theory*, EPFL thesis no 6088 (2014). Now permanent researcher in Los Alamos National Lab, USA.
- Hamed Hassani - *Polarization and Spatial Coupling: Two Techniques to Boost Performance*, EPFL thesis no 5706 (2013). Inaugural Thomas Cover Dissertation Award 2014. Now Assistant Professor at University of Pennsylvania, Philadelphia, USA.
- Satish Korada - *Polar Codes for Channel and Source Coding*, EPFL thesis no 4461 (2009). ABB 2010 Thesis Award. Now Research Analyst at De Shaw, New York, USA.
- Shrinivas Kudekar - *Statistical Physics Methods for Sparse Graph Codes*, EPFL thesis no 4442 (2009). Now researcher at Qualcomm, New Jersey, USA.
- Christian Ferrari - *Aspects of Two Dimensional Magnetic Schroedinger Operators: Quantum Hall Systems*, EPFL thesis no 2769 (2003). Now in Liceo Locarno, Ticino, Switzerland.
- Clause Alain Piguet - *Long Range Orders in Models of Iteinerant Electrons Interacting with Classical or Quantum Fields*, EPFL thesis no 1977 (1999). Now in Merck group, director device quality management, Geneva, Switzerland.

Teaching

- *Learning Theory.* Master course, Computer and Communication Sciences EPFL, planned for Spring 2019.
- *Information, Calcul, Communication.* Bachelor 1st year class, Life Science and Chemistry EPFL, Module 2. Spring 2015, 2016, 2017, 2018.
- *Circuits et Systèms II.* Bachelor 2nd year class, Computer, Communication Sciences and Electrical Engineering EPFL. Spring 2014.
- *Random Walks.* Master course, Computer and Communication Sciences EPFL. Spring 2014, 2015, 2016, Fall 2016, 2017. (shared with Olivier Leveque).
- *Statistical Physics for Communications and Computer Science.* Doctoral course, Computer and Communication Sciences EPFL. Spring 2011, 2013, 2015, 2017 (shared with Ruediger Urbanke).
- *Traitement Quantique de l'Information.* Bachelor 3rd year class, Computer and Communication Sciences EPFL. Spring 2010 - 2013 and fall 2013 - 2017.
-*Calcul Quantique.* Bachelor 3rd year class, Computer and Communication Sciences EPFL. Spring 2016, 2017, 2018.
- *Stochastic Processes for Communications.* Bachelor 3rd year class, Computer and Communication Sciences EPFL. Fall 2008 (shared with Olivier Leveque).
- *Introduction to the Agebraic Theory of Error Correcting Codes.* CRM, continuous education of gymnasium professors. One week in September 2007, Leysin (shared with Serge Vaudenay).
- *Quantum Information Theory and Computation.* Doctoral course in Computer and Communication Sciences, EPFL. Fall 2005, 2007, 2009, 2011, 2013, 2015.
- *N-Body Methods in Condensed Matter.* Doctoral course Troisième Cycle de la Physique en Suisse Romande. Fall 2000, 2005, 2008 (shared with Dionys Baeriswyl).
- *Electrodynamique.* Bachelor 3rd year course in Physics, University of Neuchatel. Spring 2004.
- *Thermodynamique.* Bachelor 3rd year course in Physics, University of Neuchatel. Spring 2003.
- *The Quantum Hall Effect.* Master optional course in Physics, University of Neuchatel. Spring 2003.
- *Introduction to Quantum Electrodynamics.* Master course in Physics, University of Fribourg. Fall 2002.
- *Advanced Statistical Physics.* Master course in Physics, UNIL and EPFL. Spring 2000, 2002.
- *Introduction to the Techniques of the N-Body Problem.* Troisième Cycle de La Physique en Suisse Romande. "Strongly correlated electron systems". Grimentz, one week in september 2001.
- *Physique Statistique.* Bachelor 3rd year course in Physics, UNIL and EPFL. Spring 2000.
- *Advanced Quantum Mechanics.* Master course, in Physics, UNIL and EPFL. Fall semesters 1997 - 2001.

Visiting appointements and invitations in workshops

- Banff International Research station for Mathematical Innovation and Discovery - Banff, Canada 10/2018.
- Institut d'études scientifiques de Cargèse - Corse - 08/2018.
- IEEE Statistical Signal Processing Workshop - Freiburg - 06/2018.
- Dagstuhl Seminar - 03/2018.
- Les Houches School of Theoretical Physics - 03/2017.
- Ecole Normale Supérieure - Paris - 07/2016.
- Simons Institute for the Theory of Computing - Berkeley - 05/2016.
- Institut Henri Pincaré - Paris - 03/2016.
- Institute of Mathematics and its Applications - IMA - Minneapolis - 05/2015.
- Kavli Institute for Theoretical Physics China - KITPC - Beijing - 10/2014.
- Warwick University - Mathematics Research Centre 05/2014.
- KTH Royal Institute of Technology - Stockholm - ACCESS Linnaeus Centre and Nordita 01/2014.
- Los Alamos National Laboratory - Center for Non-Linear Studies 01/2014.
- Université de Paris-Sud Orsay - Laboratoire de Physique Théorique et Modèles Statistiques 01/2012.
- Laboratoire des signaux et systèmes, unité mixte: CNRS, Supelec, Paris-Sud Orsay - Paris, 12/2010.
- Banff International Research station for Mathematical Innovation and Discovery - Banff, Canada 11/2009.
- Université de Fribourg - Département de Physique 01-03/2003.
- Eidgenössische Technische Hochschule Zürich - Institut für Theoretische Physik 07-12/2002.
- Dublin Institute of Advanced Studies - 09/2003, 06/2001.
- Ecole Normale Supérieure de Lyon - Laboratoire de Physique Théorique 06/2001, 06/2000, 10/1990.
- Université de Paris-Sud Orsay - Laboratoire de Physique Théorique et Modèles Statistiques 10-12/2000.
- Erwin Schrödinger Institute - Vienna 06/1998, 09/1995.
- Rutgers University - Department of Mathematics 09/1996, 09/1994.
- Warwick University - Mathematics Research Centre 09/1994.
- Institut des Hautes Etudes Scientifiques - Bures sur Yvette, Paris 03/1993.
- University College Dublin - Department of Mathematical Physics 02/1999, 10/1997, 01/1997, 01/1996, 10/1992, 06/1991.
- Centre de Physique Théorique Luminy - Marseille 04/1999, 07/1998, 07/1995, 05/1994, 06/1993.
- Université de Paris-Sud Orsay - Laboratoire de Physique Théorique et Hautes Energies, 04-05/1989.

Services and committees:
– Member of thesis juries for:

- Dr Luc Machiels, *Simulation and theory of randomly forced turbulence,* PhD. Department of Mechanical Engineering EPFL (1997).
- Dr Philippe Curty, *Amplitude and phase fluctuations in high temperature superconductors,* PhD. Institut de Physique, Neuchâtel University (2003).
- Dr Pascal Buenzli, *The Casimir force in the semi-classical regime: a microscopic theory,* PhD. School of Basic Sciences EPFL (2006).
- Dr Mehdi Molkaraie, *Subtree-based bounds and simulated-based estimations for the partition function,* PhD. School of Computer and Communication Science EPFL (2007).
- Dr Jamal Najim, *Contribution à l'analyse asymptotique des grandes matrices aléatoires et applications aux communications numériques,* Habilitation à diriger des recherches. Université Paris-Est Marne la vallée (2009).
- Dr Mamdouh Abbara, *Turbo-codes quantiques,* PhD. Ecole Polytechnique et INRIA Paris (2013).
- Dr Jean Barbier, *Statistical physics and approximate message passing algorithms for sparse linear estimation problems in signal processing and coding theory,* PhD. Ecole Normale Supérieure et Université Paris Diderot, Paris 7 (2015).
- Dr Serj Haddad, *Throughput Analysis of Large Networks: Spatial Diversity, Beamforming Gain, and Transmission Modes,* PhD. School of Computer and Communication Science EPFL (2017).
- Rajai Nasser, PhD. School of Computer and Communication Science EPFL (2017).

– On the technical program commitees of information theory conferences: ITW 2012, ISIT 2013, 2015, 2016.

– Regular refereeing for: Journal of Physics A, Physical Review, Journal of Statistical physics, IEEE Transcations on Information Theory, IEEE Transcations on Communications, International Symposium Information Theory, Information Theory Workshop, SODA.

– Other professional activities:

- Study trip with IC students in Séoul, South Korea (September 2017).
- Member of the Commité Doctoral (Physics Department, EPFL, before 2003).

- Member of the Conférence du Corps Enseignant (CCE) of EPFL (2009-2015)

- Services for secondary education in canton de Vaud (gymnasium):

  - Expert for examens de Maturité (several years).
  - Participation in the continuous education program of the Commission Romande de Mathématiques for mathematics professors of the gymnasium (2007).

Contact address

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