

Irene Balelli

Ph.D.

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Biographical Information

Birth **November 3, 1988**, in Forlimpopoli - Italy.
Citizenship **Italian**.
Marital status **Under PACS**.
Family situation **Two children** (2015 and 2018).

Research Interests

Machine Learning Federated learning. Distributed learning. Bayesian Statistics. Data mining. Latent variable models. Generative models. Large-scale heterogeneous secured biomedical data.
Modeling/Statistics Identifiability analysis. Sensitivity analysis. Parameter estimation with population approach. Mixed effects models. Expectation Maximization
Biomedical Applications *Neurodegenerative diseases*: Alzheimer Disease. Parkinson Disease. Imaging data.
Immunology: Immune response dynamics. Immune system. Antibody affinity maturation. B-cells. Immune memory. Vaccination.
Applied Probability Random walks on graphs. Markov chains. Graph theory. Galton-Watson processes. Evolutionary landscapes

Current Position

2021–now **Research scientist (ISFP) in mathematical modeling for computational biomedicine**, EPI-ONE team - Centre Inria d'Université Côte d'Azur, Valbonne - France.

Experience

2020–2021 **Post-doctoral research fellowship in federated statistical learning for new generation meta-analyses of large-scale and secured biomedical data**, EPIONE team - Inria Sophia Antipolis Méditerranée, Valbonne - France.
2017–2019 **Post-doctoral research fellowship in modeling of the immune response to Ebola vaccine**, SISTM team - Inserm U1219 Bordeaux Population Health, Bordeaux - France.

Education

2013–2016 **PhD in Applied Mathematics with teaching activities**, LAGA - Université Paris 13, Villetaneuse - France.
Title: *Mathematical foundations of antibody affinity maturation*.
Supervisors: Vuk Milišić, Gilles Wainrib, Hatem Zaag.
Defense date: November 30, 2016.
2011–2013 **Master Degree in Mathematics Applied to Biology and Medicine**, *Master thesis*: A mathematical model of somatic hypermutation (*Supervisors*: V. Milišić, G. Wainrib), Université Paris 6, Paris - France.
2010–2011 **Erasmus Program**, Universidad Complutense, Department of Mathematics, Madrid - Spain.

2007–2010 **Bachelor degree in Mathematics**, *Bachelor thesis*: Il modello di Bressloff e Cowan: allucinazioni visive come stati stabili di attivazione corticale (*Supervisor*: G. Citti), Università di Bologna, Bologna - Italy.

Papers and Preprints

I. Balelli, S. Silva, M. Lorenzi., *A Differentially Private Probabilistic Framework for Federated Heterogeneous Multi-View Datasets Variability*, Submitted to *Journal of Machine Learning for Biomedical Imaging (MELBA)*.

I. Balelli, S. Silva, M. Lorenzi., *A Probabilistic Framework for Modeling the Variability Across Federated Datasets of Heterogeneous Multi-View Observations*, International Conference on Information Processing in Medical Imaging. Springer, Cham, 2021. p. 701-714..

Q. Clairon, C. Pasin, **I. Balelli**, R. Thiébaut, M. Prague., *Parameter estimation in nonlinear mixed effect models based on ordinary differential equations: an optimal control approach*, [arXiv: 2102.11543].

M. Prague, J. Gerold, **I. Balelli**, C. Pasin, J. Li, D. Barouch, J. Whitney, A. Hill., *Viral rebound kinetics following single and combination immunotherapy for HIV/SIV*, [bioRxiv 700401; doi: <https://doi.org/10.1101/700401>].

I. Balelli, C. Pasin, M. Prague, F. Crauste, T. Van Effelterre, V. Bockstal, L. Solforosi, R. Thiébaut, *A model for establishment, maintenance and reactivation of the immune response after vaccination against Ebola virus*, *Journal of Theoretical Biology*, 2020, DOI: 10.1016/j.jtbi.2020.110254.

C. Pasin, **I. Balelli**, T. Van Effelterre, V. Bockstal, L. Solforosi, M. Prague, M. Douoguih, R. Thiébaut, *Dynamics of the humoral immune response to a prime-boost Ebola vaccine: quantification and sources of variation*, *Journal of Virology*, 2019, DOI: 10.1128/JVI.00579-19.

I. Balelli, V. Milišić, G. Wainrib, *Multi-type Galton-Watson processes with affinity-dependent selection applied to antibody affinity maturation*, *Bulletin of Mathematical Biology*, 2019, vol. 81, no 3, p. 830-868.

I. Balelli, V. Milišić, G. Wainrib, *Random walks on binary strings applied to the somatic hypermutation of B-cells*, *Mathematical Biosciences*, 2018, vol. 300, p. 168-186.

I. Balelli, V. Milišić, G. Wainrib, *Branching random walks on binary strings for evolutionary processes in adaptive immunity*, [arXiv: 1607.00927].

Attended Conferences, Meetings and Seminars

2021 **Information Processing in Medical Imaging (IPMI) 2021**, *Poster*, Online event.

2020 **3IA Scientific Days**, *Poster*, Nice - France.

Sophl.A Summit 2020, *Talk*, Sophia Antipolis - France.

2019 **4th EBOVAC1/2 Annual meeting**, *Talk*, Nairobi - Kenya.

VRI Annual meeting, *Talk*, Paris - France.

2018 **IMI 10th Anniversary Scientific Symposium**, *Talk*, 3rd committee prize “best presentation”, Brussels - Belgium.

CROI 2018, *Poster* (J.M. Gerold, C. Pasin, **I. Balelli**, S. Lim, C. Osuna, J.B. Whitney, D.H. Barouch, M. Prague, A.L. Hill), Boston - United States.

3rd EBOVAC1/2 Annual meeting, *Talk* (shared with C. Pasin), Amsterdam - Nederland.

2017 **Systems Immunology and Vaccine design**, Heidelberg - Germany.

2016 **Probabilities and Statistics seminar (LAGA)**, *Talk*, Villetaneuse - France.

1st Challenges in inflammation meeting, Florence - Italy.

Les probabilités de demain, *Talk*, IHÉS - Bures-sur-Yvette - France.

Summer school: “PDE and Probability for Life Sciences”, *Poster*, CIRM - Marseille - France.

2015 **EDP-Normandie**, *Poster*, Havre - France.

2014 **InflaConf: Mathematical modeling in immunology and inflammation**, *Talk*, Paris - France.

- CANUM 2014**, *Poster*, Carry-le-Rouet - France.
Inflamex day, *Talk*, CIEP Sèvres - France.
 2013 **GDR Métice: Inflammation and Treatment Resistance**, *Talk*, Lyon - France.

Thematic schools

- 2021 **AI4Health Winter School**, *Workshop*: Handling heterogeneity in the analysis of biomedical information, Online event.
First Inria-DFKI European Summer School on Artificial Intelligence, *Workshop*: Federated learning methods and frameworks for collaborative data analysis, Online event.

Teaching Activities

- 2020-2021 **Bayesian learning**, *Lectures and tutorials*, M2 MSc Data Science & Artificial Intelligence, University Côte d'Azur.
 Sophia Antipolis - France
Modeling of biological systems, *Lectures and tutorials*, M2 BIM, University Côte d'Azur.
 Nice - France
- 2013-2016 **Probability and Statistics 2**, *Tutorials*, 2nd year bachelor's degree in Mathematics and MIEF, University Paris 13.
 Villetaneuse - France
Probability and Statistics 1, *Tutorials*, 2nd year bachelor's degree in Mathematics, University Paris 13.
 Villetaneuse - France
Probability and Statistics, *Tutorials*, 1st year Engineering degree (Apprentissage énergétique), Engineering School Sup Galilée.
 Villetaneuse - France
Statistics, *Tutorials*, 1st year Engineering degree MACS (Mathématiques Appliquées et Calcul Scientifique), Engineering School Sup Galilée.
 Villetaneuse - France
Probability, *Tutorials*, 2nd year IUT-Info, University Paris 13.
 Villetaneuse - France
Inferential statistics, *Tutorials*, 2nd year DUT-GEA, University Paris 13.
 Bobigny - France

References

Marco Lorenzi	marco.lorenzi@inria.fr	Hatem Zaag	zaag@math.univ-paris13.fr
Rodolphe Thiébaud	rodolphe.thiebaud@u-bordeaux.fr	Vuk Milišić	milisic@math.univ-paris13.fr
		Gilles Wainrib	gilles.wainrib@owkin.com

Computer Skills

Programming Languages	Python, Matlab, R	Operating Systems	Mac OSX, Linux, Windows
Parameter estimation softwares	Monolix, NIMROD	Numerical Simulations	Stochastic processes, Monte Carlo methods, ODE system (simulation / sensitivity analysis)
Editing & Office	OpenOffice, Office, L^AT_EX	Others	IdentifiabilityAnalysis (Mathematica), DAISY (Reduce3.8)

Languages

Italian	Mother tongue	English	Fluent
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French **bilingual**

Spanish **Fluent**