
Lorenzo SALA, PhD

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Employment

- **Post doc** at Inria Saclay, Ile-de-France. 2020 - now.
Mentor: I. Vignon-Clementel.
Project: modelling of hemodynamics in the entire circulation for targeted surgical interventions in the liver.
- Collaboration as **consultant for Gspace LLC**. 2020-2021.
Gspace LLC is a consulting company in computational modeling for smart solutions in engineering and life sciences.
Project: modelling the structural reaction of mattress to body weight.
- **Research Associate** at Imperial College London. 2019 - 2020.
Mentor: P. Degond.
Project: modelling sperm-mucus interactions across scales: apply advanced mathematical modelling and computational techniques to understand the motion of sperm cells through the heterogeneous environments they encounter during mammalian reproduction.
- **Engineer researcher** at the Université de Strasbourg. May - September 2016.
Mentors: G. Guidoboni, C. Prud'homme.
Project: Eye2Brain: study and implement innovative mathematical and physiological models to investigate the connection between the eye and the brain.

Qualifications

- **PhD in Applied Mathematics** at the Université de Strasbourg. 2016 - 2019.
Title: Mathematical modelling and simulation of ocular blood flows and their interactions.
Advisors: C. Prud'Homme, G. Guidoboni, M. Szopos.
- **MSc in Computational Science and Engineering** at Politecnico di Milano. 2013 - 2016.
Master thesis: A Cellular Scale Model of Aqueous Humour Production.
Advisors: R. Sacco, A.G. Mauri, G. Guidoboni.
- **BSc in Mathematical Engineering** at Politecnico di Milano. 2010 - 2013.

Patents

- **Cardiovascular function and ballistocardiogram**. US provisional patent application No.62/735,716. Filed on 09/24/2018.
Inventor: G. Guidoboni *Authors:* G. Guidoboni, L. Sala
Assignee: The Curators of the University of Missouri

Funding

- Contribution to 2021 AIM Square¹ entitled *Mathematical modeling of the relationship between cardiovascular function and ballistocardiogram*.
- Young researchers scholarship for the **9e Biennale Française des Mathématiques Appliquées et Industrielles**. Fees and accommodation grant. 2019.
- Contribution to the grant **Mathematical Modelling, Simulation and Optimization for Societal Challenges with Scientific Computing: Eye2Brain project**. European Union's Horizon 2020 research and innovation programme. Grant agreement No 731063. C. PRUD'HOMME. 2016-2018.
- Contribution to the grant **Prix Espoir IdEx (Initiative d'excellence)**. M. SZOPOS. 2018.
- **PhD scholarship** administrated by the Doctoral School *Mathematics, Engineering and Computer Science* of the University of Strasbourg. 2016-2019.

Honours and awards

- **VPHi-InSilicoTrials PhD Thesis Award in In Silico Medicine for potential application in industrial R&D**. VPH2020 Conference. August 28, 2020, Paris, France.
- **Best PhD Thesis Award - Prize of the Research Commission of the University of Strasbourg**. June 26, 2020, Strasbourg, France.
- **Qualified for the functions of "Maître de conférences"**.
French qualification required in order to apply for Associate Professor positions. February, 2020.
- Oral presentations at 2018 and at 2019 **Annual Meeting of the Association for Research in Vision and Ophthalmology**. Selected among circa 1000 applicants. 2018, Honolulu (HI), USA; 2019, Vancouver, Canada.
- **Best Poster Award** - University of Strasbourg Doctorate School in Mathematics, Engineering and Computer Science. October 2, 2017, Strasbourg, France.

Invited talks

- *14th World Congress on Computational Mechanics: Multidisciplinary Alliance in Biosciences: Modeling, Computing, Technology and Clinical Applications*. (Online) Paris, France. 13/01/2021.
- *2021 Virtual Joint Mathematics Meetings*. Online. 08/01/2021.
- *VPH2020 Conference*. (Online) Paris, France. 28/08/2020.
- *Applied PDEs Seminar*. Imperial College London, UK. 29/11/2019.
- *European Numerical Mathematics and Advanced Applications Conference 2019*. Egmond aan Zee, The Netherlands. 30/09/2019.
- *6th International Conference on Computational and Mathematical Biomedical Engineering*. Sendai, Japan. 11/06/2019.
- *9e Biennale Française des Mathématiques Appliquées et Industrielles*. Guidel Plages (Morbihan), France. 14/05/2019.

¹<https://aimath.org/programs/squares/>

- *Workshop Modeling the eye as a window on the body*. American Institute of Mathematics, San José (CA), USA. 17/10/2018.
- *13th World Congress on Computational Mechanics: Multidisciplinary Alliance in Biosciences: Modeling, Computing, Technology and Clinical Applications*. New York (NY), USA. 24/07/2018.
- *Workshop 5th Feel++ User Days*. IRMA, Strasbourg, France. 14/09/2017.
- *Séminaire Equations aux dérivées partielles*. IRMA, Strasbourg, France. 11/10/2016.

Presentations

- Poster at *44e Congrès National d'Analyse Numérique*. Centre Azureva, Cap d'Agde, France. 30/05/2018.
- *Workshop Mathematical Modelling, Simulation and Optimization for Societal Challenges with Scientific Computing (MSO4SC)*. Budapest, Hungary. 23/05/2017. *Presentation available on Youtube at <https://www.youtube.com/watch?v=F4JIgA1PCcA&t=1s>*
- Poster at *2017 Annual Meeting of the Association for Research in Vision and Ophthalmology. Poster session "Imaging: Macula Retina, Blood Flow, OCT Angiography"*. Baltimore(MD), USA. 07/05/2017.
- Poster at *Numerical methods for PDEs: recent developments in numerical methods for model reduction*. IHP, Paris, France. 08/11/2016.

Teaching

- Undergraduate course **Mathématique I**. Lecture series and marking. *Review of the mathematics studied at high school for 1st year undergraduate students in Biology*. Université de Strasbourg, A.Y. 2017-2018 and 2018-2019.
- Undergraduate course **Algorithme et Programmation en C++**. Exercise series, exam preparation and marking. *Practical (Computed-based) lessons on algorithms and coding in C++ for 3rd year undergraduate students in Mathematics*. Université de Strasbourg, A.Y. 2018-2019.
- **Informal supervision**: L. Berti (U. Strasbourg), G. Bonifazi (U. Missouri), G. Chiaravalli (U. Missouri), N.M. Marazzi (U. Missouri), P. Ricka (U. Strasbourg), F. Stefanoni (Politecnico di Milano), A. Walczak (Imperial College).
- **Formal supervision**: L. Thiebaud (INRIA), T. Saigre (U. Strasbourg).

Peer-reviewed articles

- **Combining physiology-based modeling and evolutionary algorithms for personalized, non-invasive cardiovascular assessment based on electrocardiography and ballistocardiography** N.M. MARAZZI, G. GUIDOBONI, M. ZAID, L. SALA ET AL. *Frontiers of Physiology*, 2021
- **Uncertainty propagation and sensitivity analysis: results from the Ocular Mathematical Virtual Simulator**. L. SALA ET AL. *Mathematical Biosciences and Engineering*, 2021.
- **Neurodegenerative disorders of the eye and of the brain: a perspective on their fluid-dynamical connections and the potential of mechanism-driven modeling**. G. GUIDOBONI, R. SACCO, M. SZOPOS, L. SALA ET AL. *Frontiers in Neuroscience*, 2020.
- **Using sensor signals in the early detection of heart failure: A case study**. L.A. DESPINS, G. GUIDOBONI, M. SKUBIC, L. SALA ET AL. *Journal of Gerontological Nursing*, 2020.
- **Mathematical assessment of the role of three factors entangled in the development of glaucoma by means of the Ocular Mathematical Virtual Simulator**. L. SALA ET AL. *Numerical Mathematics and Advanced Applications ENUMATH*, 2019.
- **A Theoretical Study of Aqueous Humor Secretion Based on a Continuum Model Coupling Electrochemical and Fluid-Dynamical Transmembrane Mechanisms**. L. SALA ET AL. *Communications in Applied Mathematics and Computational Science*, 2019.
- **Cardiovascular function and ballistocardiogram: a relationship interpreted via mathematical modeling**. G. GUIDOBONI, L. SALA ET AL. *IEEE Transactions on Biomedical Engineering*, 2019
- **Ocular mathematical virtual simulator: A hemodynamical and biomechanical study towards clinical applications**. L. SALA ET AL. *Journal of Coupled Systems and Multiscale Dynamics*, 2018
- **Multiscale nature of ocular physiology**. L. SALA, R. SACCO, G. GUIDOBONI. *Journal for Modeling in Ophthalmology*, 2018.
- **Hi-POD solution of parametrized fluid dynamics problems: preliminary results**. D. BAROLI, C.M. COVA, S. PEROTTO, L. SALA, A. VENEZIANI. In *Model Reduction of Parametrized Systems*, 2017.
- **Electro-fluid dynamics of aqueous humor production: simulations and new directions**. A.G. MAURI, L. SALA ET AL. *Journal for Modeling in Ophthalmology*, 2016.

Peer-reviewed book chapter

- **Mathematical modeling of the cerebrospinal fluid flow and its interactions**. L. SALA, F. SALERNI, M. SZOPOS. In *Mathematical Modeling of Ocular Fluid Dynamics: From Theory to Clinical Applications*, 2019.

Peer-reviewed conference proceedings

- **Influence of low perfusion pressure on the diastolic hemodynamics in central retinal vessels: a data-driven computational study**. N. MARAZZI, L. SALA ET AL. *IOVS*, 2020.
- **Case study exemplar of detecting severe diastolic dysfunction using ballistocardiogram**. L.A. DESPINS, G. GUIDOBONI, M. SKUBIC, L. SALA, M. ENAYATI, J. KELLER, M. POPESCU. *Innovation in Aging*, 3(Supplement_1), 2019.
- **An operator splitting method for the time discretization of a multi-scale model in ophthalmology**. L. SALA, C. PRUD'HOMME, G. GUIDOBONI, M. SZOPOS. In *9e Biennale Française des Mathématiques Appliquées et Industrielles (SMAI)*. 2019.
- **A web-based interface for ocular hemodynamics and biomechanics analysis via the Ocular Mathematical Virtual Simulator**. L. SALA ET AL. *IOVS*, 2019.
- **Towards a full model for ocular biomechanics, fluid dynamics, and hemodynamics**. L. SALA, C. PRUD'HOMME, G. GUIDOBONI, M. SZOPOS. *Journal for Modeling in Ophthalmology*, 2018.
- **Analysis of IOP and CSF alterations on ocular biomechanics and lamina cribrosa hemodynamics**. L. SALA, C. PRUD'HOMME, G. GUIDOBONI, M. SZOPOS, B.A. SIESKY, A. HARRIS. *IOVS*, 2018.
- **A theoretical study of the role of conformational properties of transepithelial ion pumps on aqueous humor production**. R. SACCO, L. SALA, A.G. MAURI, D. MESSENIO, G. GUIDOBONI, B.A. SIESKY, A. HARRIS *IOVS*, 2018.
- **A theoretical study of the role of conformational properties of transepithelial ion pumps on aqueous humor production**. R. SACCO, A.G. MAURI, L. SALA, S. CASSANI, B.A. SIESKY, G. GUIDOBONI, A. HARRIS. *IOVS*, 2018.
- **Unconditionally stable operator splitting method for a multiscale application in ophthalmology**. G. GUIDOBONI, C. PRUD'HOMME, L. SALA, M. SZOPOS. In *44e Congrès National d'Analyse Numérique*, 2018.
- **Patient-specific virtual simulator of tissue perfusion in the lamina cribrosa**. L. SALA ET AL. *IOVS*, 2017.
- **The role of HCO₃⁻ and NA/K ATPase in the regulation of aqueous humor production: a mathematical model**. R. SACCO, A.G. MAURI, L. SALA, S. CASSANI, B.A. SIESKY, G. GUIDOBONI, A. HARRIS. *IOVS*, 2016.