Annabelle Collin

Born on 1987, French citizenship
Married with one child born on 2018
email: annabelle.collin@inria.fr
web: http://annabellecollin.perso.math.cnrs.fr

Work Experiences

2015-Current | **Maîtresse de Conférences (assistant professor)**
HDR since 2023 December
Institut de Mathématiques de Bordeaux. Inria Bordeaux Sud-Ouest (Monc)
Bordeaux INP, ENSEIRB-MATMECA (teaching)
Maternity leave from 2018 Oct. to 2019 Feb.

2014-15 | **Postdoctoral Researcher**, Università di Pavia, Italy. Isogeometric Analysis.

2011-14 | **PhD Applied Mathematics**, Inria Saclay Île-de-France, France.
ECCOMAS award 2015, ***SMAI-GAMNI award 2015***
Main advisor: Dominique Chapelle. Co-advisor: Jean-Frédéric Gerbeau.
Asymptotic analysis in cardiac electrophysiology. Applications to modeling and to data assimilation. Defended on Oct 06, 2014.
Teaching assistant in Mathematics, UPMC, Paris, France.

Education

2023 | **HDR Applied Mathematics**, University of Bordeaux, Bordeaux, France. Defended on Dec 07, 2023. Mathematical modeling and data assimilation for biomedical problems.

2011-14 | **PhD Applied Mathematics**, Pierre and Marie Curie University, Paris, France. Inria Saclay Île-de-France, France.

2010-11 | **Master's degree in Mathematics and Applications**, summa cum laude, University of Rennes, France. École Normale Supérieure de Cachan-Bretagne, France. Speciality: PDEs and Numerical Analysis.

2010 | **Mathematical Agrégation**.

2007-09 | **Licence and Master's degree (1st year) in Fundamental Mathematics**, University of Rennes and École Normale Supérieure de Cachan-Bretagne, France.

Research activities

Themes | **Data assimilation (observers)**. Luenberger (nudging) and Kalman observers.
Asymptotic Analysis. Reduced-order models.
Oncology. Mechanistic models, Image-based prediction, Spheroids.
Electroporation. Modeling (at cellular scale and tissue scale), Applications to cardiac and tumor ablation.
Cardiac electrophysiology. Bidomain model, atria, ECG.

Publications, Conferences and Seminars

Publications

A. Collin. Population-based estimation for PDE system - Applications in electroporation of tumor spheroids. ESAIM: COCV, 2024.

P. Jaramillo-Aguayo, A. Collin, C. Poignard. Phase-field model of bilipid membrane electroporation. Journal of Mathematical Biology, 2023.

A. Collin, T. García-Sánchez, S. Corridore, L.M. Mire, C. Poignard. Deciphering immediate post-pulse membrane resealing from 4-electrode impedance measurements by numerical modeling. Bioelectricity, 2023.

J. Engelhardt, V. Montalibet, O. Saut, H. Loiseau, A. Collin. Evaluation of 4 tumour growth models to describe the natural history of meningiomas. EBioMedicine, 2023.

S. Nati Poltri, G. Caluori, P. Jaïs, A. Collin, C. Poignard. Electrocardiology modeling after catheter ablations for atrial fibrillation. Proc. of FIMH, 2023.

A. Collin, B. P. Hejblum, C. Vignals, L. Lehot, R. Thiébaut, P. Moireau, M. Prague. Using a population-based Kalman estimator to model the COVID-19 epidemic in France: estimating associations between disease transmission and non-pharmaceutical interventions. The International Journal of Biostatistics, 2023.

P. Loubet, A. Vincent, A. Collin, C. Dejous, A. Ghiotto, C. Jego. Life cycle assessment of ICT in higher education: a comparison between desktop and single-board computers. The International Journal of Life Cycle Assessment, 2023.

A. Collin, H. Bruhier, J. Kolosnjaj, M. Golzio, M.-P. Rols, C. Poignard. Spatial mechanistic modeling for prediction of 3D multicellular spheroids behavior upon exposure to high intensity pulsed electric fields. AIMS Bioengineering, 2022.

A. Collin, M. Prague, P. Moireau. Estimation for dynamical systems using a population-based Kalman filter-Applications in computational biology. MathematicS In Action, 2022.

A. Collin, V. Groza, L. Missenard, F. Chomy, T. Colin, J. Palussière, O. Saut. A model-strengthened imaging biomarker for survival prediction in EGFR-mutated non-small-cell lung carcinoma patients treated with tyrosine kinase inhibitors. Bulletin of Mathematical Biology, 2021.

A. Collin, S. Corridore, C. Poignard. Floating Potential Boundary Condition in Smooth Domains in an Electroporation Context. In International Conference by Center for Mathematical Modeling and Data Science, Osaka University. Springer, 2021.

A. Collin, T. Kritter, C. Poignard, O. Saut. Joint state-parameter estimation for tumor growth model. SIAM Journal on Applied Mathematics, 2020.

A. Collin, C. Copol, V. Pianet, T. Colin, J. Engelhardt, G. Kantor, H. Loiseau, O. Saut, B. Taton. Spatial mechanistic modeling for prediction of the growth of asymptomatic meningioma. Computer Methods and Programs in Biomedicine, 2020.

G. Jankowiak, C. Taing, C. Poignard, A. Collin. Comparison and calibration of different electroporation models. Application to rabbit livers experiments. ESAIM: Proceedings and Surveys, 2020.

D. Voyer, S. Corridore, A. Collin, R. Scorretti, C. Poignard. Numerical modeling of floating potentials in electrokinetic problems using an asymptotic method. IEEE Transactions on Magnetics, 2020.

A. Collin, S. Imperiale, P. Moireau, J.F. Gerbeau, D. Chapelle, Apprehending the effects of mechanical deformations in cardiac electrophysiology-An homogenization approach, M3AS, 2019.

O. Saut, T. Colin, A. Collin, T. Kritter, V. Pianet, C. Poignard, B.Taton Evaluating growth and risk of relapse of intracranial tumors. Computational Systems Biology Approaches in Cancer Research, 2019.

A. Gérard, A. Collin, G. Bureau, P. Moireau, Philippe, Y. Coudière, Model assessment through data assimilation of realistic data in cardiac electrophysiology, Proc. of FIMH, 2019.

C. Zhang, A. Collin, P. Moireau, A. Trouvé, M. Rochoux State-Parameter Estimation Approach for Data-Driven Wildland Fire Spread Modeling: Application to the RxCADRE S5 Experiment, Fire Safety Journal, 2019.

C. Zhang, A. Collin, P. Moireau, A. Trouvé, M. Rochoux Front shape similarity measure for data-driven simulations of wild land fire spread based on state estimation, Proc. of the Combustion Institute 2019.

Publications

N. Tarabelloni, E. Schenone, A. Collin, F. Ieva, A.M. Paganoni J.F. Gerbeau Statistical assessment and calibration of numerical ecg models, JP Journal Biostatistics, 2018.

A. Collin, S. Imperiale Mathematical Analysis and 2-Scale Convergence of an Heterogeneous Microscopic Bidomain Model. M3AS, 2018.

M. Rochoux, A. Collin, C. Zhang, A. Trouvé, D. Lucor, P. Moireau Front shape similarity measure for shape-oriented sensitivity analysis and data assimilation for Eikonal equation. ESAIM, 2017.

A. Collin, G. Sangalli, T. Takacs Analysis-suitable G^1 multi-patch parametrizations for C^1 isogeometric spaces. CAGD, 2016.

A. Collin, D. Chapelle, P. Moireau Sequential estimation based on topological gradient for electrophysiology with front level-set data. Proc. of FIMH, 2015.

A. Collin, D. Chapelle, P. Moireau A Luenberger observer for reaction-diffusion models with front position data. JCP, 2015.

E. Schenone, A. Collin, J.-F. Gerbeau Numerical simulations of full electrocardiogram cycles. IJNMBE, 2015.

D. Chapelle, A. Collin. Strong convergence results for the asymptotic behavior of the 3D-shell model. Journal of Elasticity, 2013.

A. Collin, J.-F. Gerbeau, M. Hocini, M. Haïssaguerre and D. Chapelle. Surface-based electrophysiology modeling and assessment of physiological simulations in atria. Proc. of FIMH, 2013.

D. Chapelle, A. Collin, and J.-F. Gerbeau. A surface-based electrophysiology model relying on asymptotic analysis and motivated by cardiac atria modeling. M3AS, 2012.

Conferences

(since 2016)

FIMH 2023. Electrocardiology Modeling after Catheter Ablations for Atrial Fibrillation, Lyon, France, 2023. *Done by S. Nati Poltri.*

Oncosphère International Meeting. Mathematical modeling and data assimilation in tumor growth. Some illustrative examples, Bordeaux, 2023.

ECCOMAS Congress 2022. Patient-specific prediction of the growth of asymptotic meningiomas using spatial mechanistic modeling and deep learning, Oslo, 2022. *Done by V. Montalibet.*

Workshop IHP Tissue growth and movement Mathematical models of electroporation validated on medical data, Paris, 2021.

Modelling Heterogeneous Populations with Application In Biology Using population based Kalman estimator to model COVID-19 epidemics in France: estimating the burden of SARS-Cov-2 and the effects of non-pharmaceutical interventions. Online, 2021.

Virtual Physiological Human. Spatial mechanistic modeling for prediction of the growth of asymptomatic meningiomas. Paris, 2020.

Virtual Physiological Human. Modeling and inverse problems in tumor growth. Zaragoza, 2018.

CMM-Fields-Inria Workshop on Mathematics for Medicine. Modeling and inverse problems in tumor growth. Toronto, 2018.

Foundations of Computational Mathematics 2017. A Luenberger observer for front position data. Applications in medicine. Barcelona, 2017.

CEYDA+CMA 2017 (spain applied mathematical conference). Modeling and inverse problems in tumor growth. Cartagena, 2017.

Inria @ SiliconValley. A Luenberger observer for front position data. Applications in medicine. Berkeley, 2017.

SIAM Conference on Computational Science and Engineering (CSE17). A Luenberger observer for reaction-diffusion models with front position data. Atlanta, 2017.

Overview in Neurooncology. Image-based prediction of tumor growth for meningiomas ; the Bordeaux experience. Cuidad Real, 2016.

Inverse problems, Control and shape optimisation. PICOF 2016. A Luenberger observer for reaction-diffusion models with front position data. Autrans, 2016.

Invited seminars	Séminaire Modélisation, Analyse et Calcul, IMT, Toulouse, 2024.
	Séminaire de Mathématiques Appliquées. Laboratoire Jean Leray, Nantes, 2024.
(since 2016)	Ecole de l'Inserm Liliane Bettencourt, Paris, 2023.
	Kick-off du plan cancer MECI, Bordeaux, 2022.
	Réseau de Recherche Impulsion Public Health Data Science, Bordeaux, 2022.
	Laboratory IAME (Infection, Antimicrobials, Modelling, Evolution), Team BIPID, INSERM, 2021.
	GDR Happy Bio, Toulouse, 2021.
	Infectious Disease Outbreaks, Lecture Series, 2020.
	Maths Bio, IMT, Toulouse, 2020.
	MAP 5, Paris, 2020.
	Centrale Nantes (public: researchers and M2 students), Nantes, 2020.
	LJAD / EDP-AN-Modélisation, Nice, 2019.
	FEMTO-ST, Besançon, 2019.
	CEMRACS, Marseille, 2018.
	Rencontres Inria-LJLL en calcul scientifique, Paris, 2018.
	Institut Langevin, Paris, 2018.
	Journées contrôle/problème inverses à Clermont Ferrand, 2017.
	Meetup Machine Learning, Bordeaux, 2017.
	Seminar PDE, Modeling and Numerical Analysis, Lyon, 2017.
	CEMRACS, Marseille, 2016.
	ISAE, Toulouse, 2016.
	CERFACS, Toulouse, 2016.

Supervision

PhD	Codirector of Audrey Gossard (50%, 2023-..).
	Codirector of Simon Bihoreau (50%, 2022-..).
	Codirector of Virginie Montalibet (50%, 2021-..).
	Codirector of Simone Nati Poltri (50%, 2021-..).
	Codirector of Pedro Jaramillo-Aguayo (50%, 2019-23).
	Codirector of Sergio Corridore (50%, 2016-20).
	Coadvisor of Thibault Kritter (20%, 2015-18).
Post-doct	Giorgia Ciavolella (50%, 2022-..).
	Océane Saincir (50%, 2019-20).
	Cédrick Copol (50%, 2018-21).
	Floriane Gidel (50%, 2018-19).
Master	Advisor or coadvisor of 10 students of Master 2 since 2016.

Funding obtained as coordinator

2022	**AAP de recherche interdisciplinaire et exploratoire, Univ. Bordeaux** *Déchiffrer la réponse tumorale au propranolol dans l'angiosarcome : Une approche intégrée de modélisation mathématique et déxpériences biologiques.* in collaboration with BRIC Institute 100k€.
2022	**ANR** *Modeling of Irreversible Electroporation for Ventricular Tachycardia* in collaboration with IHU Liryc 250k€.
2017-18	**PEPS** Jeunes chercheur.se.s 6k€
2016-19	**Labex TRAIL** in collaboration with Institut Bergonié. Funding 220k€.

Teaching activities

2015-..	Bordeaux INP (ENSEIRB-MATMECA, ENSCBP)
	- [**In charge**] Course "Ordinary Differential Equations" 3rd year students (since 2022)
	- [**In charge**] Course "Sustainable development and social responsibility: Climate fresk, biodiversity collapse, digital sufficiency, life cycle analysis" 3rd year students (since 2021)
	- [**In charge**] Course "Data Analysis (machine learning)" 5rd year students (since 2019)
	- [**In charge**] Course "Mesh generation and mesh adaptation for PDE" 5rd year students
	- [**In charge (2015-23)**] Practical C++ programming 4th year students
	- [**In charge (2019-23)**] Course "Numerical methods and analysis" 3rd year students
	- Tutorials "Ordinary Differential Equations" 3rd year students (before 2019)
	- Tutorials "Partial Differential Equations" 4th year students (before 2018)

Responsabilities

2024-..	In charge of *Axe: Mathématiques, Santé, Sciences de la Vie*, Réseau Thématique *Math Bio Santé*.
2021-..	Elected member of *Conseil scientifique de Bordeaux INP.*
2019-23	Elected member of *Conseil National des Universités.*
2019-..	In charge of *Mission Développement Durable et Responsabilité Sociétale de l'ENSEIRB-MATMECA.*
2019-..	Member of *GDS CNRS EcoInfo.*
2018-22	Member of *Conseil du laboratoire de l'Institut Mathématiques de Bordeaux.*
2018-20	Co-creator and in charge of *Mission parité de l'Institut Mathématiques de Bordeaux.*
2018-21	Member of Jury of *Agrégation de Mathématiques.*
since 2016	Member of Jury of *Concours MCF, CR or IR* (∼2 by year).
2018-23	Member of *Commission de Développement Technologique du Centre Inria de l'Université de Bordeaux.*
2017-20	Member of *Opération Postes.*
2015-18	Organizer of the seminar *Calcul Scientifique et Modélisation de l'Institut Mathématiques de Bordeaux.*
2016-21	Elected staff representative at the center committee of Inria Bordeaux.

Popularization (since 2016)

2022	Conference for the congress Maths en Jeans, Bordeaux.
2022	Conference for the days Moi Informaticienne Moi Mathématicienne, Bordeaux.
2020-23	Conference (8) on *Ecologie et numérique : Comprendre et Agir* : Conseil Développement Durable de Bordeaux Métropole (general public) ; LABRI and IMB departments of University of Bordeaux ; open conference (students and staff) of University of Bordeaux ; SBM department of University of Bordeaux (two conferences, one of which is available online here) ; Bordeaux INP (staff) ; Réseau Ampère ; IA4Industry.
2021	Interview for the newspaper *Actualité Nouvelle-Aquitaine* on the subject of the mathematics of life for Fédération Margaux.
	Interview for the local newspaper Sud-Ouest 5G : quel est l'impact écologique ?
2019	Participation in Robot Makers Day (Women in Science).
2018	Paper published in Pixees: *L'erreur est humaine ... est-elle aussi numérique ?* with Juliette Chabassier.
2016-18	Organization of the visit of 30 high school students at the *Institut Mathématiques de Bordeaux* for the *Printemps de la mixité.* Popularized presentation of *Calcul Scientifique.*
2017-18	Participation in workshops *Digit'elles* (women in science testimonials).
2016-18	Participation in days *Filles & Math.*
2015-19	Intervention in several classes of colleges or high schools in the New Aquitaine region (within the framework of the association *Femmes & Sciences*).

Skills

Languages	French: mother tongue. English: fluent. Italian: advanced.
Programming skills	Operating systems: Linux, Mac OS. Programming: C/C++, Python. Computational software: Matlab, R.