

Elias Ventre

Inria Junior Researcher

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Date of birth: 27/09/1990

Professional Experience

- Since 2024 **Junior Researcher (CRCN)**, Inria – team COMPO (COMPUtational pharmacology and clinical Oncology)
- 2022–2024 **Post-doctoral fellow**, The University of British Columbia, Topic: Optimal transport approaches for multiomics single-cell data analysis. Supervised by G. Schiebinger
- 2015–2017 **Building engineer**, Builders & Partners

Education

- 2019–2022 **PhD in Applied Mathematics**, ENS Lyon, Thesis: Analysis, calibration and evaluation of stochastic models of gene expression. Supervised by O. Gandrillon, T. Espinasse, T. Lepoutre
- 2017–2019 **Master in Applied Mathematics**, UCBL Lyon 1, with highest honours
- 2013–2015 **Master in Architecture**, ENSAPB
- 2010–2013 **Master in Building Engineering & Bachelor in Architecture**, ESTP & ENSAPLV
- 2008–2010 **Classes préparatoires MPSI-MP**, Lycée Fénélon
- 2008 **Baccalauréat (with honours)**, Lycée Louis Le Grand

Publications

- 2026 **Whole-organism lineage reconstruction from lineage tracing bulk sequencing via inverse Wasserstein barycenter**, *bioRxiv*. Authors: Natalia Kravtsova*, **Elias Ventre***, Rentian Yao, Nozomu Yachie, Geoffrey Schiebinger.
- 2026 **CardamomOT: a mechanistic optimal transport-based framework for gene regulatory network inference, trajectory reconstruction and generative modeling**, *PLOS Computational Biology*. Authors: Yann Maugé, **Elias Ventre**.
- 2025 **Global StationaryOT: Trajectory inference for aging time courses of single-cell snapshots**, *Bioinformatics*. Authors: Cole Boyle, **Elias Ventre**, Geoffrey Schiebinger.
- 2025 **Cell Trajectory Inference based on Schrödinger Problem and a Mechanistic Model of Stochastic Gene Expression**, *npj Systems Biology and Applications*. Authors: Clémence Fournié, **Elias Ventre**, Ulysse Herbach, Aymeric Baradat, Olivier Gandrillon, Fabien Crauste.
- 2024 **Trajectory inference for a branching SDE model of cell differentiation via lineage tracing**, *Journal of Mathematical Biology*. Authors: **Elias Ventre**, Aden Forrow, Nitya Gadhiwala, Parijat Chakraborty, Omer Angel, Geoffrey Schiebinger.
- 2024 **Convergence of the Sinkhorn algorithm when the Schrödinger problem has no solution**, *Annales de la Faculté de Sciences de Toulouse*. Authors: Aymeric Baradat, **Elias Ventre**.
- 2023 **One model fits all: combining simulation and inference of gene regulatory networks**, *PLOS Computational Biology*. Authors: **Elias Ventre***, Ulysse Herbach*, Thibault Espinasse, Gérard Benoît, Olivier Gandrillon.

- 2022 **Evidence for close molecular proximity between reverting and undifferentiated cells**, *BMC Biology*. Authors: Souad Zreika, Camille Fourneaux, Elodie Vallin, Laurent Modolo, Rémi Seraphin, Alice Moussy, **Elias Ventre**, Matteo Bouvier, Anthony Ozier-Lafontaine, Arnaud Bonnaïffoux, Franck Picard, Olivier Gandrillon, Sandrine Giraud.
- 2021 **Reverse engineering of a mechanistic model of gene expression using metastability and temporal dynamics**, *In Silico Biology*. Authors: **Elias Ventre**.
- 2021 **Reduction of a stochastic model of gene expression: Lagrangian dynamics gives access to basins of attractions as cell types and metastability**, *Journal of Mathematical Biology*. Authors: **Elias Ventre**, Thibault Espinasse, Charles-Edouard Bréhier, Vincent Calvez, Thomas Lepoutre, Olivier Gandrillon.

Softwares

- 2026 **anchorOT**: whole-orgAnism liNeage Construction from Hybrid Omics via Reverse Optimal Transport, *Python package*. Authors: **Elias Ventre**, Natalia Kravtsova.
- 2026 **cardamomOT**: New version of CARDAMOM using mechanistic-based Optimal Transport, *Python package*. Authors: **Elias Ventre**, Yann Maugé.
- 2024 **LTreweighting**, Mean Field Langevin algorithm to reconstruct cellular trajectories from sparse lineage tracing data, *Python*. Authors: **Elias Ventre**, Aden Farrow.
- 2022 **CARDAMOM**: Cell type Analysis from scRna-seq Data Achieved from a Mixture MOdel, *Python package*. Authors: **Elias Ventre**, Ulysse Herbach, Olivier Gandrillon.

Supervision

PhD Students

- 2025- Co-supervision of Y. Maugé, with A-S. Chrétien (CRCM)
- 2024- Co-supervision of C. Berthaud, with M. Castets (CRCL)

Postdocs

- 2025-2027 Co-supervision of G. Fiandaca, with S. Benzékry (Inria)

Master students

- 2026 Supervision of Z. Weizmann (UCA)
- 2023-2024 Co-supervision of N. Gadhiwala and P. Chakraborty with G. Schiebinger and O. Angel (UBC)

Teaching

University courses

- 2026– **Optimal transport for machine learning** (12h), graduate course, Université Claude Bernard Lyon 1
- 2022–2024 **Integral Calculus** (62h/year), undergraduate level, The University of British Columbia
- 2019–2022 **Fundamentals of Mathematics** (64h/year), undergraduate level, Université Claude Bernard Lyon 1

Workshops and advanced courses

- 10/2025 **Simulation and inference of gene regulatory networks**, Workshop CompSysBio2025, Aussois
- 07/2025 **Dynamical Optimal transport for trajectory inference from single-cell data**, Workshop *Mathematics of single-cell data analysis*, CIRM, Marseille

Academic Responsibilities

Organization of workshops and conferences

- 2026 Co-organizer of the workshop *From Cell to Clinic: Multi-scale Mechanistic Modeling and Statistical Learning for Health*, Lyon (CRCL)
- 2025 Co-organizer of the workshop *Mathematics of single-cell data*, Marseille (CIRM)
- 2023–2024 Organizer of the weekly UBC Mathbio seminar, Vancouver

Reviewing activity

- Since 2021 15 papers in Bioinformatics, Communications Biology, Current Opinion in Systems Biology, International Conference on Intelligent Systems for Molecular Biology, Journal of Mathematical Biology, Journal of Theoretical Biology, PLOS Computational Biology, Science Advances, Systems Biology and applications.

Grants and Awards

Grants

- 2026 110 000 euros from INCa for the call PRT-K 2026 (coordinator: Jean-Yves Blay)
120 000 euros from INCa for the call PEDIA-ORI26 (coordinator: Thomas Mercher)
19 000 euros from ANR for the project SCITCH (coordinator: Nicolas Dray)
5 000 euros from RT math-bio-santé and PEPR Maths-vives for co-organizing the workshop *From Cell to Clinic: Multi-scale Mechanistic Modeling and Statistical Learning for Health*
- 2025 4600 euros from the Laennec Institute for a 5 months scholarship
- 2023 3500 euros from UBC for organizing the Mathbio seminar series.

Awards

- 2026 Best Poster Award at the ECMTB conference, Gräz
Best Pitch Award at the Canceropole-PACA annual seminar, Saint-Raphaël

Competitive positions

- 2024 COMPETITION n°SIF-CRCN-2024 (INRIA), ranked 4th at the concours de Chargé de recherche de classe normale of the Centre INRIA de Sophia Antipolis – Méditerranée.
- 2019 Biosyl scholarship for M2 research internship

Main talks

- 07/2026 Mathematical Foundations for Spatial Omics in oncology – Workshop, CIRM
- 07/2026 ECMTB – Minisymposium, Graz
- 07/2026 Canceropole-Paca – Annual Seminar, Saint-Raphaël
- 10/2025 CompSysBio2025 – Workshop, Aussois
- 07/2025 Mathematics of single-cell data analysis – Workshop, CIRM
- 06/2025 Canceropole-Paca – Virtual
- 03/2025 GT-mathbio annual day – Institut de Mathématiques de Marseille
- 04/2024 Optimal Transport: Theory and applications – Workshop, Cargèse
- 12/2023 Computational tools for omics data – Workshop, Brown University
- 05/2023 Kantorovitch Initiative annual day – University of Washington
- 04/2023 Mathematical Cell Biology Symposium – The University of British Columbia
- 12/2021 GDR Mamovi – Virtual
- 12/2021 GDR Netbios – Virtual
- 07/2021 Biophysics Symposium – Ecole de Physique des Houches
- 12/2020 SinCellMod-2020 – Virtual

