Rachel Topno

POSTDOCTORAL RESEARCHER

RESEARCH INTERESTS

Postdoctoral researcher passionate about leveraging AI/ML and data science to drive innovation in biotech and healthcare. Expertise includes Machine Learning, Image analysis, and Stochastic Modelling, with a particular emphasis on transforming complex biological data into actionable insights through advanced computational and computer vision techniques. Proven track record of developing robust computational pipelines and publishing 5+ peer-reviewed scientific papers in international journals.

PROFESSIONAL EXPERIENCE

Research Engineer • Institut de Génétique Humaine

Jan 2025 | Jun 2025 | Montpellier, France

- Building deep learning solutions for advanced microscopy and high-dimensional biological data analysis. Developed pipelines using PyTorch, TensorFlow, Scikit-Image and OpenCV for spot detection, object classification, and tracking, addressing challenges like noise and variable morphology.
- Investigating hierarchical noise in biological systems through mathematical modeling.

Doctoral Research • Université de Montpellier

Oct 2020 | December 2024 | Montpellier, France

- Led an interdisciplinary project integrating virology, disease mechanisms, and transcriptional regulation with computational modeling and imaging data analysis using Python, enabling biological insights that informed experiments and drove methodological innovation; collaborated with international partners to enhance experimental design.
- Developed and optimized robust software pipelines for microscopy image analysis including edge detection, segmentation, spot detection, classification, and tracking, automating data processing tasks.
- Developed a cross-correlation-based mathematical framework to analyze dynamic time-series imaging data, validated using synthetic simulations.
- Led development of the *burstdeconv* application software, reducing pipeline runtime through parallel programming and creating a user interface for non-technical users, enhancing usability and adoption.
- Secured three competitive grants, including the LabMUSE EpiGenMed PhD Scholarship and funding from Sidaction and ANRS, demonstrating strong grant writing skills and securing four years of research funding.

Bioinformatics Research Trainee • Amity University

Jun 2017 | Feb 2020 | Noida, India

- Conducted comprehensive transcriptomic and genomic data analyses using R programming and shell scripting, applying Bioconductor packages and WGCNA for coexpression network construction and gene clustering.
- Analyzed RNA-Seq, microarray, and ChIP-Seq datasets to identify novel prognostic biomarkers, contributing to two publications widely cited in the scientific community.
- Automated data acquisition processes through web scraping techniques to retrieve gene survival analysis reports, improving workflow efficiency.
- Presented research findings at an international prestigious workshop via poster sessions, effectively communicating complex bioinformatics results to expert audiences.

CONTACT

LOCATION
Montpellier, France

EMAIL
rachel.kt1208@gmail.com

LINKEDIN
LinkedIn

PORTFOLIO
rachel-kt.github.io/

EDUCATION

Doctorate

Université de Montpellier

Montpellier, France • Feb 2025

Thesis: Extrinsic and intrinsic transcriptional noise in the control of HIV-1 latency.

Post Graduate Diploma in Applied Statistics

Indira Gandhi National Open University

New Delhi, India • Aug 2019

M.Sc. in Physics

St. Stephen's College, University of Delhi

India • May 2017

B.Sc. in Physics

St. Stephen's College, University of Delhi

India • Jun 2013

LANGUAGES

English — *Fluent*

Hindi — *Native*

Bengali — *Native*

French — *Professional*

PRIZES & DISTINCTIONS

Best Interdisciplinary Thesis Award • Le Collège Doctoral de l'Université de Montpellier (CDUM)   *June 2025*
  - Awarded for work bringing together multiple disciplines to study a scientific problem using a transdisciplinary approach.

Virendra Kumar Memorial Prize (M.Sc. Physics) • St. Stephen's College, University of Delhi   *Jul 2016*
  - Awarded to the top-scoring M Sc. Physics student among 120 peers for achieving the highest aggregate marks.

SELECTED PUBLICATIONS

Cell heterogeneity contributes to the variable response of HIV-1 to latency reversing agents. Topno, R. † , Karaki H.† (under revision in Science Advances)

April 2026

BurstDECONV: A signal deconvolution method to uncover mechanisms of transcriptional bursting in living cells. Topno R. † , Douaihy M.† , et al . Nucleic Acids Research

July 2023

Integrated bioinformatic analysis identifies UBE2Q1 as a potential prognostic marker for high grade serous ovarian cancer. Topno, R. et al. BMC Cancer 21, 220

March 2021

Integrative genome wide analysis of protein tyrosine phosphatase identifies CDC25C as prognostic and predictive marker for chemoresistance in breast cancer, Topno, R.† , Nazam, N.† et al. Cancer Biomarker.

July 2021

Tantale, K. et al Stochastic pausing at latent HIV-1 promoter generates transcriptional bursting. Nat Comm (2021)

July 2021

CONFERENCES AND WORKSHOPS

Annual meeting of the Physics of Living Systems (PoLS) 2024 • ICTP, Triest, Italy | Oral Presentation • ICTP, Triest, Italy | Oral Presentation   *June 2024*

Advanced Lecture Course on Computational Systems Biology. • INRIA Aussois 2021 | Poster presentation   *June 2021*

Annual Meeting of the International Physics of Living Systems (iPoLS) Network 2022 • Poster presentation | Flash Talk   *May 2022*

LabMUSE mini-symposium on Transcriptional Noise 2023 |Oral Presentation • Organized by the Department of Mathematical Sciences -Politecnico di Torino   *November 2023*

WORKSHOPS

Biomat School on Multiscale Model in Life Sciences 2022 • Universidad de Granada, Spain   *June 2022*

Summer School in Systems Biology 2019 |Dresden, Germany • IMPRS-CSBD   *August 2019*

Chemical Reaction Networks Summer School 2022| Torgnon • Organized by the Department of Mathematical Sciences - Politecnico di Torino   *April 2022*

REFERENCES

Prof. Ovidiu Radulescu from University of Montpellier

ovidiu.radulescu@umontpellier.fr

Dr. Edouard Bertrand from Institute of Human Genetics - CNRS

edouard.bertrand@igh.cnrs.fr

SKILLS

Soft Skills

English Communication, Stakeholder Management, Analytical Skills, Time Management, Multicultural Collaboration, Resilience, Perseverance, Professional Commitment, Attention to Detail, Rigour, Adaptability and Learning Agility

Programming

Python, R, C++, MATLAB, Bash, Git, Shell

Data Science

Advanced Numerical Methods, Data Engineering Statistical Analysis, Model Validation, Hypothesis Testing, Time-series Data Analysis, Database Management (SQL)

Computer Vision

Scikit-Image, OpenCV, Object Detection, Object Tracking, Segmentation

Machine Learning and Deep Learning

Genetic Algorithms, PyTorch, TensorFlow, CNNs, U-Nets

Modelling and Simulation

Signal Processing, Signal Reconstruction, Markov Processes

DevOps & Tools

CI/CD Tools, Gitlab, Docker, Jupyter, PyQt, Flask

Bioinformatics

RNA-Seq, Microarray Analysis, ChIP-Seq, Gene Expression Analysis, Gene Ontology, Transcriptomics, Co-expression Analysis