

# Bobby Ranjan

European Molecular Biology Laboratory (EMBL), Rome, Italy

[bbbranjan@gmail.com](mailto:bbbranjan@gmail.com) | +39 351 948 1408

[ORCID](#) | [GitHub](#) | [Personal webpage](#) | [Twitter](#) & [Bluesky](#)

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## NARRATIVE

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Computational biologist with 7+ years of experience developing and applying single-cell multi-omics methods, combined with 4 years of hands-on expertise in mouse and molecular biology. Passionate about leveraging gene-environment interactions to uncover mechanisms driving disease onset.

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## RESEARCH EXPERIENCE

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<b>2021 - present</b> <b>(defence Oct 2025)</b>	<b>Predoctoral Fellow</b> <u>European Molecular Biology Laboratory (EMBL), Rome, Italy</u> Supervisor: Jamie Hackett Research topic: Microbiome-mediated epigenetic inheritance of disease risk
<b>2018 - 2021</b>	<b>Bioinformatics Specialist</b> <u>Genome Institute of Singapore, Spatial &amp; Single-cell Systems, Singapore</u> Supervisor: Shyam Prabhakar Research topic: Methods development for scRNA-Seq data analysis
<b>2015 - 2016</b>	<b>Undergraduate Research Experience on Campus (URECA)</b> <u>Nanyang Technological University, Singapore</u> Supervisor: Zheng Jie Research topic: Mathematical modelling of neuronal calcium signalling

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## EDUCATION

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<b>2021 - present</b> <b>(defence Oct 2025)</b>	<b>Doctor of Philosophy   Computational and Systems Biology</b> <u>European Molecular Biology Laboratory &amp; Heidelberg University, Germany</u>
<b>2014 - 2018</b>	<b>Bachelor of Engineering   Computer Engineering   GPA: 4.60/5.00</b> <u>Nanyang Technological University, Singapore</u> <i>Minor in Life Sciences &amp; Minor in Entrepreneurship</i>

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## FELLOWSHIPS, HONORS AND AWARDS

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- **Small Scale Human Ecosystems Funding Award** | EMBL | 2024
- **ISMB Fellowship Award** | International Society for Computational Biology | 2020 & 2021
- **President's Research Scholar** | Nanyang Technological University | 2015

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## TECHNICAL SKILLS

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- **Computational skills:** Fluent in programming (R, Python, Bash), Git administration, server administration, software development, reproducible coding practices (for >10 years).
- **Multi-omics data analysis:** bulk RNA-seq analysis, metabolomics analysis, single-cell RNA-seq and ATAC-seq analysis and methods development.
- **Mouse handling (including in germ-free and BSL2 conditions):** administering oral gavage, IP injections, dissecting various tissue samples including blood, liver, heart, testis, & sperm.
- **Molecular lab techniques:** 10x Genomics single-cell multiome, sample prep for transcriptomics & metabolomics, FACS sorting cells from fresh tissue, basic microscopy.
- **Scientific writing:** brought in over 40.000 € in research funding for my PhD project, highlighted preprints as part of preLights.

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## SCIENTIFIC PRESENTATIONS

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- **Selected speaker** at **Gordon Research Seminar**, "Mechanisms of Epigenetic Inheritance", August 2025, Barcelona, Spain.
  - **Invited speaker** at **University of Cambridge**, "Modelling microbiome-mediated epigenetic inheritance of disease risk", March 2025, Cambridge, United Kingdom.
  - **Invited speaker** at **Indian Institute of Science**, "Embryonic signatures of intergenerational inheritance across paternal environments and genetic backgrounds", January 2025, Bengaluru, India.
  - **Selected speaker** for **Workshop: From DNA to Phenotype: Epigenetic Mechanisms in Resilience and Adaptation**, "Why your father's microbes matter: Intergenerational effects of gut-germline communication", October 2024, Baeza, Spain.
  - **Invited speaker** at **Indian Institute for Science, Education and Research (IISER) Pune**, "The mammalian gut-germline axis and its impact on offspring outcome", December 2023, India.
  - **Selected speaker** for **Human Cell Atlas Asia**, "DUBStepR is a scalable correlation-based feature selection method for accurately clustering single-cell data", October 2020 [Virtual].
  - **Selected speaker** for **Single Cell Analyses Meeting**, "scConsensus: combining supervised and unsupervised clustering for cell type identification in single-cell RNA sequencing data", November 2019, Cold Spring Harbor Laboratory, New York, USA.
  - **Selected speaker** for **Asia-Pacific Bioinformatics Conference**, "Composite mathematical modelling of calcium signalling behind neuronal cell death in Alzheimer's disease", April 2018, Yokohama, Japan.
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## TEACHING AND SUPERVISION

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- **Invited Lecturer** at the **Sapienza University of Rome**, as part of the Master's course titled "Computational Methods in Biology", December 2024, Rome, Italy.
  - **Instructor** at **EMBL Rome Bioinformatics Community**, "The mathematics behind high-dimensional omics data analysis", February-July 2024 & April-July 2025, Rome, Italy.
  - **Mentor and supervisor** for two master students (Kunal Mishra and Jinyu Park) during my appointment at Genome Institute of Singapore. Both master students are co-authors on my publications and are currently enrolled in PhD programmes.
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## SCIENTIFIC SERVICE

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- **EMBL Predoc representative** of the Rome Unit, 2022-2024.
  - **Lead organizer** of the **EMBL Rome Fellows' Visit to the Human Technopole**, September 2024, Milan, Italy (35 participants).
  - **Contributor** for **preLights: The Company of Biologist's preprint highlighting service**, 2020-2021.
  - **Member** of the **International Society for Computational Biology** (2020-2022).
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## PROFESSIONAL DEVELOPMENT

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- Five-days **Gene-environment interactions in human health & disease**, March 2025, Hinxton, United Kingdom.
  - Three-days **SymbNET Metabolomics Workshop**, June 2023, Lausanne, Switzerland.
  - Five-days **EMBO Epigenome inheritance and reprogramming workshop**, September 2022, Split, Croatia.
  - Two-weeks **Training course in Laboratory Animal Science**, November 2023 [Virtual].
  - Nine-weeks **EMBL Predoc Course**, October-December 2021, Heidelberg, Germany.
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## LANGUAGES

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**English:** Native speaker    **Hindi:** Fluent    **Tamil:** Fluent (spoken)    **Italian:** Novice

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## REFERENCES

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**Dr. Jamie Hackett**

PhD supervisor  
EMBL Rome

[jamie.hackett@embl.it](mailto:jamie.hackett@embl.it)

**Dr. Ayele Argaw-Denboba**

PhD mentor and collaborator  
Max Planck Institute of  
Immunobiology and Epigenetics  
[denboba@ie-freiburg.mpg.de](mailto:denboba@ie-freiburg.mpg.de)

**Dr. Shyam Prabhakar**

Former supervisor  
Genome Institute of Singapore  
[prabhakars@gis.a-star.edu.sg](mailto:prabhakars@gis.a-star.edu.sg)

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## RESEARCH PUBLICATIONS

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7 peer-reviewed publications, 4 as first-author (+1 pre-print). \* shared first-author

**Topic 1: Mechanisms of epigenetic inheritance of disease risk**

Dura\* M, **Ranjan\*** B, Serrano JB, ..., Boskovic A and Hackett JA. Embryonic signatures of intergenerational epigenetic inheritance across paternal environments and genetic backgrounds.

**EMBO Journal, 2025.** [DOI](#).

[This study captures molecular signatures of how paternal diet, microbiome perturbations, age and genetic background affect the earliest stages of embryonic development, and proposes a novel variability analysis approach ([GenEVA](#)) to capture embryonic responses to paternal conditioning.]

Argaw-Denboba A, Schmidt TSB, Di Giacomo M, **Ranjan** B, Devendran S, Mastrorilli E, ..., and Hackett JA. Paternal microbiome perturbations impact offspring fitness. **Nature, 2024.** [DOI](#).

[This study provides the first evidence that disruption of the gut microbiome in male mice directly alters survival and disease risk in offspring, thus discovering the mammalian 'gut-germline axis'.]

**Topic 2: Methods for single-cell transcriptomics data analysis**

**Ranjan** B, Sun W, Park J, Mishra K, Schmidt F, Xie R, Alipour F, Singhal V, Joanito I, and Prabhakar S. DUBStepR is a scalable correlation-based feature selection method for accurately clustering single-cell data. **Nature Communications, 2021.** [DOI](#).

[DUBStepR is based on the observation in scRNA-seq data that cell-type-specific genes are highly correlated in expression with one another. DUBStepR significantly outperformed existing methods and proposed a new metric for scoring feature selection algorithms.]

Schmidt\* F, **Ranjan\*** B, Lin QXX, Krishnan V, Joanito I, Honardoost MA, Nawaz Z, and Prabhakar S. RCA2: a scalable supervised clustering algorithm that reduces batch effects in scRNA-seq data.

**Nucleic Acids Research, 2021.** [DOI](#).

[RCA2 (Reference Component Analysis 2) projects input scRNA-seq data onto validated reference transcriptomes and clusters cells in supervised space, making it robust and scalable to large datasets.]

**Ranjan\*** B, Schmidt\* F, Sun W, Park J, Honardoost MA, Tan J, Arul Rayan N, Prabhakar S. scConsensus: combining supervised and unsupervised clustering for cell type identification in single-cell RNA sequencing data. **BMC Bioinformatics, 2021.** [DOI](#).

[scConsensus generates a consensus clustering by combining supervised and unsupervised clustering approaches, and improves the homogeneity of cell types by refining clusters using DE genes.]

**Other research contributions**

Honardoost MA, Adinatha A, Schmidt F, **Ranjan** B, ..., and Prabhakar S. Systematic immune cell dysregulation and molecular subtypes revealed by single-cell RNA-seq of subjects with type 1 diabetes.

**Genome Medicine, 2024.** [DOI](#).

Lee HO, Hong Y, Etioglu HE, ..., **Ranjan** B, ..., and Park WY. Lineage-dependent gene expression programs influence the immune landscape of colorectal cancer. **Nature Genetics, 2020.** [DOI](#).

**Ranjan** B, Chong KH, and Zheng J. Composite mathematical modelling of calcium signaling behind neuronal cell death in Alzheimer's disease. **BMC Systems Biology, 2018.** [DOI](#).