Karthik Raman



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/RamanLab

Profile

Professor in the Department of Data Science and AI at IIT Madras and founding Co-ordinator of the Centre for Integrative Biology and Systems mEdicine (IBSE). My group builds networks, models and AI to understand, predict and design biological systems, from metabolic network algorithms to microbial communities, cancer genomics, infectious disease and drug discovery. Key contributions include FAST-SL for identifying synthetic lethal drug targets, MetQuest and COSMOS for metabolic and community modelling, PIVOT for personalised cancer driver prediction, and PURE, an AI framework for structure-constrained molecular generation. I also co-lead large genomics and microbiome efforts, including GenomeIndia and, with NASA-JPL, studies of the International Space Station microbiome.

At a glance

Publications	95 journal articles, 3 conference papers, 2 books, 3 edited volumes, 9 book chapters; 19 open-source software tools
Funding	PI on 19 projects (₹7.7 crore as PI), co-investigator on 16, including 9 industry projects
Mentoring	PhD: 8 graduated, 5 ongoing; MS: 5 graduated, 3 ongoing; 11 post-doctoral fellows; 47 MTech and dual-degree theses
Teaching	9 courses at IIT Madras; NPTEL *Computational Systems Biology* (6,965 enrolments)
Talks	55 invited talks and seminars

Full CV: ramanlab.github.io/cv/karthik-raman-cv.pdf (updated November 25, 2026)

Current Positions

2024– *Professor*, Department of Data Science and AI, Wadhwani School of Data Science and AI, IIT Madras
2025– *Core Leadership*, India's Centre of Excellence in AI for Education—IITM Bodhan AI Foundation
2015– *Co-ordinator*, Centre for Integrative Biology and Systems mEdicine (IBSE), IIT Madras
2020– *Advisor*, International Secretariat, Office of Global Engagement, IIT Madras
2018– *Co-founder & Director*, qBiome Research Private Limited, Chennai

Past Positions

2022–24 *Professor*, Department of Biotechnology, Bhupat and Jyoti Mehta School of Biosciences, Indian Institute of Technology (IIT) Madras
2018–22 *Associate Professor*, Department of Biotechnology, Bhupat and Jyoti Mehta School of Biosciences, Indian Institute of Technology (IIT) Madras
2017–24 *Core Faculty*, Robert Bosch Centre for Data Science and Artificial Intelligence (RBCDSAI), IIT Madras

2011–18 *Assistant Professor*, Department of Biotechnology, Bhupat and Jyoti Mehta School of Biosciences, Indian Institute of Technology (IIT) Madras

2008–11 Post-doctoral researcher, Andreas Wagner Lab, Department of Biochemistry/Department of Evolutionary Biology and Environmental Studies, University of Zürich, Switzerland

Education

2009 PhD in *Systems Biology*, Supercomputer Education and Research Centre/Bioinformatics Centre, Indian Institute of Science, Bangalore, India

2003 BTech in Chemical Technology, Institute of Chemical Technology, University of Mumbai, India

Publications

Selected journal articles (12 of 95)

2025 Abhor Gupta*, Barathi Lenin, Sean Current, Rohit Batra, Balaraman Ravindran, **Karthik Raman***, Srinivasan Parthasarthy* "PURE: Policy-guided Unbiased REpresentations for structure-constrained molecular generation" *Journal of Cheminformatics* **17**:156

2025 Lavanya Raajaraam and **Karthik Raman*** "COSMOS: COmmunity and Single Microbe Optimisation System" *npj Systems Biology and Applications* **11**:51

2024 Indumathi Palanikumar, Himanshu Sinha, **Karthik Raman*** "Panera: A novel framework for surmounting uncertainty in microbial community modelling using Pan-genera metabolic models" *iScience* **27**:110358

2024 Aswathy Raghu, Indumathi Palanikumar and **Karthik Raman*** "Designing function-specific minimal microbiomes from large microbial communities" *npj Systems Biology and Applications* **10**:46

2022 Rachita K Kumar, Nitin Singh, Sanjaay Balakrishnan, Ceth W. Parker, **Karthik Raman*** and Kasthuri Venkateswaran* "Metabolic modeling of the International Space Station microbiome reveals key microbial interactions" *Microbiome* **10**:102

2022 Malvika Sudhakar, Raghunathan Rengaswamy* and **Karthik Raman*** "Multi-Omic Data Improve Prediction of Personalized Tumor Suppressors and Oncogenes" *Frontiers in Genetics* **13**:854190

2020 Kern Rei Chng, Tarini Shankar Ghosh, Yi Han Tan, Tannistha Nandi, Ivor Russel Lee, Amanda Hui Qi Ng, Chenhao Li, Aarthi Ravikrishnan, Kar Mun Lim, David Lye, Timothy Barkham, **Karthik Raman**, Swaine Chen, Louis Chai, Barnaby Young*, Yunn-Hwen Gan* and Niranjan Nagarajan* "Metagenome-wide association analysis identifies microbial determinants of post-antibiotic ecological recovery in the gut" *Nature Ecology and Evolution* **4**:1256–1267

2020 Gayathri Sambamoorthy and **Karthik Raman*** "MinReact: a systematic approach for identifying minimal metabolic networks" *Bioinformatics* **36**:4309–4315

2020 Aarthi Ravikrishnan, Lars M. Blank, Smita Srivastava and **Karthik Raman** "Investigating metabolic interactions in a microbial co-culture through integrated modelling and experiments" *Computational and Structural Biotechnology Journal* **18**:1249–1258

2018 Aarthi Ravikrishnan, Meghana Nasre and **Karthik Raman*** "Enumerating all possible biosynthetic pathways in metabolic networks" *Scientific Reports* **8**:9932
Software available from /RamanLab/MetQuest/

2017 Aravind Sankar, Sayan Ranu* and **Karthik Raman*** "Predicting Novel Metabolic Pathways through Subgraph Mining" *Bioinformatics* **33**:3955–3963

2015 Aditya Pratapa, Shankar Balachandran and **Karthik Raman*** "Fast-SL: An efficient algorithm to identify synthetic lethal sets in metabolic networks" *Bioinformatics* **31**:3299–3305

Papers in international conferences

2027 Srikrishnan Balamuhunthan, Saketha Nath Jagarlapudi, **Karthik Raman*** "RxnPred: A Generative Framework for Enzymatic Reaction Prediction" *Pacific Symposium on Biocomputing (PSB 2027)*

2027 Sapna Raja, Harikeshav Karthik, **Karthik Raman*** "Beyond Topology: Informative Node Features in AI-

Based Community Detection on Biological Networks" *Hawaii International Conference on System Sciences (HICSS-60)*

2026 Abhor Gupta*, Barathi Lenin, Sean Current, Rohit Batra, Balaraman Ravindran, **Karthik Raman***, Srinivasan Parthasarthy* "PURE: Policy-guided Unbiased REpresentations for structure-constrained molecular generation" *ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD 2026)*

Books

2021 **Karthik Raman** "An Introduction to Computational Systems Biology: Systems-Level Modelling of Cellular Networks" CRC Press/Taylor & Francis, Boca Raton ISBN 978-1138597327

2018 Aarthi Ravikrishnan and **Karthik Raman** "Systems-Level Modelling of Microbial Communities: Theory and Practice" CRC Press/Taylor & Francis, Boca Raton ISBN 978-1138596719

Ongoing grants & consultancy

2026– Principal investigator on a project "SUKSHMA: A System for Unified Knowledgebase for Structured Harmonised Microbiome Analysis" ANRF-ARG grant (PI) (₹1.14 crores)

2026– Co-investigator on a project "Support to AI CoE for Education" from Google Asia (₹18.02 crores)

2026– Co-investigator on a project "Bodhan AI: AI CoE for Education" from the Ministry of Education, Government of India (≈₹500 crores)

2025– Co-investigator on a project "Herbalife CoE" (funded by Herbalife) along with Prof. Smita Srivastava (PI) (₹6 crores)

2025–27 Principal investigator on a project "Network modelling for ..." funded by Unilever India Private Limited (₹55 lakhs)

2025–26 Principal investigator on a project "Microbiome Systems Biology: Understanding Microbial Synergy in Poultry Gut" funded by Kemin Industries South Asia Private Limited (₹15.65 lakhs)

2025–28 Principal investigator on a project "AI Samarth: AI Literacy Curriculum" funded by Central Square Foundation (₹194.70 lakhs)

2025 Principal investigator on a project "Methods for construction and use of network models from RNA-seq data" funded by Aganitha Cognitive Solutions (₹2.35 lakhs)

2024–25 Principal investigator on a project "Scientific Knowledge Graph Analytics Development" funded by Pfizer Inc. USA (₹20.22 lakhs)

Honours & awards (selected)

2021 *Institute Research and Development Award (Early Career)* (IIT Madras), for outstanding achievements in teaching, scholarship and creative research work

2015 *Young Faculty Recognition Award* (IIT Madras), for excellence in teaching and research

2011 *Sir Vithal N. Chandavarkar Memorial Medal* for the best PhD thesis of the year in the Supercomputer Education and Research Centre, Indian Institute of Science

Editorial roles

2026– *mSystems*, **Associate Editor** (Board of Editors)

2023– *PLoS Complex Systems*, **Editorial Board Member**

2023– *npj Systems Biology and Applications*, **Editorial Board Member**

2022– *Microbial Biotechnology*, **Editorial Board Member**

2022– *PLoS ONE*, **Editorial Board Member**

2021– *ACS Synthetic Biology*, **Editorial Advisory Board**

2019–25 *Scientific Reports*, **Editorial Board Member**