Saish Jaiswal

Ph.D. Researcher | Machine Learning & Computational Biology
Indian Institute of Technology Madras

saish@cse.iitm.ac.in | GitHub | Google Scholar | Website

Research Summary

Ph.D. researcher at IIT Madras working at the intersection of **machine learning and computational biology**, with a focus on antimicrobial resistance (AMR) prediction from whole-genome sequencing (WGS) data. Research interests include scalable AI for genomic sequence analysis, biological foundation models, and robust evaluation frameworks for clinical applications, with additional interests in computational neuroscience, particularly EEG-based analysis of speech and music perception.

Education

Direct Ph.D., Computer Science & Engineering Sep 2020 – Present
Indian Institute of Technology Madras, Chennai
CGPA: **9.1/10**

B.Tech., Computer Science & Engineering Jul 2016 – Jul 2020
VNIT Nagpur (+ Exchange Student, IIT Madras, 2019–20)
CGPA: **9.23/10** (Exchange at IIT Madras: **9.28/10**)

Publications & Preprints

Thesis-Related

- **Saish Jaiswal**, Hema A. Murthy, Manikandan Narayanan. *SpecGMM: Integrating Spectral Analysis and Gaussian Mixture Models for Taxonomic Classification and Identification of Discriminative DNA Regions. Bioinformatics Advances*, 4(1), 2024.
- Brintha V. P., **Saish Jaiswal**, Ansh Meshram, Deepti P. V. S., Sidharthan S. C., Manikandan Narayanan. *TB-Bench: A Systematic Benchmark of Machine Learning and Deep Learning Methods for Second-Line TB Drug Resistance Prediction. bioRxiv*, 2026.

Additional Publications

- Kandaswamy Paramasivan, **Saish Jaiswal**, Rahul Subburaj, Nandan Sudarsanam. *Understanding the role of mobility in the recorded levels of violent crimes during COVID-19 pandemic: a case study of Tamil Nadu, India. Crime Science*, 13, 21, 2024.
- Kandaswamy Paramasivan, Rahul Subburaj, **Saish Jaiswal**, Nandan Sudarsanam. *Empirical evidence of the impact of mobility on property crimes during the first two waves of the COVID-19 pandemic. Humanities and Social Sciences Communications*, 9, 373, 2022.
- M. G. Kumar, Jom K., Anand T., Arun Kumar*, Ashish Seth*, L. V. S. V. Durga Prasad*, **Saish Jaiswal***, Anusha Prakash, Hema A. Murthy. *Dual Script E2E Framework for Multilingual and Code-Switching ASR. Interspeech*, 2021. [*equal contribution]

Poster Presentations

Thesis-Related

- Brintha V. P., **Saish Jaiswal**, Ansh Meshram, Deepti P. V. S., Sidharthan S. C., Manikandan Narayanan. *Can we reliably predict second-line TB drug resistance? A comprehensive benchmark of WGS-based computational approaches.*
  Poster accepted at **RECOMB 2026**, Thessaloniki, Greece.
- **Saish Jaiswal**, Hema A. Murthy, Manikandan Narayanan. *SpecGMM: A Spectral Learning Framework for Interpretable and Scalable Taxonomic Classification of DNA Sequences.*
  Poster presented at **ISMB/ECCB 2025**, Liverpool, UK.

Additional

- **Saish Jaiswal**, Hema A. Murthy. *Deciphering Neural Correlates of Speech Across Indian Languages Using EEG: A Study on Subject-Specific and Linguistic Signatures.*
  Poster presented at the **ICASSP 2025** Workshop on Mapping Brain-Body-Behavior Signal Dynamics in Human Speech Production and Interaction, Hyderabad, India.

Research Experience

MIC Prediction from Whole-Genome Sequencing (*M. tuberculosis*) Dec 2025 – Present
IIT Madras | Advisor: Prof. Manikandan Narayanan

- Designing a multimodal learning framework integrating WGS-derived sequence features, regulatory regions, and biological knowledge graphs for MIC prediction in *M. tuberculosis*.
- Leveraging transformer-based sequence encoders (DNABERT) and heterogeneous graph transformers (STRING, KEGG, metabolic networks) with feature fusion to model gene–gene and gene–drug interactions.
- Benchmarking model performance against existing ML/DL approaches for MIC prediction, with a focus on generalization and biologically interpretable insights.

Benchmarking Second-Line TB Drug Resistance Prediction May 2025 – Present
IIT Madras | Advisor: Prof. Manikandan Narayanan

- Designed and implemented TB-Bench, a systematic benchmark evaluating 15+ ML/DL methods for second-line drug resistance prediction from WGS data.
- Established standardized evaluation protocols for reproducible comparison across feature extraction strategies, model families, and resistance profiles.

SpecGMM: Spectral Analysis Framework for DNA Taxonomy Aug 2020 – Dec 2024
IIT Madras | Advisors: Prof. Hema A. Murthy & Prof. Manikandan Narayanan

- Developed SpecGMM, integrating STFT-based spectral features with Gaussian Mixture Models for genome-scale taxonomic classification.
- Identified discriminative genomic regions via spectral decomposition.

Research Visits

University of Southern California July 2024
Signal Analysis and Interpretation Lab | Advisor: Prof. Srikanth Narayanan

- Gained hands-on exposure to multimodal neural data acquisition (EEG, ECG, GSR), including experimental design and psychophysiological data collection protocols.
- Learned analysis pipelines for preprocessing and interpreting multimodal signals in the context of attentional bias and mental health studies (DARPA PRECOG project).

Massachusetts Institute of Technology August 2024
Sur Lab | Advisor: Prof. Mriganka Sur

- Gained exposure to Neuropixels-based neural recordings in mice for analyzing decision-making dynamics under pharmacological conditions.
- Gained exposure to human EEG datasets (Boston Children's Hospital), including preprocessing and exploratory analysis of neural activity in *Rett syndrome* and control populations.
- Learned preprocessing and exploratory analysis techniques to characterize neural dynamics across behavioral conditions.

Technical Skills

- **Programming:** Python, C/C++, MATLAB, Bash
- **Machine Learning:** PyTorch, TensorFlow, HuggingFace Transformers, scikit-learn, NumPy, Pandas
- **Bioinformatics:** WGS data analysis, AMR prediction pipelines, genomic sequence feature extraction, variant-based modelling
- **Tools:** Linux, Git, LaTeX, Jupyter
- **Courses:** Pattern Recognition and Machine Learning, Fundamentals of Deep Learning, Linear Algebra and Random Processes, Algorithmic Approaches to Computational Biology, Statistical Foundations of Data Science, Computational Neuroscience, Speech Technologies.

Awards & Fellowships

- **Prime Minister's Research Fellowship (PMRF) 2022–2025**, Govt. of India — highly competitive national fellowship awarded to outstanding Ph.D. researchers in science and technology.
- **Star Teaching Assistant Award**, CSE Dept., IIT Madras — for outstanding contributions as TA for *Pattern Recognition and Machine Learning*, *Algorithmic Approaches to Computational Biology*, *Programming and Data Structures*, and *Introduction to Programming*.
- JLPT N4/N5 (Japan Foundation); Sanskrit Prathama & Dvitiya Diksha (Rashtriya Samskrit Sansthan)
- *Rajya Puraskar* (State Award), Maharashtra State Bharat Scouts & Guides.