Satwik Bathula

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Education

University of Southern California, Los Angeles **Expected May 2027**

Master of Science in Electrical and Computer Engineering, Specialization in Machine Learning and Data Science

Advisors: Prof. Anand A. Joshi and Prof. Richard M. Leahy

Indian Institute of Technology Bhubaneswar **Nov. 2021 – May 2025**

Bachelor of Technology in Electronics and Communication Engineering

Advisor: Dr. Himanshu Padole

Research Interests

- Expressivity of neural network architectures
- Mechanistic interpretability and causal analysis of neural representations
- Representation Alignment
- Computational Neuroscience

Publications and Preprints

- Satwik. B and A. A. Joshi, "Fisher Rank Inflation: A Spectral Signature of Memorization under Label Noise" *Under Review @ TMLR* https://arxiv.org/abs/2607.12438.
- Satwik. B and A. A. Joshi, "Gating Enables Curvature: A Geometric Expressivity Gap in Attention," *FoGen @ ICML 2026* https://openreview.net/forum?id=2A4G243DmP.
- Satwik. B "On the Geometry of Memorization: Interpolation and Second-Order Representation Irregularity," *MemFM @ ICML 2026* https://openreview.net/forum?id=khVMWyj9BP&noteId=oXSyaLSRks.
- P. Sasideep, B. Satwik, Nitya Tiwari, Himanshu Pramode, et al., "GEMReg: A Spatio-Temporal Grayordinate Ensemble Modelling Framework for Predicting Task Activation Maps from Resting State fMRI," *Frontiers In Neuroscience*, Accepted Frontiers in Neuroscience — Article ID 1716271. .
- P. Sasideep, B. Satwik, Nitya Tiwari, Himanshu Pramode, et al., "Hybrid IQ Prediction Model Using Multidimensional Temporal and Relational Information in rs-fMRI," *Journal Of Medical Imaging*, under peer review.
- J. Patel, B. Satwik, N. Bagga, et al., "Machine Learning Augmented TCAD Assessment of Corner Radii in Nanosheet FET," *Solid State Electronics, Elsevier* Read the article here: ScienceDirect — S0038110125000590. .
- Arijit Patra, B. Satwik, Himanshu Padole, and Sayan Dey, "Real-Time Arsenic Ion Detection in Water Using a Large-Area All-rGO Thin-Film Transistor," *ACS Applied Nano Materials*, 2026. Link.

Internship Experience

Signal Processing and Machine Learning Intern | LarkAI Healthcare, Gurugram, Haryana **Mar 2024 – Aug 2024**

- Developed a pipeline to **digitize ECG report images into digital waveforms** for downstream signal analysis.
- Applied **Fourier-based filtering, color-space transforms, and morphological processing** to isolate ECG signals from noisy reports.
- Designed **cardiac waveform segmentation (PQR detection)** using second-derivative thresholding and correlation-based feature extraction.
- Implemented **Pix2Pix GAN (PatchGAN discriminator)** for image-to-signal translation and explored **Graph Kolmogorov–Arnold Networks** for signal reconstruction.

Machine Learning Intern | Neumeric Technologies Corporation, Hyderabad, Telangana **Jun 2023 – Aug 2023**

- Performed in-depth **data analysis** on real-time datasets from Telangana using advanced machine learning techniques.
- Developed **predictive, descriptive, and diagnostic models** based on the analyzed data.
- Focused research on healthcare datasets, including **HbA1c** (a diabetes marker), **complete blood profiles**, and **malaria-related data**.