Sankaran Vaidyanathan

✉ sankaranv@cs.umass.edu
sankaranv.com
linkedin.com/in/sankaranv8/

Education

Sep '21–Dec '26 **Ph.D., Computer Science**, University of Massachusetts Amherst

Sep '19–May '24 **M.S., Computer Science**, University of Massachusetts Amherst *GPA: 3.97/4.0*

Aug '13–May '17 **B.E., Electrical and Electronics Engineering**, Anna University *GPA: 8.45/10*

Research Experience

Jan '20–present **Research Assistant**, Knowledge Discovery Lab, University of Massachusetts Amherst
Advisor: David Jensen

Jul '17–Jun '19 **Project Associate**, RISE-IIL Lab, Indian Institute of Technology Madras
Advisor: Balaraman Ravindran

Publications

arXiv:2411.16105 *(under review)* **Adaptive Circuit Behavior and Generalization in Mechanistic Interpretability**
Jatin Nainani*, **Sankaran Vaidyanathan***, AJ Yeung, Kartik Gupta, David Jensen

arXiv:2406.12624 *(under review)* **Judging the Judges: Evaluating Alignment and Vulnerabilities in LLMs-as-Judges**
Aman Singh Thakur*, Kartik Choudhary*, Venkat Srinik Ramayapally*, **Sankaran Vaidyanathan**, Dieuwke Hupkes

arXiv:2404.10883 *(under review)* **Automated Discovery of Functional Actual Causes in Complex Environments**
Caleb Chuck*, **Sankaran Vaidyanathan***, Stephen Giguere, Amy Zhang, David Jensen, Scott Niekum

Neural Networks vol. 173 (2024) **Data-driven Learning of Chaotic Dynamical Systems using Discrete-Temporal Sobolev Networks**
Connor Kennedy, Trace Crowdis, Haoran Hu, **Sankaran Vaidyanathan**, Hong-Kun Zhang

Applied Network Science, 5, 52 (2020) **Hypergraph Clustering by Iteratively Reweighted Modularity Maximization**
Tarun Kumar, **Sankaran Vaidyanathan**, Harini Ananthapadmanabhan, Srinivasan Parthasarathy, Balaraman Ravindran

Complex Networks (2019) **A New Measure of Modularity in Hypergraphs: Theoretical Insights and Implications for Effective Clustering**
Tarun Kumar*, **Sankaran Vaidyanathan***, Harini Ananthapadmanabhan, Srinivasan Parthasarathy, Balaraman Ravindran *(* denotes equal contribution)*

Technical Skills

- **Programming Languages**: Python, C++, R
- **Frameworks**: PyTorch, Pyro, PyMC, HuggingFace Transformers, Box2D, TransformerLens
- **Tools and Platforms**: Figma, Git, Kubernetes, Arduino, Linux

Funded Research Projects

May '23–May '24 **Analysis and Prediction of Cognitive Load Among Teams During Cardiac Surgery**
In collaboration with the National Institute of Health and Harvard Medical School

- Modeled and visualized various measures of heart rate variability, to predict cognitive load and stress among members of a surgical team while performing cardiac surgery.
- Developed transformer-based neural network models for time-series prediction of heart-rate variability.
- Leveraged explainable AI techniques including SHAP, feature ablation, and permutation importance, to identify key features that the models prioritized when predicting cognitive load.
- Developed an MCMC-based imputation scheme to fill in missing data from faulty heart rate monitors.

May '20–Aug '22 **Competence-Aware Machine Learning**

Joint work with David Jensen (UMass Amherst), Joydeep Biswas (UT Austin), and Charles River Analytics

- Determined the causes of failure for a pre-trained reinforcement learning agent navigating in the AirSim driving environment, by estimating causal effects of various environmental conditions on mission failure.
- Learned causal models that estimated the agent's competence, or probability of mission success, for a route with pre-specified environmental conditions.
- Developed a system that allowed a human operator to specify environmental conditions for a new episode prior to deployment, and returned an upper and lower bound on the agent's estimated competence.

Teaching Experience

Sep-Dec '24 **COMPSCI 590X: Decarbonization and Data Science**, University of Massachusetts Amherst

Feb-May '23 **COMPSCI 688: Probabilistic Graphical Models**, University of Massachusetts Amherst

Sep-Dec '22 **COMPSCI 383: Artificial Intelligence**, University of Massachusetts Amherst

Dec '21 **MATH 605: Probability Theory**, University of Massachusetts Amherst

- Gave a guest lecture on sampling methods, Markov Chain Monte Carlo, and Hamiltonian Monte Carlo.

Jan–May '19 **Introduction to Machine Learning**, Indian Institute of Technology Madras

Coursework

Bayesian Statistics, Machine Learning, Intro to Causal Inference, Research Methods in Empirical CS, Probabilistic Graphical Models, Artificial Intelligence, Reinforcement Learning, Probability Theory, Distributed and Operating Systems, Quantum Information Systems, Fixing Social Media, Neural Networks: A Modern Introduction, Advanced Natural Language Processing