Vijay Sadashivaiah

Ph.D. Student in Computer Science

sadasv2@rpi.edu • vjysd.github.io

Education

Rensselaer Polytechnic Institute — Troy, NY
- Doctor of Philosophy in Computer Science — January 2021 - Present
- Master of Science in Computer Science — December 2022
- GPA: 4.00/4.00

Johns Hopkins University — Baltimore, MD
- Master of Science in Biomedical Engineering — May 2017
- GPA: 3.87/4.00

PES Institute of Technology — Bangalore, India
- Bachelor of Engineering in Electrical Engineering — May 2015
- Visiting student at Massachusetts Institute of Technology — Summer 2014
- GPA: 9.32/10.00

Research Experience

Rensselaer Polytechnic Institute — Troy, NY

Research Assistant, Advisors: Profs. James Hendler and Chris R. Sims — January 2022 - Present

- Exploring research questions at the intersection of transfer learning and model interpretability
  - Developing and applying model interpretability methods to understand what contributes to positive and negative transfer between models
  - Exploring information theoretic approaches to constrain knowledge transferred in deep transfer learning models
- Spearheading a joint collaboration between scientists at IBM Research and advisors at Rensselaer

IBM Thomas J. Watson Research Center — Remote

Summer Intern in Trustworthy AI group — May 2021 – September 2021

- Proposed a bandit-based router to improve transfer learning in image classification tasks
  - Used adversarial bandit to route knowledge from a teacher model to student model
  - Improved several tasks with 10+% accuracy gains
- Explored Grad-CAM based visual explanation techniques to understand transferred knowledge

Lieber Institute for Brain Development — Baltimore, MD

Staff Scientist in Machine Learning and Data Science — August 2017 - January 2021

- Explored novel data-driven methods on heterogeneous datasets to identify the underlying biological pathways involved in Schizophrenia and other neurodevelopmental disorders
  - Applied three-way parallel ICA to learn patterns between structural-MRI, functional-MRI and genetic data of Schizophrenic patients
  - Revealed genetic markers that were considered for further experiments in a durg discovery pipeline
- Applied several machine learning methods to classify neuroimaging data
  - Explored regression, SVM, neural networks and transfer learning approaches

Johns Hopkins University Baltimore, MD
Research Assistant in Neuromedical Control Systems Lab September 2015 – May 2017

- Constructed probabilistic, functional & mechanistic models of a mammalian nerve fiber
- Quantified interactions between electrical nerve stimulation and underlying nerve activity
  - Introduced a reliability measure to capture these interactions
  - Proposed models were used to inform Neurophysiologists conducting chronic pain research

École Polytechnique Fédérale de Lausanne Lausanne, Switzerland
Summer Researcher in Laboratory of Sensory Processing June 2015 - August 2015

- Accepted into a highly competitive international research program (5% acceptance rate)
- Analyzed voltage–sensitive dye images of mouse neocortex
  - Introduced a reliability measure to capture these interactions
  - Proposed models were used to inform Neurophysiologists conducting chronic pain research

Massachusetts Institute of Technology Cambridge, MA
Visiting Student Researcher in Camera Culture Lab June 2014 - September 2014

- Designed a high–speed imaging system to capture light in motion (nanophotography)
  - Designed a circuit to house a camera array with custom clocking inputs
  - Programmed and integrated this camera array with light source and FPGA
- Experimented with multi-frequency light sources to imporve the depth accuracy of this system

Skills

Programming: (Proficient) Python, MATLAB, R, Bash, LaTeX; (familiar) C, Java, Perl
Frameworks and tools: Pytorch, TensorFlow, Keras, CUDA, MPI, Git, NEURON, Docker
Relevant courses: Learning Theory, Information Theory, Machine Learning (ML) from Data, ML and Optimization, Deep Learning, Parallel Computing, Probability Theory, Image Processing

Institutional & Community Experience

Center for Social Concern – Johns Hopkins University Baltimore, MD
Volunteer November 2015 – September 2020

- Refurbishing and repairing old computer systems before donating them to local schools in Baltimore
- Teaching basic computer skills like programming and word processing to students in 3rd through 5th grade

Graduate Representative Organization – Johns Hopkins University Baltimore, MD
Advocacy Chair May 2016 – May 2017

- Organized town halls every quarter with university administration to advocate graduate student needs and issues
- Facilitated discussion of topics including student healthcare, maternity leave and dining options on campus
- Assisted Social Chairs in organizing social and cultural events on campus

College Field Hockey – PES Institute of Technology Bangalore, India
Goal-Keeper May 2012 – May 2014

- Participated in practices, weekly drills, competitions, and community service events
- Drafted for state team trails at 2013 inter-collegiate tournament

Awards and Fellowships

Finalist - Quad Fellowship	2022
Best Poster award - International Semantic Web Summer School	2022
Distinguished Biomedical Engineering Fellowship - Johns Hopkins University	2015 - 2017
Semi-finalist - The Data Incubator Challenge	2017
Foundation Leenaards' Summer Research Fellowship - EPFL	2015
University Merit Scholarship - PES Institute of Technology	2011 - 2015
"Code Something that Matters" Scholarship - Vecna Robotics	2015
TEQIP Travel Grant - PES Institute of Technology and Government of India	2014, 2013
Global finalist - Vertech Symposium	2014
Best Student Project - IEEE International Conference on Impact of E-Technology	2014
Finalist - Intel Global Challenge	2013
Winner - Biotechnology Entrepreneurship Student Teams, Department of Biotechnology, India	2013
Semi-finalist - Go Green in the City, Schneider Electric	2013

Publications

1 Brate, R., Dang, M. H., Hoppe, F., He, Y., Meroño-Peñuela, A., **Sadashivaiah, V.** Improving Language Model Predictions via Prompts Enriched with Knowledge Graphs. ISWC workshop on Deep Learning for Knowledge Graphs 2022.

2 Murugesan, K*., **Sadashivaiah, V.***, Luss, R., Shanmugam, K., Chen, P. Y., & Dhurandhar, A. Auto-Transfer: Learning to Route Transferable Representations. ICLR 2022. (* equal contribution)

3 **Sadashivaiah, V.**, Tippani, M., Page, S. C., Kwon, SH, Bach, S. V., Bharadwaj, R. A., Hyde, T. M., Kleinman, J. E., Jaffe, A. E., Maynard, K.R. SUFI: An automated approach to spectral unmixing of fluorescent biological images. BioRxiv 2021.

4 Tran, M. N., Maynard, K. R., Spangler, A., Torres, L. C., **Sadashivaiah, V.**, Tippani, M., ... & Jaffe, A. E. Single-nucleus transcriptome analysis reveals cell type-specific molecular signatures across reward circuitry in the human brain. Neuron 2021.

5 Ren, M., Hu, Z., Chen, Q., Jaffe, A., Li, Y., **Sadashivaiah, V.**, Li, Y., ..., Yang, F. KCNH2-3.1 mediates aberrant complement activation to impair hippocampal-medial prefrontal circuitry associated with working memory deficits. Molecular Psychiatry 2020.

6 **Sadashivaiah V.**, Sacre P., Guan Y., Anderson W. S., Sarma S. V. Modeling the interactions between stimulation and physiologically induced APs in a mammalian nerve fiber: dependence on frequency and fiber diameter. Journal of Computational Neuroscience 2018.

7 **Sadashivaiah, V.**, Sacré, P., Guan, Y., Anderson, W. S., Sarma, S. V. Studying the Interactions in a Mammalian Nerve Fiber: A Functional Modeling Approach. EMBC 2018.

8 **Sadashivaiah, V.**, Sacré, P., Guan, Y., Anderson, W. S., Sarma, S. V. Selective Relay of Afferent Sensory Induced Action Potentials from Peripheral Nerve to Brain and the Effects of Electrical Stimulation. EMBC 2018.

9 **Sadashivaiah, V.**, Sacré, P., Guan, Y., Anderson, W. S., Sarma, S. V. Electrical neurostimulation of a mammalian nerve fibers: A probabilistic versus mechanistic approach. EMBC 2017.

10 Gunnarsdottir, K., **Sadashivaiah, V.**, Kerr, M., Santaniello, S., Sarma, S. V.; Using Demographic and Time Series Physiological Features to Classify Sepsis in the Intensive Care Unit. EMBC 2016.

11 Kyriakatos A., **Sadashivaiah V**., Zhang Y., Motta A., Auffret M., Petersen C. H. Voltage-sensitive dye imaging of mouse neocortex during a whisker detection task. Neurophotonics 2016.

Conference Abstracts

1 **Sadashivaiah, V.**, Goldman, A., Ulrich, B., Radulescu, E., Breman, K. F., Mattay, V. S., Weinberger, D. R., Chen, Q. Using machine learning to identify novel neuroimaging phenotypes associated with cognitive dysfunction in Schizophrenia. SfN 2019.

2 **Sadashivaiah, V.**, Goldman, A., Ulrich, B., Straub, R. E., Calliott, J. H., Breman, K. F., Mattay, V. S., Weinberger, D. R., Chen, Q.; Exploring Shared Brain Cognitive Networks and the Related Genetic Components using Three-way Parallel ICA. SoBP 2018.

Interests

Rock Climbing, Running, Hiking, Backpacking, Homelabbing and recently into Swimming