

AKASH NAGARAJ

✉ akash.n@brown.edu | 📷 grassknotted | 🌐 akashnagaraj.me

EDUCATION

Brown University

Aug 2024 – Present

Master of Science (Sc.M.), Major: Computer Science

Providence, USA

- **Relevant Courses:** Computational Linguistics, Self-Supervised Learning, Probability Theory in Quantum Mechanics, Deep Learning (Audited: Computational Probability & Statistics, Information Theory, Statistical Inference I)

PES University (PES Institute of Technology)

Aug 2015 – May 2019

Bachelor of Technology (B.Sc.), Major: Computer Science, Minor: Data Science, Major GPA: 9.51/10

Bangalore, India

- **Honors:** Merit scholarship for top 20 students; Best undergraduate thesis award (Department)
- **Relevant Courses:** Advanced Machine Learning, Data Structures, Design & Analysis of Algorithms, Cloud Computing, Big Data, Operating Systems, Discrete Mathematics and Logic, Linear Algebra & Applications

RESEARCH EXPERIENCE

Research Scholar

Oct 2021 – Present

Brown University, Advisor: Prof. Thomas Serre

Providence, USA

- **Visual Alignment:** Training large-scale vision models on novel data diets using NeRF trajectories for 3D visual representation learning and human alignment, inspired by human visual development. (*CCN'24*, *NeurIPS'23 workshop*, *arXiv'24*)
- **Deep Behavioral Phenotyping:** Developing computer vision algorithms to detect and characterize behavior, with applications in pain modeling and early diagnosis of neurodegenerative diseases. (in prep) (*SfN'23*, *YBC'24*)
- **Generative modeling:** Analyzed 1300+ generative algorithms for alignment, comparing model generative properties with humans. Helped design *ClickMe* to collect human-centric visual features for vision research. (*ICML'23 Oral*)
- **Clinical Scar Detection:** Developed an NIH-funded system to detect and categorize self-harm scars to predict suicide risk. (in prep)
- **Vision Benchmarks:** Designing benchmarks to evaluate models on perspective taking (*arXiv*) and long-context dependency.

Research Collaborator

Apr 2024 – Present

MIT Media Lab (Camera Culture Group)

Boston, USA

- **Agent-based Models:** Building an end-to-end trainable agent-based model to simulate the dynamics and interactions of CD8+ T-cells in clinical tumor biopsies, using AgentTorch.

Research Assistant

Aug 2017 – May 2019

PES University, Advisors: Prof. Dinkar Sitaram, Prof. Sanchika Gupta

Bangalore, India

- Developed ML-driven EHR system for Indian Institute of Applied Dermatology. Optimized treatment combinations for Filarial lymphoedema using predictive modeling. (*Manuscript*)
- Improved source code vulnerability detection accuracy using static fuzzing and ML. Reduced false positives by 66.5%. (*arXiv*)

Research Assistant

May 2017 – Jul 2017

PES University, Advisor: Prof. Vinod K Agrawal

Bangalore, India

- **Embedded Systems:** Built an embedded control system for a cost-effective, portable hemodialysis blood pump for rural settings.
- Designed microcontroller firmware with real-time monitoring and safety protocols for modules deployed on the *PiSat nanosatellite*.

RESEARCH PUBLICATIONS AND PRESENTATIONS

Peer-reviewed Publications

- A. Nagaraj, A.K. Ashok, D. Linsley, F.E. Lewis, P. Zhou, and T. Serre. **Ecological data and objectives align deep neural network representations with humans**, *NeurIPS Workshop on Unifying Representations in Neural Models*, 2023 [[Workshop Publication](#)]
- V. Bouton, T. Fei, L. Singhal, R. Mukherjee, A. Nagaraj, J. Colin, and T. Serre. **Diffusion Models as Artists: Are We Closing the Gap between Humans and Machines?**, *ICML*, 2023. [Oral](#), (Top 2.3% of papers) [[Publication](#)]
- A. Nagaraj, M. Sood, G. Srinivasa. **Real-time Automated Answer Scoring**, *ICALT*, 2018. [Best Student Paper](#) [[Publication](#)]
- A. Nagaraj, A. K., A. Venkatesh, S. H.R. **Cross-domain Variational Capsules for Information Extraction**, *ICSE*, 2020 [[Publication](#)]

Preprints and Datasets

- A. Nagaraj. **American Sign Language (ASL) Alphabet Recognition**, *Public Dataset* (DOI: 10.34740/kaggle/dsv/29550), 2018. [[Dataset](#)]

- D. Linsley*, P. Zhou*, A. Ashok*, **A. Nagaraj**, G. Gaonkar, F. Lewis, Z. Pizlo, and T. Serre. **The 3D-PC: a benchmark for visual perspective taking in humans and machines**, *arXiv preprint*, 2024. (Under review at ICLR 2025) [[arXiv](#)]
- **A. Nagaraj**, M. Sood, C. Sureka, G. Srinivasa. **Real-time Action Recognition for Fine-Grained Actions & The Hand Wash Dataset**, *arXiv preprint*, 2020. [[arXiv](#)] [[Dataset](#)]
- **A. Nagaraj**, M. Sood, B. M. Patil. **A Concise Introduction to Reinforcement Learning in Robotics**, *arXiv preprint*, 2020. [[arXiv](#)]
- **A. Nagaraj**, B. Sinha, M. Sood, V. Kapoor, Y. Mathur. **Digital Image Forensics using Deep Learning**, *Published in eForensics Magazine*, May 2020 Edition. [[arXiv](#)]
- **A. Nagaraj**, M. Sood, Y. Mathur, B. Sinha, S. Gupta, D. Sitaram. **Learning Algorithms in Static Analysis of Web Applications**, *arXiv preprint*, 2018 [[arXiv](#)]

Conference Abstracts

- **A. Nagaraj**, A. Ashok, D. Linsley, F. Lewis, P. Zhou, T. Serre. **Ecological Data and Objectives for Human Alignment**, *CCN*, 2024 [[PDF](#)]
- P. Zhou, D. Linsley, A. Ashok, G. Gaonkar, **A. Nagaraj**, F. Lewis, and T. Serre. **Walk a mile in my shoes! 3D visual perspective taking in humans and machines**, *CCN*, 2024 [[PDF](#)]
- T. Burke, **A. Nagaraj**, R.T. Liu, K.R. Fox, T. Serre. **Employing Computer Vision to Objectively Assess the Severity of Self-injury to Augment Suicide Risk Prediction**, *Association for Behavioral and Cognitive Therapies*, 2024. [Oral Presentation](#)
- S. Karmali, **A. Nagaraj**, P. Gravelle, A.V. Eckartsberg T. Serre, R. Gutman, J. Fallon. **A Computer-Vision-Based Automated Continuous Behavioral Monitoring (ACBM) System Characterizing Neuromotor Behavior in Male 5XFAD Mice in Light and Dark Conditions**, *Yale Biomedical Engineering Conference*, 2024. [[Poster](#)]
- D. Linsley, **A. Nagaraj**, P. Zhou, A. Ashok, and T. Serre. **Building better models of biological vision by searching for the principles that shape visual system development**, *NAISys & VSS*, 2024. [[PDF](#)]
- R. Meir, **A. Nagaraj**, S. Samadov, O. Okasi, T. Serre, D. Sheinberg, J. Ritt, and D. Lipscombe. **Closed-Loop Optogenetic System for Deep Behavioral Phenotyping**, *Society for Neuroscience*, 2023 [[PDF](#)] [[Poster](#)]
- **A. Nagaraj**, M. Sood, B. Sinha, A. Raman, D. Sitaram. **Machine Learning-based Analysis of Filarial Lymphoedema**, *National Colloquium on Evidence-Based Integrative Medicine*, 2018 [[Manuscript](#)]

Working Papers

- R. Meir, **A. Nagaraj**, S. Samadov, O. Okasi, T. Serre, D. Sheinberg, J. Ritt, and D. Lipscombe. **Closed-loop optogenetic analysis platform for Deep Behavioral Phenotyping**, (*in prep*) [[Draft](#)]
- L. N. Govindarajan, **A. Nagaraj**, T. Rigg, J. Becker, A.K. Ashok, T. Serre, and A. Holmes. **Homecage behavior predictors of mouse fear and alcohol drinking**, (*in prep*) [[Draft](#)]
- **A. Nagaraj**, T. Burke, R.T. Liu, K.R. Fox, T. Serre. **Leveraging Computer Vision to Augment Suicide Risk Prediction**, (*in prep*)

INDUSTRY EXPERIENCE

Senior Analyst (*promoted in Dec 2020*)

Jan 2020 – Sep 2021

Goldman Sachs

Bangalore, India

- Worked on algorithmic trading and high-touch/low-touch flows for derived equity instruments (bonds, ETFs, stocks) as part of the Global Equities Trading Desk.
- Solely led the design and development of the Trade Enrichment Module, for scalable and high-throughput trading workflows.
- Developed a high-capacity securities trading platform, increasing throughput by 5x to manage 100k+ orders with <1ms latency and handle daily cash flows of \$5 billion effectively.

Software Development Engineer (*promoted from Software Engineering Intern in Jun 2019*)

Jan 2019 – Jan 2020

Cisco Systems

Bangalore, India

- Streamlined an ML pipeline for sentiment analysis and corrective action prediction for product failure cases, reducing processing time from over 24 hours to 2 minutes.
- Designed a solution to reduce source code vulnerabilities using a signature-based approach to identify and rectify bugs.
- Invented a solution to improve inventory Line-In Fill Rate by predicting order demand using machine learning.

SERVICE, AWARDS AND OUTREACH

Academic Service

- **Reviewer:** Nature Communications Biology (2024); ICML (2024 & 2023); Behavioral ML Workshop at NeurIPS (2024); Re-Align Workshop at ICLR (2024); Cognitive Computational Neuroscience (2024); UniReps Workshop at NeurIPS (2023)
- **Open-source Contributor:** PyTorch XLA, SymPy, MetaBrainz, OpenMM

Teaching

- **Course Design and TA**, CLPS-1291: *Computational Methods for Mind, Brain, and Behavior*, Brown University 2023, 2022
- **Project Mentor and TA**, CS-341: *Cloud Computing (Project Mentor for 44 students)*, PES University 2019
- **Project Mentor and TA**, CS-314: *Big Data (Project Mentor for 60 students)*, PES University 2018

Mentoring

- **Research Mentor**, Mentored 3 students from *The Leadership Alliance* (an NSF Funded Summer Research Program) 2024
(*Projects: Epidural electrical stimulation and Automated Continuous Behavior Monitoring*)
- **Research Mentor**, Mentored 2 students from *The Leadership Alliance* (an NSF Funded Summer Research Program) 2023
(*Project: Closed-Loop Deep Behavioral Phenotyping*)

Awards

- **Grant**, Google DeepMind Travel Grant for NeurIPS 2023 2023
- **First Place**, Cisco Global Intern Case Competition (out of 100+ teams internationally) 2020
- **Best Undergraduate Thesis Award**, Department of Computer Science, PES University 2019
- **Merit Scholarship**, Prof. CNR Rao Scholarship for being in the top 20 students (out of 430 students) 2019
- **Fourth Place**, Microsoft code.fun.do++ (out of 6000+ teams internationally) 2018

Outreach

- **Mentor & Tech Writer**, GirlScript Foundation (India's Largest Tech Education NGO) Mar 2020 - Nov 2020
- **Data Structures and Algorithms Mentor**, CodeChef Apr 2020 - Jul 2020
- **Education Support Fellow**, Make A Difference (India) - Grade 10 (400+ hours) Jun 2017 - Mar 2018
- **Core-organizer**, The Amateur Scientist, National-level Science Fest (6000+ attendees) Aug 2017 - Nov 2017
- **Volunteer Teacher**, Workshop Innovation Science Experiments (WISE) - Grades 4 and 5 Apr 2017 - Jul 2017

SELECTED PROJECTS

- Sensorium: Visual Cortex Modeling** [Code] 2022
 - Accurate predictive models of 28,000 neurons from primary visual cortex responses (captured using calcium imaging) to thousands of natural stimuli.
 - Achieved **single-trial correlation of 0.41** using an optimized HMAX model with neural circuits & recurrent connections.
- Unvoiced: Computer Vision for Sign Language to Speech** [Code] [Dataset] 2018
 - A real-time system for converting sign language from video streams into speech. (**90+ GitHub Stars**)
 - Created and published the ASL Alphabet Dataset, which has **400+ citations** and **70,000+ downloads**.
- Rahat: AI Disaster Management Platform** [Code] [Project Video] 2018
 - Multilingual, end-to-end, AI-based disaster management platform using a custom protocol over GSM (no internet required).
 - Entry to the Microsoft code.fun.do++ competition, and **ranked 4th amongst 6000+ entries** internationally.

TECHNICAL SKILLS

Programming Languages: Python, Java, C++, C, JavaScript, Go, Rust, R, Lua, PHP, HTML, SQL
Skills: TPU training, UNIX System Programming, Web Development, Electron, PyQt
Frameworks: PyTorch, PyTorchXLA, ReactJS, TensorFlow, CUDA, MuJoCo, SpringBoot, Flask, Django, Docker
Technologies: DeepLabCut, Git, AWS, Azure, GoogleCloud, Kubernetes