

Akash Nagaraj

· RESEARCHER · SOFTWARE DEVELOPER ·

+1(917)-708-2648

✉ akashnagaraj07@gmail.com

🌐 akashnagaraj.me

📄 grassknotted

📺 akashnagaraj

Education

PES University (PES Institute of Technology)

Bangalore, India

BACHELOR OF TECHNOLOGY | MAJOR: COMPUTER SCIENCE | MINOR: DATA SCIENCE

2015 - 2019

- Overall GPA: 9.02/10 | Minor GPA: 10/10 | Major GPA: 9.51/10
- Dean's list for 6/7 semesters (Merit scholarship for being in the top 20 students of the batch)
- Best undergraduate thesis in Computer Science

RELEVANT COURSES

- AI/ML:** Computational Methods for Mind, Brain and Behavior*, Deep Learning*, Advanced Machine Learning
- Computer Science:** Data Structures, Design & Analysis of Algorithms, Cloud Computing, Big Data, Operating Systems
- Mathematics:** Computational Probability & Statistics*, Information Theory*, Statistical Inference*, Discrete Mathematics and Logic, Linear Algebra & Applications.

* = Audited as a Research Scholar at Brown University

Experience

Serre Lab, Brown University

Providence, RI, USA

RESEARCH SCHOLAR, Advisor: Thomas Serre

October 2021 - Present

- Learning human-like 3D Visual Representations:** Novel, scalable data diet and training regime to align machine vision with humans, utilizing 3D vision with generated NeRF trajectories resulting in rotational equivariance. (*Under Review at NeurIPS 2023 UniReps*).
- Behavioural Markers of External Cues:** Building an objective framework to characterize the influence of external cues, genes and neural activity on behavioral modules from videos, using Generative Modelling, Transformers & Representation Learning (*with NIH*).
- Clinical Scar Characterization:** Developed an AI-based system to process raw medical image data, to locate and characterize non-suicidal self-injury scars using recurrent feedback mechanisms and MaskRCNN (*with Massachusetts General Hospital, Harvard Univ.*).
- Models of Human Depth Perception:** Constructing unsupervised models of depth perception of humans in response to 2-dimensional stimuli, using Energy-based Models.
- Horizontal Gated Recurrent Unit:** Optimizing feedback-based neural circuits with a new learning algorithm-cRBP (Contractor Recurrent Back-Propagation). Authored tutorials on using recurrent feedback loops to work with neural, sequential, and image data.
- Visual Constancy:** Investigating visual constancy across environmental stimulus changes, and modeling visual competitive (inhibitory and excitatory) neural hypercolumns to solve intricate computer vision problems.
- Multiple Object Tracking:** Extending InT to a neural-circuit-based MOT algorithm, currently achieving SOTA results on TrackingNet.
- Harmonization:** Training routine that aligns DNN and human visual strategies while improving categorization for images and videos.

Goldman Sachs

Bangalore, India

SENIOR ANALYST (PROMOTED IN DECEMBER 2020)

January 2020 - September 2021

- Derivative Trading Flows** Worked on algorithmic trading, high-touch and low-touch flows for derived equity instruments (bonds, ETF, stocks) for the Global Equities Trading Desk, in New York.
- Securities Trading Platform:** Built the trading platform for Global Equities Trading Desk with 5x more capacity (100k+ orders) and extremely low latency (<1ms) to handle a daily cash flow of \$5 billion. Led the development of the Trade Enrichment Module.
- Design and Scaling:** Brainstormed and engineered various system design architectures to improve and scale trading workflows.

Cisco Systems

Bangalore, India

SOFTWARE DEVELOPMENT ENGINEER (OFFERED A FULL-TIME POSITION FROM INTERNSHIP)

January 2019 - January 2020

- Failure Analysis Senti-meter:** Streamlined timeline of sentiment analysis and prediction of corrective action of Cisco product failures globally from over 24 hours to 2 minutes using Feature Engineering, Machine Learning and Natural Language Processing.
- Gnosis Signature Effectiveness:** Reduction of vulnerabilities using a signature-based approach to identify and rectify bugs.
- LIFR:** Invented an AI-based solution to improve inventory Line-In Fill Rate, placed first in the Cisco Intern Global Case Competition.

Centre for Cloud Computing and Big Data

PES University, Bangalore, India

RESEARCH INTERN, Advisors: Dinkar Sitaram, K V Subramaniam, Sanchika Gupta

August 2017 - May 2018

TEACHING ASSISTANT: CLOUD COMPUTING

December 2018 - May 2019

- Worked on **Machine Learning-based Analysis of Filarial lymphoedema** using association rules and frequency pattern mining, and **Learning Algorithms in Static Analysis of Web Applications** using encoding, static fuzzing, and machine learning.
- Teaching Assistantship:** Mentored and evaluated 40+ students building a microservice platform with container orchestration.

Crucible of Research and Innovation

PES University, Bangalore, India

SUMMER INTERN: EMBEDDED SYSTEMS, Advisor: Vinod K Agrawal

April 2016 - July 2016

- Developed a low-cost blood pump to advance dialysis in rural India, and built modules used on the in-house satellite - **PiSat**.

Research Publications

Diffusion Models as Artists: Are we Closing the Gap between Humans & Machines?

2023

PUBLISHED AT [ICML 2023](#), AVAILABLE ON [ARXIV](#)

Victor Boutin, Thomas Fel, Lakshya Singhal, Rithik Mukherjee, **Akash Nagaraj**, Julien Colin, Thomas Serre

Real-time Automated Answer Scoring

2018

PUBLISHED AT [IEEE ICALT 2018](#), AVAILABLE ON [IEEEEXPLORE](#), [ARXIV](#) AND [YouTube](#)

Akash Nagaraj, Mukund Sood, Gowri Srinivasa

Cross-domain Variational Capsules for Information Extraction

2020

PUBLISHED AT SPRINGER IICSE 2020, AVAILABLE ON [SPRINGERLINK](#) AND [ARXIV](#)

Akash Nagaraj, Akhil K, Akshay Venkatesh, Srikanth H R

A Concise Introduction to Reinforcement Learning in Robotics

2020

ACCEPTED FOR PRESENTATION AT SPRINGER ICMISC 2020, AVAILABLE ON [ARXIV](#)

Akash Nagaraj, Mukund Sood, Bhagya M Patil

Learning Algorithms in Static Analysis of Web Applications

2018

ACCEPTED FOR PRESENTATION AT SPRINGER ICMISC 2020, AVAILABLE ON [ARXIV](#)

Akash Nagaraj, Mukund Sood, Vivek Kapoor, Yash Mathur, Bishesh Sinha, Sanchika Gupta, Dinkar Sitaram

Association Rule-based Analysis of Filarial lymphoedema

2018

PRESENTED AT 8TH NATIONAL COLLOQUIUM ON EVIDENCE BASED INTEGRATIVE MEDICINE, ON [RESEARCHGATE](#)

Akash Nagaraj, Mukund Sood, Bishesh Sinha, Ashok Raman, Dinkar Sitaram

Research Preprints

Real-time Action Recognition for Fine-Grained Actions & The Hand Wash Dataset

2020

PATENT-PENDING, AVAILABLE ON [ARXIV](#) | [G](#) | [S](#)

Akash Nagaraj, Mukund Sood, Chetna Sureka, Gowri Srinivasa

Digital Image Forensics using Deep Learning

2019

PUBLISHED IN [EFORENSICS MAGAZINE-MAY 2020 EDITION](#), AVAILABLE ON [ARXIV](#)

Akash Nagaraj, Bishesh Sinha, Mukund Sood, Vivek Kapoor, Yash Mathur

Selected Projects

Sensorium: Visual Cortex Modeling

2022 (In-progress)

- Accurate predictive models of 28,000 neurons from primary visual cortex responses (captured using calcium imaging) to thousands of natural stimuli. Achieved a single trial correlation of 0.41 using an optimized HMAX model with neural circuits & recurrent connections.

Scar Characterization from Clinical Images

2022 (In-progress)

- Utilize computer vision to determine the predictive utility of non-suicidal self-injuries using tissue damage and lethality as severity signals derived from clinical self-injury images in predicting prospective suicide attempt risk. Working with Dr. Taylor Burke at Harvard.

Rahat: Disaster Management Platform | [G](#) | [YouTube](#)

2019

- Multilingual, end-to-end, AI-based disaster management platform using a custom protocol over GSM (no internet required).
- This project was my entry to Microsoft code.fun.do++, and ranked 4th amongst 6000+ entries.

Unvoiced: Sign Language to Speech | [G](#) | [S](#)

2019

- Conversion of sign language into speech using Deep Learning and Image Processing in real-time.
- The ASL Alphabet dataset created has 150+ citations, over 37,000 downloads, and has been used in numerous theses.

litFS: FUSE based File System | [G](#)

2018

- FUSE file system built using Basil framework in Go. Apart from providing normal I/O operations on files and directories, it also achieves persistence across machine reboots by emulating a single Unix file as a disk for file system.

Awards & Extracurricular Activities

Awards

2022	Fourth Place , NeurIPS Workshop: Sensorium 2022 - Mouse Visual Cortex Modelling	40+ teams overall
2020	First Place , Cisco Global Intern Case Competition	100+ teams overall
2020	Finalist (top 5) , Microsoft code.fun.do++ (Final round)	6000+ teams overall
2020	First Place , Microsoft code.fun.do++ (Regional Round)	300+ teams overall
2019	First Place , IEEE Cisco Internet of Things Hackathon - 2019	200 teams overall
2018	First Place , Cisco Data Analytics Hackathon - 2018	50+ teams overall
2018	Ninth Place , IEEE Signal Processing Society - Camera Model Identification (Student Category)	581 teams overall

Extracurricular Activities

2023	Academic Reviewer , ICML 2023, NeurIPS 2023 UniReps	2023 - Present
2021	Open-source Contributor , SymPy, MetaBrainz, OpenMM	2018 - Present
2020	Education Mentor & Tech Writer , GirlScript Foundation (India's Biggest Tech Education NGO)	Mar 2020 - Nov 2020
2020	Data Structures and Algorithms Mentor , CodeChef	Apr 2020 - July 2020
2018	Education Support Fellow , Make A Difference - Grade 10 (400+ hours)	Jun 2017 - Mar 2018
2017	Core-organizer , The Amateur Scientist, National Science Fest	6000+ attendees

Skills

Programming	Python, Java, C++, C, JavaScript, Go, Rust, R, Lua, PHP, HTML, MySQL
Frameworks	PyTorch, Tensorflow, MuJoCo, SpringBoot, Flask, Django, ReactJS, Docker
Technologies	DeepLabCut, Git, AWS, Azure, Collab, GoogleCloud, Jenkins CI/CD