# Sai Anuroop Kesanapalli

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## Education

**M.S., University of Southern California** August 2022 - May 2024
Major: Computer Science CGPA: 3.85/4
**B. Tech., Indian Institute of Technology Dharwad** July 2017 - June 2021
Major: Computer Science and Engineering CPI: 8.86/10

## Skills

Python, PyTorch, NumPy, pandas, scikit-learn, NLTK, HuggingFace, Matplotlib, C++, C, GDB, Bash, Linux, Linux4Tegra, macOS, Weenix OS, HTML, CSS, Git, LaTeX, MATLAB, SQL

## Work Experience

1 year 3 months

**MACHINE LEARNING SOFTWARE INTERN** *(Full-time)* **DeGirum Corp.**, Santa Clara
*Summer Internship* May 2023 - August 2023

- Developed an ONNX OCR pipeline with pre/post-processor modules compatible with edge-hardware [OCR].
- Worked on a NumPy-only implementation of the forward pass of some vision-based PyTorch operators such as Conv2D, MaxPool, among others, and published as a PyPI package [beaverpy].

**PROJECT ASSOCIATE - I** *(Full-time)* **Indian Institute of Science**, Bangalore
*Advisor: Prof. Yogesh Simmhan* August 2021 - July 2022

- Contributed to a research project on optimizing performance of deep learning workloads on edge-GPUs [1, 3, 4], and a review of systems research into training deep learning models on edge hardware [2].
- Developed a comprehensive instrumentation harness that profiled various system and workload parameters such as CPU, GPU and RAM utilization, average and instantaneous power.
- Implemented and automated large-scale training runs of several deep learning models such as ResNet-18, MobileNetV3, and LeNet-5, across 3 classes of Nvidia Jetson devices - AGX, NX, and Nano.
- The project made significant progress and led to several publications at top venues in less than a year. Received NSF Travel Grant to present [1] at SIGMETRICS @ ACM FCRC 2023 (core A*) at Orlando, FL.

## Projects (Multimodal ML, NLP)

A comparison of shared encoders for multimodal emotion recognition [Multimodal ML] [Slides | Report | Code]

- Developed unimodal audio and vision, and multimodal emotion recognition pipelines by employing various classes of shared encoders – 2D CNNs (`ResNet18`, `GoogLeNet`, `VGG16`), 3D CNNs (`Simple3D CNN`, `I3D`), Transformers (`ViT`, `VideoMAE`).
- Tested pipelines on a full-scale version of CREMA-D dataset. Presented a principled comparison of the performance of different pipelines and encoders, identified the achievements and shortcomings of these architectures, and discussed the implications.

Leveraging static analysis for evaluating code-generation models [NLP] [Slides | Report | Code]

- Developed a pipeline that integrates static errors generated by linters (`cppcheck`, `flake8`) as feedback to improve the baseline code generation model (`CodeLlama`), and fine-tuned the model using DPO to enhance its ability to directly generate code with fewer errors.
- Demonstrated the effectiveness of both strategies in reducing frequency of static errors in generated code.

## Projects (Computer Vision, ML Theory, Time Series ML)

beaverpy: An implementation of the forward pass of PyTorch operators using only NumPy [CV] [Code]

Forward-Forward: Is it time to bid adieu to BackProp? [CV] [Slides | Code]

Presentation on the Implicit Bias of SGD [ML Theory] [Slides]

Notes on Rethinking Classic Learning Theory in Deep Neural Networks [ML Theory] [Notes]

Store Sales - Time Series Forecasting [Time Series ML] [Report | Code]

Credit Card Fraud Detection [Time Series ML] [Poster | Report | Code]

## Projects (Operating Systems, Distributed Systems, Databases, Computer Architecture, Networks)

Implemented `Procs`, `VFS`, and `VM` kernel modules of Weenix OS [OS] [CS 402, USC]

Implementation of Immediate Files in Minix OS [OS] [Report | Code]

Heterogeneity-Aware Hashing [Distributed Systems] [Slides | Report | Code]

Buffer Manager for PF Layer of ToyDB [DB] [Report | Code]

Processor Simulator for ToyRISC [Computer Architecture] [Code]

TCP Congestion Control [Networks] [Report | Code]

## Other Experience (Academic Staff + Research) 1 year 2 months

**COURSE PRODUCER** *(Part-time)* **University of Southern California**, Los Angeles
*Advisor: Prof. Vatsal Sharan* August 2023 - May 2024
CP for [CSCI 699] Theory of Machine Learning and [CSCI 567] Machine Learning. Graded assignments, held discussion sessions, and scribed lectures.

**RESEARCH ASSISTANT** *(Part-time)* **University of Southern California**, Los Angeles
*Advisor: Prof. Vatsal Sharan* March 2023 - August 2023
Contributed to Tensor Toolbox, an open source project on tensor decomposition methods for MATLAB, by adding a new functionality for Orthogonalized ALS [Orth-ALS], and worked on a faster C++ implementation of a random forest based anomaly-detection algorithm [PIDForest].

**UNDERGRADUATE RESEARCHER** *(B. Tech. Project)* **Indian Institute of Technology Dharwad**
*Advisor: Prof. B. N. Bharath* August 2020 - June 2021
Worked on Federated Algorithms with Bayesian [5] and Exponential Weighted Average approaches [Report | Code].

## Publications


1. Prashanthi S.K, **Sai Anuroop Kesanapalli**, and Yogesh Simmhan. "Characterizing the Performance of Accelerated Jetson Edge Devices for Training Deep Learning Models". In: SIGMETRICS '23. Orlando, Florida, United States: Association for Computing Machinery, 2023, pp. 37–38. DOI: 10.1145/3578338.3593530.
2. Prashanthi S. K, Aakash Khochare, **Sai Anuroop Kesanapalli**, Rahul Bhope, and Yogesh Simmhan. "Don't Miss the Train: A Case for Systems Research into Training on the Edge". In: *2022 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)*. 2022, pp. 985–986. DOI: 10.1109/IPDPSW55747.2022.00157.
3. Prashanthi S.K, **Sai Anuroop Kesanapalli**, and Yogesh Simmhan. "Characterizing the Performance of Accelerated Jetson Edge Devices for Training Deep Learning Models". In: *Proc. ACM Meas. Anal. Comput. Syst.* 6.3 (2022). DOI: 10.1145/3570604.
4. Prashanthi S. K, **Sai Anuroop Kesanapalli**, Aakash Khochare, and Yogesh Simmhan. "Characterizing the Performance of Deep Learning Workloads on Accelerated Edge Computing Devices". In: *28th IEEE International Conference on High Performance Computing, Data & Analytics Student Research Symposium (HiPC SRS)*. 2021, [Poster].
5. **Sai Anuroop Kesanapalli** and B. N. Bharath. "Federated Algorithm with Bayesian Approach: Omni-Fedge". In: *ICASSP 2021 - 2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. 2021, pp. 3075–3079. DOI: 10.1109/ICASSP39728.2021.9413571.


## Awards & Achievements

2024 **Gift Award** worth INR 600,000 and **Travel Grant** worth INR 50,000 by **Tata Education and Development Trust** for studies abroad.

2023 **J N Tata Endowment Scholarship** worth INR 900,000 for the year 2023-24, towards master's.

2023 **NSF Travel Grant** worth USD 1200 for attending SIGMETRICS, co-located with ACM FCRC 2023.

2020 **AP grade** for exceptional performance twice: CS 405 B. Tech. Project - CSE on Federated Learning in Autumn 2020-21, and CH 301 Environmental Studies in Spring 2019-20, during B. Tech. at IIT Dharwad.

2017 IIT JEE (Advanced) **All India Rank 8682** among ~171,000 candidates.

2016 **Telangana State Rank 1** among ~700,000 candidates in first year and under top ten ranks in second year TSBIE Intermediate Public Examination.

2014 **Certificate of Merit** from CBSE Delhi, for outstanding performance and for obtaining Grade **A1** in all the five subjects in Secondary School Examination.