Siddarth Aananth

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Education

University of Illinois Urbana Champaign **August. 2021 - May. 2025**
B.S. Computer Science and Statistics, ***Minor:*** *Mathematics (****Grade****: 3.92/4.0)*

- **Relevant Coursework**: Data Science, Machine Learning Theory, Compilers, Systems Programming, Statistical Modeling, Stochastic Processes, Bayesian Analysis, Financial Engineering, Algorithmic Market Microstructure, High-Frequency Trading

Skills

Programming Languages: Python, C++, C, Java, R, Flutter, JavaScript, SQL, Bash, HTML, CSS
Frameworks and Tools: PyTorch, TensorFlow, Keras, Flask, ONNX
Skills: Machine Learning, Computer Vision, NLP, Data Science, Statistical Modeling, MapReduce (Distributed Systems), AWS Cloud Computing, Network and Systems Programming, Web Development

Professional Experience

Rivian Automotive, Inc. - Machine Learning Engineering (MLE) Intern **October. 2023 - May. 2024**
Machine Learning, Product Development Team *Machine Learning Infrastructure Development*

- Developed **customized ML operators** to meet **hardware specifications** and maintain SoTA accuracy (PyTorch)
- Added support to operator functions in order to **optimize real-time image processing** in Rivian's Advanced Driver-Assistance Systems **(ADAS)** models
- Engineered tools to convert standard ML operators into Rivian's custom format by integrating **ONNX** functionality

Research Experience

Machine Learning Generalization Research **January. 2024 - Present**
Research with Dr. Arindam Banerjee (Research Paper in progress/submission) *Theoretical Machine Learning*

- Exploring the properties of SAM's (Sharpness-Aware-Minimization) second-order representation, in the context of generalization
- Achieved a **93.28% top-1 accuracy** with ResNet18 on CIFAR10 using second-order SAM, and attempting to prove that this second-order representation learns **more robust features** as compared to SGD and SAM which have a $\approx 95\%$ accuracy
- Studying SAM to see if it can learn (more) domain-invariant representations - than Stochastic Gradient Descent (SGD)

LLVM Research Group - Machine Learning Research Assistant **January. 2023 - Present**
Research with Dr. Vikram Adve (2 Research Paper's in progress/submission) *Machine Learning @Edge, Approximate Computing*

Searching for Fast Semi-Supervised Learners

- Developed a novel **NAS (Neural Architecture Search)** algorithm to search optimal models during training, **integrating deployment-specific model approximations directly into the training process**
- Integrated SSL techniques with model pruning for the effective exploration of the Pareto frontier in order to identify models that are **notably sparse** without a significant loss in accuracy, thus allowing for **faster inference** on Edge devices
- Achieved promising results, for example in ResNet18, where we discover a model that is **74.9% percent smaller** than our initial model, with **under 1% loss in test accuracy** when trained on CIFAR100 with 2500 known labels

Novel Class Detection *(in progress)*

- Solving the novel class detection problem in **open-world object detection tasks** that include OOD (out-of-distribution) data
- Developing 4-stage system where stage-1 (auto-encoder ensemble) detects novel class features with a **77.57% TPR (true +ve rate) and 69.4% AUC**

Centre for Digital Agriculture - Computer Vision Research Intern **May. 2023 - August. 2023**
IAF, IFarm *Computer Vision, ROS*

- Engineered image augmentation techniques to optimize the Disease Detection Algorithm and **improve accuracy by 32.5%**
- Developed a publisher-subscriber tool with ROS (robot-operating system), to get real-time images from a robot, run inference using several ML vision models and stream output images via CBRF to another edge device within **4 seconds (CPU)**
- Integrated HPVM (Heterogeneous Parallel Virtual Machine) into the Image-Inference Pipeline in order to run large vision models on **low-compute edge devices**

Research with Dr. Jana Diesner - Natural Language Processing **August. 2022 - December. 2022**
Social Computing Lab - Context Project *Java, NLP Libraries*

- Implemented fundamental tooling for the ConText Project, an open-source tool for the joint analysis of text and network data
- Built functionality for **tf-idf**, **tokenization**, **relation extraction**, and the joint analysis of text data and network data

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Interests: National Level Archer, Trap and Skeet, Guitar, Indian Classical Music, Mythology, Philosophy