KIRTHI SHANKAR SIVAMANI

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EDUCATION

Purdue University, West Lafayette, IN — Aug 2017-May 2021
B.S. in Computer Engineering (*Highest Distinction*) — **GPA 4.0**

PROFESSIONAL EXPERIENCE

Deep Learning Engineer, NVIDIA, Santa Clara, CA — Jun 2021–Now

- Investigating and optimizing compute performance of deep learning models released by Nvidia such as SE3Transformer (Graph Neural Network), GPT2 (Transformer), and SEResNet150 (Convolutional)
- Developing PyTorch features for optimal model performance on NVIDIA hardware under distributed settings
- Formulating accurate training recipes for large language models for lower precision training

Machine Learning Intern, NVIDIA, Santa Clara, CA — May 2020–Aug 2020

- Created cuda extensions for PyTorch to harness Ampere GPU's sparse matrix multiplication to speedup BERT inference by 2x
- Developed accurate checkpointing of model parameters when using distributed optimizers in PyTorch
- Formulated training recipes for BERT to ensure that accuracy does not suffer when using Ampere's sparsity feature to speedup inference

Software Engineering Intern, Data Resolve Technologies, New Delhi, India — May 2018–Jul 2018

- Wrote a technical brief assessing potential security vulnerabilities in the company's leading product, InDefend
- Developed a Python tool for internal use allowing employees to set up personal data management policies such as backup, archive, and purge
- Set up and managed Windows servers on Amazon EC2 for clients

RESEARCH EXPERIENCE

Researcher, El Gamal Research Group, West Lafayette, IN — Aug 2019 – May 2020

- Discovered a novel method to detect adversarial inputs to Convolutional Neural Networks
- Achieved state-of-the-art detection accuracies across 4 attacks: PGD, DeepFool, CW2, FGSM
- Published a paper in IEEE Letters of Computer Society (https://ieeexplore.ieee.org/abstract/document/9082120)

Research Assistant, CAM2, West Lafayette, IN — Aug 2018 – Aug 2019

- Developed a method for unsupervised domain adaptation to work with real-time video data (CAM2 data)
- Improved object detection accuracy from 52% to 82% when using YOLOv3 on CAM2 data
- Presented techniques and results at Purdue Grad Expo 2019

TEACHING EXPERIENCE

Teaching Assistant, ECE 595 Purdue University — Spring 2021

Title: Advanced Software Engineering (*Graduate Level*), *Professor*: Davis James

- Developed and graded 15+ homework/lab/midterm assignments in various software engineering topics
- Helped teams to refine and build their course project ideas and implementations

Undergraduate Teaching Assistant, ECE 270 Purdue University — Spring 2019

Title: Introduction to Digital System Design, *Professor*: Mark Johnson

- Supervised one lab section per week, briefed the students on the topic and provided instructions
- Held weekly office hours to help students with lab assignments and doubt clarification

Undergraduate Teaching Assistant, PHYS 172 Purdue University — Fall 2018

Title: Modern Mechanics, *Professor*: Sanjay Rebello

- Attended lab sessions and answered doubts regarding basic kinematics and vPython simulations

PROJECTS

Adversarial autoencoders (Python) **Report**: https://arxiv.org/pdf/1912.04497.pdf Fall 2020

- Created a denoising autoencoder for preprocessing inputs to Convolutional Networks to defend attacks
- Explored new loss functions such as perpetual losses of the model to train the autoencoder
- Achieved adversarial classification accuracy comparable to current state-of-the-art input preprocessing methods

BoilerBot (Arm Assembly, C, Python) **Demo:** https://github.com/ksivaman/boilerbot Fall 2020

- Built a delivery robot for indoor locations that uses lidar for navigation (esp32 microcontroller + ROS)
- Features include automated path resolution, obstacle detection, secure delivery (locks), self-charging/docking
- Ability for users in the indoor space to authenticate and queue deliveries via a web-UI

USB SoC Module (System Verilog) Spring 2020

- Designed a USB full-speed bulk-transfer endpoint AHB-Lite SoC module
- Implemented AHB-Lite slave, protocol controller, data buffer, USB receiver, and USB transmitter
- Implemented cyclic redundancy check for detection of errors during packet transmission

IBM Trusted-AI, Open Source (Python) **Code:** https://github.com/Trusted-AI Fall 2019-Now

- Suite of machine learning libraries for adversarial robustness, interpretability, and dataset fairness
- Implementing adversarial attacks and defenses for the PyTorch framework to secure/target ML models
- Writing tutorials/documentation and actively participating in internal forums to discuss ideas and algorithms

Image inpainting, style-transfer, super-resolution (Python) Summer 2019

- Implemented 2 research papers from scratch: "Perceptual Losses for Real-Time Style Transfer and Super-Resolution" and "Image Style Transfer using Convolutional Neural Networks"
- Extended the models to a new application of image inpainting and denoising
- Results and code for super-resolution and inpainting: https://github.com/ksivaman/super-res
- Results and code for style transfer: https://github.com/ksivaman/Transfer-image-styling

Smart City (pothole detection), EPICS Purdue University Spring 2018

- As a part of Engineering Projects in Community Service (EPICS), created hardware modules using Arduino that were installed on garbage trucks to scan for potholes in the road
- Developed an Android app where users can click pictures of potholes and report its location
- Pitched the hardware and app to the engineers of the West Lafayette city and helped with installation

Medium Blog, Link: https://medium.com/@smkirthishankar

- Writing articles about machine learning concepts for medium.com publications such as *Towards Data Science* and *The Startup*
- The articles have received 25000+ views till date

SKILLS and HONORS

Programming languages: (Proficient) Python, C, C++ (Competent) MATLAB, Java
Tools and Technologies: PyTorch, TensorFlow, GCP, git, cuda + cuda-extensions, slurm, docker, dlprof, linux

Dean's List and Semester Honors for Academic Excellence Fall 2017-Spring 2021
Paper accepted at *IEEE Letters of Computer Society* (journal) 2020