Arjun Ashok Rao

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Research Interests

Adversarial Examples/ Robustness in Deep Learning, Generalization and Loss Landscapes, Computer Vision

Education

The Chinese University of Hong Kong (CUHK) 2018-2022 (Expected)
Bachelor of Engineering in Financial Technology *Hong Kong S.A.R*
Minor in Data Analytics and Informatics
GPA: 3.45/4.0 — Latest Term: 3.82

Selected Courses: Optimization Methods, Probability and Statistics, Linear Algebra, Machine Learning, Stochastic Models, Data Structures

Research Experience

Department of Computer Science and Engineering, CUHK May. 2020 – Present
Undergraduate Researcher – Professor Bei Yu's Group *New Territories, Hong Kong*

- Studied the effect of adversarial perturbations (PGD, FGSM) on stereo-based object detection in autonomous systems
- Discovered that adversarial examples compromise stereo disparity perception and cause large and inaccurate region proposals on background elements
- Developed a novel adversarial training algorithm *SmoothStereo* which uses left-right feature map regression and local linearization to deliver robustness to common stereo-based computer vision models within a moderate perturbation set $\delta \in \Delta_\epsilon$
- *SmoothStereo* demonstrated superior robustness with a more convex loss-landscape, lesser gradient obfuscation

Department of Systems Engineering, CUHK Sep. 2020 – Present
Undergraduate Researcher - Professor Hoi To Wai's Group *New Territories, Hong Kong*

- Studied the convergence and generalization properties of distributed deep learning on multiple nodes
- Understanding how the generalization of DNNs in a distributed setting scale with over-parameterization

Publications

- Qi Sun, **Arjun Ashok Rao**, Xufeng Yao, Bei Yu, Shiyan Hu.
"Counteracting Adversarial Attacks in Autonomous Driving"
IEEE/ACM International Conference on Computer-Aided Design (**ICCAD**), Westminster, CO, Nov. 2–5, 2020.
(Invited Paper)

Work Experience

LSCM R&D Centre, Cyberport June. 2019 – August. 2019
Summer Research Intern *Cyberport, Hong Kong*

- Built an attention-transformer model for Chinese to English legal document translation
- Our machine translation model demonstrated significant BLEU score improvements and captured essential context in legal documents.

Asiabots, Hong Kong Science Park April. 2020 – June. 2020
Intern - Asiabots Voice AI *Hong Kong Science Park, Hong Kong*

- Developed a semi-supervised Ladder-VAE based TTS Model For emotion and speech generation
- Improved model understanding by developing algorithms to sample latent space of VAEs and generate speech prosody changes with alteration in high-dimensional latent variables.

Academic Awards & Achievements

- CUHK Admission Scholarship (2018 – Present) Awarded for Outstanding Academic Performance
- Faculty of Engineering Admission Scholarship, CUHK (2018 – Present)
- CUHK Outstanding Student Award for community service at the International Student Association ISA-CUHK
- Microsoft Learn Student Ambassador: Selected to the Microsoft Developer network for excellent research and project experience
- Dean's List (2019-20): Awarded for year GPA = 3.8, top 10% of cohort

Projects

Super Resolution Convolution Neural Network[1]| *(Paper Implementaiton)* June 2020

- Wrote a from-scratch PyTorch implementation of SRCNN (MMLab CUHK)
- Improved qualitative performance of initial model by taking a weighted average of PSNR, SSIM, and standard error metrics.

E-Wallet Mobile Application for Welfare Management[2] | *(FTEC3002 Course Project)* January 2020

- Designed an developed WelfareWallet: An E-Wallet mobile application to help senior citizens manage payment schemes
- Integrated Android platform with OpenBankAPI for secure transaction handling
- Collaborated with Minecraft server administrators to suggest features and get feedback about the plugin

Food Classifier Using Small-Sample Learning[3] | *(Huawei AI Developer Competition '19)* March 2019

- Designed a ResNet-based model to classify several Hong Kong food images
- Classes split into 75 large (1000 samples/category) categories and 25 small (30 samples/category) categories
- Conducted transfer learning on small samples by using semantically similar (large) classes as pre-trained input.

Location-Based Personal Safety Mobile Application[4] | *Personal Project* March 2018

- Built a hands-free personal safety application using MapBoxAPI and Google Places API
- Designed and Developed with Java and XML with Google Cloud Vision API to automate authentication

Extracurriculars, Outreach

- International Student Association at CUHK - Information Technology Officer (Feb 2019 - Feb 2020)
- Treasury Officer, Hong Kong Institute of Engineers
- Finalist - Cyberport University Partnership Program (CUPP) For Flux - A Reinforcement Learning based Financial Planner
- Volunteer Educator, Sri Ramana Maharishi School for the Blind - Spent two years as a volunteer parttime computer science instructor for visually disabled students in Bangalore, India. Helped teach concepts in data structures, algorithms, and basic computing.

[1] (Github)
[2] (Google Play App) | (Github Source)
[3] (Github Source)
[4] (Github Source)