ARJUN ASHOK RAO

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CURRENT RESEARCH INTERESTS

Reinforcement Learning in Finance, Robust optimization for Deep Learning, Adversarial Machine Learning for AI Security

EDUCATION

The Chinese University of Hong Kong Expected Graduation: 07/2022
Bachelor of Engineering
Major in Financial Technology
Minor in Data Analytics and Informatics
GPA: 3.45 — Latest Term: 3.82
Courses Taken: Optimization Methods, Probability and Statistics for Engineers, Linear Algebra and Vector Calculus, Discrete Mathematics, Data Structures, Introduction to Data Science, Fundamentals of Financial Engineering.

RESEARCH EXPERIENCE

The Chinese University of Hong Kong May 2020 - Present
Undergraduate Researcher – Professor Bei Yu's Research Group

Studied the effect of adversarial perturbations on stereo-regression models under the supervision of Professor Bei Yu. Adversarial examples generated via gradient-optimization techniques (PGD, FGSM) affect stereo-depth/disparity perception. Our stereo-adversarial training algorithm *SmoothStereo* improves model robustness by regularizing left-right stereo pair regression feature maps $f_l(x_l)$ and $f_r(x_r)$. We enforce local linearity of the loss surface by upper bounding the regularization term with the remainder of its first-order Taylor expansion. *SmoothStereo* exhibits greater adversarial robustness within a moderate perturbation set $\delta \in \Delta_\epsilon$ with comparatively lesser gradient obfuscation and beats standard adversarial training for stereo-image based 3D object detection in autonomous driving. Our work was accepted to ICCAD '20 as an invited paper.

The Chinese University of Hong Kong September 2020 - Present
Undergraduate Researcher – Professor Hoi To Wai's Research Group

Ongoing work on the theoretical study of distributed optimization in machine learning - analyzing the convergence and generalization properties of distributed deep learning on multiple nodes. Our work also aims to study popular deep neural network (DNN) compression techniques and understand how DNN compression-aided generalization scales with over-parameterized DNNs which are more frequently used in industry.

PUBLICATIONS

Conference Papers

- 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

Asiabots Limited April 2020 - June 2020
Summer Intern, Asiabots Voice AI Hong Kong Science and Technology Park, Hong Kong

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

LSCM R&D Centre June 2019 - August 2019
Summer Intern, Financial Technology R&D Dept Cyberport, Hong Kong

Freshman year summer internship: Worked on a learning-based machine translation model for understanding document-level context in English and Chinese legal documents. My tasks included writing language-invariant pre- processing algorithms using text-mining and deep learning. Trained on a Transformer-attention model to significantly improve BLEU translation scores, and was able to capture essential legal context in text.

AWARDS, OUTREACH, LEADERSHIP

- Finalist - Cyberport University Partnership Program (CUPP) For Flux - A Reinforcement Learning based Financial Planner
- CUHK Admission Scholarship for Outstanding Academic Achievement
- Faculty of Engineering Admission Scholarship
- Dean's List (2019-20)
- Microsoft Learn Student Ambassador - Selected to The Microsoft Developer Program with access to community developer network and several project resources.
- CUHK Outstanding Student Award for community service at the International Student Association ISA-CUHK
- Winner, Huawei AI Developer Competition (Hong Kong and China) for our image classifier. Presented findings to Huawei AI Cloud Team
- Volunteer Educator, Sri Ramana Maharishi School for the Blind - Spent two years as a volunteer part-time computer science instructor for visually disabled students in Bangalore, India. Helped teach concepts in data structures, algorithms, and basic computing.