

# Arjun Ashok Rao

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## RESEARCH INTERESTS

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

## EDUCATION

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### 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

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### 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

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- Qi Sun, **Arjun Ashok Rao**, Xufeng Yao, Bei Yu, Shiyang 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

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### 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

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- 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

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- Super Resolution Convolution Neural Network<sup>1</sup>** | (*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<sup>2</sup>** | (*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<sup>3</sup>** | (*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<sup>4</sup>** | (*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

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- 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.

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<sup>1</sup>(Github)

<sup>2</sup>(Google Play App) | (Github Source)

<sup>3</sup>(Github Source)

<sup>4</sup>(Github Source)