

# Siqiao Ruan

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## EDUCATION

### University of California, San Diego

La Jolla, CA (09/2017 - 06/2021)

- B.S. in Computer Engineering | Cumulative GPA: 3.95 / 4.00 | Major GPA: 3.98 / 4.00 | CSE Honors Program | Provost Honors
- Relevant Coursework: Pattern Recognition & Machine Learning; Probabilistic Reasoning & Graphical Models; Computer Vision; Recommender Systems; AI: Statistical Approach; AI: Search and Reasoning; Computer Architecture; Database System Principles; Networked Services; Operating Systems; Software Engineering; Design & Analysis of Algorithms; Linear & Nonlinear Optimization.

## PUBLICATIONS

**Siqiao Ruan**, Ian Colbert, Ken Kreutz-Delgado, and Srinjoy Das. “Generative and Discriminative Deep Belief Network Classifiers: Comparisons Under an Approximate Computing Framework,” submitted to 2021 ISCAS. IEEE. [ [paper](#) ] [ password: siqiao ]

**Siqiao Ruan**, Wenzeng Zhang. “PASA-SEBA hand: An underactuated hand with seven-gear empty-trip mechanisms and built-in actuators,” in proceedings of 2017 ROBIO. IEEE. [ [paper](#) ]

**Siqiao Ruan**, Wenzeng Zhang, Tianyi Zhang, and Shuang Song. “COSA-FBA Hand: An Underactuated Hand with Five-gear Mechanisms and Built-in Actuators,” in proceedings of IFToMM Asian MMS 2016. [ [paper](#) ]

Yuchen Xing, **Siqiao Ruan**, and Wenzeng Zhang. “PISA-GBM hand: An indirectly self-adaptive robot hand with built-in actuators,” in proceedings of 2017 ROBIO. IEEE. [ [paper](#) ]

## RESEARCH EXPERIENCE

### Calit2/QI Pattern Recognition Laboratory

UCSD (06/2020 - Present)

- Researched approximate computing for deep learning models; proposed a novel approximate computing framework for semi-supervised discriminative deep belief networks, which reduced the size of the model by 800% while preserving 1% accuracy tolerance.
- Performed extensive experiments to investigate discriminative deep belief networks with both generative and discriminative learning objectives to investigate their power-at-performance for supervised & semi-supervised applications under an approximate framework.
- Elaborated tradeoffs amongst training objectives, bitwidth values, out-of-distribution performance, and accuracy sensitivity in order to provide novel insights for system designers to implement DDBNs with minimum power consumption, subject to accuracy tolerances.

### Advanced Robotics and Controls Lab

UCSD (11/2018 - 05/2020)

- Researched the applications of machine learning in multi-dimensional robotics motion planning.
- Designed learning-based model for proxy collision detection that increases efficiency in high-dimension C-space using Tensorflow.

### Advanced Robot Hand Lab

Tsinghua University (07/2016 - 05/2017)

- Researched in the topic of self-adapting under-actuated humanoid multi-fingered hand; designed two innovate structures of under-actuated robot hands that decreased the cost of manufacture by 15%. Received five China invention patents.

## WORK EXPERIENCE

### Cambricon - Deep Learning Algorithm Intern

Beijing, China (08/2019 - 09/2019)

- Realized a novel trainable quantization method for convolutional neural networks, which decreased the model size to 6% — 20% of the original full precision model, while preserving the original accuracy in Tensorflow.
- Implemented the quantization algorithm in popular CNN structures, including ResNet-18, ResNet-34 and AlexNet in Tensorflow.
- Built the testing and evaluation framework for applying the quantized neural network models on ImageNet datasets in Tensorflow.
- Developed a Tensorflow API to accelerate low-bit neural network operation, including matrix multiplication and convolution, using the Intel Math Kernel Library for Deep Neural Networks to facilitate testing quantization zoo in C++.

### CSE Department, UCSD - Teaching Assistant for CSE21

La Jolla, CA (06/2019 - 08/2019)

- Hosted discussion sessions and office hours to provide guidance on algorithms design & implementation; graded exams & homework.

## SELECTED PROJECTS

### Flowery: A Flower Recognition App - Software Development Lead

La Jolla, CA (09/2019 - 11/2019)

- Led a team of 4 developers to build a cross-platform app that allows real-time recognition of flowers in a Hackathon.
- Designed and developed the interactive user interface using React-Native; implemented image parsing, handled HTTP requests and responses, and developed components to display prediction results.
- Implemented the backend pipeline of flower recognition with Django, including morphologically denoising and inputting image processing, and using pre-trained lower bit-width model to make fast predictions and responses.

### SSH: An Off-campus Student Housing App - Front-end Lead

La Jolla, CA (03/2019 - 06/2019)

- Developed a full-stack cross-platform app for UCSD students to rent houses and find roommates with React-Native.
- Designed the backend data model. Used Google Firebase to store and manage data, such as user and housing info.
- Implemented interactive features — such as chat, like and favorite, add new house, and search nearby — using Firebase API.

## SKILLS

Programming Language: Java; Python; C/C++; Go; MATLAB; HTML5; CSS; JavaScript; PHP; SQL; Verilog; SystemVerilog

Programming Tools: Tensorflow; PyTorch; Scikit-learn; OpenCV; NumPy; React; React Native; Node.js; Ajax; JUnit; Docker; Linux