RUICHEN JIANG

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EDUCATION

Tsinghua University — Beijing, China
B.Eng. in Electronic Engineering (First Major) — Aug 2016 - Jun 2020 (Expected)

- GPA:3.86/4.0; Rank:10/266
- Received the Academic Excellence Award (2017 - 19)

Tsinghua University — Beijing, China
B.Eng. in Pure and Applied Mathematics (Second Major) — Sept 2017 - Jun 2020 (Expected)

- GPA:3.81/4.0

University of New South Wales — Sydney, Australia
Exchange Student — July 2018 - Nov 2018

- WAM: 94.25/100
- Achieved second place (joint) in the 2nd Simon Marais Mathematics Competition

RESEARCH EXPERIENCE

The University of Hong Kong (Department of Electrical and Electronic Engineering)
Pokfulam, Hong Kong
Research Assistant to Dr. Kaibin Huang, — July 2019 - Present
Cooperative Diversity in Over-the-Air Computation

- Machine learning applications at wireless edge involve collecting massive data from edge devices, which can be very costly. To tackle this challenge, *over-the-air computation* (AirComp) is a promising solution where many devices transmit their message simultaneously to achieve ultra-fast aggregation. However, channel fading can severely impair its performance.
- In this project, we incorporate cooperative diversity techniques into AirComp. We find in experiment that in a system of K sensor nodes where the server is equipped with M receive antennas, even a simple amplify-and-forward scheme with L relays can achieve a diversity order of $M+L-K+1$.
- We plan to give a rigorous proof for this observation in future research.

Tsinghua University (Department of Electronic Engineering) — Beijing, China
Research Assistant to Prof. Sheng Zhou and Prof. Zhisheng Niu, — March 2019 - Present
Reliable Communication in mmWave Vehicular Network Using Deep Learning

- The mmWave wireless systems face two main challenges: first, mmWave signals are highly sensitive to blockages, which affects the system reliability especially in a dynamic environment; Second, the narrow beam and large antenna arrays can introduce critical beam training overhead. In prior work, a solution based on recurrent neural network is proposed to predict blockage/handoff from previous beam sequences. Also, some authors address the beam selection problem by using machine learning tools with situational awareness.
- In this project, we hope to extend prior work by combining the channel information and situational awareness efficiently, and investigate the problem with the presence of dynamic blockages. Currently, we have configured Wireless Insite, a ray-tracing simulator, together with SUMO, a traffic simulator, to generate training and testing dataset. More research is in progress.

University of New South Wales (School of Electrical Engineering) Sydney, Australia
Research Assistant to Prof.Jinhong Yuan, July 2018 - Nov 2018
Soft Decoding of BCH Codes

- BCH codes form a powerful class of error-correcting codes that have been widely used in communication and data storage systems. Traditionally, they are effectively decoded with hard-decision decoding algorithms like Berlekamp-Massey algorithm. However, these hard-decision decoders fail to exploit soft information available, limititng their error performance.
- We explore a recently proposed coding scheme that performs iterative soft decoding of binary BCH codes, where a collection of codewords are transformed into a codeword of non-binary low-density parity-check (LDPC) code. We repeat the simulation reported in the paper, and find some motivations behind the coding scheme.

Tsinghua University (Department of Electronic Engineering) Beijing, China
Student Research Training Project with Prof.Fei Qiao, Dec 2017 - Jun 2018
Integrated Vision and Intelligent Perception Lab
Dynamic Vision Sensor

- Collected the event-based data from the dynamic vision sensor
- Studied how spiking neural network (SNN) can be utilized to process the asynchronous data

SELECTED AWARDS AND HONORS

- Joint 2nd place in the 2nd Simon Marais Mathematics Competition, 2018 (among 355 participants)
- The China Scholarship Council (CSC) Scholarship, 2018
- Tsinghua Academic Excellence Award, 2017-19 (Top 5% of 266 students)
- 1st Prize for the 34th National Undergraduate Physics Olympic, 2017
- 3rd Prize for 19th Tsinghua Electronic Design Competiton, 2017 (top 8 of 70 teams)

ADDITIONAL INFORMATION

- **Computer skills:** C/C++, MATLAB, Mathematica, Python, Linux, LaTeX
- **Language skills and proficiency:** Chinese (Native); English (TOEFL: 107, GRE: 170+156)
- **Extracurricular activities:** Drop-in Tutoring for STEM courses (Volunteer: 2019.3-present); Electronic Engineering Student Association of Science and Technology (Member: 2017-2018)

RELEVANT COURSES

Core Courses
Communications and Networks (A-, 4.0/4.0)
Probability and Stochastic Processes (A, 4.0/4.0)
Signal and System (A+, 4.0/4.0)
Data and Algorithm (A, 4.0/4.0)
Fundamentals of Electronic Circuits and System (A, 4.0/4.0)

Other Courses
Convex Optimization (A+, 4.0/4.0)
Probability Theory (A, 4.0/4.0)
Complex Analysis (A-, 4.0/4.0)
Differential Equations (A-, 4.0/4.0)