YUNRUI ZHANG

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EDUCATION

Tsinghua University, Beijing, P.R.China

Bachelor of Engineering in Automation *Aug, 2020 – Jul, 2024*

- **GPA: 3.65/4.0(major courses)**
- **TOEFL iBT 113/120** (Reading 30, Listening 30, Speaking 25, Writing 28)
- **GRE 328/340+4.0/6.0** (Verbal 158, Quantitative 170, Analytical Writing 4.0)
- Member of **Spark Program**, Tsinghua University

Core Courses

- **Mathematics**: Advanced Calculus, Linear Algebra for Physical Sciences, Random Mathematics and Statistics, Numerical Analysis and Algorithms, Operations Research
- **CS**: Programming Fundamentals, Data Structures, Computer Networks and Applications, Foundation of Artificial Intelligence, Digital Image Processing, Pattern Recognition and Machine Learning
- **EE and Control Theory**: Principles of Electric Circuits, Digital electronics, Fundamentals of Analog Electronics, Contemporary Electronic System Design, Signals and System Analysis, Theory of Automatic Control, Process Control

SCHOLARSHIPS & AWARDS

- **2022 Tsinghua Innovation Award of Science and Technology** (**0.2%**)
- **2022 Tsinghua Award of Outstanding Public Service** (**0.2%**)
- **2023 First Prize in Beijing Challenge Cup** (Awarded to top innovative projects in Beijing, **0.1%**)
- **2021 Guangzhou Pharmaceutical Holdings Limited Scholarship** (Scholarship in Tsinghua sponsored by Guangzhou Pharmaceutical Holdings Limited, **0.1%**)
- **2021 Tsinghua Award of Academic Progress** (**0.2%**)
- **2022 Tsinghua Spark Program Membership** (Top student program in academic research, **1%**)
- **2022 Honorable Prize** in the **Mathematical Contest in Modeling (MCM) and Interdisciplinary Contest in Modeling (ICM)** , Consortium for Mathematics and its Applications(COMAP)

PUBLICATIONS & PATENTS

1 **Yunrui Zhang**, Xiao Long, Gangtie Zheng, Richard M. Voyles. Workshop proposal: Robotics and Plastic Surgery. Submitted to *2024 IEEE International Conference on Robotics and Automation (ICRA)*. Under review.

2 **Yunrui Zhang**, Chen Chen, Pengming Pu, Moshan Guo, Mengyuan Zhang, Fengzhou Du, Xiao Long, Gangtie Zheng. An intelligent water-light needle injection robot, *CN Patent*, Sept 2023.

3 Chen Chen, **Yunrui Zhang**, Pengming Pu, Moshan Guo, Mengyuan Zhang, Fengzhou Du, Xiao Long, Gangtie Zheng. A method for the recognition, positioning, and motion control of surgical robot on human facial region, *CN Patent*, Sept 2023.

RESEARCH INTEREST

Fields Magnetic Resonance Imaging, Multi-modal Biomedical Imaging, Surgical Robots, Quantum Control System

Methods Machine Learning, Neural Networks, Signal Processing, Control Theory

RESEARCH EXPERIENCE

University of Illinois Urbana-Champaign, IL, USA (on site)
Quantitative Multiscale Imaging Group, Beckman Institute *July, 2023 – Present*
Research Assistant, Advisor: Prof. Fan Lam
Project: A deep learning approach to reconstructing high-dimensional MRSI data

- Proposed a novel deep learning-based method for magnetic resonance spectroscopic imaging (MRSI) reconstruction, which can achieve high-quality MRSI reconstruction from highly undersampled parallel imaging brain data.
- Devised specialized convolutional kernels and a complex convolutional neural network architecture to enhance both the efficiency of training and the quality of reconstruction.

Tsinghua University & Peking Union Medical College, Beijing, P.R.China
School of Aerospace Engineering *Oct, 2022 – Present*
Project Leader, Advisors: Prof. Gangtie Zheng & Prof. Xiao Long
Project: Intelligent Surgical System Based on 3D Multi-Modal Deep Digital Face

- Established a 3D multi-modal digital face model by fusing the imaging data from MRI, ultrasonography, CT, etc. for simulating and planning cosmetic operations, which enhances the quality and reality of medical cosmetology.
- Developed an algorithm that determines the injection points based on the 3D digital model and plans out the trajectory for the operation robot.
- Developed the control system for the intelligent robot which outperformed manual cosmetic operations in accuracy and safety.

Tsinghua University, Beijing, P.R.China & **Princeton University**, NJ, USA (remote)
Department of Automation *Feb, 2022 – Nov, 2022*
Research Assistant, Advisors: Prof. Rebing Wu & Prof. Herschel Rabitz
Project: Research on Universal Frame for Quantum Machine Learning based on Quantum Singular Value Transformation

- Applied Quantum Singular Value Transformation(QSVT) to quantum machine learning, an efficient way of constructing nonlinear layers in quantum computers without frequent measurements which consumes a lot of qubit resources.
- Designed and developed the quantum circuit for nonlinear activation functions including ReLU, sigmoid and tanh using QSVT. Successfully embedded the nonlinear part into a quantum neuron, which outperformed known quantum neurons that require repetitive measurements.

PROGRAMMING SKILLS

Proficient Python, PyTorch, Matlab, C/C++, Markdown, LaTeX, Git

Familiar TensorFlow, Linux, Java, Verilog, HTML, etc.