YUNRUI ZHANG

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EDUCATION

Tsinghua University, Beijing, P.R.China

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

- **GPA: 91.25/100**
- **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: Random Mathematics and Statistics, Numerical Analysis and Algorithms, Operations Research, Data Structures, Computer Networks and Applications, Foundation of Artificial Intelligence, Digital Image Processing, Pattern Recognition and Machine Learning, Signals and System Analysis, Theory of Automatic Control, Process Control

SCHOLARSHIPS & AWARDS

- **2023, 2022 Tsinghua Innovation Award of Science and Technology** (**0.2%**)
- **2023 First Prize in Beijing Challenge Cup** (Awarded to top innovative projects, **0.1%**)
- **2023 Tsinghua - Shanghai Xitai Investment Management co., Ltd. Scholarship** (**0.1%**)
- **2022 Tsinghua Spark Program Membership** (Top student program in academic research, **1%**)
- **2022 Tsinghua Award of Outstanding Public Service** (**0.2%**)
- **2021 Tsinghua - Guangzhou Pharmaceutical Holdings Limited Scholarship** (**0.1%**)
- **2021 Tsinghua Award of Academic Progress** (**0.2%**)
- **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**, Ruiyang Zhao, Zepeng Wang. A (k,t)-RAKI Method for Interpolating Sparse Data in Accelerated MRSI Acquisitions. Submitted to *2024 International Society for Magnetic Resonance in Medicine (ISMRM)*. Under review.

2 **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.

3 **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.

4 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,

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

RESEARCH EXPERIENCE

University of Illinois Urbana-Champaign, IL, USA (on site)
Quantitative Multiscale Imaging Group, Beckman Institute *Jul, 2023 – Sept, 2023*
Research Assistant, Advisor: Prof. Fan Lam
Project: A (k,t)-RAKI Method for Interpolating Sparse Data in Accelerated MRSI Acquisitions

- Proposed a self-supervised learning-based (k,t)-space interpolation method, (k,t)-RAKI, that is useful for further accelerating MRSI acquisition, in combination with subspace methods.
- Devised specialized convolutional kernels and a complex convolutional neural network architecture to enhance both the efficiency of training and the quality of reconstruction.
- Effectively reconstructed data for different undersampling designs in in vivo brain MRSI, leading to improved subsequent spatiospectral processing results.

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.