Ruiqi Ding

e0134117@u.nus.edu GitHub
Research Assistant, National University of Singapore (**NUS**)
Studied Physics to understand Nature, now exploring Neuroscience to understand Intelligence

1 Education

- 2016 - 2020, **NUS**, B.Sc. (1st Class Honours) Physics, GPA 4.52/5
  - Focus: Quantum Optics, Quantum Computing, Density Functional Theory
- 2019, **University of Göttingen**, M.Sc. (Non-degree Exchange Program) Physics, GPA 1.4/1
  - Focus: Molecular Dynamics, Genetic Physics, Fluid Dynamics, Statistical Mechanics

2 Employment

- 2020 - now, **NUS** Gao lab, Research Assistant in Superconducting Quantum Computing (details below at 3.2)

3 Research Experiences

- 2020 - now, **Stanford** Lin lab, Genetically Encoded Voltage Indicator Molecular Dynamics
  - Investigating kinetic barriers encountered by GEVI during activation/deactivation using MD simulation and analysis, in order to develop faster indicators of neural activity
- 2020 - now, **NUS** Gao lab, Quantum Optimal Control & RF Electronics & Lab Software
  - Developing deep reinforcement learning based algorithm and writing ODE solvers for QOC, in order to achieve fast and high fidelity quantum operations
  - Built RF electronics systems with ESP32 microcontroller, Raspberry Pi and custom PCBs. Wrote PID programs. Carried out calibrations like IQ mixer tuning, in order to drive/measure the superconducting qubits
  - Developed full stack (MCU + Python & Node backend + React frontend App + WebRTC) real-time dilution refrigerator monitoring system. Wrote programs (GUI & API) to control signal generators / spectrum analyzers etc. Wrote programs to generate Electron-beam lithography (EBL) pattern for qubit manufacturing
- 2019 - 2020, **NUS** Englert group, Density (Potential) Functional Theory
  - Developed DPFT program using the GPU parallel acceleration advantage of PyTorch. Used it to study spin polarized Fermi gas with magnetic dipole-dipole interaction in both position & momentum space
- 2019, **Göttingen** Kree group, Deep Reinforcement Learning & Medical Nanorobots
  - Studied the physics of complex fluids (human tissues) and programmed it as a stochastic RL environment. Used RL to navigate the (simulated) nanorobot to target location, in order to achieve medical applications such as drug / gene delivery
- 2018 - 2019, **NUS** Matsukevich lab, Laser & FPGA Systems
  - Built laser system with PID control, for laser cooling and trapping of Ytterbium ion qubits
  - Built FPGA system (Linux + Verilog + Websocket) for high speed signal processing, such as photon counting and quantum gate sequencing
- 2017 - 2018, **NUS** Englert group, Stern Gerlach Interferometer Quantum simulation
  - Wrote MATLAB & Mathematica programs to simulate & calculate the SGI, in order to benchmark a new 4th-order Suzuki-Trotter approximation to the unitary evolution operator, based on consecutive Fourier transforms between position and momentum space
- 2016, **NUS** Sow lab, Carbon Nanotube growth
  - Learnt to grow carbon nanotubes

4 Awards

- 2016 - 2020, **NUS**, Science & Technology Undergraduate Scholarship
- 2015, **Singapore government**, China-Singapore SM2 Scholarship
  - One of the 90 scholars selected from best High schools in China to study at NUS
- 2013, **Chinese Physical Society**, National High School Physics Competition 3rd prize
- 2013, **Huawei Technologies**, Huawei High School Science Fair best performance award
  - Built power electronics based Musical Dual Resonant Solid State Tesla Coil and Plasma Speaker

5 Skills

- **Electronics**: ESP32, Arduino, Raspberry Pi, FPGA, Power & RF Electronics; Altium Designer, Quartus; EBL
- **Languages**: Python, JavaScript & Typescript, C & C++, Verilog; Mathematica, MATLAB; SQL, CSS
- **Frameworks**: PyTorch, TensorFlow, JAX, Autograd; Node, React, MobX; Django, Express
- **Design**: Solidworks, Autodesk Fusion 360