Zhou (Silvia) Fang

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Research Interests

Quantum Software, Quantum Computer Architectures, Control Software for Quantum Systems

Education

Duke University, MS in Electrical and Computer Engineering Aug 2022 – May 2024

- GPA: 3.87/4.0
- **Coursework:** Fundamental Computer System and Engineering, Programming & Data Structures & Algorithms in C++, Algorithms, Engineering Robust Server Software, Systems Programming & Engineering, Random Signals and Noises, Human-Centered Computing, Database Systems, Towards More Reliable Software

Renmin University of China, BS in Physics Sep 2017 – June 2022

- GPA: 3.75/4.0
- **Coursework:** Quantum Mechanics, Intro to Computer Science (Python), Programming Language (Fortran), Foundation of Data Science, Electrical Engineering and Circuits, LabVIEW and Virtual Instrument Design

Research Experiences

Duke Quantum Center, Research Intern - Advisor: Prof. Crystal Noel July 2024 – Present
Project: Fast Imaging for Ion Trap Quantum Computing | Python, C, Linux, ARTIQ

- Designed a Python interface for an EMCCD camera to enable quantum state readout for trapped ions.
- Achieved over 90% reduction in acquisition time while maintaining data integrity.
- Conducted no-hardware simulations using ARTIQ to validate integration processes.
- Integrating ion image readout into the ARTIQ control system to improve usability and experimental workflows.

Duke University, Research Assistant - Advisor: Prof. Kishor Trivedi May 2024 – Present
Project: Software Reliability in Autonomous Driving Systems (Working Paper)

- Conducted a literature review of 30+ papers, focusing on the unique challenges posed by non-deterministic behavior in autonomous driving systems.
- Analyzed reliability issues specific to generative AI and AI-involved systems.
- Explored enhancement methods, including combinatorial testing, to identify potential system vulnerabilities.
- Applied formal methods such as model checking to ensure safety and robustness in system designs.

Duke University, Research Assistant - Advisor: Prof. Rabih Younes Feb 2024 – Present
Project: Duke Faculty Scheduler | HTML, CSS, JavaScript, React, Firebase

- Developed the "Duke Faculty Scheduler" Web App, a tailored platform that enables Duke professors to manage course schedules with ease and efficiency. Features include uploading, online editing, and exporting their course schedules into multiple formats (HTML, CSV, PDF, LaTex) .
- Integrated Firebase to provide secure, real-time user authentication, and centralized schedule management functionality, ensuring secure access and data synchronization for a large user base.

Duke University, Project Lead - Advisor: Prof. Jun Yang Jan 2024 – May 2024
Project: Devil's Database | Python, SQL, Docker

- Implemented core database functionalities with Python, including multi-pass external memory hash join, large-scale aggregation, and a query optimizer using Selinger-style dynamic programming.
- Optimized database performance by over 20% via implementing partial aggregation techniques.

Renmin University of China, Research Assistant - Advisor: Prof. Peng Cai Project: Sep 2020 – June 2021
Graphical User Interface for Lock-In Amplifier | LabVIEW

- Developed a software interface to control a Lock-In Amplifier (SR830), which enabled data acquisition, data visualization, and instrument control for experimental measurements.

Professional Experiences

Chinese Institute for Brain Research, Instrument Development Intern — Oct 2021 – April 2022

Project 1: Animal Behavior Monitoring Device Based on Photoelectric Principle

- Collaborated on PCB layouts and circuit board design using Altium Designer.
- Programmed the Arduino Nano chip in **C** using Arduino Nightly to modulate light signal frequency.
- Assembled the final device and conducted rigorous product testing to ensure functionality.
- Authored a report identifying common errors and implemented design improvements to enhance safety and reduce interference with animals.

Project 2: Non-contact Micro-dispensing Print Heads Based on Piezoelectric Principle

- Fabricated two piezoelectric print heads with distinct mechanical models to explore design variations.
- Built a testing system to validate functionality and identified optimal working modes and parameters.
- Conducted experiments to evaluate the performance of piezoelectric materials under different conditions.
- Optimized driving circuit design to improve efficiency and operational stability.

Projects

Exchange Matching Engine (C++, XML, PostgreSQL) — March 2023 – April 2023

- Created a multi-threaded stock trading system using TinyXML2 for parsing XML commands and PostgreSQL for managing user data, orders, and transactions. The system handled client requests via TCP sockets, ensuring fast and scalable responses in XML format.

Ride-Sharing Service (Python, Django, PostgreSQL, Docker) — Jan 2023 – Feb 2023

- Built a full-stack web application modeling a ride-sharing service like Uber, enabling users to manage accounts, request or share rides, act as drivers, track order status, modify details, and send email notifications.

TETRIS Game on FPGA (Verilog) — Nov 2022 – Dec 2022

- Developed a classic TETRIS game on an FPGA, integrating VGA display, PS2 keyboard controls, custom I/O, and processor-based enhancements such as pseudo-random block placement and real-time scoring.

Technical Qualifications

Languages: Python, Java, C, C++, SQL, JavaScript, HTML, CSS, R, Fortran, LabVIEW, Verilog, Shell, Scheme

Tools: Git, Linux, IntelliJ, PyCharm, VS Code, Jupyter Notebook, RStudio, MATLAB, PostgreSQL, MySQL, Firebase, Emacs, Vim, Nano, Django, Docker, Make, CMake, Pandas, Numpy, matplotlib, PySpark, Seaborn, Plotly, Scipy

Skills: Software Engineering, Embedded Systems, Digital Design, Data Science, Interfaces and UI/UX Design

Awards & Honors

First Class Scholarship (**Top 5%**) — Nov 2021

Outstanding Student Scholarship in Basic Sciences (**Top 15%**) — Mar 2020

Outstanding Student Award in School of Natural Sciences (**Top 20%**) — Nov 2018

References

Crystal Noel Assistant Professor, Duke University, Department of Electrical and Computer Engineering
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Kishor Trivedi Professor, Duke University, Department of Electrical and Computer Engineering
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