

# CUI HONGJIAN

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## OBJECTIVE

Data-driven quantitative researcher with a background in physics and engineering, specializing in mathematical modeling, data analysis, and financial algorithm development. Skilled in Python, MATLAB, and machine learning, with a strong foundation in applying mathematical models to real-world financial data. Searching opportunities as quant researcher/trader.

## EDUCATION BACKGROUND

**National University of Singapore**, Electrical and Computer Engineering, *PhD* 2018.8 - 2023.8

**Supervisors:** Prof John Ho, Prof Qiu Chengwei; with scholarship, graduated

**National University of Singapore**, Mechanical Engineering, *Bachelor* 2014.8 - 2018.5

**Distinction**, received full scholarship from University and Ministry of Education (MOE). Second award in High School Physics Olympic, China.

## TECHNICAL SKILLS

- **Programming:**  
Python(pandas, NumPy, SciPy, scikit-learning), MATLAB, SQL, C/C++, Linux, System Verilog
- **Quantitative Analysis:**  
Regression analysis, time series forecasting, Monte Carlo simulation, HMM
- **Data Visualization:**  
Tableau, Matplotlib, Seaborn
- **Hardware:**  
SolidWorks (CSWP), COMSOL, HFSS, LtSpice, GNURadio, LabView... for hardware and equipments

## RELEVANT EXPERIENCE

**MARVELL**, Staff Design Verification Engineer 2022.07-present

- Developed functional verification tests using Verilog and C++ for automotive Ethernet switches, achieving 100% functional and code coverage.
- Designed algorithms to process Ethernet frame contents and data with different patterns such as sfd, crc and time stamp for preemptable frames verification purpose, also implementing round-robin and other queue management techniques.
- Created test plans and conducted code coverage assessments, enhancing quality assurance and ensuring compliance with ISO 26262 automotive safety standards.
- Taking charge of creating tests for verifying several IC design units such as PMU, preemption with tsn ptp, functional safety with bus parity, EEPROM, SPI driver and several new automotive ASIC design features.

**Envilink (Startup)**, Research Engineer 2017.07-2018.03

- Developed multi-sensor environmental monitoring systems using data processing analyze and improve sensor accuracy and reliability.

**Applied Materials**, Internship Engineer 2017.07-2017.12

- Analyzing process data and use SEM to verify the DRIE process etching.

## RELEVANT PROJECT

**Kaggle Optiver-Trading at the Close, silver medal awarded, World top 5%** Current

- Attended Kaggle competitions. Ranked as top 5% and get silver medal.
- 1 This competition is based on actual stock quotes and trading data to accurately infer the rise and fall of stock prices in the last 10 minutes of trading each day.
- 2 A series of feature combinations such as transaction price difference, quote price difference, and trading volume are extracted. LightGBM model is chosen for development. Additionally, to enhance the model's robustness,

we divided the transaction dates into five segments to create test sets, conducting thorough testing to avoid overfitting.

## Machine Vision and Neural Networks

2018.8-2019.8

- Implemented image thinning and segmentation algorithm (Stentiford, Zhang Suen Algorithm). Improved thinning performance of algorithm. Solved problems where traditional dilation and erosion algorithm makes small edge disappearing.
- Developed code for regression, Convolutional Neural Networks (CNN), Back Propagation (BP), Support Vector Machine (SVM), Self-organizing map (SOM) and Q-learning Algorithm without Keras and sklearn kit.

## PHD THESIS

**PT-symmetry in Non-Hermitian Hamiltonian Wireless Coupled Electronic Oscillators.** Employing mathematical modeling expertise and analytical techniques for equation manipulation, I have adeptly transposed principles from quantum mechanics to formulate a comprehensive math model to describe physical world for electronics. This approach allows facilitating a deeper understanding of their dynamic behavior. I published related papers on **top Physics journal (JCR q1)** as first author. (PhysRevApplied, Editors' Suggestion.)

## PAPERS

### Fano Resonance Enabled Frequency Locking in Physiological Parameters Readout

Paper submitted

- **Innovation:**

- 1 Our team first extracted mathematical model from coupled oscillators with physical phenomenon called Fano resonance.
- 2 Developed C++-based circuit for frequency signal conversion, contributing to real-time physiological monitoring. [Seminar given](#)

### High-Efficiency Selective Wireless Power Transfer in a Bistable PT-Symmetric Circuit

2022.10

- **Innovation:**

- 1 We first designed the circuit and mathematically described single-transmitter, multi-receiver's wireless powering model as Non-Hermitian Hamiltonian.
- 2 Based on mathematical prediction, the wireless powering efficiency can be boosted to 65% where conventional devices only have 25%. We experimentally verified the results.

- **Main Contribution:** Equations Analysis. Simulations and Experiment. Paper writing. Published on top physics journal as first author. DOI: [10.1103/PhysRevApplied.18.044076](https://doi.org/10.1103/PhysRevApplied.18.044076)

### Wireless Magnetic Actuation with a Bistable Parity-Time-Symmetric Circuit

2021.2

- **Innovation:** We exploited the wireless actuation applications for non-Hermitian circuit. The current design improve the robustness and controllability from maximum attraction to maximum repulsion while actuating.
- **Main contribution:** PDMS microfluidic devices fabrication. Electronics simulations and experiment. Published on Physical Review Applied. DOI: <https://doi.org/10.1103/PhysRevApplied.15.024023>