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# Chendi Han

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## PROFILE SUMMARY

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- An active researcher in efficient Machine Learning algorithms, covering few shot classification, fast neural PDE solver and time series prediction.
- Work experience in computer vision with application to biomedical and data-driven testing.

## EDUCATIONAL BACKGROUND

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**ARIZONA STATE UNIVERSITY** Apr. 2018-Dec. 2022

*Ph.D. in Electrical Engineering*, Dean's Dissertation Award

- **GPA:** 3.94/4.00

**ARIZONA STATE UNIVERSITY** Aug. 2017-Dec. 2019

*M.s. in Electrical Engineering*

- **GPA:** 3.92/4.00

**LANZHOU UNIVERSITY** Sept. 2013-Jun. 2017

*B.s. in Physics*

- **GPA:** 88.38/100

## WORK EXPERIENCE

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**Cleveland Clinic** Las Vegas, NV

*MRI Research Engineer* Jul. 2023-Present

- Conducted disease-related brain imaging research such as fMRI, CT and PET.
- Developed artificial neural network and correlation analysis to discover the relation between human behavior and brain activity.
- Analyzed the internal mechanism for Alzheimer's or Parkinson's to help with early diagnosis and clinical treatment.

**UNITED INTEGRATED SERVICES CORP.** Pheonix, AZ

*Electrical Engineer* Dec. 2022-Jul. 2023

- Carried out maintenance and tests for the power system of TSMC FAB 21.
- Coded with Python and SQL to test the hundreds of AC/DC circuits' continuity and stability.
- Reported construction issues that violate National Electrical Code, which helped avoid financial losses.

**MERITI** Coppel, TX

*Research and Development Intern.* Feb. 2022-Aug. 2022

- Developed a Convolutional Neural Network (CNN) and 3D computational algorithms for brain surgery planning. Constantly revised the program to meet FDA standards.
- Analyzed and converted CT/MRI data to 3D images with OpenCV and Pydidom, built and trained a 2D/3D U-Net for semantic segmentation via AWS and GPU parallel. Tested the model with 10k cases and improved robustness by image denoising and data augmentation.
- Implemented maintenance for the computational environment and data management system with Docker, Shell Script and Google Cloud and updated them using GIT.

**LEETCODE** Palo Alto, CA

*Internal Contest Tester (part-time)* Nov. 2021-Apr. 2022

- Wrote programs with Python and C++ to solve each occurred coding problem for educational purposes, as well as to make sure only programs that met all the requirements get to pass the test.

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## RESEARCH PROJECTS

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### FEW SHOT CLASSIFICATION FOR QUANTUM SCARS

*Research Assistant, Arizona State University*

Jan. 2022-Dec. 2022

- Generated Meta Learning algorithms and few shot classifications for electromagnetic systems with a classification accuracy of 90% for quantum scars.
- Implemented data augmentation to increase the training robustness.
- Built the first quantum scar detector with ensemble neural networks.
- Extracted the correct quantum scars from the image pool of wave functions.

### FAST NEURAL PDE SOLVER FOR DEVICE DESIGN

*Research Assistant, Arizona State University*

Jan. 2020-Dec. 2021

- Developed a Multi-Layer Perceptron (MLP) and a Convolutional Neural Network (CNN) for PDE solver.
- Designed the structure of the neural network and the loss function based on provided data and optimized the devices with the BackPropagation algorithm.
- Created holography in 2D materials with 95% similarity.

### PHYSICS ENHANCED MACHINE LEARNING

*Research Assistant, Arizona State University*

Apr. 2018-Dec. 2020

- Formulated an innovative custom loss function, and implemented training based on TensorFlow and Keras.
- Constructed an adaptive neural network for Hamiltonian systems with a 2% error rate.
- Developed a general framework to detect hidden quantum qubits structure with 90% accuracy.
- Earned \$400k funding from Army Research Laboratory with the research results.

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## ACADEMIC PROJECTS

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### JPX TOKYO STOCK EXCHANGE PREDICTION (Kaggle Competition)

May 2022-Jul. 2022

- Reviewed and analyzed CSV files with  $10^7$  rows in Pandas.
- Further developed LSTM, Attention, and Graph Neural Network (GNN) for JPX data set.
- Coded for batch normalization, feature selection, and custom weights with PyTorch.
- Predicted the daily stock ranking with a Sharpe Ratio equal to 0.3, and ranked No. 130 among 2033 teams.

### MULTIAGENT REINFORCEMENT LEARNING

Feb. 2021-May 2021

- Developed an MLP for policy and value iteration, coded for Multiagent Rollout with Python.
- Compared Greedy, Actor-Critic, and Q-learning for Searching and Rescuing Problems.

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## SELECTED PUBLICATIONS

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**In total of 11 publications in peer review journals with 70 citations.**

- **Chen-Di Han** and Ying-Cheng Lai, *Deep Learning Based Dirac Electron Holography Design* (Under review by *Phys. Rev. B*).
- **Chen-Di Han**, Cheng-Zhen Wang and Ying-Cheng Lai, *Classifying and Detecting Quantum Scars by Machine Learning*, *Phys. Rev. Appl.* 19, 034030, 2023.
- **Chen-Di Han**, Ying-Cheng Lai, *Generating Extreme Quantum Scattering in Graphene with Machine Learning*, *Phys. Rev. B* 106, 214307, 2022.
- **Chen-Di Han**, Bryan Glaz, Mulugeta Haile and Ying-Cheng Lai, *Tomography of Time-Dependent Quantum Spin Networks with Machine Learning*, *Phys. Rev. A* 104, 062404, 2021.
- **Chen-Di Han**, Bryan Glaz, Mulugeta Haile and Ying-Cheng Lai, *Adaptable Hamiltonian Neural Networks*, *Phys. Rev. Res.* 3, 023156, 2021.
- **Chen-Di Han**, Hong-Ya Xu, Liang Huang and Ying-Cheng Lai, *Manifestations of Chaos in Relativistic Quantum Systems-A Study Based on Out-of-Time-Order Correlator*, *Phys. Open* 1, 100001, 2019.
  - Has been selected as the **Elsevier Year in Physics, 2019**; one of the 12 breakthroughs in 2019.

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## SKILLS & QUALIFICATIONS

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**Programming:** Python, C++, Matlab, Git, Shell Script;

**Packages:** PyTorch, TensorFlow, Keras, Sklearn, OpenCV;

**Neural Networks:** CNN, RNN, LSTM, GNN, Attention;

**Database:** Pandas, SQL, AWS, Docker, Linux, GPU;