

Ce (Matthew) Shen

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EDUCATION BACKGROUND

Fudan University

Ph.D. in Theoretical Physics

- Research Area: Tensor Network, Topological Quantum Computation
- Supervisor: [Ling-Yan Hung](#)

Shanghai, China

Sep. 2016 - Jun. 2022

Fudan University

B.S. in Physics

Shanghai, China

Sep. 2012 - Jun. 2016

Perimeter Institute for Theoretical Physics

Visiting Student

Waterloo, Ontario, Canada

Oct. 2018 - Dec. 2018 & Sep. 2019 - Nov. 2019

Tsinghua University

Visiting Student

Beijing

2020.12 - 2021.04

EXPERIENCE

Baidu

Senior Researcher

- Led the research and development of the **Quantum Finance** project.
- Participated as a core member in the development of the **Quantum Large Model** project.

Beijing, China

2022.07-2023.12

Qilin Capital

Quantitative Researcher, Intern

- Developed a comprehensive library of statistical models, such as ARIMA and Kalman filter.
- Created a library for simulating various continuous and discrete time stochastic processes.

Shanghai, China

2021.10-2022.01

WorldQuant

Quantitative Researcher, Intern

- Developed statistical models and conducted data analysis using historical data from the US stock market.
- Identified new alpha signals from price/volume data and fundamental data.

Beijing, China

2021.08-2021.09

SKILLS

LLM Data Acquiring, Data Cleaning | Fine-tuning, LoRA, RLHF, Post-pretrain | OpenAI API, Ernie API, Model Deploying | Prompt Engineering, Embedding, Recommendation System

Frontend ChatBot | React, Nextjs | Typescript, Javascript | HTML, CSS

Tools Linux, Docker, Git | SQL, Milvus | Postman, Wireshark, Nginx

Python Numpy, Matplotlib | TensorFlow, PyTorch | Flask, Streamlit, FastAPI

C/C++ Large scale matrix/tensor calculation | High performance scientific calculation

Mathematics Tensor Calculus, Tensor Network | Category Theory, Vertex Operator Algebra | Probability, Statistics, Stochastic Process

Languages Chinese (Native Speaker) | English (Proficient) | German (CGT4 certificate) | French (Basic)

SELECTED PUBLICATION

- **C. Shen**, L. Hung. "Defect Verlinde Formula for Edge Excitations in Topological Order." **PRL** 123 (5), 051602 (2019)
- P. Peng, W. Cao, **C. Shen**, *et al.* "Anti parity time symmetry with flying atoms." **Nature Phys** 12, 1139-1145 (2016) doi:10.1038/nphys3842
- J. Lou, **C. Shen**, C. Chen, L. Hung. "A (Dummy's) Guide to Working with Gapped Boundaries via (Fermion) Condensation" **JHEP** 2021 (2), 171
- **C. Shen**, J. Lou, L. Hung. "Ishibashi states, topological orders with boundaries and topological entanglement entropy. Part II. Cutting through the boundary." **JHEP** 2019 (11), 168
- J. Lou, **C. Shen**, L. Hung. "Ishibashi states, topological orders with boundaries and topological entanglement entropy. Part I." **JHEP** 2019 (4), 17.
- R. Wang, X. Zeng, **C. Shen**, L. Hung. "Virasoro and Kac-Moody algebra in generic tensor network representations of two-dimensional critical lattice partition functions." **PRB** 106, 115116
- R. Wang, X. Zeng, **C. Shen**, L. Hung. "Virasoro generators in the Fibonacci model tensor network: Tackling finite-size effects". **PRB** 107, 245146

HONORS & AWARDS

- 2019 **National Scholarship for PhD,**
- 2013 **Frist Prize (Shanghai),** National College Mathematics Competition
- 2015 **Frist Prize (Shanghai),** National College Mathematical Modeling Competition
- 2015 **National Encouragement Scholarship,**
- 2014 **Outstanding Talent,** Physics Department, Fudan Univ.
- 2016 **Best Project,** “Twilight Star” Scientific Innovation Plan, Fudan Univ.
- 2015 **Outstanding League Cadres,** Fudan Univ.

PROJECTS

Quantum Finance

- Independently completed the development of the “**QFinance**” package, which involved the full process of studying cutting-edge international research papers, algorithm design, coding, testing, and deployment. Updated the algorithm regularly based on the latest research papers. “QFinance” primarily employs Quantum Monte Carlo methods to address derivative pricing problems in financial industry. The package features capabilities for the preparation of arbitrary initial state and the loading of probability distributions. Additionally, it includes implementations of various quantum amplitude estimation algorithms. Also created bilingual (Chinese and English) user guides and API documentation for the “QFinance” package.
- Responsible for welcoming visiting financial client teams, in particular major banks and hedge-fund clients, introduced the basics of quantum computing and Baidu Quantum’s quantum solutions, and provided guidance on the use of quantum simulators. Communicated with clients about customized deployment solutions and prepared POC paperwork based on client needs and budget.

Quantum Large Model

- Pioneered in the development of the groundbreaking “Quantum Large Model”, **unveiled in October 2023**, playing a pivotal role in its fine-tuning and deployment.
- Data Preparation:** Prepare and format the quantum QA dataset. Acquired and cleaned approximately 140,000 quantum physics papers from arXiv. Devised a novel approach that combines data extraction and cleaning, facilitated by LLM.
- Fine-tuning:** Fine-tuned the model on the Baidu Wenxin platform, experimenting with various hyperparameters and incrementally larger datasets, utilizing LoRA training methodologies.
- Deployment and API Management:** Successfully deployed the model, creating a straightforward web API and enhancing it with an intuitive user interface. Automated access token renewal and managed stream outputs and error handling efficiently.
- QPS Optimization:** Managed the API request flow to circumvent QPS limitations by setting up a dedicated server for queuing requests.
- Evaluation System Development:** Contributed significantly to the design and execution of a comprehensive evaluation system for the fine-tuned model, enabling automated performance assessment across various tasks and generating detailed reports.

ArXiv Recommendation System

- Independently developed a cross-language search and recommendation system, based on embedding vectors.
- Data Preparation:** Collected and processed metadata for over 2.3 million arXiv papers, streamlining the extraction and cleaning of abstracts, and effectively storing data in an SQL database.
- Embedding:** Use the embedding of the abstract to calculate the similarity between papers. Embedding vectors are generated by LLM and stored in Milvus.

ChatBot for the fine-tuned Model

- Functionality:** Incorporated features for recording user feedback, supporting markdown, LaTeX, and code blocks, and providing question recommendations.
- Technical Improvements:** 1. Implemented functional calling to enhance accuracy in generating outputs related to renowned physicists. 2. Integrated multiple extensions accessible via a simple “/” command interface.