Fanpu Cao

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🎓 Education

South China University of Technology (SCUT), Guangzhou, China Sep. 2021 – Present

Undergraduate student in Artificial Intelligence

GPA: 3.72/4.0

Research Interests: Long-term Time series forecasting, Quantitative Finance, LLM, Diffusion model, Contrastive learning, Security of Machine learning.

ⓘ Core Courses

- C++ Programming (4.0/4.0)
- Python Programming (4.0/4.0)
- Advanced Language Programming Practice (4.0/4.0)
- Machine Learning (4.0/4.0)
- Deep Learning and Computer Vision (4.0/4.0)
- Big Data and Data Mining (4.0/4.0)
- Optimization Methods (4.0/4.0)
- Large Language Models and AI Engineering Design (4.0/4.0)

👥 Project Experience

Five-in-a-Row Game Development May 2022

Python, tensorflow Individual Project

Project link: https://github.com/macovaseas/five-in-a-row-

- Developed a five-in-a-row game using Python
- Supported local human vs. AI and human vs. human game-play
- Designed a simple and elegant game interface
- Implemented AI game-play using a CNN model

Texas Hold'em Game Development Dec 2022 – Jan 2023

Python Team Project

Project link: https://github.com/frinkleko/RL-Poker

- Developed a 1v1 Texas Hold'em game using OOP programming principles
- Designed a simple AI opponent based on mathematical principles
- Future improvements include designing multiplayer game-play and enhancing AI with reinforcement learning

SCUT-Baidu Pinecone Elite Program July 13, 2022 – May 31, 2023

Paddle Paddle aistudio Competition

- NLP Chinese news topic classification (**3rd/27**) using *Bert* pre-trained model
- CV classification competition (**5th/33**) using *resnet152* pre-trained model + random cropping + pseudo-labeling
- Awarded "Baidu Pinecone Talent Development Elite Program Outstanding Student"

Stock Price Prediction Nov 2022 – Dec 2022

torch, Deep learning Deep Learning Project

Using GRU network model, predicted stock prices for the Shanghai and Shenzhen 300 index from Jan 4, 2005, to Dec 31, 2019 (including open price, high price, low price, close price, price change percentage, trading volume, and trading value), and forecasted the stock prices from 2020 to Oct 28, 2022.

- Cleaned and preprocessed stock price data, predicted future stock prices based on historical data

- Built and trained a GRU model using the torch framework
- Formulated investment strategies based on the stock price predictions

Large Language Model Deployment and Fine-Tuning   Oct 2023 – Nov 2023

LLM   AIGC Project

Deployed ChatGLM-6B model on a server, fine-tuned the model on a custom dataset using the P-tuning-v2 algorithm, and achieved significant improvements in rouge and bleu scores compared to baseline.

- Deployed the model on a Linux terminal
- Fine-tuned the model using training scripts with custom hyperparameters
- Validated the fine-tuning results using validation scripts

Life Expectancy   Nov 2023 – Dec 2023

Scikit-learn, Lightgbm   Data Mining Project

Project link: https://github.com/frinkleko/Life-expectancy

- Used data mining techniques to extract key and interesting information from the Life Expectancy Data.csv
- Cleaned and preprocessed the data, analyzed data features (such as correlation, KDE distribution, data visualization results)
- Predicted life expectancy using LightGBM
- Visualized model interpretability using the shap library to identify features most related to life expectancy
- Conducted feature engineering using the RFECV algorithm to further enhance model prediction performance

Tree Drawing Suicide Project   Oct 2023 – Present

Graph Neural Network, CNN   Deep Learning Project

Guided by Prof. Ye Liu, this project uses a tree drawing dataset from Beijing Normal University, which includes tree drawings by children affected by disasters and associated suicide tendency labels. The project aims to build a deep learning model to classify and predict potential suicide tendencies based on children's drawings.

- Performed random oversampling to balance the classes
- Constructed a knowledge graph based on the characteristics of the tree drawings and psychological features
- Integrated CNN full convolution architecture with graph neural networks using Knowledge-Embedded Representation Learning, combined with gating mechanisms for prediction
- Split the data into test, validation, and training sets, achieving an accuracy of 97% on the validation set
- Used GradCAM for model heatmap visualization to identify features and elements in the drawings influencing suicide tendencies

♡ Honors and Awards

Excellence Awards, Baidu Paddle Paddle Cup	Dec. 2021
Outstanding Students, South China University of Technology-Baidu Pinecone Elite Class	Jun. 2013
S Awards, 2024 Mathematical Contest In Modeling	April. 2024
3rd *Awards*, 2023 Asia and Pacific Mathematical Contest in Modeling	Nov. 2023

🎓 Papers

Ister: Inverted seasonal-trend decomposition Transformer   March. 2024 – present

Advised by Dr. Shu Yang, Next Generation Internet R&D Center, Tsinghua University Research Institute, Shenzhen. Research on tasks associated with time series analysis, long-term forecasting. We introduces a novel benchmark model: **Ister**. This model employs a strategy of decomposing time components into seasonal and trend components. It utilizes a Transformer architecture to predict seasonal components and a Multi-Layer Perceptron (MLP) for forecasting trend components. Our model achieves state-of-the-art (SOTA) results across multiple existing public datasets. Aiming to submit to *AAAI 2025*.

CEDTS-RL: Towards efficient and green cross-geographical data centers based on reinforcement learning 2024

Working with Dr. Shu Yang, Next Generation Internet R&D Center, Tsinghua University Research Institute, Shenzhen. Aiming at the huge energy consumption of data centers and the carbon emissions they generate, we propose a novel cross-data center task scheduling mechanism that aims to reduce the overall carbon emissions while satisfying user demands.We first constructed a task scheduling model designed to optimize carbon emissions while considering latency and energy consumption. Subsequently, a reinforcement learning-based algorithm called CEDTS-RL (Carbon Emission-Driven Task Scheduling Algorithm Based on Reinforcement Learning) is developed, which utilizes information on the production and consumption of renewable energy between different data centers.The effectiveness of the CEDTS-RL algorithm is validated through a comprehensive simulation using data center location data from commercial companies and NASA's surface climate dataset. The simulation results show that the proposed algorithm effectively reduces carbon emissions compared to the baseline algorithm, albeit with a slight increase in average latency. This work contributes to optimizing the environmental sustainability of data center operations and optimizing task allocation based on renewable energy availability.

⚙ AI Skills

- Programming Languages: Python*, C++
- Maths: Calculus, Linear Algebra, Complex Functions, Probability&Statistics, Convex Optimization, Matrix analysis and calculation
- Frameworks: Pytorch , Pandas , GBDTs (lightgbm etc.), Visualization (Matplotlib, Seaborn, shap, etc.), Scikit-learn, Numpy, Scipy, OpenCV
- Platform&Tools: Windows, Linux, LaTeX, Markdown, Git, VSCode.
- Fields: CV(OpenCV, VGG, Resnet, YOLOv8, ViT), NLP(Transformers, Berts, LLMs), GANs, GNN, DataMining&Machine learning(Linear regression, SVM, KMeans, GBDTs, etc.)

ⓘ Miscellaneous

- Native place: *ShenZhen*
- Hobby: Basketball, Violin*(Performed twice at the Shenzhen Odeum)*
- Languages: *English* - IELTS **7.0**, CET6 Grade **550**, CET4 Grade **602**