

Baqer Farhan

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EDUCATION

University of Toronto

HBSc, Mathematics - Statistics Stream (Specialist)

Toronto, ON

Sept. 2023 – Present

- University of Toronto Entrance Scholarship (\$3000)
- Relevant coursework: Probability Theory, Statistical Inference, Regression Analysis, Stochastic Processes.

TECHNICAL SKILLS

Technical: Python (NumPy, Pandas, Scikit-learn), R, C, TensorFlow, Keras, Flask, MySQL, Tableau

Machine Learning: Neural Networks, Collaborative Filtering, Gradient Boosting, Feature Engineering

Data Analysis: Statistical Modeling, Quantitative Analysis, Predictive Modeling, Time Series Analysis

Visualization: Matplotlib, TA-Lib, Interactive Dashboards, Tableau

Big Data: Basic understanding of Hadoop and distributed systems

PROJECTS

Matrix Multi-Purpose Calculator

Dec. 2023

Tech Stack: HTML, CSS, JavaScript

- Developed a web-based calculator capable of performing various matrix operations including addition, subtraction, multiplication, inversion, scaling, transposition, eigenvalue computation, and determinant calculation.
- Implemented a user-friendly interface with real-time error handling and input validation for matrix elements.
- Designed an intuitive user interface that displays results in LaTeX-formatted matrices, enhancing readability and user experience.
- Added features to display eigenvalues and determinants for square matrices, providing insights into matrix properties and behaviors.

Neural Collaborative Filtering Movie Recommendation System

Aug. 2024

Tech Stack: Python, TensorFlow, Flask, NumPy, Pandas, Scikit-learn, Custom Embedding Optimization

- Analyzed the MovieLens dataset (25M ratings, 162.5K users, 62.4K movies) to develop a custom Neural Collaborative Filtering (NCF) architecture.
- Integrated embedding layers, dense neural networks, and a custom Lambda layer for dynamic embedding.
- Developed a diversity algorithm considering genres, decades, franchises, and user history for enhanced recommendations.
- Achieved an RMSE of 0.79, MAE of 0.60, and MSE of 0.62 on a 5-star rating scale.
- Built a RESTful API with error handling, logging, and batch processing for scalability.
- Developed a responsive web interface using HTML/CSS/JavaScript for interacting with the recommendation API.
- Optimized user embeddings with early stopping and learning rate scheduling, improving model generalization.

S&P-500 Prediction System

Dec. 2024

Tech Stack: Python, scikit-learn, NumPy, Pandas, TA-Lib, Matplotlib

- Implemented quantile regression using Gradient Boosting to predict S&P-500 returns with confidence intervals.
- Engineered 150+ features incorporating cross-asset correlations, market regimes, and technical indicators.
- Built a visualization dashboard showing predictions, confidence intervals, and market regimes.
- Achieved 71.56% prediction interval coverage and scaled RMSE of 0.0248 on 5-day forward returns.
- Developed feature importance analysis identifying key predictive signals across asset classes.
- Implemented adaptive market regime detection and risk management through VIX-based volatility regimes and dynamic confidence interval scaling.