Time-Series Foundation Models (TSFM) in Finance

**Project overview:**

For the purposes of this project, we will use the state-of-the-art TSFMs (Lag Llama and TimeGPT) to predict financial time-series data. TSFMs will be pitched against the standard time-series prediction models (benchmark) such as ARIMA and the simple autoregressor.

**Project Aim:**

Main aim of this research is to find out whether TSFMs are good at predicting financial time-series data. Secondary aims are to discover how TSFMs’ performance can be improved and to provide a comprehensive analysis of the results – giving insight into what type of data can TSFMs be used for, and which configuration they should be used in.

**Current progress:**

1. Implemented Lag Llama and benchmark models
2. Implemented the data gathering and preparation functionalities
3. Implemented the fine-tuning framework for Lag Llama
4. Implemented the framework for the evaluation of the models
5. Implemented the evaluation of the predictions
6. Implemented the Time-series cross validation framework
7. Implemented the interactive results visualization capability

**Future steps (in no particular order)**

1. To run the experiment on different types of financial data across different configurations of the Models
2. To implement TimeGPT
3. (possibly) to implement more benchmark models
4. To refine the results visualization capability
5. To implement the results recording and aggregation functionality
6. Thorough analysis of the results

**Preliminary results**

* Lag Llama (LL) greatly benefits from fine-tuning
* With stationary time-series data (stock prices), LL performs slightly better with longer context length
* With non-stationary data (stock returns), LL performance significantly drops with longer context length
* Raw LL performs significantly worse than the benchmark in terms of actual predictions errors
* Raw LL performs slightly better than the benchmark in terms of directional accuracy
* Fine-tuned LL has significantly lower prediction errors than the raw version
* Fine-tuning LL doesn’t appear to improve its’ directional accuracy

**Example results of Time-series cross validation (Apple daily Close stock price prediction):**

EVALUATION

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VISUALIZATION

A graph with different colored lines

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SUMMARY

A screenshot of a computer screen

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