Proposal

In light of current financial instability, this project aims to model the volatility of the target financial assets (e.g., stocks, forex, commodities) using data sourced from Google Finance or Yahoo Finance. Independent investors, particularly those with limited capital, are experiencing significant losses—especially in the technology sector as the stock market crashes—due to recent tariff policies imposed by the U.S. administration.

This project will focus on applying advanced Bayesian techniques to analyze financial data and extract insights for mitigating risk. While macroeconomic factors play a role in market dynamics, the primary focus here is to develop quantitative models that can inform practical trading strategies and actionable insights.

I am particularly interested in understanding how investors can mitigate risk in a free-falling market. A few questions of interest to explore are mentioned below, with my order of preference:

1) How investors can optimize their portfolios and allocate their funds appropriately using expected assets as a metric developed using Bayesian Decision Theory. This would utilize Bayesian regression (linear/non-linear depending on the data) and MCMC with Stan, which would be a great choice given the uncertainty of the market.
2) How we can use Bayesian Hierarchical GARCH modelling to forecast sector-specific volatility (the sector I am interested in is TECH; this way I can even make use of the FAANG data as well). The choice of GARCH models befits the time-varying nature of the dataset.This idea would delve deeper into individual modelling of the stocks and collective modelling of the overall sector, to see how the shifting market positions affect the overall trend.

But before, we must do adequate research about existing literature with the following dataset:

1) This research is heavily rooted in using bayesian statistics to dampen uncertainty hence resulting in better portfolio weights allocation. This, however, is not based on the dataset that we will be using. Similarly, the MV (mean-variance) quadratic utility function is at the core of the paper, which would differ as we would be more open to pick the parameters we want to focus on and vary different kinds of utility functions (exponential, gaussian etc.)
   Full article: Bayesian mean–variance analysis: optimal portfolio selection under parameter uncertainty

2) Volatility forecasting with GARCH models is a quite famous research topic and I have found multiple papers with similar ideas, however they mostly utilize a frequentist approach. Moreover, my approach incorporates hierarchical modelling as well, by modelling two stocks and then the whole sector. Prior choice for GARCH parameters will be informed by pre existing literature and finance expert opinions/insights.
   High-frequency volatility estimation and forecasting with a novel Bayesian LGI model
   Chapter 15 Volatility and Correlation Forecasting - ScienceDirect