Frontier Tech Leaders Ethiopia ML Bootcamp

Capstone Project Proposal

Title: Analyzing the Impact of Global Events on Oil Prices

1. Project Idea

The global oil market is highly volatile, influenced by various geopolitical, economic, and policy-driven events. This project aims to analyze how significant events—such as political decisions, conflicts in oil-producing regions, global economic sanctions, and changes in OPEC policies—affect oil prices. The goals are to identify events that significantly impacted oil prices over the past decade, quantify the effect of these events on price fluctuations, and provide data-driven insights that assist investors, analysts, and policymakers in understanding and responding to price fluctuations more effectively.

2. Relevance to SDGs

This project aligns with **Sustainable Development Goal (SDG) 7 (Affordable and Clean Energy)** and **SDG 12 (Responsible Consumption and Production)**. By improving the understanding of oil price volatility, the project supports better decision-making in energy policy, market regulation, and sustainable economic planning.

3. Literature

1. **Hamilton, J. D. (2009). Causes and Consequences of the Oil Shock of 2007–08.** This research examines the relationship between oil prices and macroeconomic factors, highlighting the impact of supply disruptions and global demand shifts.

2. **Kilian, L., & Zhou, X. (2020). Oil Prices and Stock Returns in a Time-Varying World.** This study explores the influence of geopolitical events and economic shocks on oil price fluctuations and their broader financial implications.

4. Data

The dataset consists of historical oil prices, covering daily prices from May 20, 1987, to September 30, 2022.

Data Fields:

Date: The recorded date of oil prices, formatted as 'day-month-year'.

Price: The price of Brent crude oil per barrel (in USD).

5. Approach

The project employs **time series forecasting** techniques to analyze the relationship between major events and Brent oil price fluctuations. Various models will be explored, including:

ARIMA (AutoRegressive Integrated Moving Average): To analyze price trends and make short-term predictions.

GARCH (Generalized Autoregressive Conditional Heteroskedasticity): To model price volatility.

LSTM (Long Short-Term Memory) Networks: To capture long-term dependencies in time series data.

Steps:

1. **Data Collection:**

   Source data from financial databases, government agencies, and industry reports (e.g., World Bank, IMF, IEA).

2. **Data Preprocessing:**
   Handle missing values, outliers, and format inconsistencies.

3. **Exploratory Data Analysis (EDA):**
   Use visualizations to identify trends, seasonality, and event correlations.

4. **Model Development:**

Train ARIMA, GARCH, and LSTM models to forecast oil prices.

5. **Model Evaluation:**

Compare model performance using RMSE, MAE, and R-squared metrics.

6. **Insight Generation:**

Interpret results to provide strategic recommendations for stakeholders.

Conclusion

By leveraging data-driven analysis, this project aims to bridge the gap between historical events and oil price movements. The findings will help energy market participants make informed decisions, aligning with SDG 7 and SDG 12 for a more sustainable and stable energy future.