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Data Science Project

Stock Market and Fundamental Analysis with ML

Analysing Stock Performance and forecasting

Specialization: Stock Analysis

Business Focus: Finance Analysis and Forecasting

Project Guide

Tool: Python, Jupyter & Git

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Business Introduction

Company: Prime INC
Industry: Information Technology, Energy and Utilities

Prime Investments is a globally recognized firm, known for its strategic investments in **emerging markets**. The firm offers highly flexible investment solutions to meet varying client preferences and leverages advanced technology to provide seamless e-investment options and tailored stock portfolios to its diverse clientele. After losing out on some significant investment opportunities last quarter, management has decided to incorporate innovative methods involving machine learning to enhance decision-making and identify profitable opportunities.

Key Evaluation Metrics:

- Seasonal pricing variations.
- Customization options influencing price variability and direction.

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Business Problem

Prime INC recently missed key investment opportunities due to inefficient decision-making processes. To address this, the firm is looking to adopt Data-driven strategies to predict market trends and identify lucrative stocks efficiently. As part of their ongoing Data adoption Strategies, the company collaborated with Amdari to address the challenging issues, Predicting the direction of the stock price to aid management in identifying the best stock portfolios to invest in.

Specific Obstacles:

1. **Missed Investment Opportunities**: Delays in analyzing stock data resulted in suboptimal decision-making.
3. **Lack of Predictive Insight**: The absence of reliable models to forecast future stock performance.
4. **Financial Complexity**: Difficulty interpreting financial statements to assess long-term profitability.

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Project Overview

Your team has been onboarded to perform in depth analysis of stocks with high probabilistic potentials listed on Prime Incs portfolio. One of the key deliverables is checkmating the current status of these (stocks) in relation to established market benchmarks such as (FTSE100 and S&P500).

Your team is further mandated to provide comparative analysis of two organizations that Prime Inc is looking to engage for the next quarter. The goal is to obtain critical insights as regards which stock has the most promise by measuring:

- Risks Association or Volatility of the stocks
- Correlation of stock prices between portfolio stocks and Industry benchmarks(FTSE100,S&P 500)
- The Market capitalisation of the Stock
- Stock Trend & Direction of the stock price.

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Project Learning Opportunity

- **Bridge Theory and Practice**: Apply financial and machine learning theories to real-world datasets.
- **Work on a Real-World Scenario**: Analyze a real company listed on the either the FTSE 100 index or the S & P 500 .
- **Develop Analytical Mindsets**: Gain insights into the relationships between financial health, market behavior, and investment potential.
- **Contribute to Decision-Making**: Generate actionable investment recommendations for a beginner investor.

Learning Skills

- **Data Acquisition: Using the Yahoo Finance API for stock market data**
- **Statistical Analysis: Understanding returns, volatility, and trends in stock prices.**
- **Time Series Forecasting: Implementing models like ARIMA, moving averages, exponential smoothing, XGBoost and an LSTM DNN model.**
- **Financial Analysis: Researching Performance Markers, Extracting and analyzing financial statements for revenue, profit, and capital structure trends.**
- **Visualization: Creating impactful visualizations with Python libraries like Matplotlib and Seaborn.**
- **Decision Support: Presenting insights in a formal business report to guide investment decisions.**

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Project Rationale

Why Stock Market and Fundamental Analysis with ML Matters:

1. **Empowering the Investor**: Provides actionable insights to a novice investor.
2. **Holistic Evaluation**: Combines technical market analysis with fundamental financial health assessment.
3. **Predictive Accuracy**: Improves decision-making by forecasting stock trends using machine learning.
4. **Risk Mitigation**: Identifies risks and compares them with potential returns for optimal investments.
5. **Data-Driven Decisions**: Supports the client's goals through evidence-based investment recommendations.

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Project Scope

01

Preparation and Setup

- Select the target company, competitor, and the index to use as the benchmark,
- Set up a Python environment with required libraries.

02

Data Collection

- Use APIs to retrieve historical stock prices.
- Download financial statements from corporate websites or trusted sources.

03

Stock Market Analysis

- Split data into training (80%) and test (20%) sets.
- Conduct descriptive analysis to examine returns and volatility.
- Explore relationships among stock prices using correlation and regression analysis.

04

Perform time series analysis:

- Visualize stock trends, Implement and compare forecasting methods
- Evaluate predictions against test data.

05

Fundamental Analysis

- Extract financial metrics from annual reports.
- Analyze changes in revenue, net income, and capital structure over time.
- Visualize trends to compare financial health with market performance.

06

Reporting

- Compile results into a formal business report.
- Include visualizations, insights, and actionable recommendations.

Data Description

These features are derived from historical stock prices, competitor data, and the FTSE 100 index:

- **Date**: Timestamp of the stock price data.
- **Open Price**: Opening price of the stock on a given day.
- **High Price**: Highest stock price during the trading day.
- **Low Price**: Lowest stock price during the trading day.
- **Close Price**: Final price of the stock at market close.
- **Adjusted Close Price**: Closing price adjusted for stock splits and dividends.
- **Volume**: Total number of shares traded in a day.

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Project Workflow

Ingest API Data

1. Extract stock price data for selected company and competitor.
2. Gather financial data from company annual reports.

Exploratory Data Analysis

- Investigate historical trends, returns, and volatility.
- Compare stock performance between selected company, the competitor and the FTSE 100 or s&p 500 market indices.

Feature Engineering

- Creating a ‘returns’ feature , and a 'Direction' feature. The direction column provides binary observations of daily price movements, indicating whether the stock price moved up or down.

Modeling & Evaluation

- Use time series models (Xgboost and LSTM) to forecast the target’s (“direction”) Trend
- Validate models using a train-test split (80:20).
- Evaluate results

Fundamental Analysis

- Analyze revenue, profit, and capital structure trends from financial statements.
- Assess how these financial metrics influence stock performance.

Reporting and Strategy Recommendations

Generate a good report with actionable insights for Prime INC to guide portfolio investment decisions.

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REQUIREMENTS

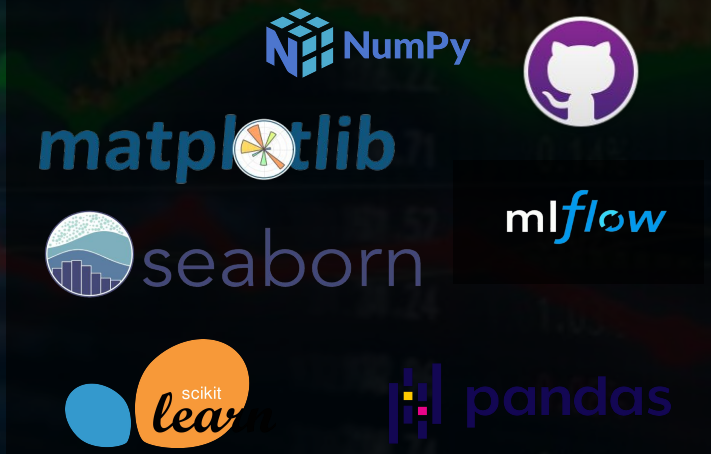
To enhance the project deliverables, you are required to implement using these MLOPS best practices

Docker: Conternarize the application using docker

Mlflow: track the models performance & Experiments using mlflow

Git : set a version control system using git

Deployment: Build a simple web front-end to deploy model using streamlight, Fast API or Flask.



Tech Stacks

1.Programming language – Python

2. Git & Github

- Numpy: For performing mathematical operations over data
- Pandas: For Data Analysis and Manipulation
- Matplotlib.pyplot: For Data Visualization
- Seaborn: For Data Visualization
- Scikit-learn: For Machine Learning