**INVESTMENT DASHBOARD**

**Applying machine learning into the stock market**

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**\*\*\*The project is for study propose only\*\*\***

**Summary**

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**Overview**

The purpose of the dashboard is to present a detailed visualization of company insight with historical performance, technical indicators and predict the upcoming volatility applying machine learning.

Target clients: Experienced investors.

**Introduction**

This project is an Interactive Stock Dashboard with [Python](https://plotly.com/dash/) with some Technical Indicators.

**Data Source**

Yahoo Finance

**Existing Libraries:** Matplotlib, Pandas, Numpy, Plotly, Sklearn, Stats model

**New Libraries:** Dash, Tkinter, Quantstats

**Approach**

* Imported various libraries for visualization of stock performances.
* Imported Ticker and created a selection window for all the tickers available at Yfinance.
* Identified the trend and visualized the historical prices for the selected tickers (for coding refer Jupyter Notebook).
* Apply multiple models to predict future Price and volatility.

**Dashboard Visualization**

\*\*\*ADD THE PICTURE HERE\*\*\*

**Understanding the Theory**

Based on those models we prepared a dashboard consisting of 4 tabs:

1. **Stock Overview**
   1. **Stock Profile**

Composed by:

Last closing price;

Industry;

Sector;

Business Summary.

You can select your desire period of Stock Performance:

1mo, 3mo, 6mo, 1y, 2y, 5y, 10y, ytd, max.

1. **Return and Volatility matrix**
   1. **Cumulative Return**

A cumulative return is the aggregate daily return that the stock has gained or lost over time. The cumulative return is expressed as a percentage based on the stock closing price.

* 1. **Sharpe Ratio**

Sharpe ratio is a well-known and well-reputed measure of risk-adjusted return on an investment or portfolio. It can be used to evaluate the performance of an individual stock.

The Sharpe ratio indicates how well an equity investment performs in comparison to the rate of the S&P 500 index and NASDAQ.

* 1. **Rolling Standard Deviation**

Standard deviation is the statistical measure of market volatility, measuring how widely prices are dispersed from the average price. If prices trade in a narrow trading range, the standard deviation will return a low value that indicates low volatility. A volatile stock has a high standard deviation, while the deviation of a stable blue-chip stock is usually rather low.

Rolling Standard Deviation is a metric calculated over the range of a shifting (rolling) window. The Annualized Standard Deviation is the standard deviation multiplied by the square root of the number of periods in one year (252 trading days).

* 1. **Rolling EWM**

A weighted average is an average that has multiplying factors to give different weights to data at different positions in the sample window.

1. **Algo Trading Strategy** 
   1. **Algo Trading**

It is usually applied for short term strategies because this is a high-risk strategy where the idea is to maximize gain and/or minimize losses.

Using Moving Average of Stock closing price as a Criteria, the graph shows points of BUY / SELL (Entry / Exit) recommendations when the 50-day moving average stock price goes below/under the 100-day moving average.

* 1. **Exponential Moving Average**

The exponential weighted moving average reacts more significantly to recent price changes than a simple moving average (SMA), which applies an equal weight to all observations in the period.

It is used to highlight trends and illustrate the price trajectory of a stock.

* 1. **Bollinger Banda**

It is a technical analysis tool for generating oversold or overbought signals composed with three lines: A simple moving average low, middle and upper band.

It can tell you how closer the price moves to the upper band (more overbought the market), and the closer the price moves to the lower band (the more oversold the market)

* 1. **Random Forest Model**

A random forest is a meta estimator that fits a number of decision tree classifiers on various sub-samples of the dataset and uses averaging to improve the predictive accuracy and control over-fitting. The sub-sample size is controlled with the max\_samples parameter if bootstrap=True (default), otherwise the whole dataset is used to build each tree.

1. **Predictions with Machine Learning Techniques**
   1. **LSTM RNN Predicted vs Actual Stock Price with Bollinger**

Long Short-Term Memory (LSTM) Model to Predict Stock Prices are powerful in sequence prediction problems because they're able to store past information.

* 1. **Predicted vs Actual Return**

**Actual daily return vs. predicted return over the period.**

**This graph is to visualize the**

* 1. **ARMA Forecast**

The Auto Regressive Moving Average (ARMA) model consists of two parts, an autoregressive (AR) part and a moving average (MA) part. The Auto Regressive part involves regressing the variable on its own lagging(past) values.

The ARMA model uses past values to predict future stock price.

* 1. **ARIMA Forecast**

The Auto Regressive Integrated Moving Average (ARIMA) model is a famous and widely used forecasting method for time-series prediction. ARIMA models can capture a suite of different standard temporal structures in time-series data. The model is a measure of how many non-seasonal differences are needed to achieve stationarity.

The ARIMA model uses past values and error to predict future stock price.

If no differencing is involved in the model, then it becomes simply an ARMA.

* 1. **Volatility Forecast**

GARCH model is used to predict volatility of the stock price, based on the variance across the period.

Remember: HIGHER VOLATILITY = MORE RISK

**Room for Improvement:**

* Adding more parameters to build better prediction model.
* Adding more modelling options.
* Improve the Dashboard running speed.

**Q&A Session**