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Leveraging Machine Learning for Strategic Decision-Making: A Case Study on Medtronic

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Introduction

This project leverages machine learning and financial analysis from an Americna-Irish company, after looking a database to work it, I have selected their stock prices where I applied models such as Linear Regression, K-Means Clustering, KNN, etc. The company that I have analysed is called Medtronic, a global enterprise in medical technology, services, and solutions, dedicated to improving healthcare for customers around the world. Medtronic has pioneered innovations in areas like cardiovascular therapies, diabetes, neurological problems and minimally invasive procedures. Essentially, the mission of the company is responsible for resolves pain, restoring health focusing on welfare by using biomedical engineering.

Objectives

General Objectives

- oUnderstand the dataset and the use of models on it.
- oThe use of this techniques in real life.
- oExamine the stock prices of an Irish company.
- oInspect the results obtained and give a deep explanation.

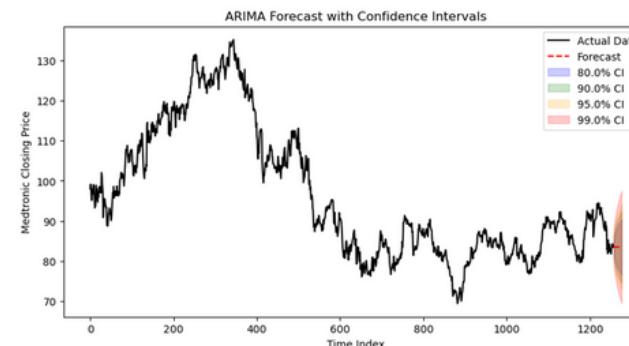
Specific Objectives

- oAnalyse the results through model performance metrics, robustness checks, and comparative analysis.
- oClean and normalize the dataset and perform it through visualizations.
- oDetermine optimal parameters to execute before evaluating the models.
- oDescribe the results and their applicability in similar cases, particularly in relation to forecasting, smooth noisy data and identifying correlations.

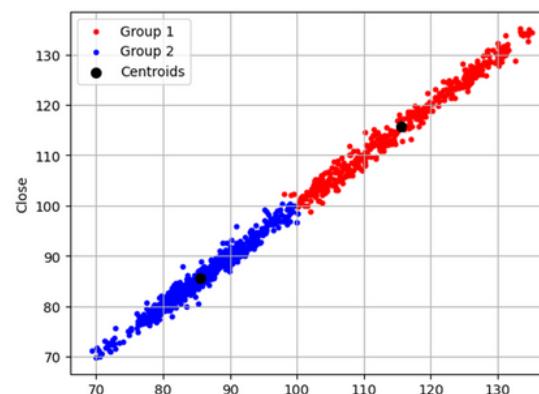
Methodology

- Data Collection
- Data Cleaning
- Exploratory Analysis
- Models Presentation

Key Findings



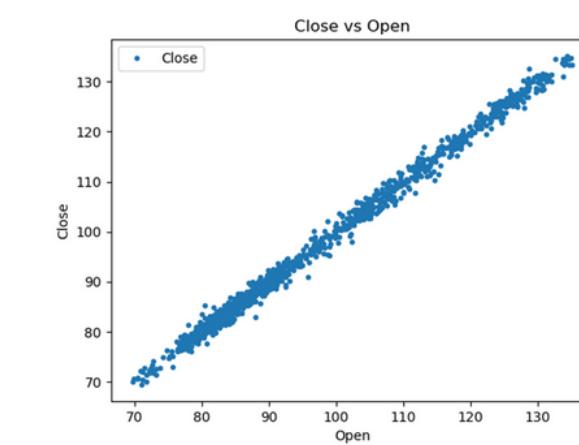
I have used the ARIMA model but with confidence intervals that are particularly valuable for risk assessment and decision-making. The 80% interval might be suitable for routine planning where some risk is acceptable, while the 99% interval would be appropriate for conservative scenarios where being wrong could have severe consequences.



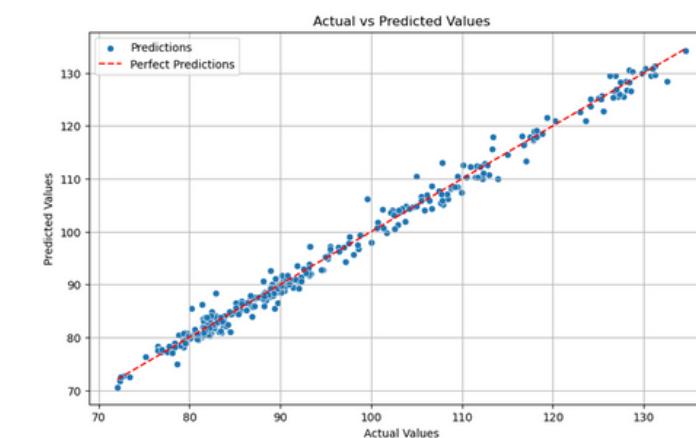
After obtaining the result, we can understand the positive distribution and centroids, which indicate each stock's group. For instance, centroids can serve as equilibrium points for risk categories. If a price is near the centroid, I might hold or ignore it, but if it is far, I should start selling or stay alert, if we consider that there will be a drop. However, opportunities may arise to sell when prices approach centroids and buy when stocks are oversold (far from centroids), if we are anticipating a bounce.

Descriptive and Analytical:

- Analyzes patterns
 - Study trends
 - Search potential influencing factors
- Predictive:
- Models to forecast future prices



I have made some examples finding which would be the best option for being a dependent and independent variable, I have chosen as an independent variable (x) "Open" and as a dependent variable (y) "Close". We can see that there is a positive correlation between these two variables. CV mean has a high value which could mean overfitting and leakage because of my dataset, this is a financial data where the markets are in constantly changing, so that is the reason for the outcome's values.



Here, the blue dots represent the model's predictions, while the red line indicates perfect predictions. In this visualization, each blue dot corresponds to a specific prediction made by the model for a given data point. The closer these blue dots are to the red line, the more accurate the model's predictions are. Deviations from the red line show errors or inaccuracies in the model's predictions, providing insights into areas where the model may need further refinement or improvement.



Conclusion

During the project, I have studied the application of models in time series and machine learning models in databases about the price of a company's stocks over the last five years. Additionally, I have utilized codes recently covered in class, which has helped improve my skills in these tools and their practical application across various sectors such as the industrial sector. Also, Throughout the project, I integrated these concepts with real data, improving not only my technical skills but also my understanding of how these models can drive innovation and efficiency across many fields.

