

GENERATING PRICE ELASTICITY OF DEMAND CURVE USING MACHINE LEARNING



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INTRODUCTION

This project focuses on analyzing price elasticity using sales and revenue data from a retail company.

Price elasticity of demand is a measurement of the change in the consumption of a product in relation to a change in its price. Expressed mathematically, it is: $\text{Price Elasticity of Demand} = \frac{\text{Percentage Change in Quantity Demanded}}{\text{Percentage Change in Price}}$.

The goal of this project, therefore, is to see whether machine learning can be efficient in creating the price elasticity table for each product. The project was done with the help of OgenTech, a company that uses artificial intelligence to help businesses in Israel and around the world with forecasting demand, planning inventory, and managing orders. We used machine learning to learn from past sales and revenue data of one of OgenTech's customers to figure out how sensitive different products are to price changes.

MOTIVATION

By accurately estimating the price elasticity for each product, the retail company can smartly decide on pricing strategies, use resources wisely, and become more efficient, profitable and competitive. That's why an accurate price elasticity calculation can provide businesses a competitive edge. Retail demand data are abundant, notoriously noisy, and many times difficult to interpret analytically.

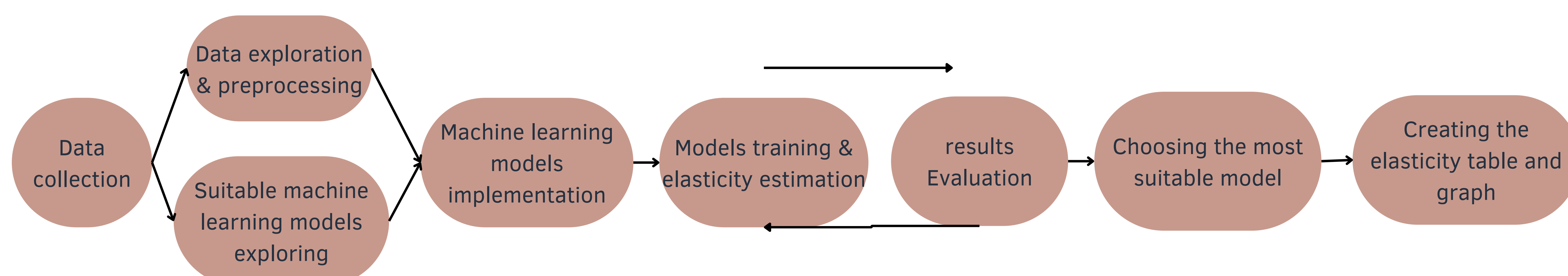
That's where machine learning tools come in. They can help in the development of efficient predictive models that will try to estimate as accurately as possible the price discounts elasticity of different products.

METHODOLOGY

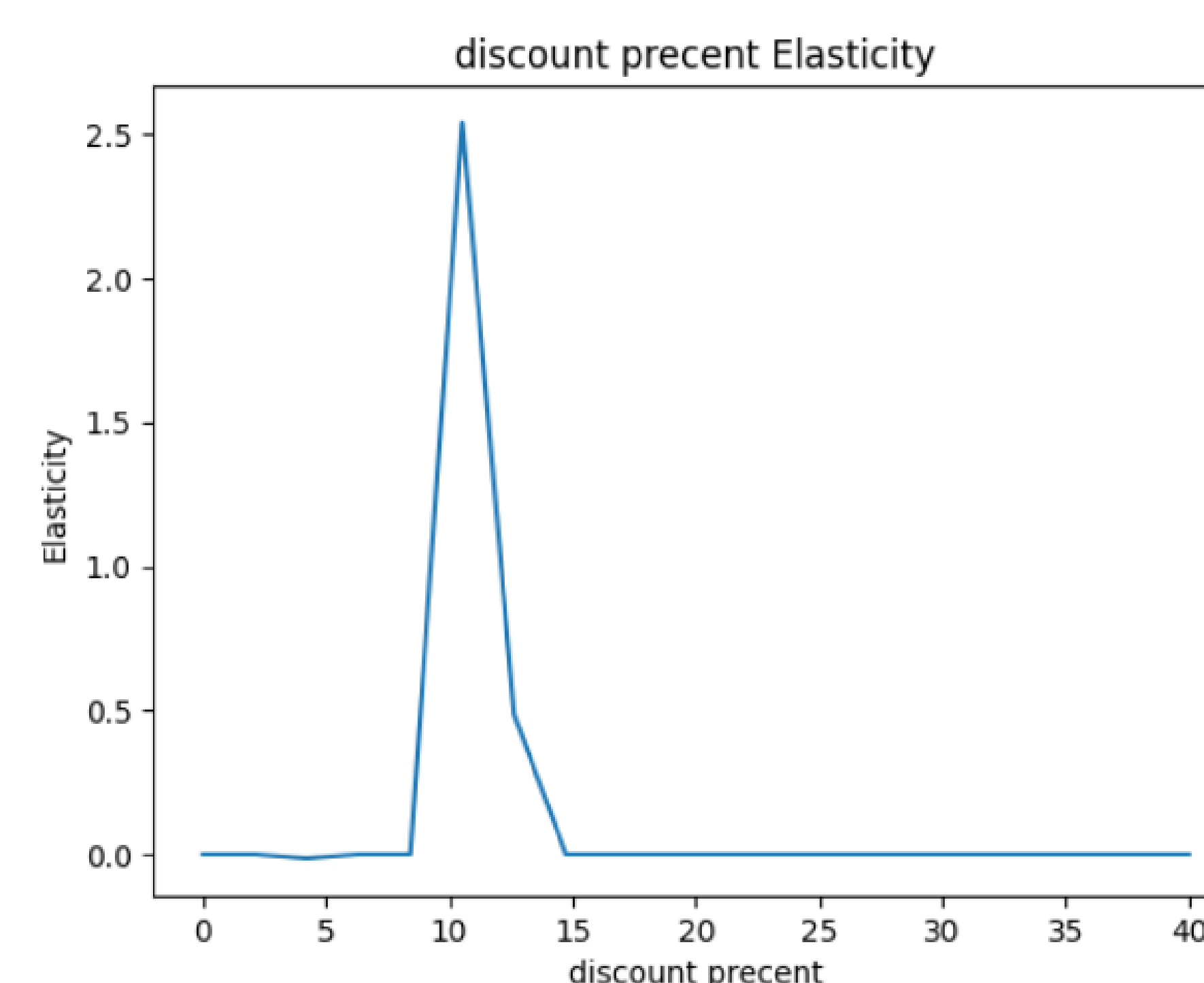
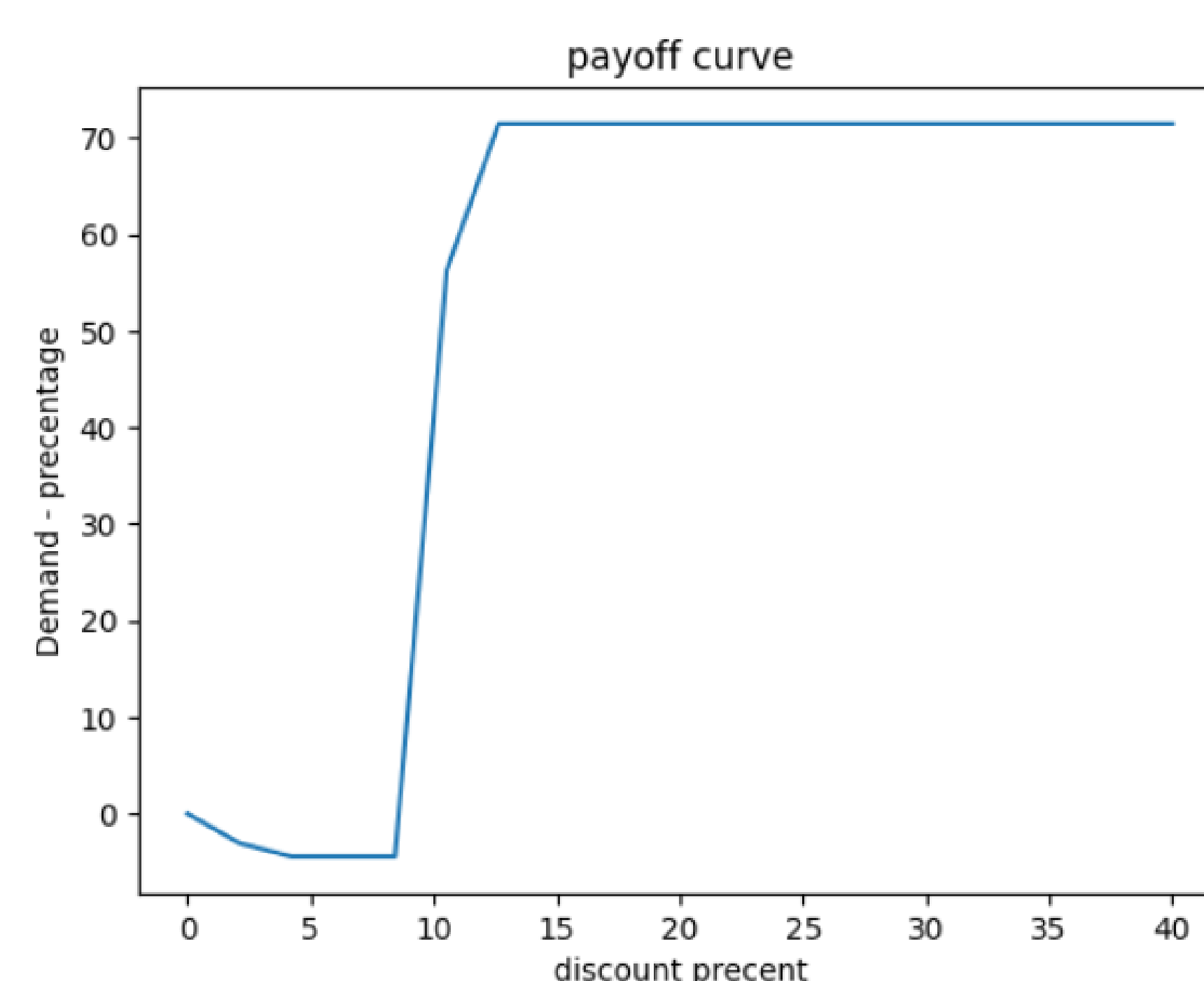
We started by studying the concept of price elasticity and the related technologies. We also explored and analyzed the data provided by Ogen Tech. For the project, we used tools like the Google Colab platform and the Python language for coding. In addition, we utilized Python libraries, namely, Pandas, NumPy, Scikit-learn, and others.

Our main focus was to create machine learning models that are suitable for predicting demand. Through these models, we calculated the price elasticity of products.

WORKFLOW



RESULTS EXAMPLE



CONCLUSION

We have tested a few machine learning models and, based on the model outcomes, we discovered that the Random Forest model performed best for predicting demand. The basic assumption is that for many products there may exist a specific price discount range where altering the product's price affects its demand. In particular, an important aspect of our investigation is to find the "efficient interval" in which a price discount will greatly boost demand. In fact, we were able to identify this range for each product through the graphs we generated. We have also identified the intervals in which increased discount did not bring increased sales and was, therefore, redundant.

FUTURE WORK

- Training & Testing the model on a bigger dataset to check the possibility of improving the results.
- Beyond the current outcomes, refining the results is feasible by considering extra factors that influence demand, like time, location, special events, holidays, etc.
- To advance this project's outcomes, it's possible to calculate the best range of discount percentages that maximize profit for the retail company. This can be achieved by utilizing relevant data on supply costs, production, maintenance, and more.