# RETAIL PRICE PREDICTION USING MACHINE LEARNING

**A Project Work Synopsis**

*Submitted in the partial fulfillment for the award of the degree of*

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**MACHINE LEARNING**


**Submitted by:**

**TANYA GUPTA**

**(20BCS6600)**

**TANUSH SHARMA**

**(20BCS6596)**

**SRI KUMAR DAS**

**(20BCS6629)**

**VEDANT**

**(20BCS6624)**

**Under the Supervision of:**

**MONIKA SINGH**



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**CHANDIGARH UNIVERSITY, GHARUAN, MOHALI - 140413, PUNJAB**


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# DECLARATION

We, **'Tanya Gupta', 'Tanush Sharma', 'Sri Kumar Das'** & **'Vedant'** student of **'Bachelor of Engineering in Branch Name'**, **session: _2020-2024,** Department of Computer Science and Engineering, Apex Institute of Technology, Chandigarh University, Punjab, hereby declare that the work presented in this Project Work entitled **'Retail Price Prediction'** is the outcome of our bona fide work and is correct to the best of our knowledge and this work has been undertaken taking care of Engineering Ethics. It contains no material previously published or written by another person nor material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

**Tanya Gupta**
**Tanush Sharma**
**Sri Kumar Das**
**Vedant**

**Student UID's:**
**(20BCS6600)**
**(20BCS6596)**
**(20BCS6629)**
**(20BCS6624)**

**Date: 05/03/2022**
**Place: Chandigarh university**

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Thank You.

# ABSTRACT

Predicting retail prices of things is something that both businesses and customers are interested in. The price of a product at a certain target outlet is often related to the pricing of the same or similar products at neighboring competing outlets in a competitive setting.

Using four-vector autoregression models that incorporate the historical retail prices of the product at a target outlet and at rival outlets, this study predicts the start of day and current pricing of a certain product at every outlet in a given city. The models also contain the product's anticipated wholesale price. Three methods are discussed for identifying local rivals. A wholesale supplier is one that has price patterns that are similar to those of a target outlet. A basic autoregression technique outperforms the proposed models.

# Table of Contents

# ***List of Tables***

***Table Title*** ***page***



# ***List of Figures***

***Figure Title*** ***page***

# 1 INTRODUCTION

### 1.1

When it comes to appropriately pricing their items, the biggest challenge for retail teams is answering the question: What is a fair price for this item given the market, the present time of year, demand, and the product's characteristics? Because these variables are always changing, this question is extremely difficult to answer correctly.

#### 1.1.1

They can alter in a matter of minutes depending on the goods, which is particularly true in the eCommerce sector. This is why, on a daily basis, companies such as Amazon adjust their product prices millions of times. It is, however, extremely difficult for smaller merchants to compete with Amazon. They have no choice but to compromise; either they don't consider many variables in order to change the prices, or they don't consider many elements in order to change the prices. in a timely manner, or take into account as many elements as possible and hope that the market hasn't changed significantly by the time prices are determined. Pricing methods that have been around for a long time rely entirely on human judgment. The diagram below depicts the basic distinction between human-supervised ML-driven pricing and pricing that is entirely human-powered.

# 2 LITERATURE REVIEW

## 2.1 Literature Review Summary

Table 2.1: Literature review summary

| Year and citation | Article Title | Purpose of study | Tools/ Software used | Comparison of technique done | Source (Journal/ Conference) | Findings | Data set (if used) | Evaluation parameters |
|---|---|---|---|---|---|---|---|---|
| 2018 | Machine Learning for Retail Price Recommendation with Python | To build a model that automatically suggests the proper product prices. | • Python 2.7 or higher<br>• Kaggle<br>• Google Collab | exploit purchase data to predict inventory needs in real-time. | https://towardsdatascience.com/machine-learning-for-retail-price-suggestion-with-python-64531e64186d | automatically suggested the product price | train.csv | • Accuracy<br>• Complexity |
| 2021 | How to Build a Price Recommender App with Python | To take a glance at the simplistic price optimization approach and also build a simulator app. | • Python 2.7 or higher<br>• Kaggle<br>• Google Collab | accurately predict how customers will react to certain prices and forecast demand for a given product. | https://www.analyticsvidhya.com/blog/2021/08/build-a-price-recommender-app-with-python/ | pricing optimization app | Price.csv | • Accuracy<br>• Complexity |

# 3 PROBLEM FORMULATION

Predicting the price of a product is a tough challenge since very similar products having minute differences such as different brand names, additional specifications, quality, demand of the product, etc. can have very different prices. For example, one of these sweaters cost $335 and the other cost $9.99. Can you guess which one's which?

Price prediction gets even more difficult when there is a huge range of products, which is common with most of online shopping platforms. It's highly challenging to predict the price of almost anything that is listed on online platforms.

# 4 OBJECTIVES

The proposed work is aimed to carry out work leading to the development of an approach for the Retail Price Prediction Model. The proposed aim will be achieved by dividing the work into the following objectives:

1. Minimizes the risk usually involved in changing prices thanks to its prediction capabilities.
2. Retail teams can essentially use machine learning to test out various promotions or pricing strategies to understand what their impact may be.
3. To make the pricing decisions of pricing managers more profitable.
4. Predict how customers will react to certain prices and forecast demand for a given product.

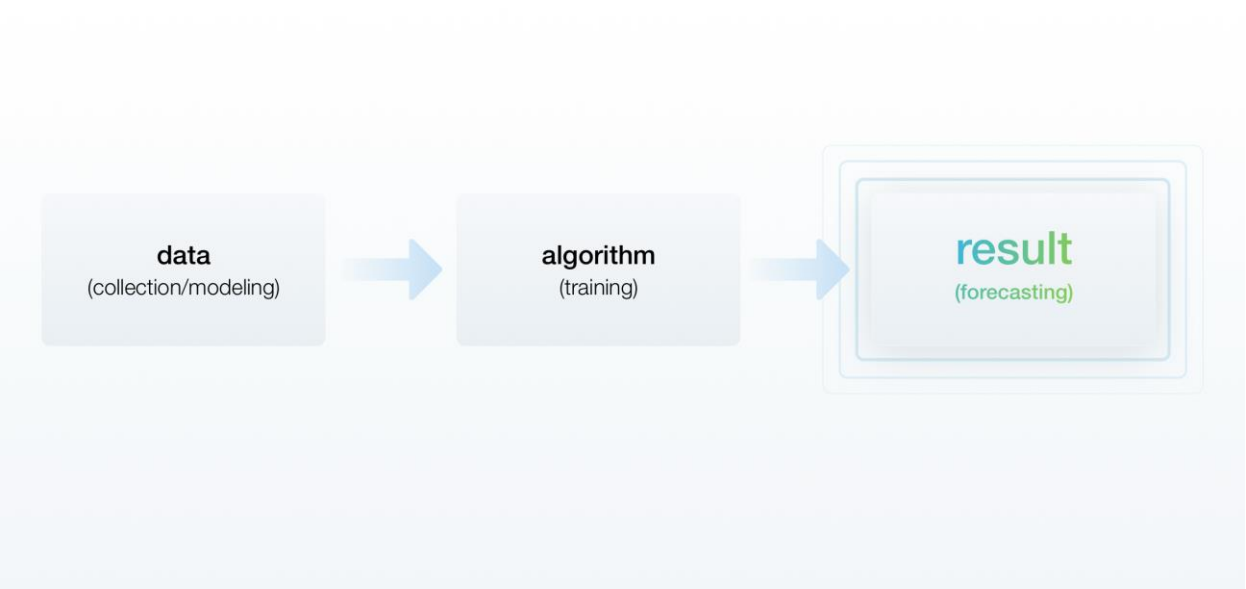
# 5 METHODOLOGY

The following methodology will be followed to achieve the objectives defined for the proposedresearch work:

1. Detailed study of **Retail Price Prediction** will be done.
2. Installation and hands-on experience on existing approaches of **Machine learning** will be done. Relative pros and cons will be identified.
3. Various parameters will be identified to evaluate the proposed system.
4. Comparison of newly implemented approaches with exiting approaches will be done.

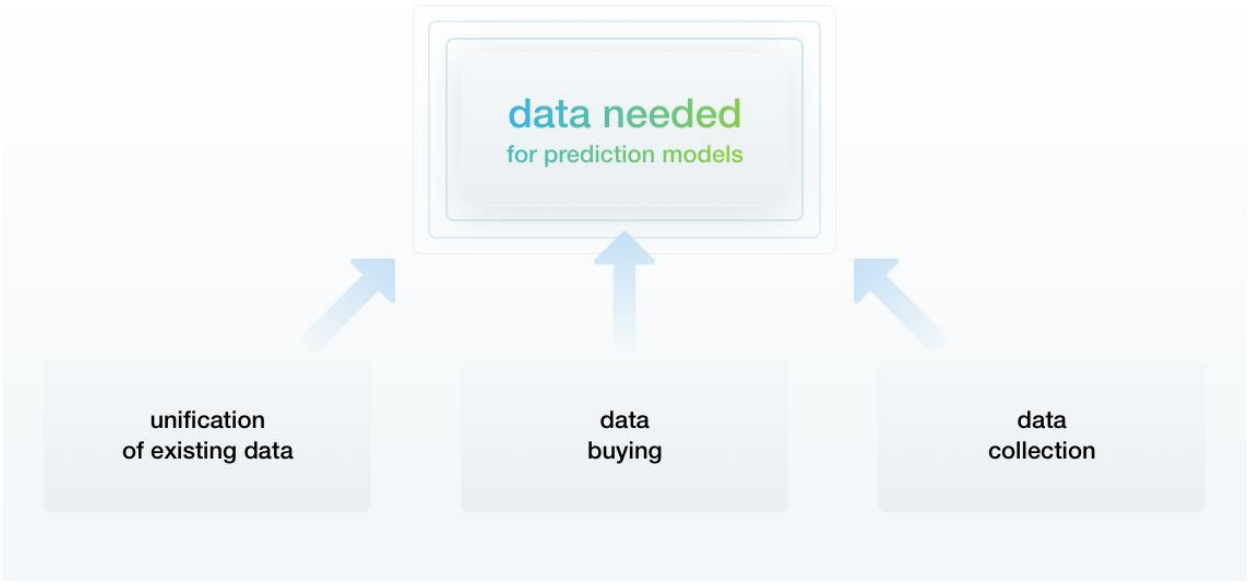
Algorithms must learn from historical and competitive data before being deployed. During the learning step, the model (or algorithm) examines every single variable that affects sales, such as pricing and traffic. The model is ready for a pilot and if the merchant is satisfied with the results, for continued use once the training is completed and the algorithm provides correct predictions that are later confirmed by real results.

Retailers frequently have incomplete, difficult-to-extract data or data that is ill-structured and in an improper format. We'll go through how machine learning deals with insufficient data in retail in the sections below.

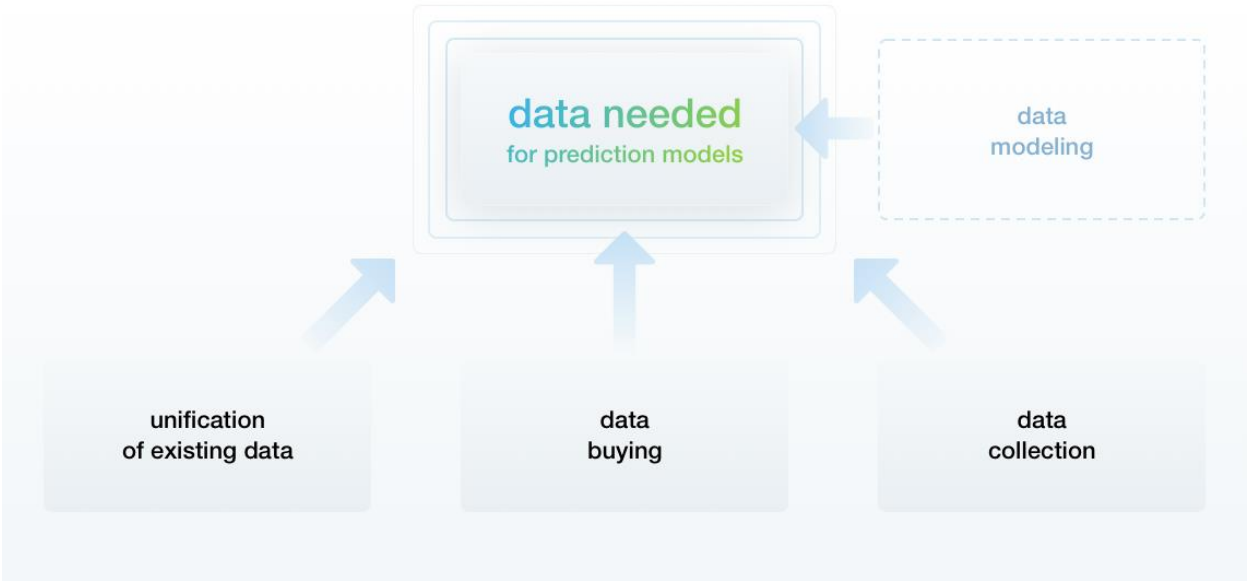


Retailers must combine all data into a single format. In addition, if a shop has previously acquired some data and then adds new data based on other criteria, such as competitive prices, the company must wait nearly a year to begin collecting new data.

Another option is to buy the missing information.




If there is no way to obtain the necessary data, the algorithms can use data modeling methods to simulate it



# 6 TENTATIVE CHAPTER PLAN FOR THE PROPOSED WORK

**CHAPTER 1: INTRODUCTION**

This chapter will cover the overview of the Retail Price Prediction Model.

**CHAPTER 2: LITERATURE REVIEW**

This chapter includes the literature available for the Retail Price Prediction Model. The findings of the

researchers will be highlighted which will become the basis of the current implementation.

**CHAPTER 2: BACKGROUND OF PROPOSED METHOD**

This chapter will provide an introduction to the concepts which are necessary to understand theproposed system.

**CHAPTER 4: METHODOLOGY**

This chapter will cover the technical details of the proposed approach.

**PUBLICATIONS (Optional)**

**REFERENCES**

# 7 REFERENCES

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[1] J. Bergstra, O. Breuleux, F. Bastien, P. Lamblin, R. Pascanu, G. Desjardins, J. Turian, D. Warde-Farley, and Y. Bengio. Theano: A cpu and gpu math compiler in python. In Proc. 9th Python in Science Conf, pages 1–7, 2010

[2] M. Y. Park and T. Hastie. L1-regularization path algorithm for generalized linear models. Journal of the Royal Statistical Society: Series B (Statistical Methodology), 69(4):659–677, 2007