# PRODUCT DEMAND PREDICTION WITH MACHINE LEARNING

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Abstract:

Predicting product demand is a critical task for businesses to optimize inventory management and meet customer needs efficiently. This paper explores the application of machine learning techniques in product demand prediction, emphasizing the use of historical sales data, market trends, and external factors. Various algorithms such as time series analysis, regression, and deep learning models are discussed, highlighting their strengths and limitations. Additionally, feature engineering and data preprocessing play a crucial role in improving prediction accuracy.

Case studies and real-world examples illustrate the practicality and benefits of implementing machine learning for product demand forecasting. The results demonstrate the potential for significant cost savings, increased customer satisfaction, and better decision-making through accurate demand predictions. Finally, the paper discusses future research directions and challenges in this domain, emphasizing the importance of continuous model refinement and adaptation to changing market dynamics

## INNOVATION:

Product demand prediction is a crucial task for businesses to ensure that they have enough inventory to meet customer demand. Machine learning has been used to predict product demand with great success. Aman Khar wal has written an article on product demand prediction with machine learning the article provides a step-by-step guide on how to predict product demand using Python. The author uses a case study of a product company that wants to offer discounts on its product during the upcoming holiday season. The company wants to find the price at which its product can be a better deal compared to its competitors .The author provides a data set of past changes in sales based on price changes and

trains a model that can predict the demand for the product in the market with different price segments. The article also provides Python code snippets for importing necessary libraries, loading the data set, analyzing the relationship between price and demand and training a machine learning model for predicting product demand.

In addition, there are other research papers that discuss how machine learning can be used for demand forecasting 2345. These papers provide insights into how machine learning can be used to forecast product demand more accurately and efficiently.

# PROGRAM:

```
# Import necessary libraries

import pandas as pd

import numpy as np

from sklearn.model_selection import train_test_split

from sklearn.linear_model import LinearRegression

from sklearn.metrics import mean_squared_error

import matplotlib.pyplot as plt

# Load a sample dataset (you should replace this with your dataset)

data = pd.DataFrame

({

'Feature1': [1, 2, 3, 4, 5],

'Feature2': [2, 3, 4, 5, 6],

'Feature3': [3, 4, 5, 6, 7],

'Demand': [10, 15, 20, 25, 30]

})

# Assuming you have features and target variable

X = data[['Feature1','Feature2','Feature3']]  # Features

y = data['Demand'] # Target variable

# Split the data into training and testing sets

X_train, X_test, y_train, y_test = train_test_split(X, y,test_size=0.2, random_state=42)

# Create a Linear Regression model
```

```
model = LinearRegression()
# Fit the model to the training data  model.fit(X_train, y_train)
# Make predictions on the test set
y_pred = model.predict(X_test)
# Calculate the Mean Squared Error to evaluate the model
mse = mean_squared_error(y_test, y_pred)
print(f"Mean Squared Error: {mse}")
# Visualize the predictions
plt.scatter(y_test, y_pred)
plt.xlabel("Actual Demand")
plt.ylabel("Predicted Demand")
plt.title("Demand Prediction")
plt.show()
```

output :

Product Demand Prediction Output

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