FEYNN LABS INTERNSHIP

PROJECT 3

AI-POWERED CUSTOMER SEGMENTATION MARKETING CAMPAIGNS FOR SMALL BUSINESSES

Submitted by,

Sawparnika.CH

ABSTRACT:
AI-powered customer segmentation has revolutionized marketing campaigns for small businesses by providing sophisticated tools to understand and target diverse customer groups effectively. Leveraging advanced machine learning algorithms, businesses can now analyze vast amounts of customer data to identify meaningful patterns and segment their customer base into distinct groups based on various factors such as demographics, behavior, preferences, and purchasing history. By employing AI-driven segmentation techniques, small businesses can personalize marketing campaigns to cater to the specific needs and interests of each customer segment, leading to improved engagement, higher conversion rates, and enhanced customer satisfaction. Additionally, AI-powered segmentation enables businesses to optimize resource allocation by directing marketing efforts towards the most profitable customer segments, thereby maximizing ROI and driving sustainable growth. Overall, AI-powered customer segmentation empowers small businesses to refine their marketing strategies, strengthen customer relationships, and stay competitive in today's dynamic marketplace.

Market/Customer/Business Need Assessment

- **Increasing Competition**:

The small scale industries face growing competition in the market. As the number of businesses in various sectors rises, there is a critical need for more effective marketing strategies to stand out and attract customers.

- **Limited Budgets:**

Small businesses often operate on constrained budgets. There is a pressing need to optimize marketing expenses by precisely identifying and targeting the most promising customer segments to ensure the best return on investment.

- **Data-Driven Decision Making**:

The modern business landscape demands data-driven decision-making processes. Small businesses need tools and methodologies to leverage the available data for strategic marketing decisions, and AI-based customer segmentation provides a solution.

- **Personalized Marketing:**

Consumers increasingly demand personalized experiences. Small businesses need the ability to tailor their marketing efforts to individual customer needs

and preferences, which can be efficiently achieved through AI-driven customer segmentation.

- **Limited Budgets:**

Small businesses often operate on constrained budgets. There is a pressing need to optimize marketing expenses by precisely identifying and targeting the most promising customer segments to ensure the best return on investment.

- **Data-Driven Decision Making**:

The modern business landscape demands data-driven decision-making processes. Small businesses need tools and methodologies to leverage the available data for strategic marketing decisions, and AI-based customer segmentation provides a solution.

- **Personalized Marketing:**

Consumers increasingly demand personalized experiences. Small businesses need the ability to tailor their marketing efforts to individual customer needs and preferences, which can be efficiently achieved through AI-driven customer segmentation.

- **Adaptability to Changing Markets:**

Small businesses operate in dynamic markets. They require solutions that can adapt to changing customer behaviours and market trends, ensuring that their marketing strategies remain relevant and effective over time.

- **Improved Marketing ROI:**

Small scale industries aim to maximize their return on marketing investment. The development and implementation of an AI-driven customer segmentation solution will contribute to improved targeting accuracy, resulting in enhanced marketing ROI.

- **Competitive Advantage:**

Gaining a competitive advantage is crucial for small businesses. A sophisticated customer segmentation strategy powered by AI can differentiate a business from its competitors by delivering more personalized and compelling marketing campaigns.

- **Efficiency in Marketing Operations:**

Small businesses are seeking ways to operate more efficiently. AI-based customer segmentation can streamline marketing operations by automating the process of identifying and targeting customer segments, reducing manual effort, and increasing overall efficiency.

- **Long-Term Customer Engagement:**

Building long-term relationships with customers is a key business objective. A targeted approach through AI-driven segmentation can contribute to increased customer satisfaction, loyalty, and sustained engagement over time.

- **Integration with Existing Systems:**

Seamless integration with existing marketing and CRM systems is essential for small businesses. The need for a solution that can work harmoniously with current infrastructure without disrupting operations is critical for the successful implementation of AI-driven customer segmentation.

By addressing these market, customer, and business needs, the proposed solution aims to provide small scale industries with a strategic advantage in their marketing efforts, helping them achieve sustainable growth and success in a competitive business environment.

PROJECT STATEMENT:

This project is focused on the customer dataset. The dataset provided comprises 24,000 data points, each representing a unique customer within a business context. It encompasses four distinct features essential for understanding customer behavior and engagement. Firstly, the "Customer ID" feature serves as a unique identifier for each customer, facilitating individual-level analysis and tracking across various business interactions. Secondly, "Products Purchased" denotes the number of products acquired by a customer within a given year, shedding light on their purchasing habits and consumption patterns. The "Complaints" feature quantifies the number of grievances raised by customers over the same period, offering insights into customer satisfaction and potential areas for improvement in products or services. Finally, "Money Spent" signifies the total expenditure made by customers within the business, serving as a crucial metric for evaluating customer lifetime value and revenue generation. Together, these features provide a comprehensive view of customer engagement, allowing businesses to tailor their strategies and enhance customer experiences effectively.

The primary objective is to amplify the efficiency of marketing strategies and boost sales through **customer segmentation** which in turn will facilitate the segmentation of customers into distinct groups using the **K-means clustering** algorithm. This segmentation will allow us to understand the distinct **customers** and preferences of different customer groups.

CODE IMPLEMENTATION

Importing the libraries:

```
import pandas as pd
import numpy as np
from sklearn.cluster import KMeans
import plotly.express as px
import plotly.graph_objects as go
import matplotlib.pyplot as plt
```

Importing the dataset:

```
customersdata = pd.read_csv("customers-data.csv")
```

Preliminary data analysis:

```
customersdata.head()
```

	customer_id	products_purchased	complains	money_spent
0	649	1	0.0	260.0
1	1902	1	0.0	79.2
2	2155	3	0.0	234.2
3	2375	1	0.0	89.0
4	2407	2	0.0	103.0

Defining k-means modelling:

```
# Define K-means model
kmeans_model = KMeans(init='k-means++',  max_iter=400, random_state=42)
```

Training the model:

```
# Train the model
kmeans_model.fit(customersdata[['products_purchased','complains',
'money_spent']])
```

Finding the optimal number of clusters

Finding the optimal number of clusters is one of the key tasks when implementing a k-means clustering algorithm. It's worth noting that a k-means clustering model might converge for any value of K, but at the same time, not all values of K will produce the best model.

For some datasets, data visualization can help understand the optimal number of clusters, but this doesn't apply to all datasets. We have a few methods, such as the elbow method, gap statistic method, and average silhouette method, to assess the optimal number of clusters for a given dataset. We are going to use elbow method.

For implementing the elbow method, the below function named "try_different_clusters" is created first. It takes two values as input:

- K (number of clusters)
- data (input data).

```
Create the K means model for different values of K
def try_different_clusters(K, data):

    cluster_values = list(range(1, K+1))
    inertias=[]

    for c in cluster_values:
        model = KMeans(n_clusters = c,init='k-
means++',max_iter=400,random_state=42)
        model.fit(data)
        inertias.append(model.inertia_)

    return inertias
```

The method try_different_clusters is called using the below code, where we pass the values of K from 1 to 12 and calculate the inertia for each value of k.

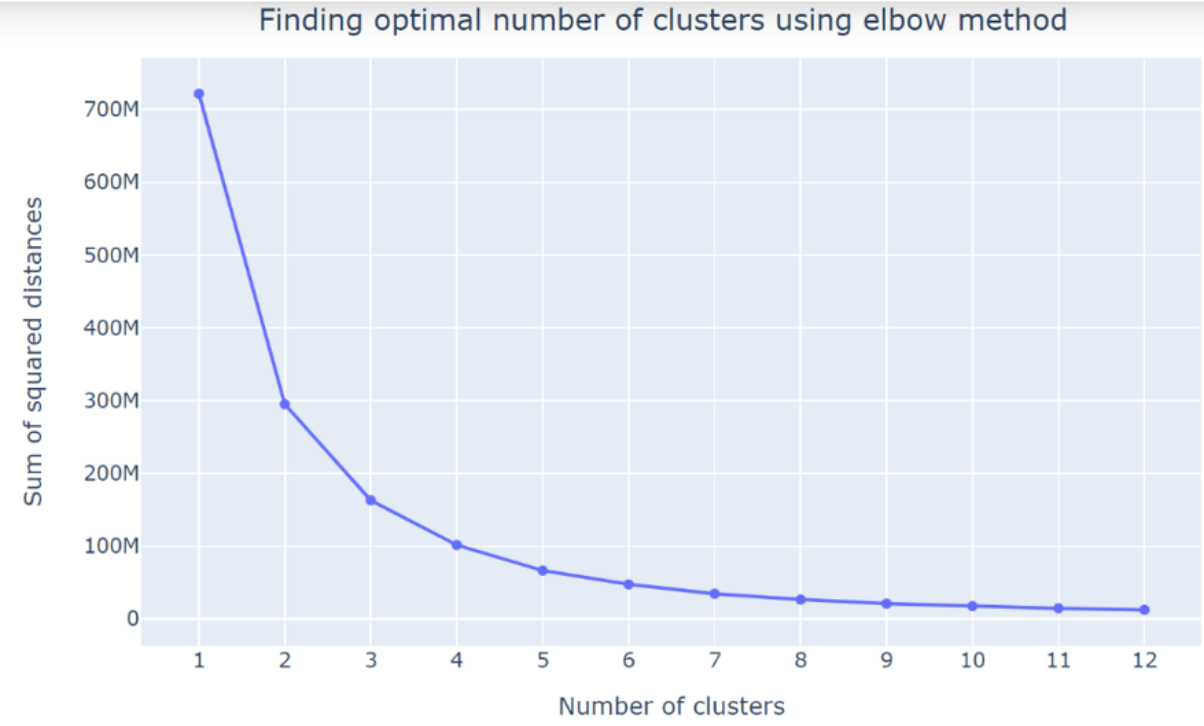
```
# Find output for k values between 1 to 12
outputs = try_different_clusters(12,
customersdata[['products_purchased','complains','money_spent']])
distances = pd.DataFrame({"clusters": list(range(1, 13)),"sum of squared
distances": outputs})
```

Using the below code, we plot the value of K (on the x-axis) against corresponding values of inertia on the Y-axis.

```
# Finding optimal number of clusters k
figure = go.Figure()
figure.add_trace(go.Scatter(x=distances["clusters"], y=distances["sum of
squared distances"]))

figure.update_layout(xaxis = dict(tick0 = 1,dtick = 1,tickmode = 'linear'),
                     xaxis_title="Number of clusters",
                     yaxis_title="Sum of squared distances",
                     title_text="Finding optimal number of clusters using
elbow method")
figure.show()
```

Elbow plot:



Optimal value of K=5. As discussed before, we need to train the k-means clustering model again with the optimal number of clusters found. We're using the fit predict method to train the model.

```
# Re-Train K means model with k=5
kmeans_model_new = KMeans(n_clusters = 5,init='k-
means++',max_iter=400,random_state=42)

kmeans_model_new.fit_predict(customersdata[['products_purchased','complains
','money_spent']])
```

Visualization

In this section, we'll be implementing some code using plotly express. This way we'll visualize the clusters in three dimensions, formed by our k-means algorithm. Plotly express is a library based on plotly that works on several types of datasets and generates highly-styled plots.

First, let's add a new column named 'clusters' to the existing customer data dataset. This column will be able to tell which customer belongs to what cluster.

```
# Create data arrays
cluster_centers = kmeans_model_new.cluster_centers_
data = np.expm1(cluster_centers)
points = np.append(data, cluster_centers, axis=1)
points
```

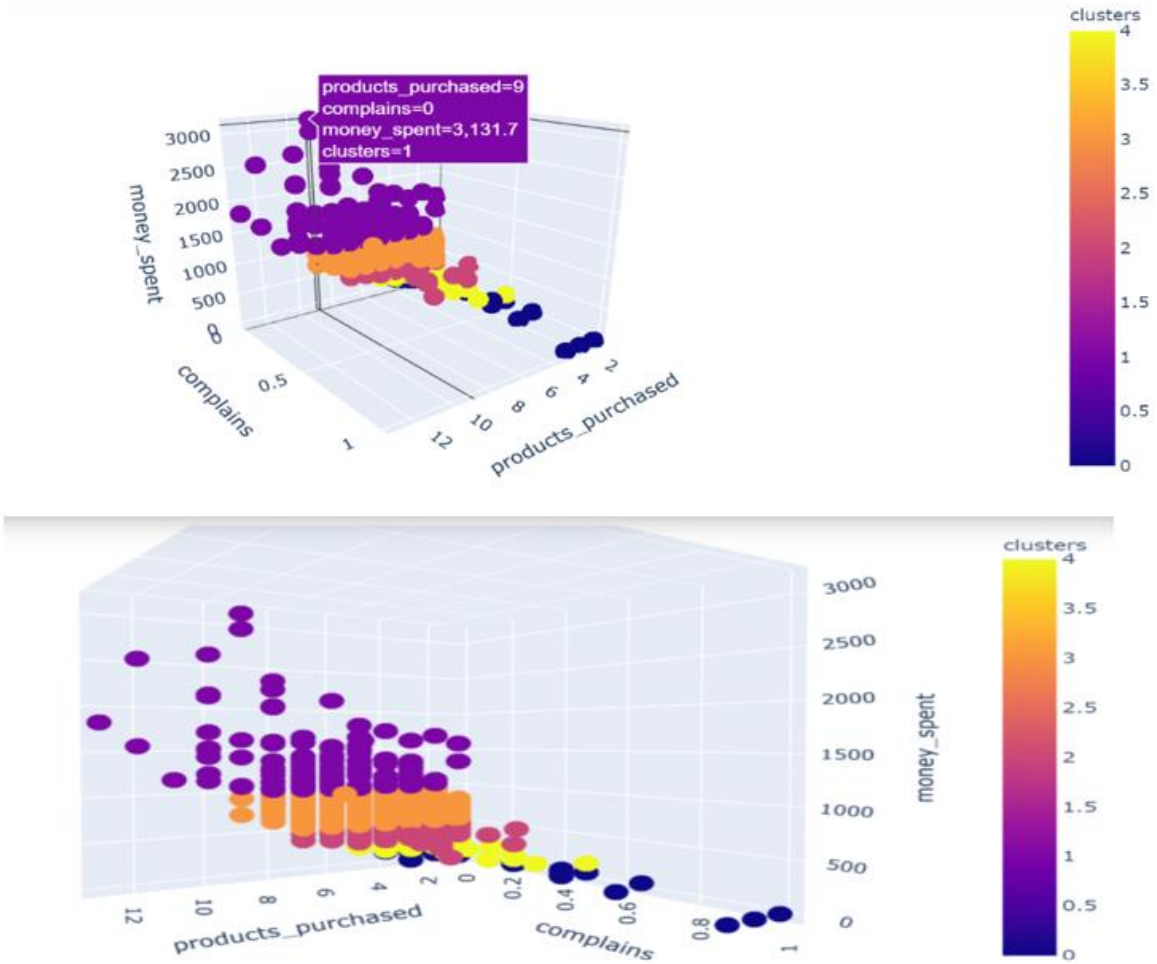
```
# Add "clusters" to customers data
points = np.append(points, [[0], [1], [2], [3], [4]], axis=1)
customersdata["clusters"] = kmeans_model_new.labels_
```

After adding the new column, named clusters, the customer data dataset will look as below.

```
customersdata.head()
```

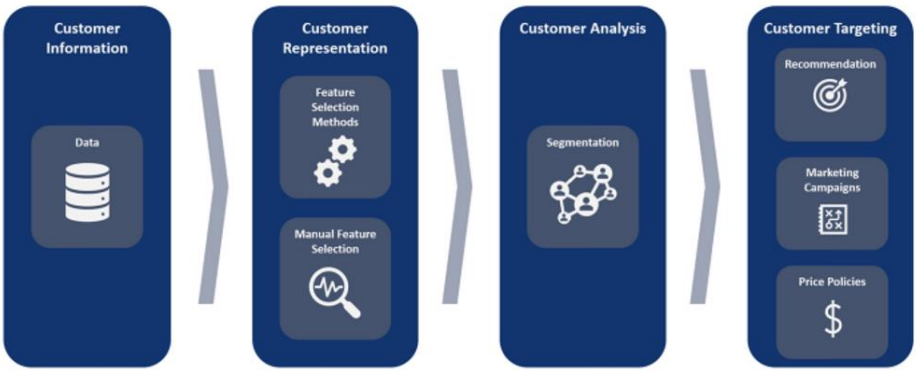
	customer_id	products_purchased	complains	money_spent	clusters
0	649	1	0.0	260.0	4
1	1902	1	0.0	79.2	0
2	2155	3	0.0	234.2	4
3	2375	1	0.0	89.0	0
4	2407	2	0.0	103.0	0

```
# visualize clusters
figure = px.scatter_3d(customersdata,
                       color='clusters',
                       x="products_purchased",
                       y="complains",
                       z="money_spent",
                       category_orders = {"clusters": ["0", "1", "2", "3",
"4"]}
                       )
figure.update_layout()
figure.show()
```



Visualization of clusters of data points is very important. Various edges of the graph provide a quick view of the complex input data set.

Final product prototype:



Financial equation:

To develop a financial equation for the AI-powered customer segmentation marketing campaign for small businesses, we can consider several factors:

a. **Revenue Generation**: Determining the potential revenue that can be generated from the marketing campaign. This can include the expected increase in sales, customer acquisition, and retention rates as a result of targeted marketing efforts.

b. **Cost of Implementation**: Calculating the costs associated with implementing the AI-driven customer segmentation solution. This may include expenses related to software development, data collection, analysis, and integration with existing systems.

c. **Marketing Budget Allocation**: Estimating the portion of the marketing budget allocated to the AI-powered segmentation campaign. This should be based on the expected return on investment (ROI) and the overall marketing objectives of the business.

d. **Customer Lifetime Value** (CLV): Considering the CLV of customers acquired through the segmentation campaign. This involves calculating the total revenue generated from a customer over their entire relationship with the business, taking into account factors such as purchase frequency, average transaction value, and customer retention rate.

e. **ROI Calculation**: Evaluating the ROI of the marketing campaign by comparing the total revenue generated to the total costs incurred. This can help determine the effectiveness and profitability of the segmentation strategy.

f. **Monetization Strategy**: Implementing a monetization strategy based on the insights gained from customer segmentation. This could involve offering personalized products or services, upselling and cross-selling opportunities, or subscription-based models tailored to different customer segments.

By incorporating these factors into a financial equation, businesses can assess the potential impact and profitability of implementing an AI-powered customer segmentation marketing campaign. This equation should provide a comprehensive overview of the costs, revenues, and ROI associated with the campaign, enabling informed decision-making and strategic planning.

Here are some sample equations that can be used in the financial modeling of the AI-powered customer segmentation marketing campaign for small businesses.

Here are some sample equations that can be used in the financial modeling of the AI-powered customer segmentation marketing campaign for small businesses:

1. **Total Revenue (TR):**

$$TR = \text{Number of Customers} \times \text{Average Purchase Value}$$

2. **Total Costs (TC):**

$$TC = \text{Implementation Costs} + \text{Marketing Budget}$$

3. **Return on Investment (ROI**):

$$ROI = \left(\frac{TR - TC}{TC}\right) \times 100\%$$

4**. Customer Acquisition Cost (CAC):**

$$CAC = \frac{\text{Marketing Budget}}{\text{Number of New Customers Acquired}}$$

5. **Customer Lifetime Value** (CLV):

$$CLV = \text{Average Revenue per Customer} \times \text{Average Customer Lifespan}$$

6. **Net Present Value (NPV):**

$$NPV = \sum \left(\frac{R_t}{(1+r)^t} \right) - TC$$

where R_t is the revenue in year t, r is the discount rate and t is the time period

7. **Break-Even Point (BEP):**

$$BEP = \frac{TC}{TR} \times 100\%$$

8. **Profit Margin**:

$$\text{Profit Margin} = \left(\frac{TR - TC}{TR} \right) \times 100\%$$

9**. Average Revenue per Customer:**

$$\text{Average Revenue per Customer} = \frac{TR}{\text{Number of Customers}}$$

10**.Marketing Return on Investment (MROI):**

$$MROI = \left(\frac{TR - \text{Marketing Costs}}{\text{Marketing Costs}} \right) \times 100\%$$

These equations provide a framework for evaluating the financial performance and effectiveness of the AI-powered customer segmentation marketing

campaign. Businesses can customize these equations based on their specific objectives, metrics, and financial data to gain insights into the ROI and profitability of their marketing efforts.

CONCLUSION:

In conclusion, the AI-powered customer segmentation marketing campaign for small businesses represents a pivotal shift in the way companies engage with their customers. By leveraging advanced data analytics and machine learning algorithms, businesses can now tailor their marketing strategies with unprecedented precision, turning clicks into meaningful connections. This project underscores the importance of personalized marketing in today's competitive landscape and highlights the transformative potential of AI in driving customer engagement and business growth. As small businesses embrace this innovative approach, they can expect to not only enhance customer satisfaction and loyalty but also achieve sustainable success in an ever-evolving market environment. Embracing the power of AI-driven segmentation is not merely a strategic choice; it's a commitment to staying ahead of the curve and delivering unparalleled value to customers in the digital age.

External Search – Links – Resources

https://www.analyticsvidhya.com/blog/2021/07/understanding-k-means-clustering-using-customer-segmentation/https://www.sciencedirect.com/science/article/abs/pii/S1568494621008462

https://link.springer.com/article/10.1007/s10257-023-00640-