Sales Dynamics Insights

Motivation

The “Sales Dynamics Insights” project looks forward a practical need to understand the relationship between sales reps and product types. The findings aim to optimize sales strategies, contribute to informed decision making, potential investments and evaluate performances for the company.

Data Collection and Processing

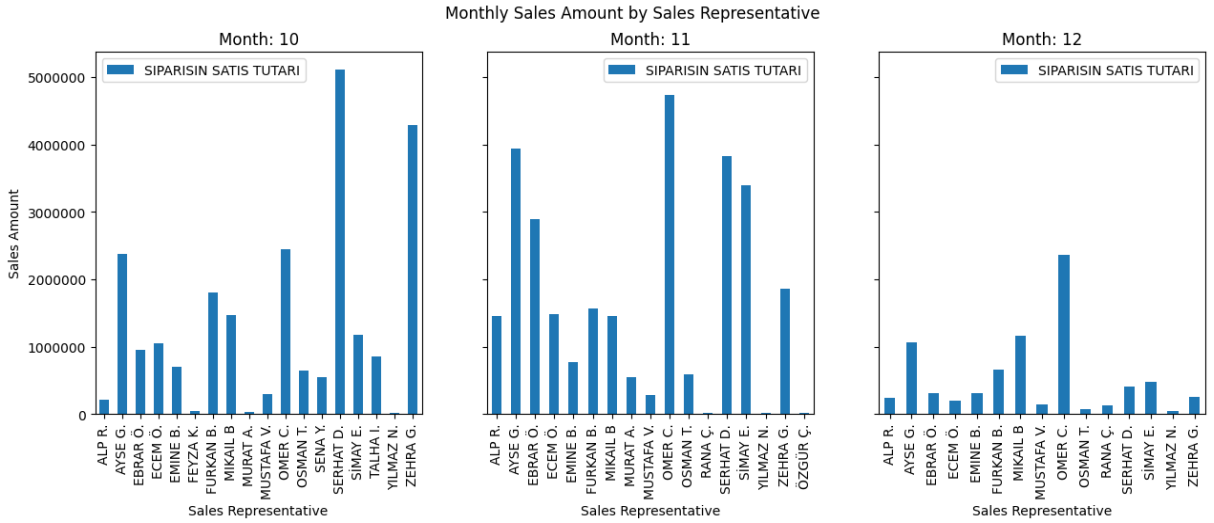
Real operational data was collected by extracting details from proforma bills, enabling a focused analysis on raw material costs and procedural intricacies. (**I changed the data by hiding the surnames of the sales representatives and giving the ID numbers to the customers, as required by "KVKK".)**

First few rows of the DataFrame:

	MUSTERI TEMSILCISI	SIPARISIN ID	TEKLIF TARIHI	TESLIM TARIHI	SIPARISIN URUN ICERIGI	SIPARISIN SATIS TUTARI	ISKONTO ORANI	ISKONTOLU SATIS TUTARI	SIPARISIN BAKILAN MALIYETI	MALIYET CARPANI
0	EBRAR Ö.	1	2023-11-30	2023-12-14	AHŞAP RAFI	49749.00	0.06	46666.55	18666.62	2.50
1	AYSE G.	2	2023-11-20	2023-12-15	MARKET RAFI	39554.00	0.00	39554.00	13790.83	2.87
2	MUSTAFA V.	3	2023-12-01	2023-12-01	AKSESUAR	1300.00	0.04	1250.00	566.50	2.21
3	MUSTAFA V.	4	2023-12-01	2023-12-01	AKSESUAR	2430.00	0.00	2430.00	829.80	2.93
4	AYSE G.	5	2023-11-30	2023-12-01	HAFİF DEPO RAFI	47090.00	0.03	45677.30	17450.21	2.62
5	FURKAN B.	6	2023-11-30	2024-01-14	HAFİF DEPO RAFI	90042.41	0.00	90042.41	39961.24	2.25
6	FURKAN B.	7	2023-11-29	2023-01-13	HAFİF DEPO RAFI	155367.45	0.00	155367.45	66876.23	2.32
7	MIKAIL B	8	2023-12-01	NaT	AKSESUAR	450.00	0.00	450.00	87.60	5.14

Key Analyses

1. **Histogram Plot of Monthly Sales by Sales Representatives**
    - A visual representation of monthly sales distribution.
    - Checking if there is a significant difference between sales representatives visually (to be further tested with hypothesis tests).



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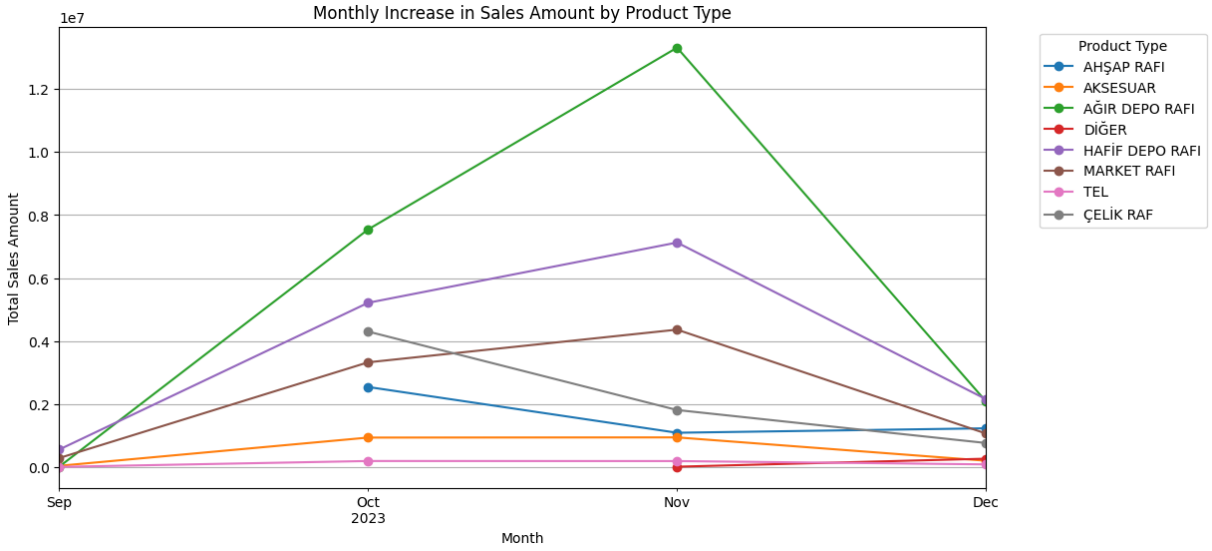
2. **Line Plot of Monthly Sales versus Total Sales Amount of Product Types**

- Exploring the relationship between monthly sales and the total sales amount of product types.
- Checking if there is a significant difference between product types (to be further tested with hypothesis tests).



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3. **Hypothesis Test for Sales Amount Difference Among Product Types**

- Testing for significant differences in sales amounts among different product types.
- Ho: There is "no" significant difference in sales amounts among different product types.
- Ha: There is a significant difference in sales amounts among different product types.

```
from scipy.stats import f_oneway

# Perform ANOVA for different product types
product_types = df['SIPARISIN URUN ICERIGI'].unique()

# Create separate groups for each product type
groups = [df[df['SIPARISIN URUN ICERIGI'] == product]['SIPARISIN SATIS TUTARI'] for product in product_types]

# Perform the ANOVA
f_stat, p_value = f_oneway(*groups)

# Check the p-value
if p_value < 0.05:
    print("Reject the null hypothesis: There is a significant difference in sales amounts among different product types.")
else:
    print("Fail to reject the null hypothesis: There is no significant difference in sales amounts among different product types.")

```

```
Reject the null hypothesis: There is a significant difference in sales amounts among different product types.
```

- Therefore, if there is a difference, we should identify what differs.

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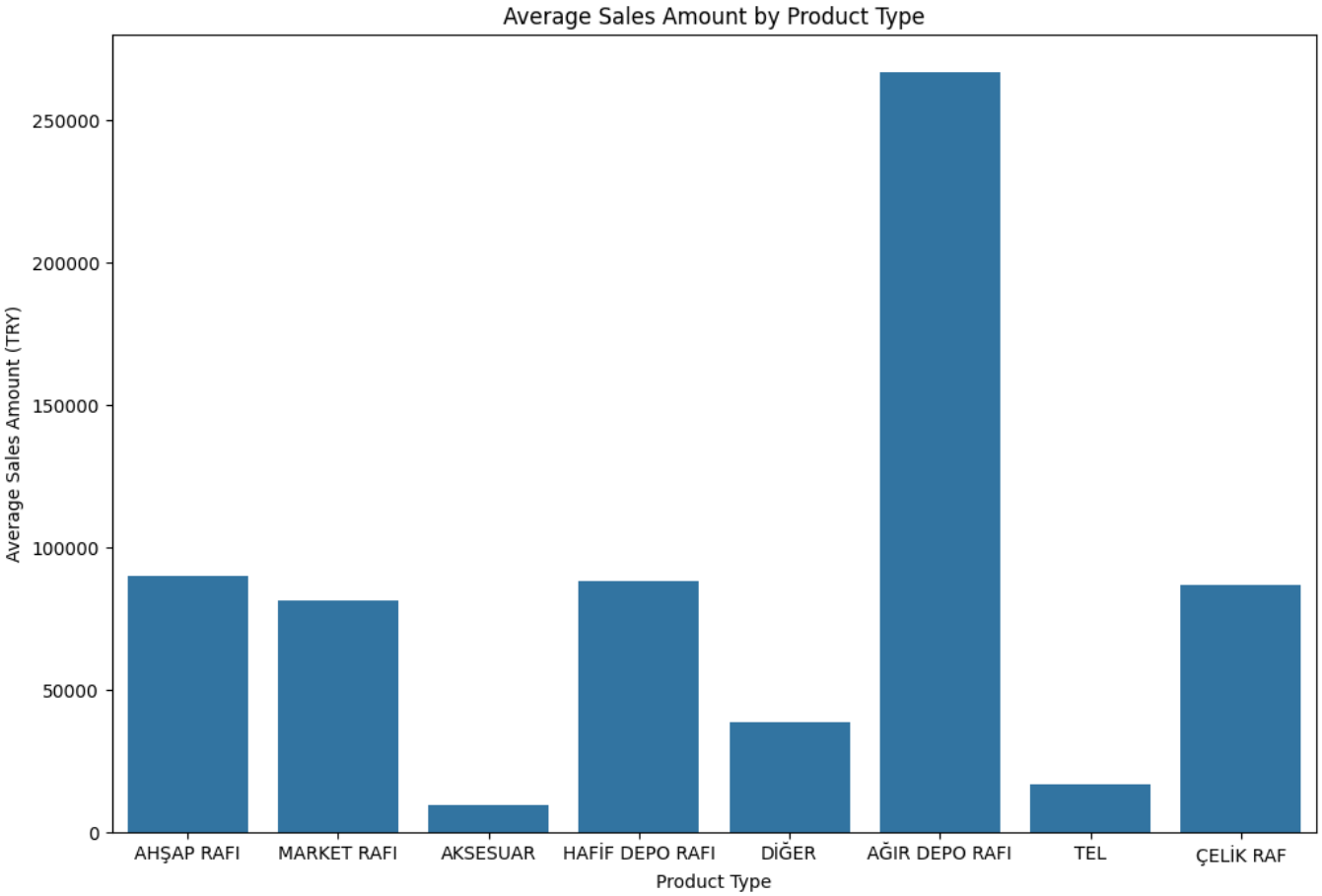
4. **Actual Months Total Sales versus Product Type**

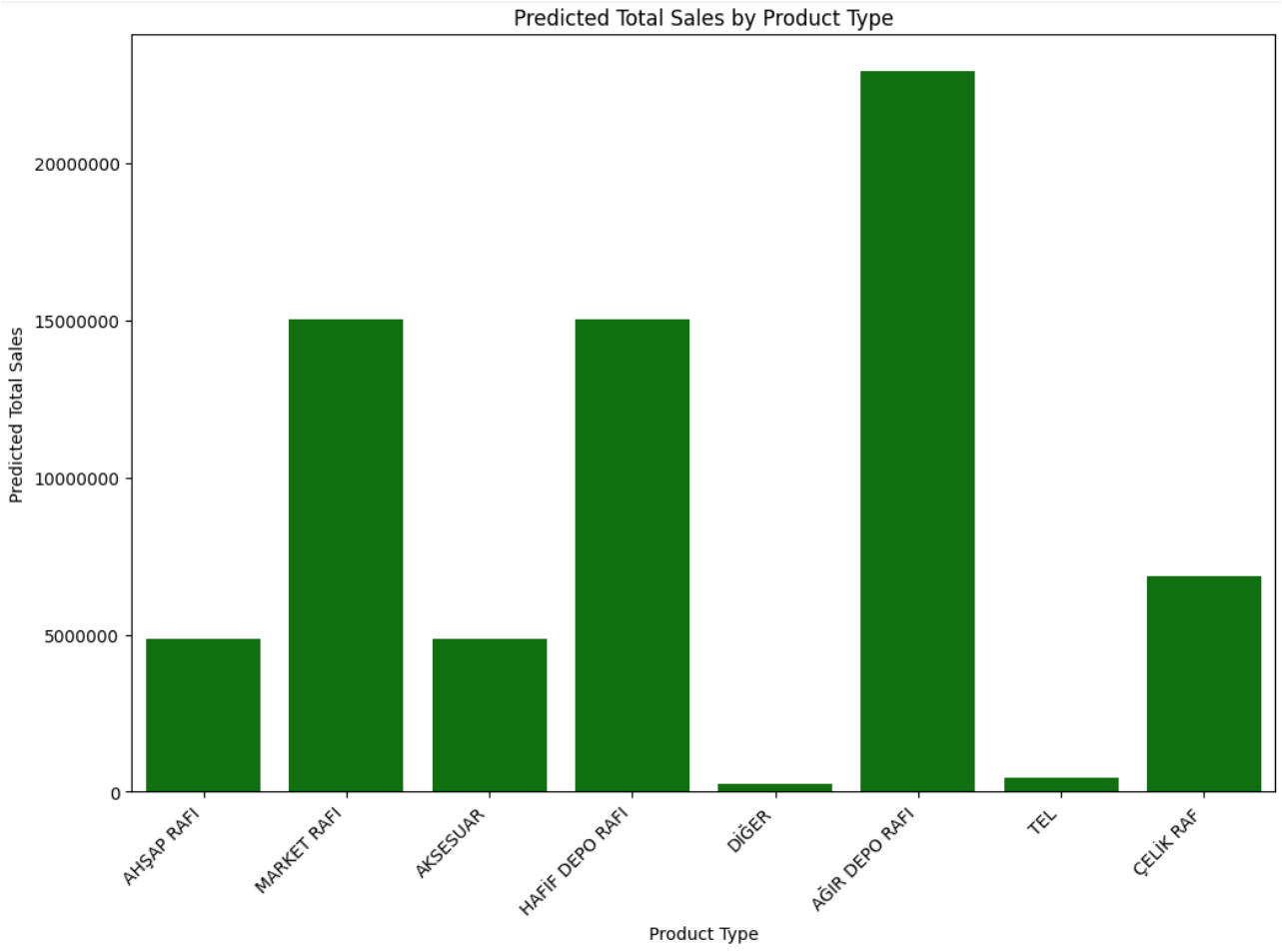
   - Examining the total sales of product types to identify key contributors to check visual plot.
   - Checking the actual total sales of product types to understand the differences.



   - It's clear that "Ağır Depo Rafı" plays a vital role in sales. To improve overall sales, let's concentrate more on promoting and selling this particular product.

5. **Train Model for Next Month Expected Sales by Product Type**

   - Building a model to predict next month's sales, focusing on the dominant product type.
   - Check next month because if we are going to focus on "Ağır Depo Rafı" type product, we need to make more predictions and keep stock. Therefore, I train a model that estimates the next month sales by the product type.



   - Clearly, "Ağır Depo Rafı" is the best seller, and the company is putting more focus and investment into it.

6. **Hypothesis Test for Sales Amount Difference Among Sales Representatives**

    - Testing for significant differences in sales amounts among different sales representatives.
    - Ho: There is a significant difference in sales amounts among different customer representatives.
    - Ha: There is no significant difference in sales amounts among different customer representatives.

```python
from scipy.stats import f_oneway

# Perform ANOVA for different customer representatives
customer_representatives = df['MUSTERI TEMSILCISI'].unique()

# Create separate groups for each customer representative
groups = [df[df['MUSTERI TEMSILCISI'] == rep]['SIPARISIN SATIS TUTARI'] for rep in customer_representatives]

# Perform the ANOVA
f_stat, p_value = f_oneway(*groups)

# Check the p-value
if p_value < 0.05:
    print("Reject the null hypothesis: There is a significant difference in sales amounts among different customer representatives.")
else:
    print("Fail to reject the null hypothesis: There is no significant difference in sales amounts among different customer representatives.")

```

    - Therefore, if there is a difference, we should identify who differs.

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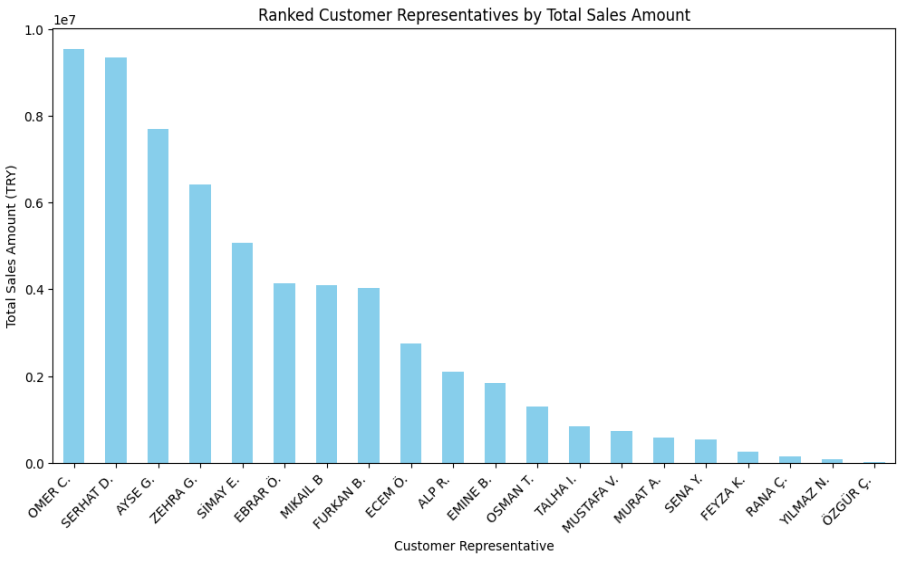
7. **Total Sales Amount versus Sales Representatives**

    - Ranking sales representatives based on their total sales amount.
    - checking for the who is the best seller. By ordering their total amount of sales

Ranked Customer Representatives by Total Sales Amount:
MUSTERI TEMSILCISI:

1. OMER C. 9543290.10
2. SERHAT D. 9347787.50
3. AYSE G. 7696035.70
4. ZEHRA G. 6408321.37
5. SİMAY E. 5062720.98
6. EBRAR Ö. 4151230.57
7. MIKAIL B 4087774.65
8. FURKAN B. 4031361.71
9. ECEM Ö. 2758369.78
10. ALP R. 2098105.63
11. EMINE B. 1848883.49
12. OSMAN T. 1304874.61
13. TALHA I. 848983.93
14. MUSTAFA V. 735530.32
15. MURAT A. 579537.20
16. SENA Y. 550382.00
17. FEYZA K. 267820.02
18. RANA Ç. 151474.00
19. YILMAZ N. 75265.76
20. ÖZGÜR Ç. 11810.00



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8. **Hypothesis Test for Profit Margin Difference Among Sales Representatives**

   - Testing for significant differences in profit margins among sales representatives.
   - Notes: (Ömer Ç., Serhat D. and Ayşe G. is dominating the total sales but we should check that is the sales representative is sold the items in good profit or just give it to for the cost of the material itself?)

     Because whoever has the most sales does not mean he/she is the best seller. So ı am checking for the is there a relationship between sales representative between profit margin.

```python
import pandas as pd
from scipy.stats import f_oneway

# Assuming 'df' is your DataFrame
# Extract relevant columns: 'MUSTERI TEMSILCISI' and 'ISKONTOLU SATIS TUTARI'
sales_representatives = df['MUSTERI TEMSILCISI'].unique()

# Calculate average profit margin for each sales representative
avg_profit_margin = df.groupby('MUSTERI TEMSILCISI')['ISKONTOLU SATIS TUTARI'].mean()


# Perform ANOVA to test for significant differences
f_stat, p_value = f_oneway(*[df[df['MUSTERI TEMSILCISI'] == rep]['ISKONTOLU SATIS TUTARI'] for rep in sales_representatives])

# Check the p-value
if p_value < 0.05:
    print("Reject the null hypothesis: There is a significant difference in profit margins among sales representatives.")
else:
    print("Fail to reject the null hypothesis: There is no significant difference in profit margins among sales representatives.")

```

   - The null hypothesis: There is a significant difference in profit margins among sales representatives.
   - Yes, there is profit margin difference

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9. **Sales Representatives Ranked by Average Profit Margin**

   - Ranking sales representatives based on their average profit margin.

Sales Representatives Ranked by Average Profit Margin:
SERHAT D. 17.52
SENA Y. 16.04
TALHA I. 11.82
SİMAY E. 10.44
RANA Ç. 8.98
ECEM Ö. 7.70
ZEHRA G. 7.37
MIKAIL B 6.82
EMINE B. 6.23
EBRAR Ö. 5.95
AYSE G. 5.89
ALP R. 5.07
ÖZGÜR Ç. 4.74
OSMAN T. 3.91
MURAT A. 3.09
YILMAZ N. 2.16
OMER C. 1.23
MUSTAFA V. 0.77
FURKAN B. 0.00
FEYZA K. 0.00

so, when we checked the top 3 Ömer Ç., Serhat D., and Ayşe G. the best seller is (1) Serhat D. (2) Ayşe G. (3) Ömer Ç. therefore, the company make sure that Ömer Ç. that increases the profit margin because he has the most sales amount.

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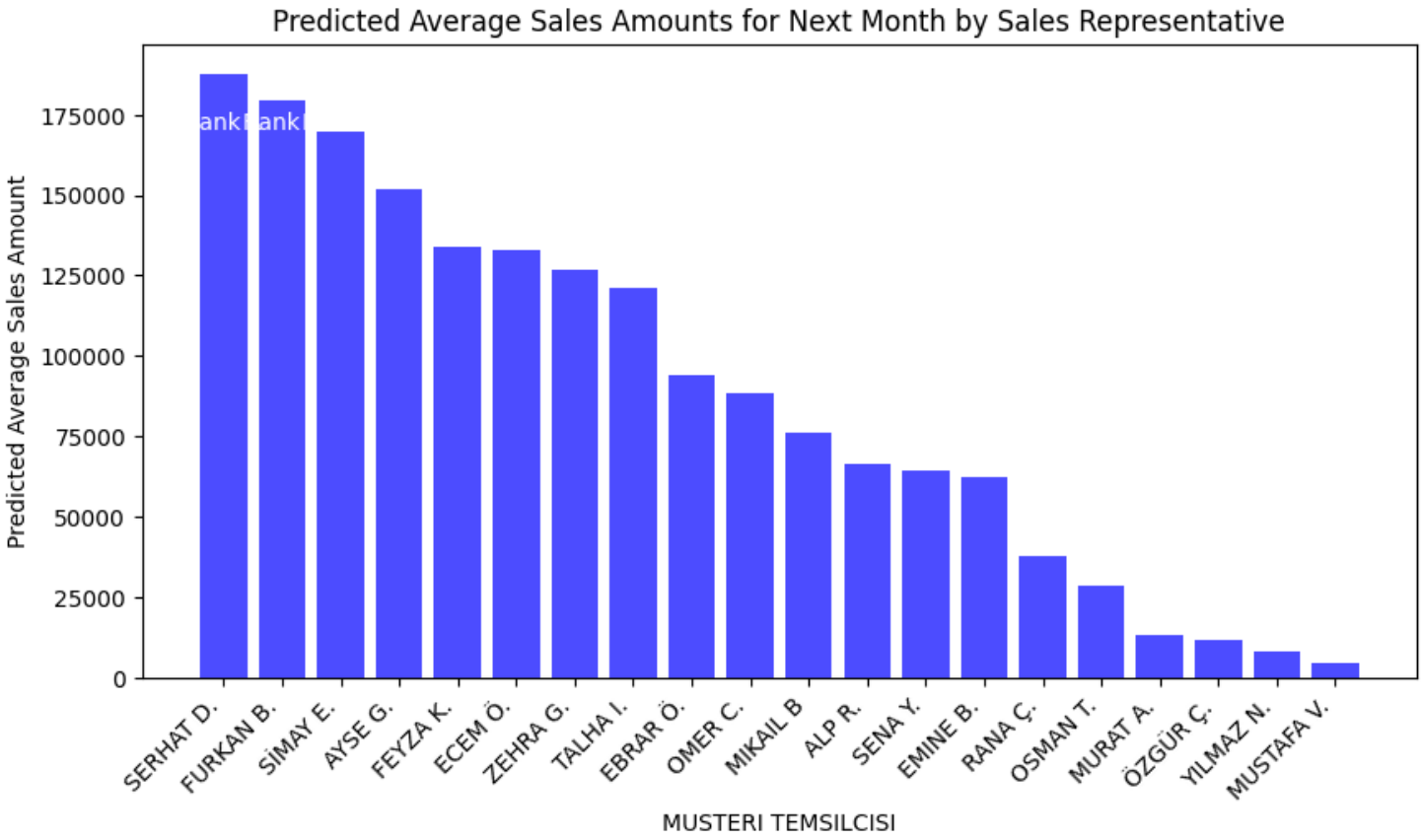
10. **Train Model for Next Month Best Sales Representative**

- Building a model to predict the next month's best-performing sales representative.
- We check because if we are going to focus on "Serhat D.", we need to make more predictions to he/she will continuous the same performance. Therefore, I train a model that estimates the next month sales by the sales representative.



- As we can see that Serhat D. is the best seller and the who has best profit margin. The human resource should think that salary increase end of the month if Serhat D. still performs well.
- Moreover, by motivating Furkan B. and Simay E. to focus on the high-profit product "Ağır Depo Rafı," the company can boost its overall profit margin.

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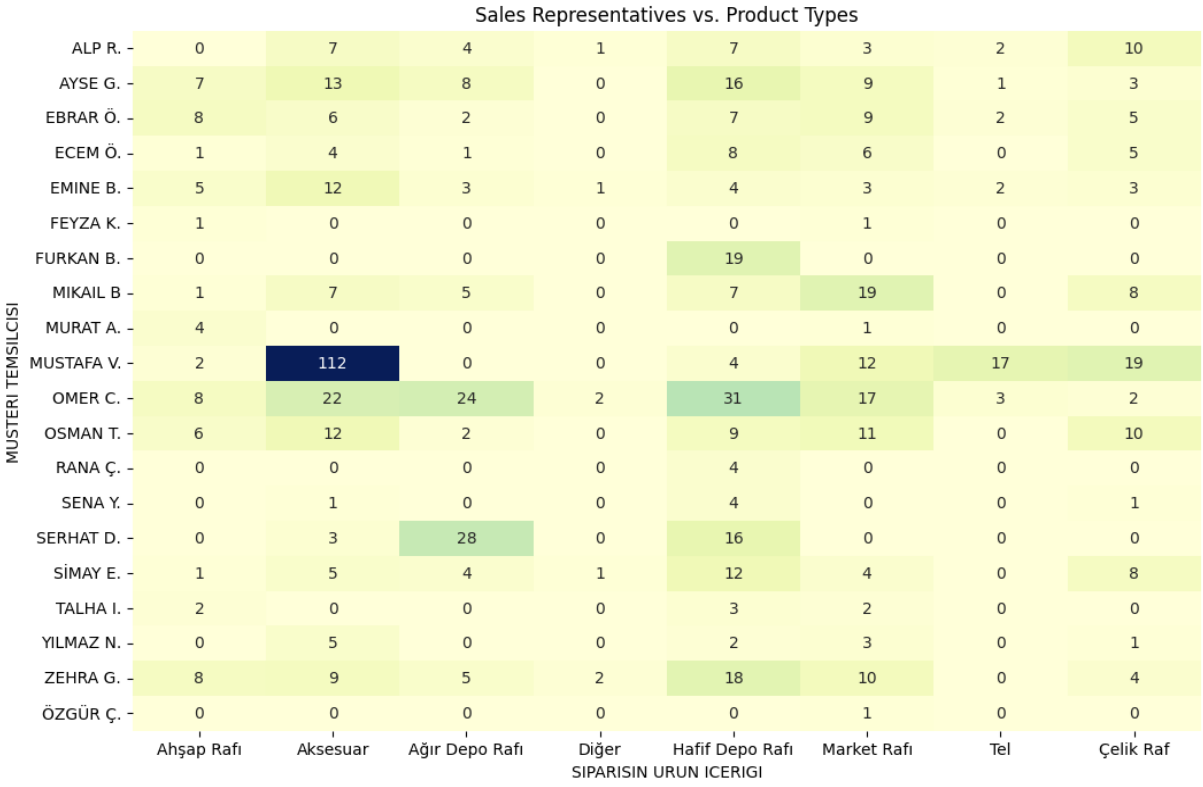
11. **Check Relationship Between Sales Representative and Product Types**

- Testing for a significant relationship between sales representatives and product types.
- We checked to hypothesis upon sales representative and product types over total amount of sales so I will check is there a relationship between them.
- Ho: There is "no" significant relationship between Sales Representatives and Product Types.
- Ha: There is a significant relationship between Sales Representatives and Product Types.

```python
import pandas as pd
from scipy.stats import chi2_contingency

# Assuming you have a DataFrame 'df' with relevant columns
# Replace these column names with the actual column names in your DataFrame
sales_rep_column = 'MUSTERI TEMSILCISI'
product_type_column = 'SIPARISIN URUN ICERIGI'

# Create a contingency table
contingency_table = pd.crosstab(df[sales_rep_column], df[product_type_column])

# Perform the chi-squared test
chi2, p, _, _ = chi2_contingency(contingency_table)

# Check the p-value
if p < 0.05:
    print("Reject the null hypothesis: There is a significant relationship between Sales Representatives and Product Types.")
else:
    print("Fail to reject the null hypothesis: There is no significant relationship between Sales Representatives and Product Types.")

```

- Reject the null hypothesis: There is a significant relationship between Sales Representatives and Product Types.
- Yes, there is relationship
- We can check with a heatmap which representative is selling which type of product mostly.



Conclusion

As we can see that the frequency is much higher in the “Aksesuar” but we find that the profit margin is higher in the “Ağır Depo Rafı” therefore we should direct the “Ağır Depo Rafı” sales to representatives.

also, the company should focus mostly "Ağır Depo" side investments, machinery, adverts and new sales representative educations.

The project concludes with actionable recommendations, emphasizing the focus on "Ağır Depo Rafı" product sales, potential investments, and strategic considerations for the best performing sales representative.

The picture of “Ağır Depo Rafı”
