Rakamin Academy X KALBE Nutritionals

Final Task

Data Science Project-Based Virtual Internship: Rakamin Academy x Kalbe Nutritionals

Presented by
Biyan Bahtiar Ramadhan

Hi!
I’m Biyan

About Me

As a Certified Data Scientist and Analyst, I have expertise in crafting dashboards using Tableau, Power BI, and Looker Studio as well as analysis from exploratory to statistics and machine learning. With experience in multiple industry including healthcare, handling big data and my skills in using Python, SQL and Excel, I will always look for a way to obtain insights for you, either solo or in team.

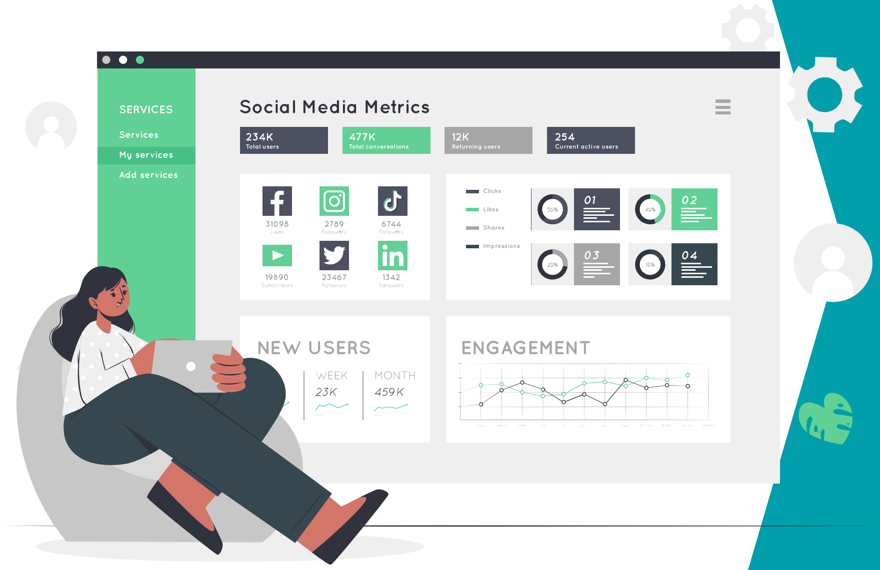
Rakamin Academy

Data Analyst Associate

• Provide analysis on stealth B2B SaaS company specializing in Human Resource Management System (HRIS).
• Created analytical dashboard that monitors funnel conversion rate and leads customer generations.
• Created leads segmentation to help company customize different marketing/sales strategy and performed impact analysis.
• Analyzed funnel conversion rate and gave recommendation and impact analysis to optimize conversion rate based on customer survey results and leads characteristics.

General Practitioner

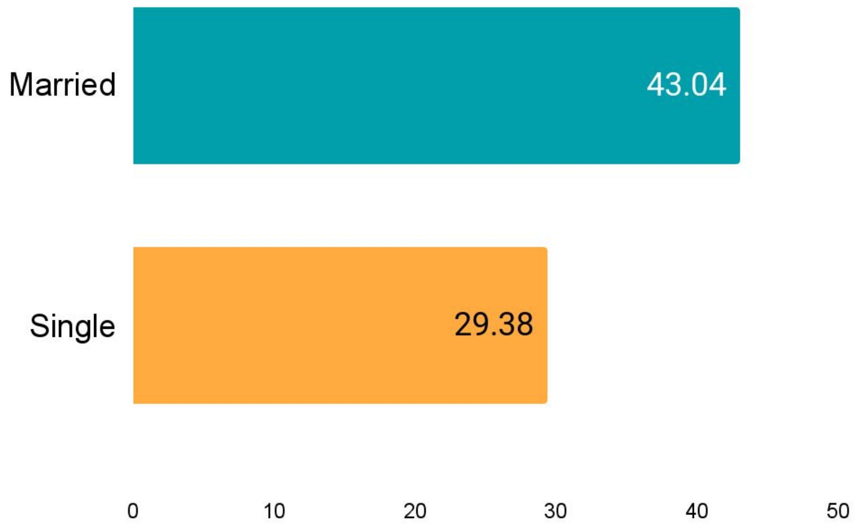
• Performed thalassemia screening on over 1000 of patients yearly and make report for patients and physician.
• Input and maintained thalassemia screening database which contains more than 5000 record.
• Perform genetic counseling for patients with thalassemia and other rare disease such as Duchenne Muscular Distrophy (DMD), Disorder of Sex Development (DSD) and more.
• Did laboratory work in relation with thalassemia screening and prepared patient samples before sending to other laboratory.



1

EDA using SQL

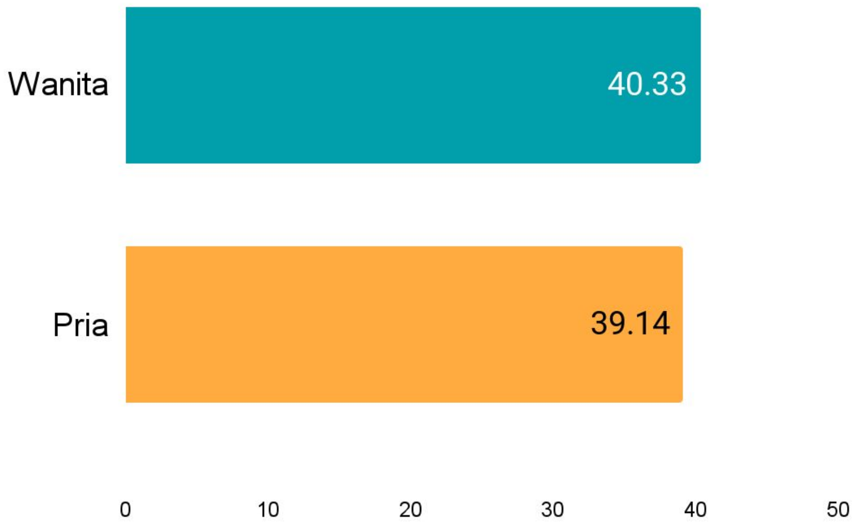
The Average Age Based on Marital Status




```sql
select
        "Marital Status" as marital_status
        , ROUND(AVG(age),2) as average_age
from public.customer
where "Marital Status" in ('Married', 'Single')
group by 1;
```

```
marital_status|average_age|
--------------+-----------+
Married       |      43.04|
Single        |      29.38|
```

The Average Age Based on Gender




```sql
SELECT
        case
                when gender = 0 then 'Wanita'
                else 'Pria'
        end as gender
        , ROUND(AVG(age),2) as average_age
FROM public.customer
group by 1;
```

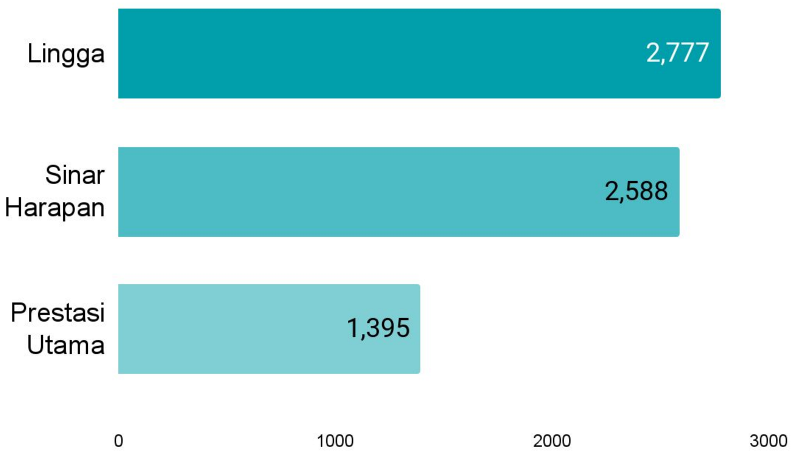
```
gender|average_age|
------+-----------+
Wanita|      40.33|
Pria  |      39.14|
```

Store Name with The Most Quantity

```
store_name|total_quantity|
----------+--------------+
Lingga    |          2777|
```

```sql
with table_1 as(
	select
		s.storename as store_name
		, sum(t.qty) as total_quantity
		, rank() over(order by sum(t.qty) desc) as "rank"
	from store s
	inner join "transaction" t
		on s.storeid = t.storeid
	group by 1
)
select
	store_name
	, total_quantity
from table_1
where "rank" = 1;
```

Top 3 Store Name with The Most Quantity



store_name	total_quantity
Lingga	2777
Sinar Harapan	2588
Prestasi Utama	1395

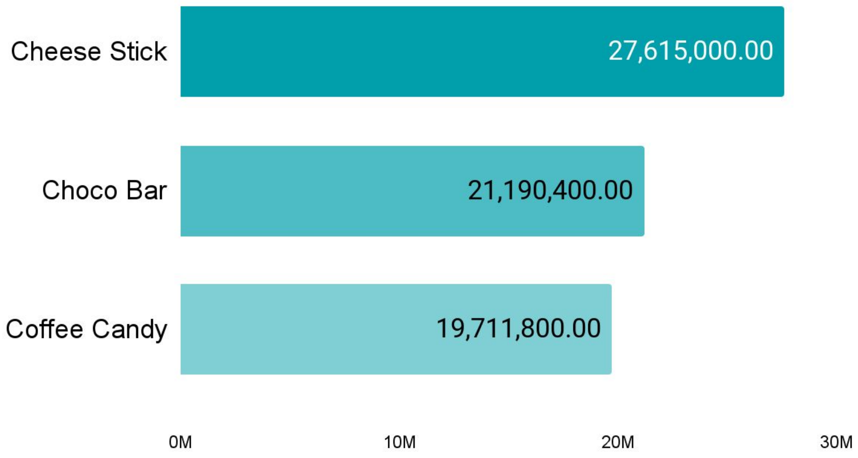
```
with table_1 as(
	select
		s.storename as store_name
		, sum(t.qty) as total_quantity
		, rank() over(order by sum(t.qty) desc) as
"rank"
	from store s
	inner join "transaction" t
		on s.storeid = t.storeid
	group by 1
)
select
	store_name
	, total_quantity
from table_1
where "rank" <= 3;
```

Product with The Most Total Amount

product_name	total_amount
Cheese Stick	27615000

```
with table_1 as(
	select
		p."Product Name" as product_name
		, sum(t.totalamount) as total_amount
		, rank() over(order by sum(t.totalamount) desc)
as "rank"
	from product p
	inner join "transaction" t
		on p.productid = t.productid
	group by 1
)
select
	product_name
	, total_amount
from table_1
where "rank" = 1;
```

Top 3 Product with The Most Total Amount



product_name	total_amount
Cheese Stick	27615000
Choco Bar	21190400
Coffee Candy	19711800

```
with table_1 as(
        select
                p."Product Name" as product_name
                , sum(t.totalamount) as total_amount
                , rank() over(order by sum(t.totalamount) desc)
as "rank"
        from product p
        inner join "transaction" t
                on p.productid = t.productid
        group by 1
)
select
        product_name
        , total_amount
from table_1
where "rank" <= 3;
```

2

Dashboard in Tableau

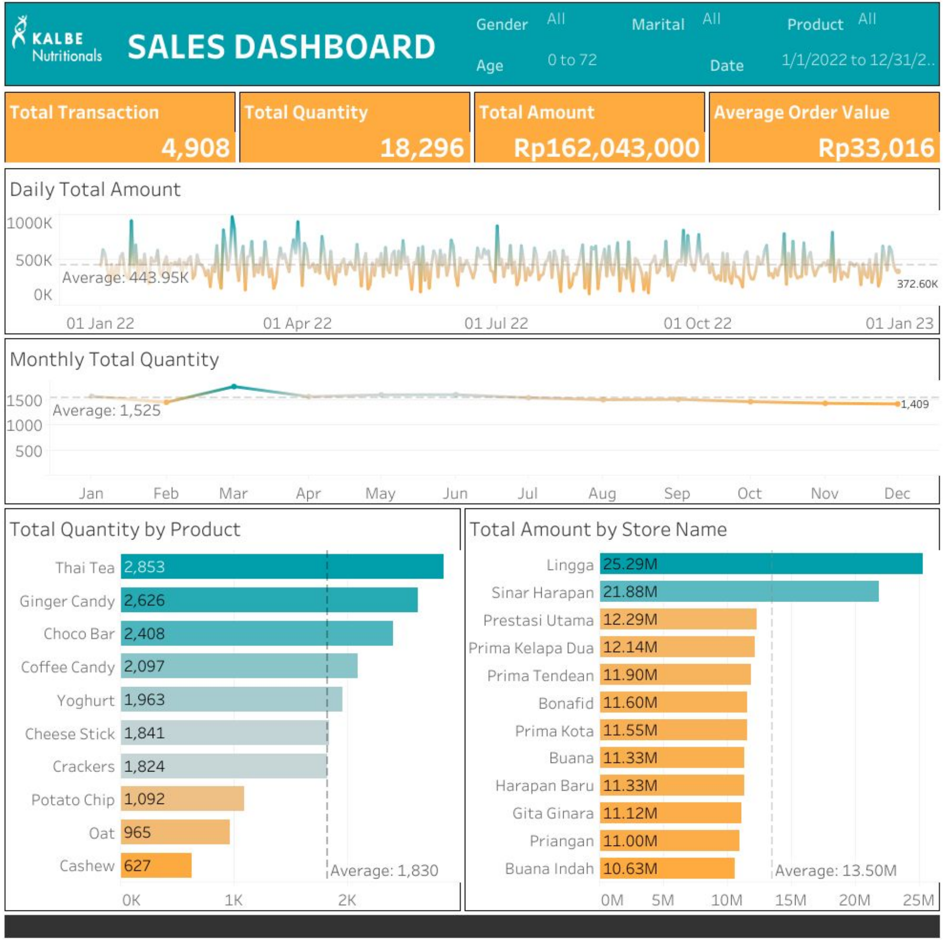
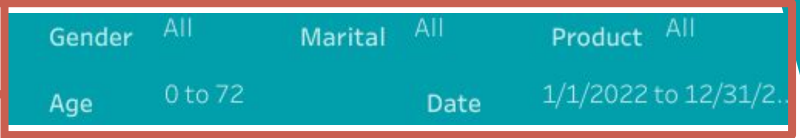


Tableau Dashboard

(Link)



User can select the filter they want by clicking these dropdowns. Available filter are **gender**, **marital status**, **product**, **age** and **date.**

Available chart are **Daily Total Amount**, **Monthly Total Quantity**, **Total Quantity by Product** and **Total Amount by Store Name.**

Scorecard are **Total Transaction**, **Total Quantity, Total Amount** and **AOV.**

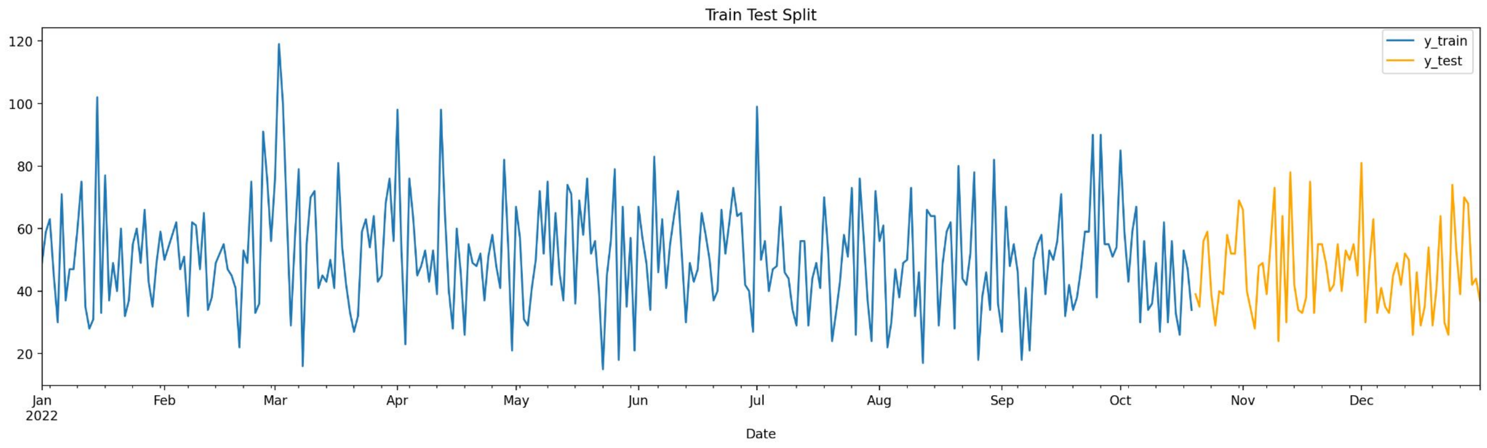
All of these are affected by filter.

3

Stock Inventory Forecast Using ARIMA

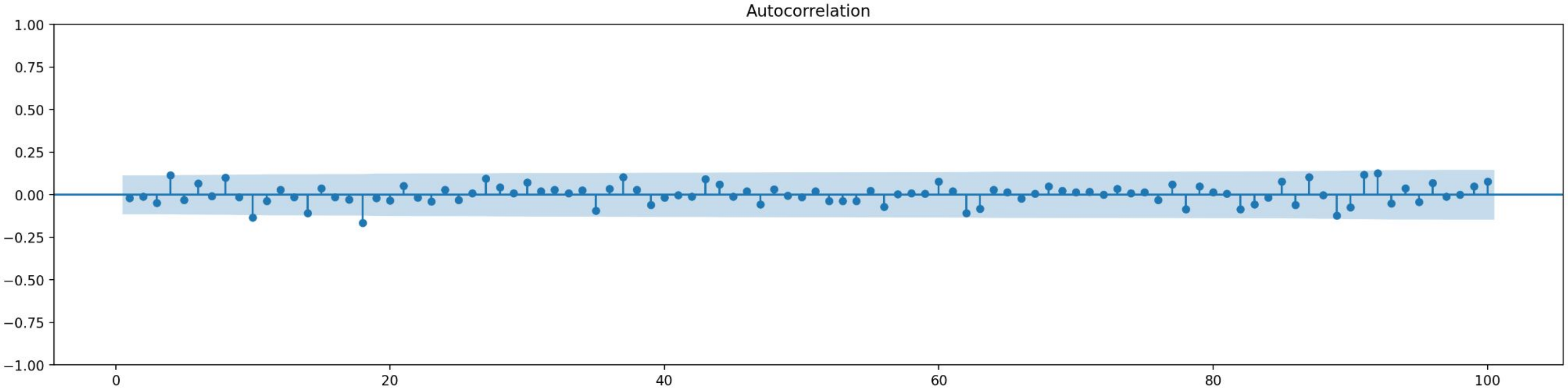
1. Prepare the Data and Train-Test Split

```
# prepare the data
arima_df = transaction_df[['Date',
'Qty']].copy().sort_values(by='Date').groupby('Date')[['Qty']].sum()
# train_test_split
arima_df_len = round(len(arima_df)*0.8)
y_train, y_test = arima_df[['Qty']].iloc[:arima_df_len], arima_df[['Qty']].iloc[arima_df_len:]
```



2. Determine Seasonality - No Seasonality

```
# No seasonality
acf_data = y_train.copy()
acf_data = acf_data - acf_data.rolling(9).mean()
acf_data.dropna(inplace=True)
fig, ax = plt.subplots(nrows=2, ncols=1, figsize=(20,10))
plot_acf(acf_data, lags=100, zero=False, ax=ax[0])
sns.lineplot(acf_data, ax=ax[1])
plt.show()
```



3. Determine Differencing and Create Model

```
# decide the correct differencing and create model
model = auto_arima(y_train, trace=True, suppress_warnings=True, max_p=20, max_d=20,
                   max_q=20)
model.summary()
```

```
Best model:  ARIMA(0,0,0)(0,0,0)[0] intercept
Total fit time: 0.822 seconds
```

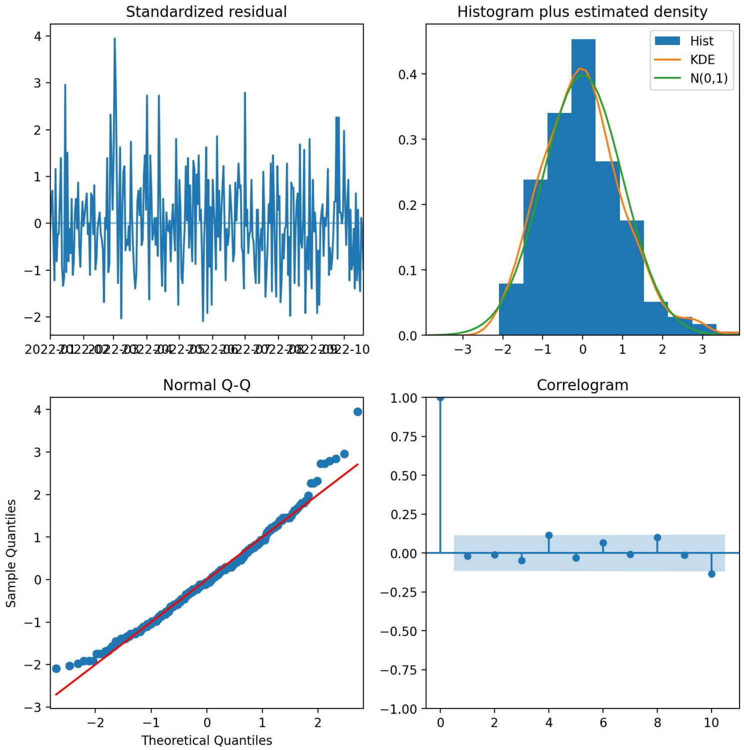
SARIMAX Results

Dep. Variable:	y	**No. Observations:**	292
Model:	SARIMAX	**Log Likelihood**	-1245.264
Date:	Thu, 31 Aug 2023	**AIC**	2494.528
Time:	09:37:04	**BIC**	2501.882
Sample:	01-01-2022	**HQIC**	2497.474
	- 10-19-2022		
Covariance Type:	opg		

	coef	**std err**	**z**	**P>|z|**	**[0.025**	**0.975]**
intercept	51.0205	1.069	47.722	0.000	48.925	53.116
sigma2	296.2872	22.615	13.102	0.000	251.963	340.611

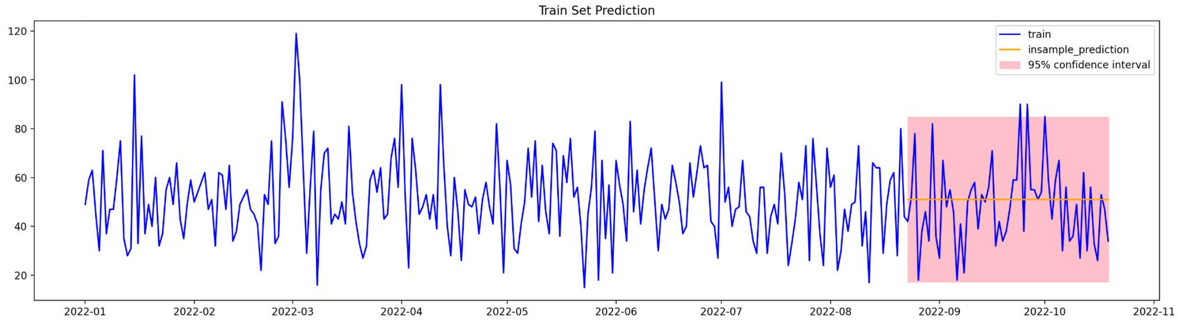
Ljung-Box (L1) (Q):	0.11	**Jarque-Bera (JB):**	19.60
Prob(Q):	0.74	**Prob(JB):**	0.00
Heteroskedasticity (H):	0.83	**Skew:**	0.55

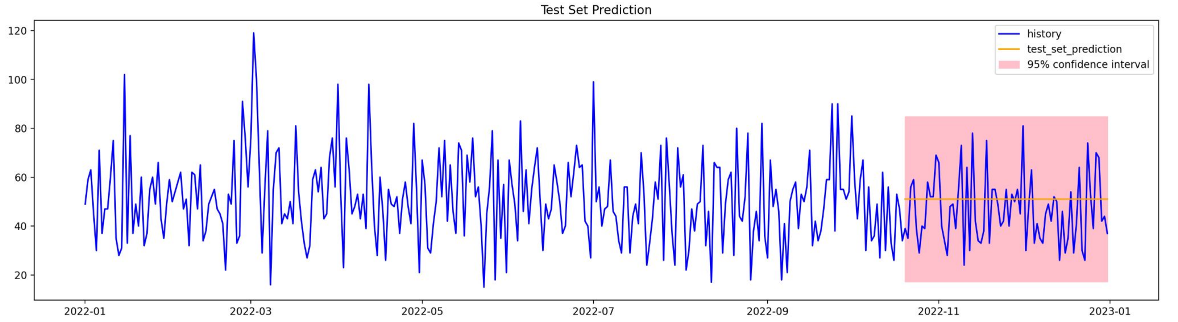
4. Plot Diagnostics




```
# plot_diagnostics
model.plot_diagnostics(figsize=(10,10))
plt.show()
```

5. Train & Test Set RMSE

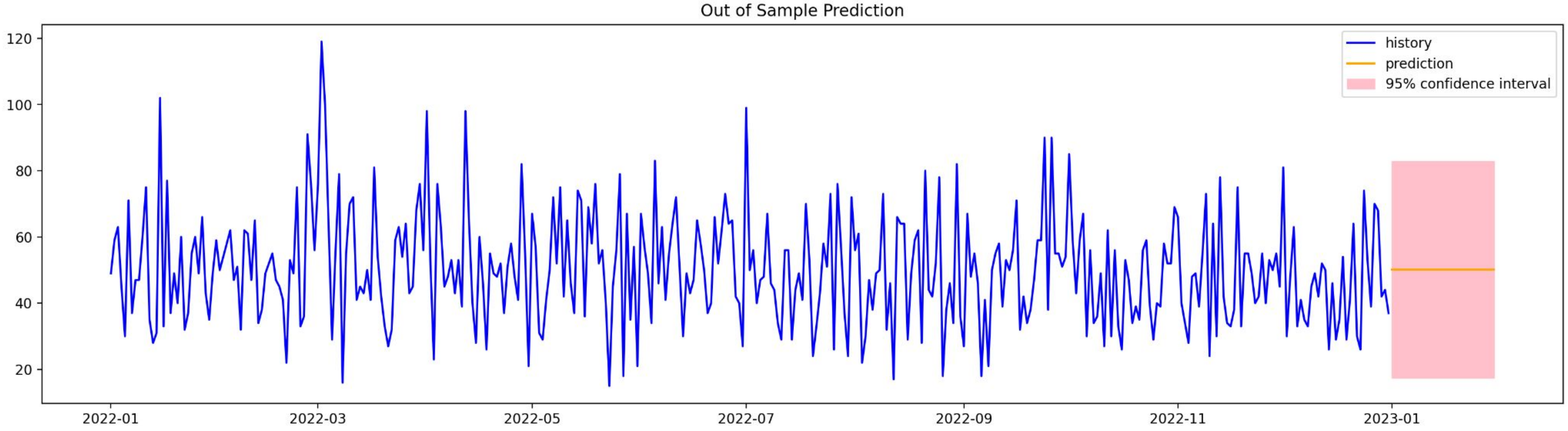




	RMSE
Train set	16.862
Test set	14.499

6. Out-of-Sample Prediction (30 days)

	Stock for Tomorrow	Stock for 1 Week	Stock for 30 days
Prediction	51	357	1530



4

Customer Segmentation for Personalized Promotion

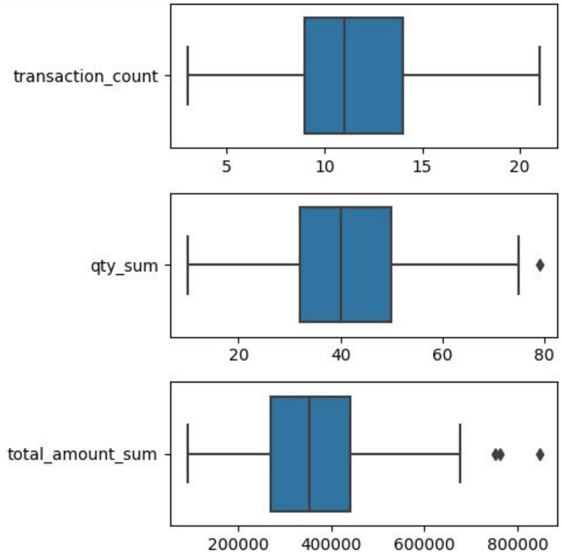
1. Preparation

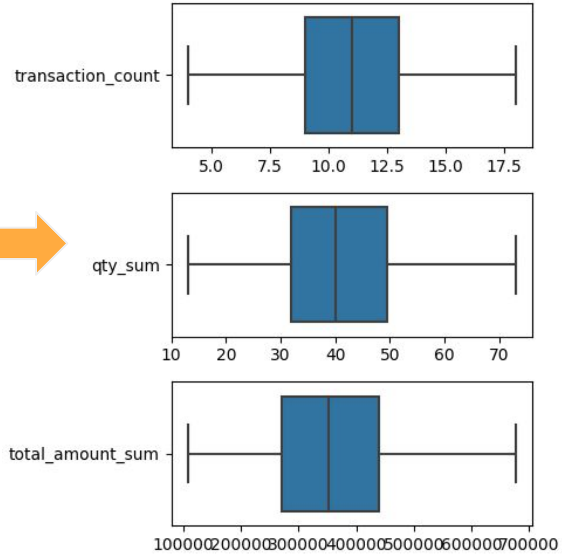
```
<class 'pandas.core.frame.DataFrame'>
Index: 447 entries, 1 to 99
Data columns (total 3 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   transaction_count   447 non-null    int64
 1   qty_sum             447 non-null    int64
 2   total_amount_sum    447 non-null    int64
dtypes: int64(3)
memory usage: 14.0+ KB
```

CustomerID	transaction_count	qty_sum	total_amount_sum
1	17	60	623300
10	14	50	478000
100	8	35	272400
101	14	44	439600
102	15	57	423300

```
# Merge All Data
master_df = transaction_df.merge(product_df,
on='ProductID', how='left')\
                          .merge(customer_df,
on='CustomerID', how='left')\
                          .merge(store_df,
on='StoreID', how='left')
master_df.drop(columns= 'Price_y', inplace=True)
master_df.rename(columns={ 'Price_x':'Price'},
inplace=True)
# Groupby: customerid, Aggregate: transaction_count,
qty_sum, total_amount_sum
group_customer =
master_df.groupby( 'CustomerID').agg({'TransactionID':'
count','Qty':'sum','TotalAmount':'sum'})
group_customer.rename(columns= dict(zip(['TransactionID
','Qty','TotalAmount'],
['transaction_count','qty_sum','total_amount_sum'])),
                       inplace= True)
```

2. Removing Outlier





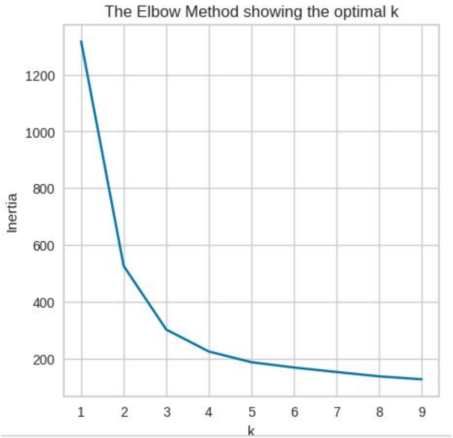
Before	After	%Data Removed
447	439	1,82%

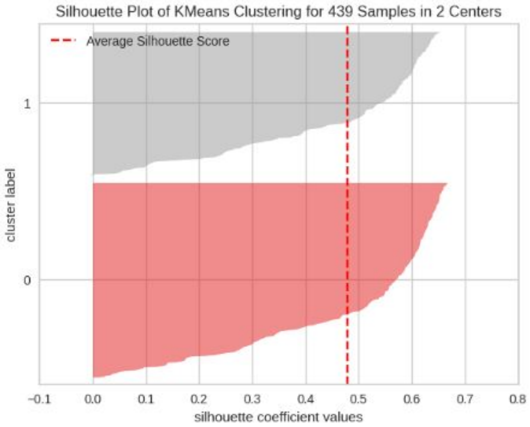
3. Preprocessing - Standardization

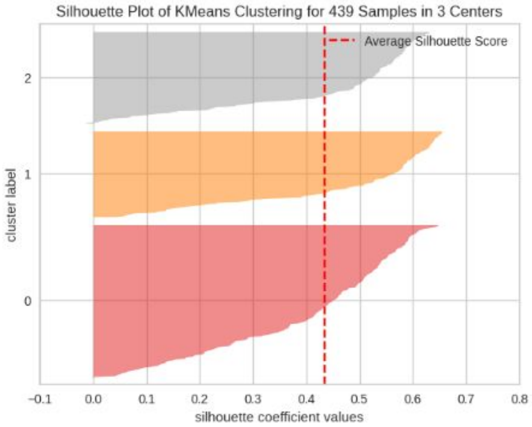
```
preprocessing = group_customer_no_outlier.copy()

# StandardScaler
ss = StandardScaler()
ss_preprocessing = ss.fit_transform(preprocessing[preprocessing.columns])
```

4. Decide Number of Cluster







Elbow method suggest 3 cluster while silhouette score suggest 2-3 cluster. I decide to pick **3 cluster**.

5. Segmentation Result

	💸High Spender	👌 Medium Spender	💔Low Spender
Total Customer	129	203	115
Female:Male	1,08:1	1,23:1	1,21:1
Married:Single	2,82:1	3,41:1	3,6:1
Avg. Age	40,4	38,7	39,7
Income	8,45	8,49	8,92
Avg. Transaction Cnt	14,9	11	7,4
Avg. Quantity Bought	56,3	39.5	26.0
Avg. Spending	511.679	348,426	220,050

Thanks!

Link to task folder

Link to presentation video

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