Kelompok 2A

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UNSUPERVISED LEARNING

AIRLINE CUSTOMER VALUE ANALYSIS CASE

Dataset Summary

- Data shape: 62988 x 23
- Columns drop: 'MEMBER_NO', 'BP_SUM', 'SUM_YR_1', 'SUM_YR_2', 'SEG_KM_SUM'
- Kolom dengan data kosong:

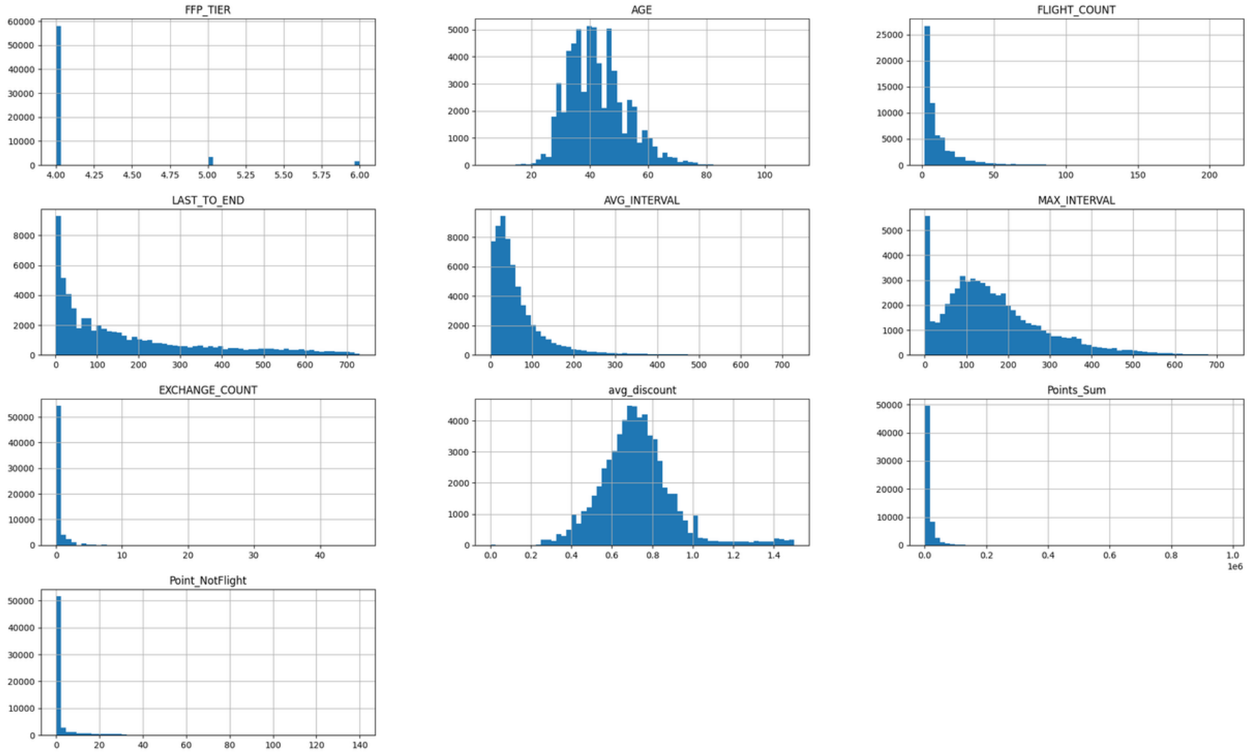
```
data.isna().sum()
```

FFP_DATE	0
FIRST_FLIGHT_DATE	0
GENDER	3
FFP_TIER	0
WORK_CITY	2269
WORK_PROVINCE	3248
WORK_COUNTRY	26
AGE	420
LOAD_TIME	0
FLIGHT_COUNT	0
LAST_FLIGHT_DATE	0
LAST_TO_END	0
AVG_INTERVAL	0
MAX_INTERVAL	0
EXCHANGE_COUNT	0
avg_discount	0
Points_Sum	0
Point_NotFlight	0

dtype: int64

Exploratory Data Analysis

- Distribusi data



Dataset Summary

Exploratory Data Analysis

- Grouping data berdasarkan jenis tipe data:

```
# pengelompokan kolom berdasarkan jenisnya
cats = ['GENDER', 'WORK_CITY', 'WORK_PROVINCE', 'WORK_COUNTRY','AVG_INTERVAL', 'avg_discount']
nums = ['FFP_TIER', 'AGE', 'FLIGHT_COUNT', 'LAST_TO_END','MAX_INTERVAL', 'EXCHANGE_COUNT','Points_Sum', 'Point_NotFlight']
timestamp = ['FFP_DATE', 'FIRST_FLIGHT_DATE', 'LOAD_TIME', 'LAST_FLIGHT_DATE']
```

- Handle missing data:
  a. Kolom cats, timestamp: Diisi dengan modus
  b. Kolom nums: Diisi dengan mean

- Duplicate rows:

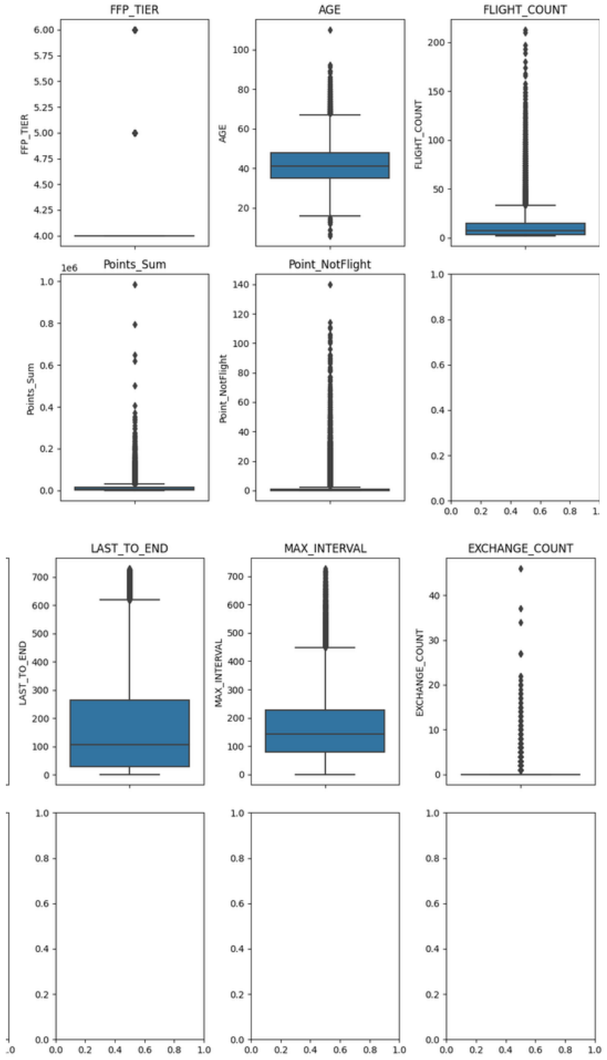
```
duplicate_rows = data[data.duplicated()]
print("Duplicate Rows except first occurrence:")
print(duplicate_rows)
```

```
Duplicate Rows except first occurrence:
       FFP_DATE FIRST_FLIGHT_DATE GENDER  FFP_TIER WORK_CITY WORK_PROVINCE  \
49085  8/11/2012         8/11/2012   Male         4    panjin      liaoning

      WORK_COUNTRY   AGE  LOAD_TIME  FLIGHT_COUNT LAST_FLIGHT_DATE  \
49085           CN  40.0  3/31/2014             2        8/18/2012

       LAST_TO_END  AVG_INTERVAL  MAX_INTERVAL  EXCHANGE_COUNT  avg_discount  \
49085          592           7.0             7               0      0.600021

       Points_Sum  Point_NotFlight
49085        1841                0
```

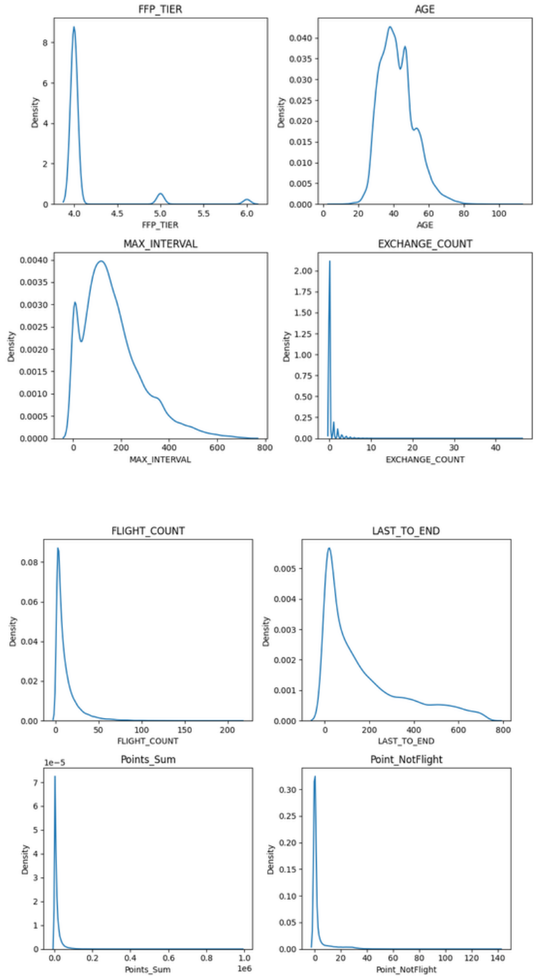
Handling duplicate rows:
drop_duplicates()

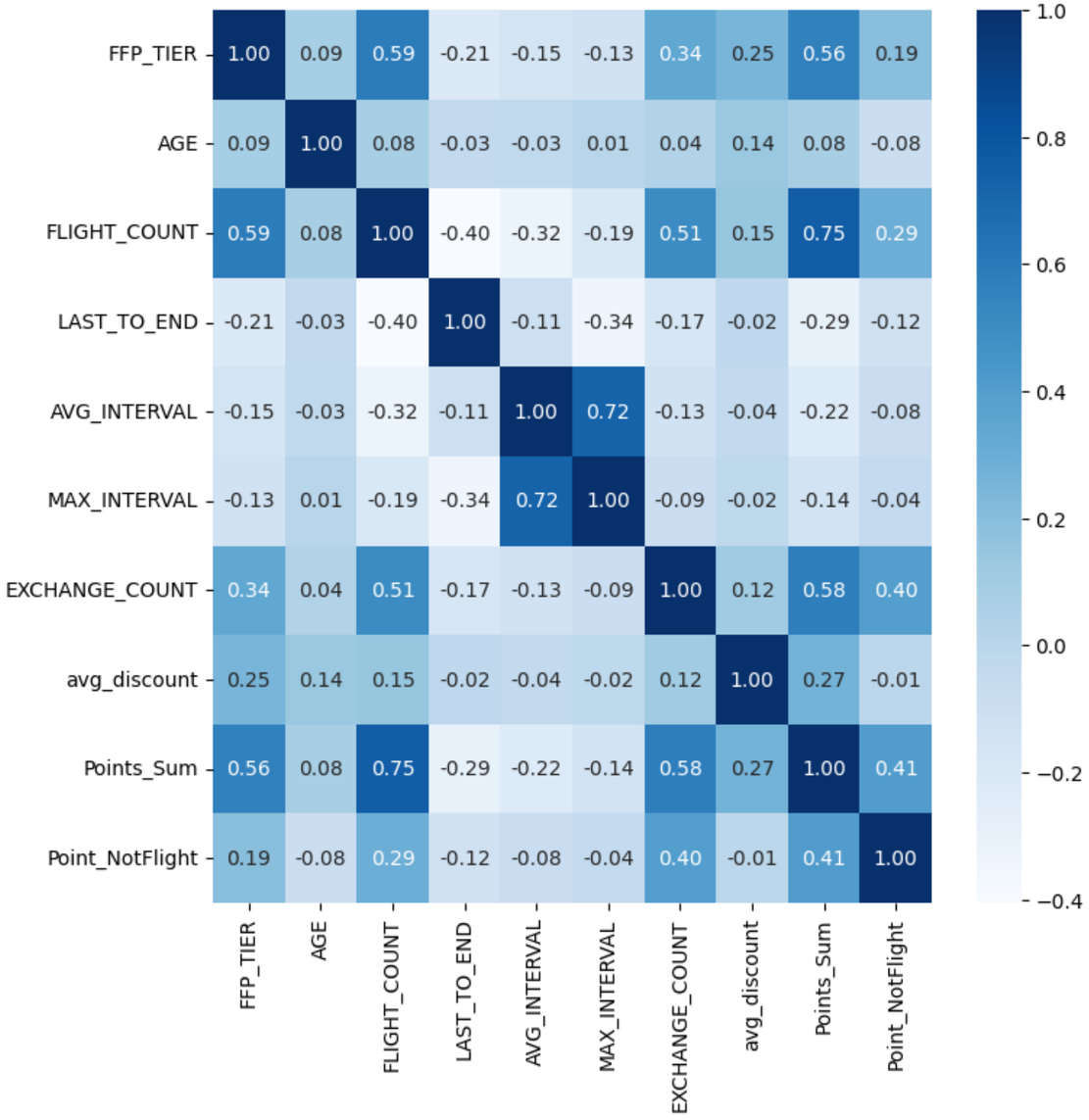
Dataset Summary

- Unique values:
  - FFP_DATE: 3062
  - FIRST_FLIGHT_DATE: 3399
  - GENDER: 2
  - WORK_CITY: 2959
  - WORK_PROVINCE: 1132
  - WORK_COUNTRY: 106
  - LOAD_TIME: 1
  - LAST_FLIGHT_DATE: 731



Exploratory Data Analysis



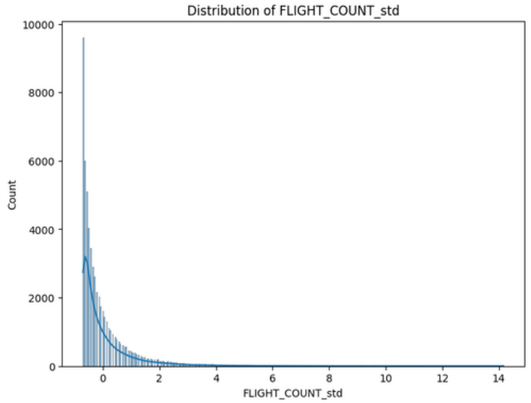


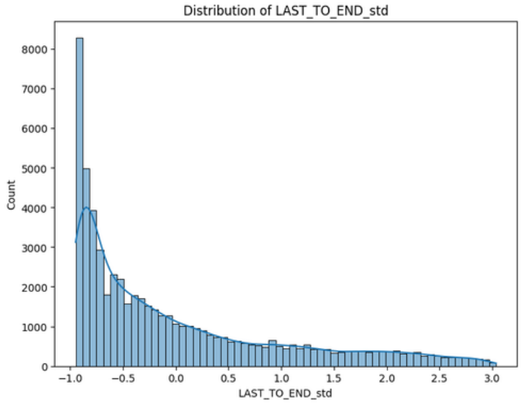
- Kolom-kolom dengan Korelasi Tinggi: ['FLIGHT_COUNT', 'AVG_INTERVAL', 'MAX_INTERVAL', 'Points_Sum']

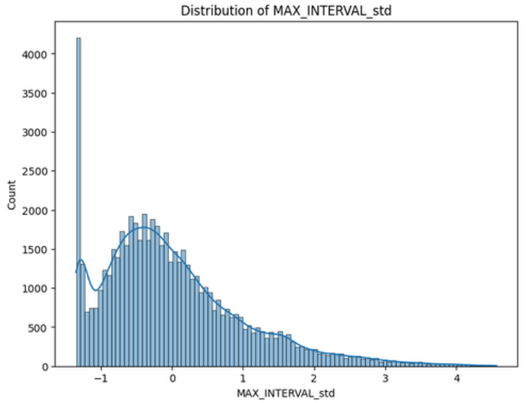
Feature Selection

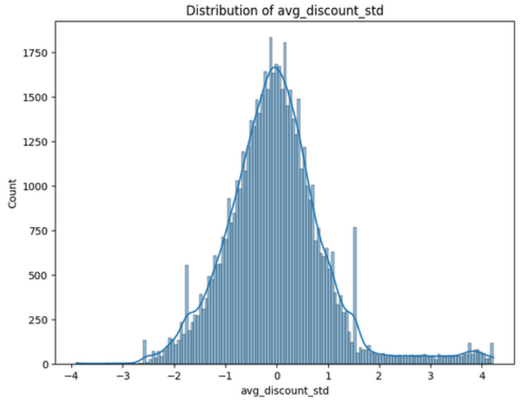
Feature Extraction

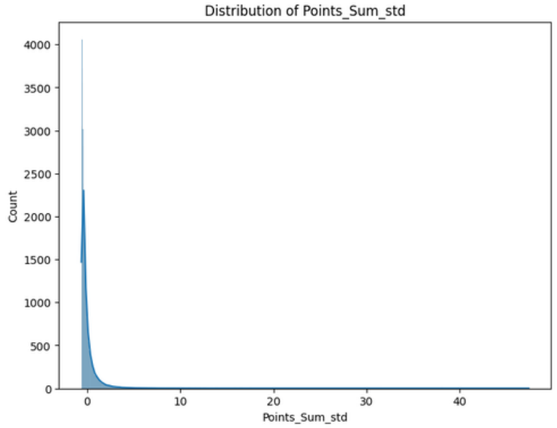
- Membuat kombinasi linier dari beberapa filter yaitu Travel_Score dengan membagi FLIGHT_COUNT dengan LAST_TO_END
- Melakukan standarisasi pada kolom FLIGHT_COUNT, LAST_TO_END, MAX_INTERVAL, EXCHANGE_COUNT, avg_discount, Points_Sum, AVG_INTERVAL, dan Travel_Score
- Men-drop kolom yang tidak dilakukan standarisasi: 'FLIGHT_COUNT_std','LAST_TO_END_std','MAX_INTERVAL_std','EXCHANGE_COUNT_std','avg_discount_std','Points_Sum_std','AVG_INTERVAL_std','Travel_Score_std'

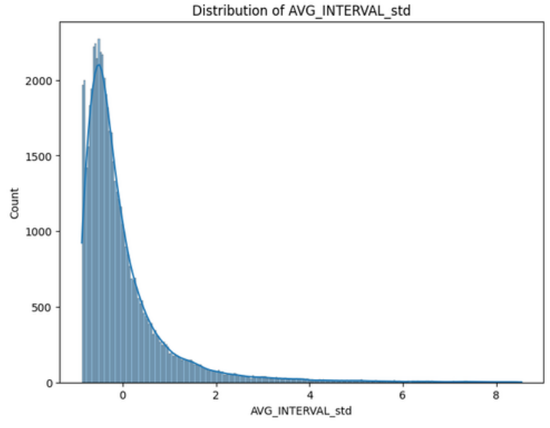


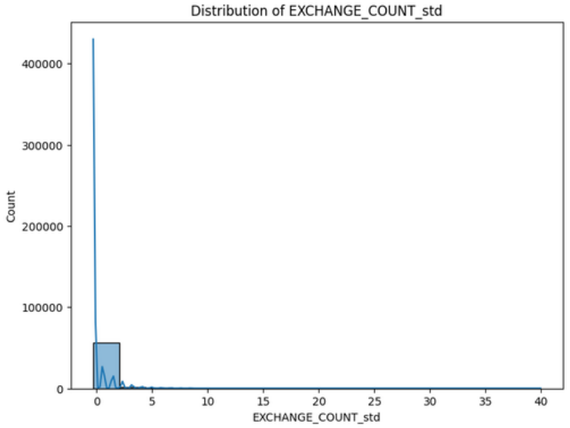


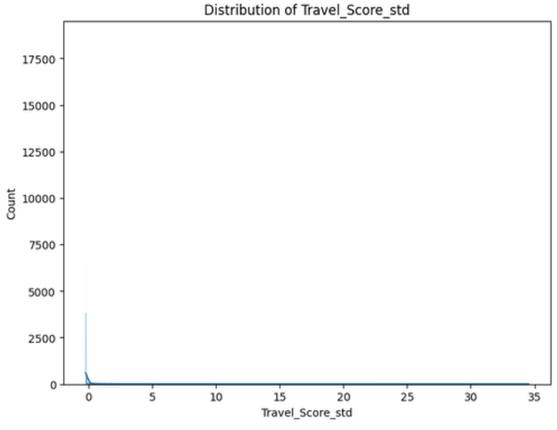




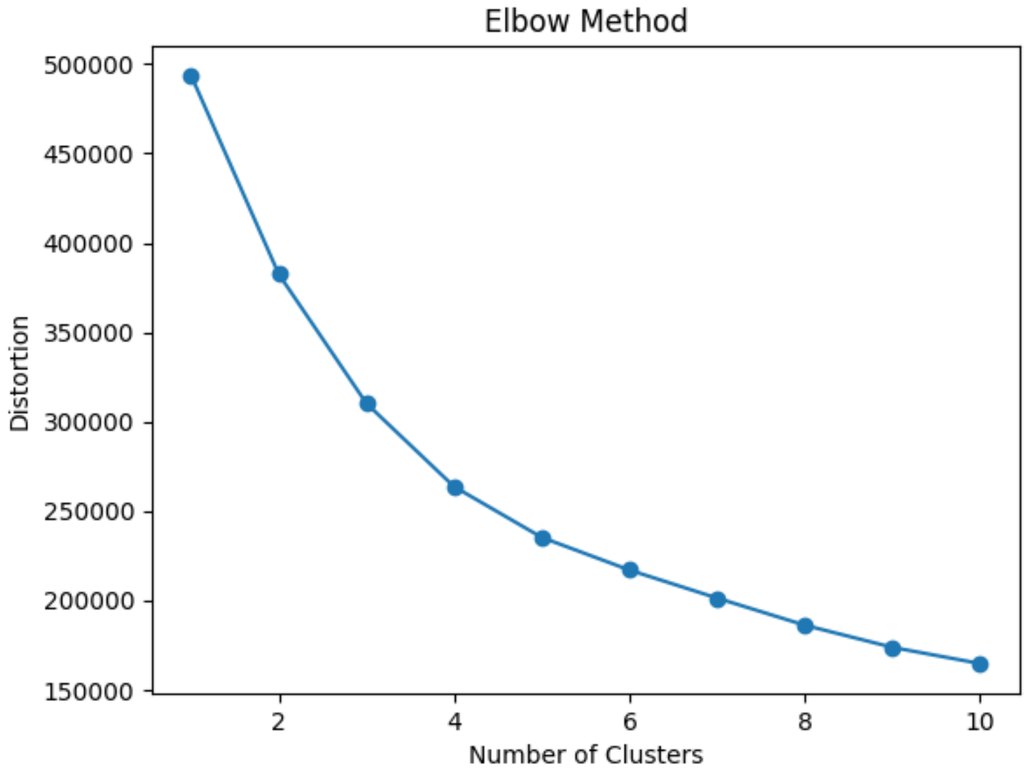




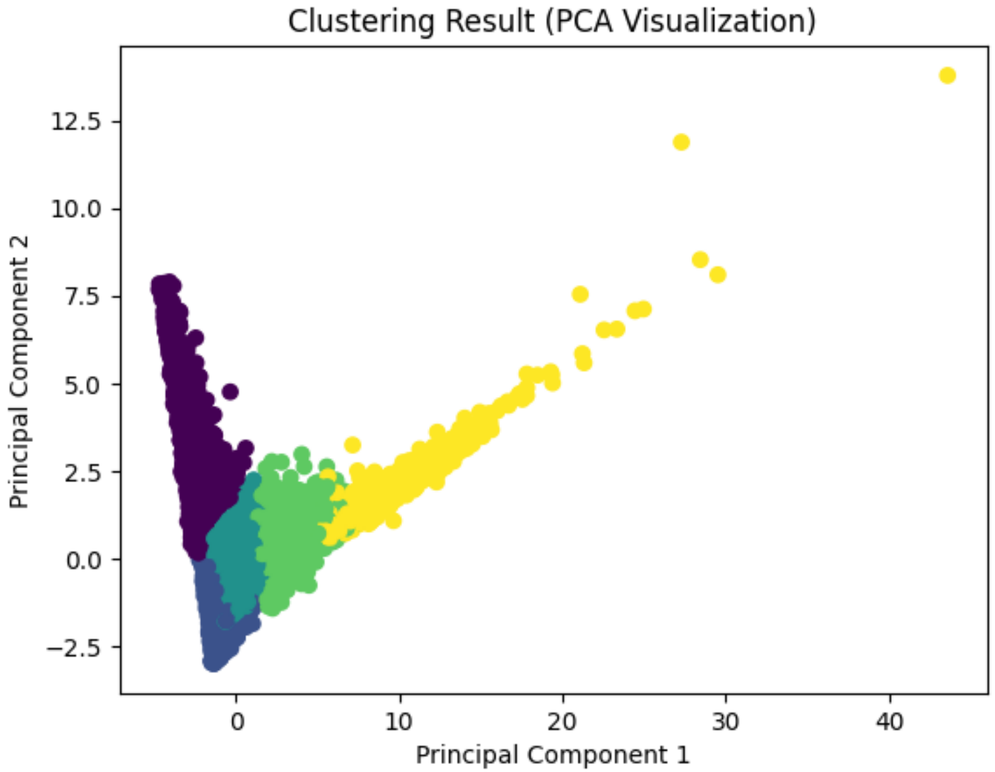




Modelling



Dipilih Cluster sebanyak 5 dengan kondisi tidak menggunakan Cluster yang terlalu banyak namun nilai cukup baik karena nilai setelah tidak terlalu menggambarkan grafik yang terlalu signifikan



Silhouette Score: 0.28825371310470 48

Modelling

Cluster Centers:

	FLIGHT_COUNT_std	LAST_TO_END_std	MAX_INTERVAL_std	EXCHANGE_COUNT_std	\
0	-0.560713	1.573742	-0.826149	-0.242371	
1	-0.073654	-0.432708	-0.000331	-0.166547	
2	1.741547	-0.748856	-0.485031	1.109962	
3	4.486854	-0.907560	-0.818827	4.312208	
4	-0.561065	-0.242786	1.706053	-0.231082	

	avg_discount_std	Points_Sum_std	AVG_INTERVAL_std	Travel_Score_std	\
0	-0.046672	-0.415803	-0.422996	-0.224094	
1	-0.074897	-0.125196	-0.175139	-0.116286	
2	0.502972	1.449561	-0.596862	0.604115	
3	0.784947	4.725832	-0.727132	5.924837	
4	-0.105567	-0.401336	1.784124	-0.193733	

	Cluster
0	1.000000e+00
1	2.000000e+00
2	3.000000e+00
3	4.000000e+00
4	-9.237056e-14

```
[ ]  # Evaluasi cluster dengan silhouette score
     silhouette_avg = silhouette_score(df_filter_std, df['Cluster'])
     print(f'Silhouette Score: {silhouette_avg}')

     Silhouette Score: 0.2904077415166286

     from sklearn.metrics import davies_bouldin_score

     # Evaluasi cluster dengan Davies-Bouldin Index
     db_index = davies_bouldin_score(df_filter_std, df_filter_std['Cluster'])
     print(f'Davies-Bouldin Index: {db_index}')

     Davies-Bouldin Index: 1.1303101628898262
```

- Nilai 0.29 pada Silhouette, menunjukkan bahwa clustering tersebut memiliki sejumlah besar overlapping antar cluster, namun tetap menunjukkan sejauh mana setiap data point berada dalam clusternya masing-masing.
- Nilai 1.13 pada Davis Bouldin menunjukkan tingkat overlap yang moderat antara cluster dan sejauh mana cluster-cluster tersebut berbeda satu sama lain.
- Meskipun Silhouette Score menunjukkan adanya overlap antar cluster, Davies-Bouldin Index menunjukkan bahwa cluster tersebut masih cukup terpisah dan terdefinisi dengan baik.

Evaluation