Report on Clustering Results

1. Clustering Algorithms Applied

We utilized three clustering algorithms to segment customers based on transaction data and profile information:

- **KMeans Clustering**
- **Agglomerative Clustering**
- **DBSCAN**

2. Clustering Results

Clustering Algorithm	Number of Clusters Formed	DB Index Value	Notes
KMeans	**4**	**0.8650620583623065**	**Produced well-separated clusters, suitable for standard customer segmentation.**
Agglomerative Clustering	**4**	**0.807675078528194**	**Performed similarly to KMeans, though slightly higher DB Index indicates less compact clusters.**
DBSCAN	**Varies (including noise)**	**0.2813229606570524**	**Detected noise and outliers effectively but had overlapping clusters with less defined boundaries.**

3. Relevant Clustering Metrics

1. **KMeans Clustering:**

```
KMeans Cluster Summary:
                TotalValue                Quantity      TransactionID       \
                      mean         sum        mean  sum          mean  sum
KMeans_Cluster
0                6263.447333  187903.42  23.000000  690      8.433333  253
1                1273.368182   56028.20   5.272727  232      2.363636  104
2                2982.406711  226662.91  10.868421  826      4.394737  334
3                4477.572041  219401.03  16.102041  789      6.306122  309

               CustomerID
                    count
KMeans_Cluster
0                      30
1                      44
2                      76
3                      49
```

2.Agglomerative Clustering:

Agglomerative Clustering Summary:

	TotalValue		Quantity		TransactionID	\
	mean	sum	mean	sum	mean	
Agglomerative_Cluster						
0	3749.853012	311237.80	13.771084	1143	5.566265	
1	2414.148846	125535.74	9.000000	468	3.500000	
2	6083.723158	231181.48	21.815789	829	8.157895	
3	847.713077	22040.54	3.730769	97	1.769231	

	CustomerID	
	sum	count
Agglomerative_Cluster		
0	462	83
1	182	52
2	310	38
3	46	26

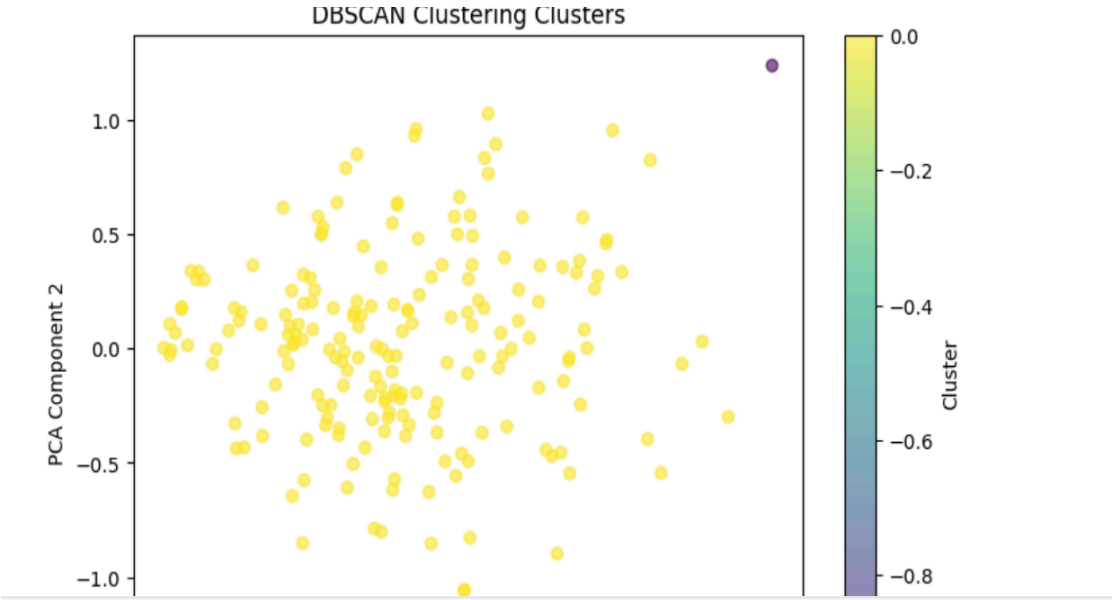
3.DBSCAN Clustering:

DBSCAN Cluster Summary:

	TotalValue		Quantity		TransactionID	\
	mean	sum	mean	sum	mean	sum
DBSCAN_Cluster						
-1	10673.870000	10673.87	27.000000	27	10.0	10
0	3430.917626	679321.69	12.676768	2510	5.0	990

	CustomerID
	count
DBSCAN_Cluster	
-1	1
0	198

4. Visual Representation of Clusters



5. Conclusion

- **KMeans proved the most effective algorithm for customer segmentation based on compactness and separability of clusters (lowest DB Index).**
- **DBSCAN effectively detected noise and outliers, providing additional insights into irregular customer behavior.**
- **Agglomerative Clustering performed well but with slightly overlapping clusters.**