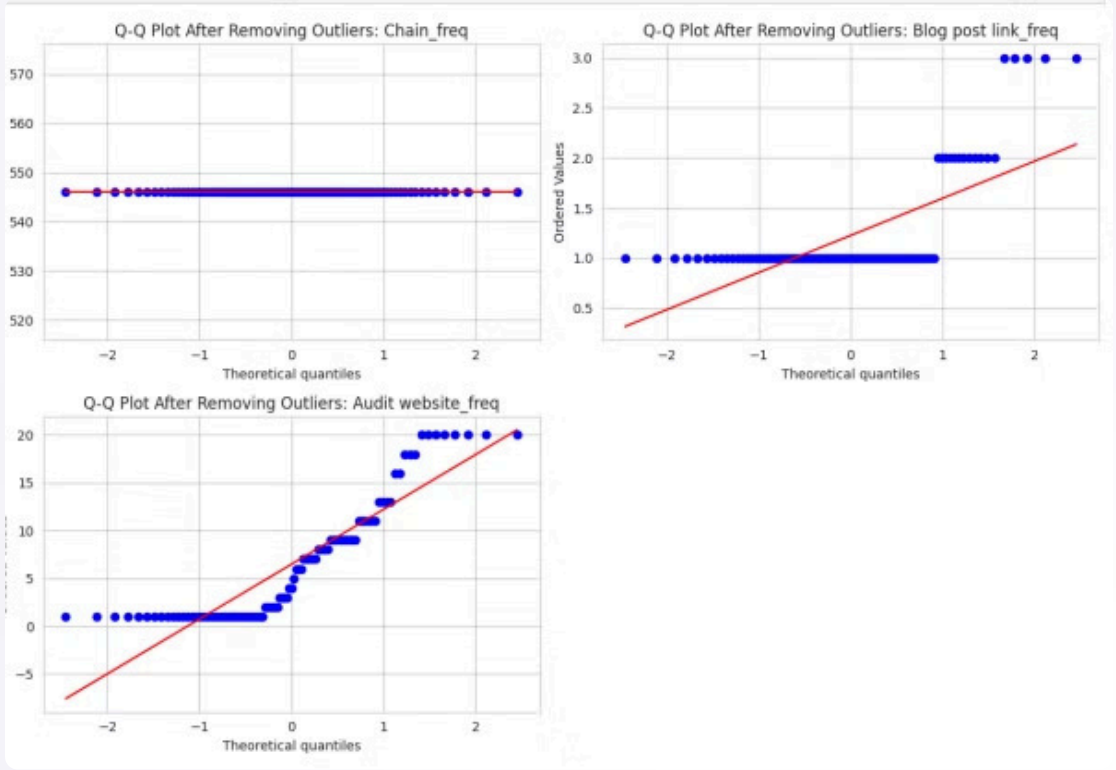
Smart Contract Risk Analysis

Exploring clustering techniques on preprocessed data.



Data Preprocessing

1 Standardization

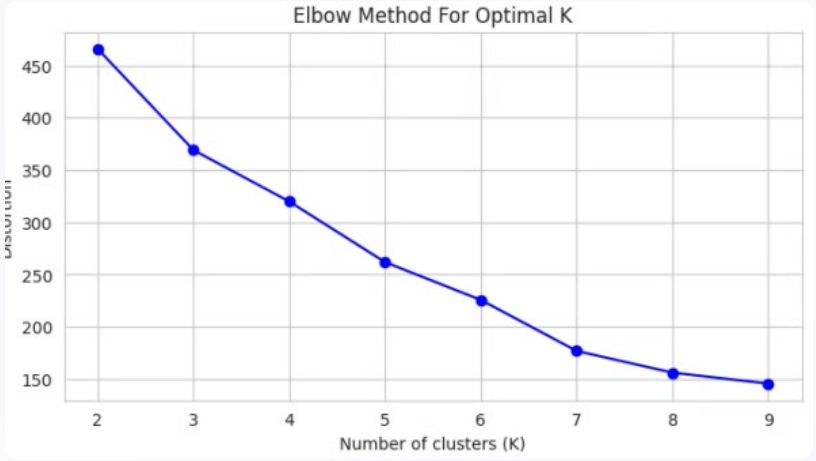
StandardScaler applied to normalize data.

2 PCA

Dimensionality reduction with 95% variance retention.

3 Feature Selection

35 features identified for analysis.



K-Means Clustering

1 Elbow Method

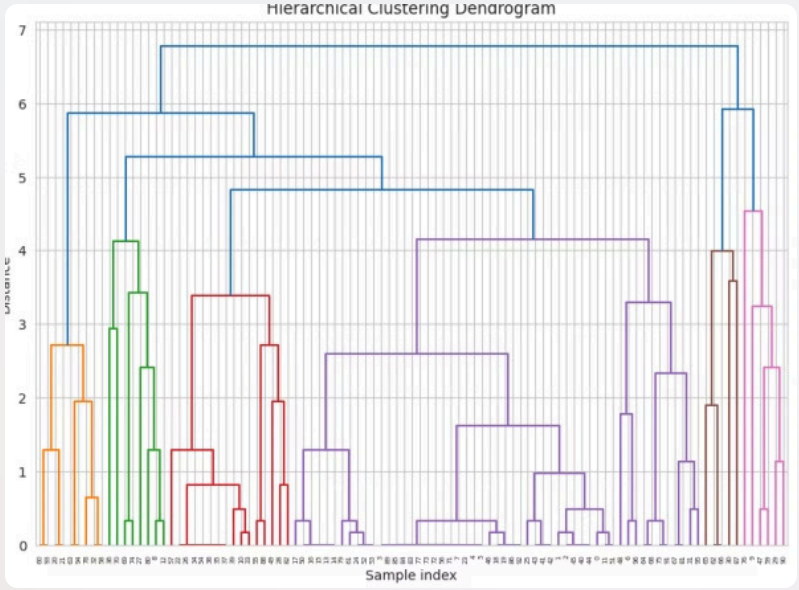
Used to determine optimal number of clusters.

2 Visualization

Clusters plotted on first two PCA components.

3 Silhouette Score

0.4749 for K=9 clusters.



Hierarchical Clustering

1

Linkage

Complete linkage method used.

2

Dendrogram

Visualizes hierarchical structure of clusters.

3

Comparison

Silhouette score: 0.4368, slightly lower than K-Means.

DBSCAN Clustering

Parameters

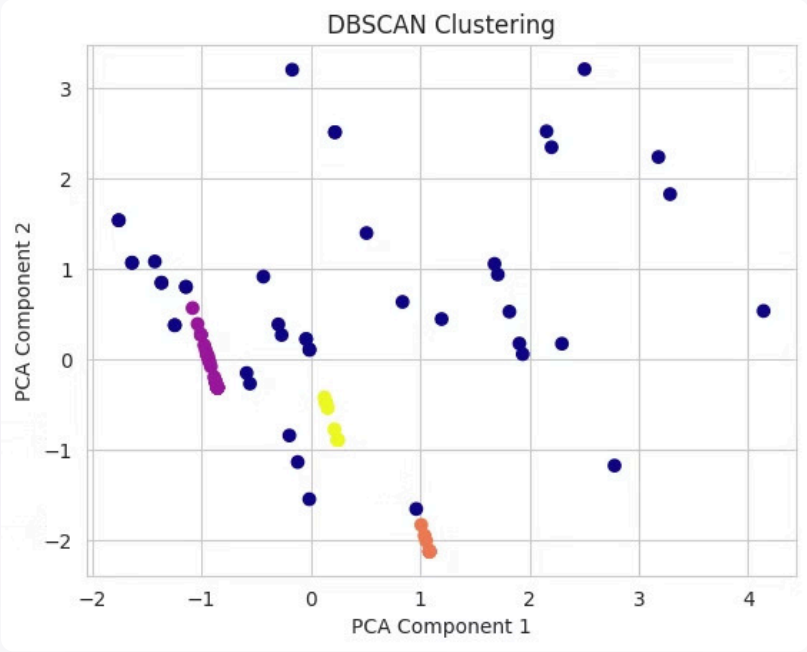
Eps: 0.7, Min samples: 5.

Visualization

Clusters plotted on PCA components.

Performance

Silhouette score: 0.2961, lower than other methods.



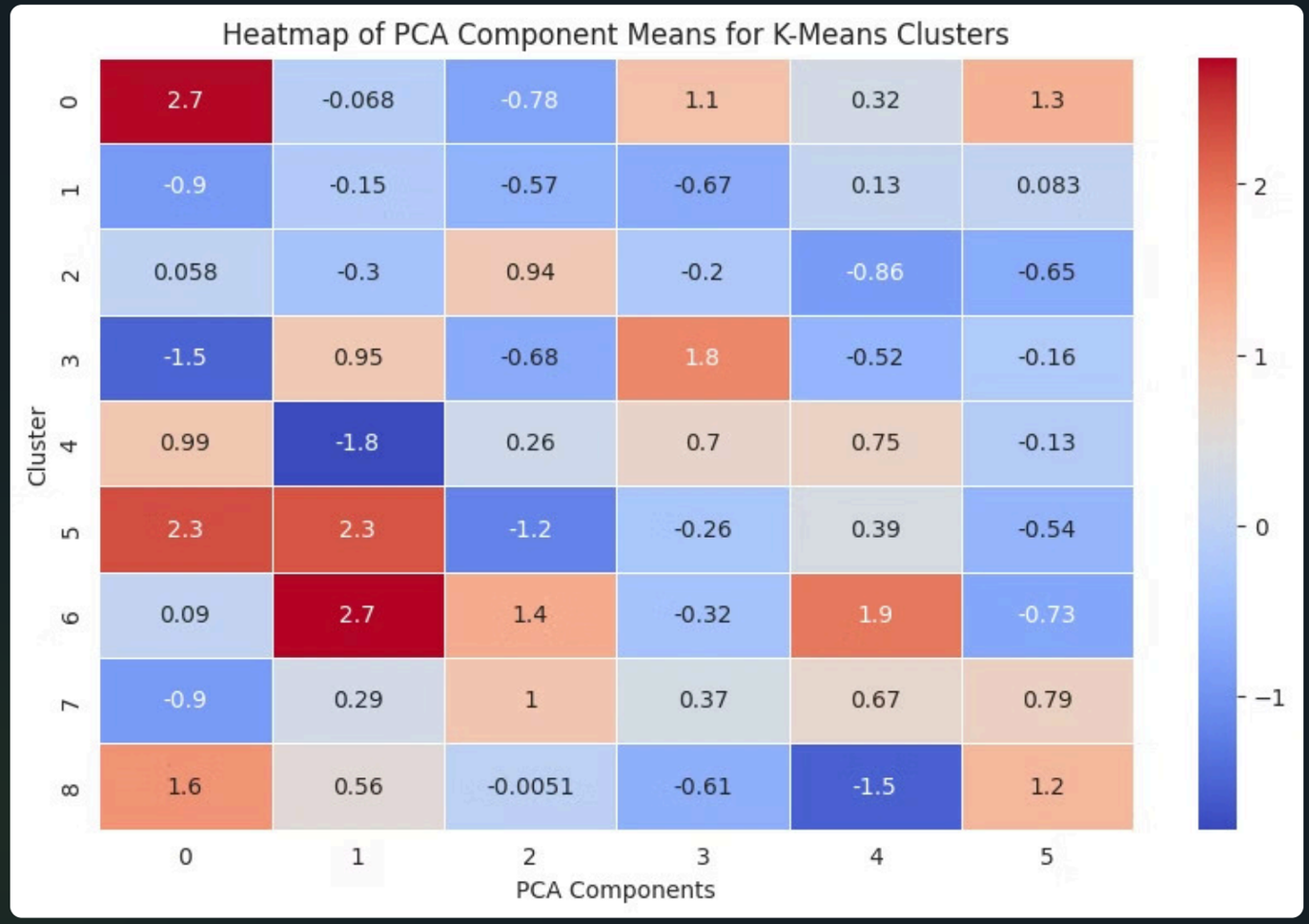
Correlation Analysis

Heatmap

Visualizes correlations between PCA components.

K-means Clustering

Applied to correlation matrix for grouping.



Cluster Characteristics

1 Cluster 0

- High: PC0, PC3, PC5
- Moderate: PC1, PC4
- Low: PC2

2 Cluster 1

- High: NA
- Moderate: PC1, PC4, PC5
- Low: PC0, PC2, PC3

3 Cluster 2

- High: PC2
- Moderate: PC0, PC1
- Low: PC3, PC4, PC5

4 Cluster 3

- High: PC1, PC3
- Moderate: PC5
- Low: PC0, PC2, PC4

5 Cluster 4

- High: PC0
- Moderate: PC2, PC3, PC4, PC5
- Low: PC1

6 Cluster 5

- High: PC0, PC1
- Moderate: PC3, PC4
- Low: PC2, PC5

7 Cluster 6

- High: PC1, PC2, PC4
- Moderate: PC0
- Low: PC3, PC5

8 Cluster 7

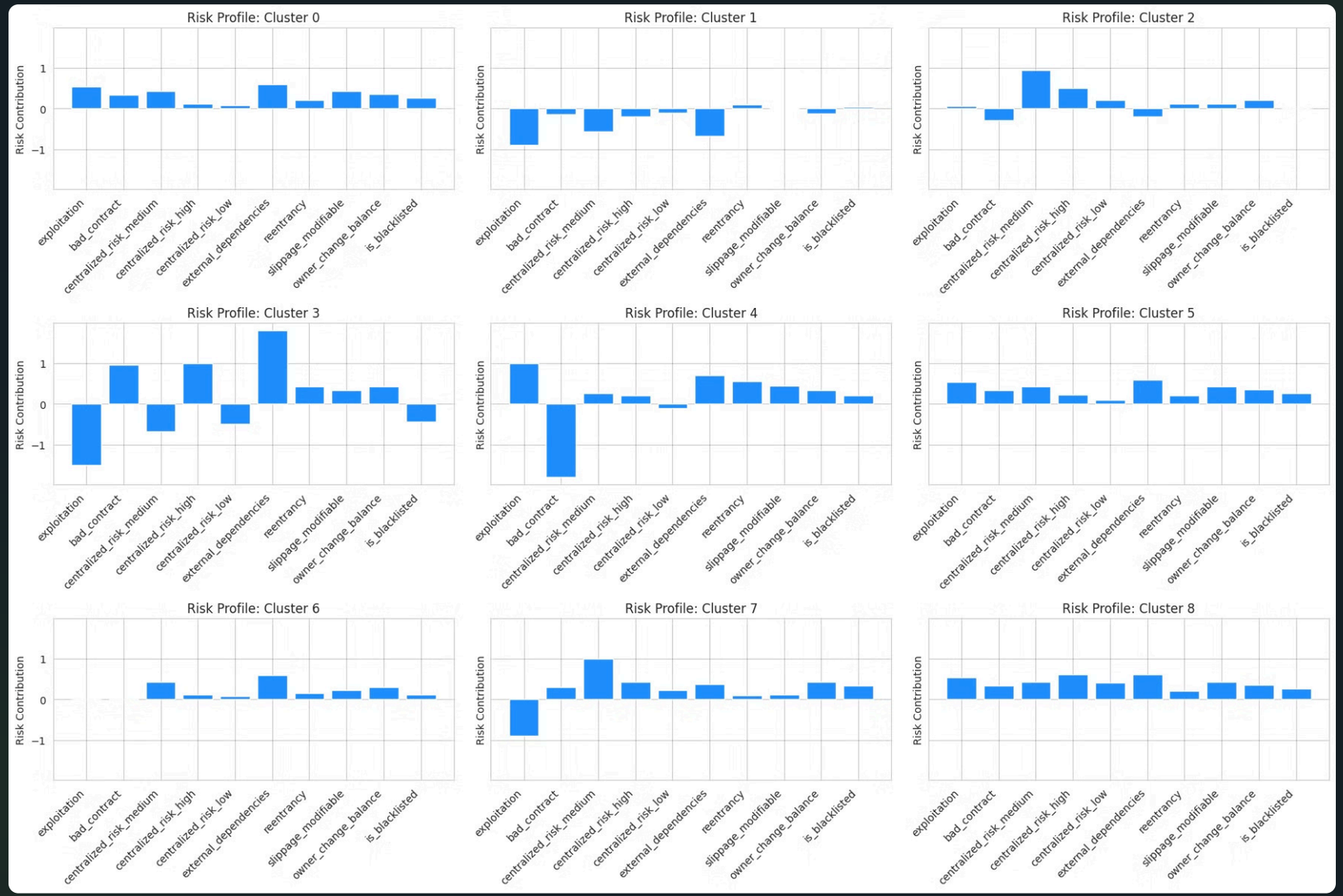
- High: PC2
- Moderate: PC1, PC3, PC4, PC5
- Low: PC0

9 Cluster 8

- High: PC5, PC0
- Moderate: PC1, PC2
- Low: PC4, PC3

Risk Profile Analysis

Varied risk profiles across 9 clusters.



Cluster-Based Risk Mitigation Strategies

High-Risk Clusters

Clusters 2, 3, and 6, which exhibit high centralized risk, bad contracts and external dependencies require robust security measures to mitigate vulnerabilities. Secure multi-party computation, decentralized governance, contract review and regular security audits are essential to protect these clusters.

Moderate-Risk Clusters

Clusters 0, and 5 demonstrate moderate risk profiles, suggesting a mix of proactive and reactive risk management techniques. Implementing bug bounty programs, incident response plans, and continuous monitoring can effectively address these clusters.

Low-Risk Clusters

Clusters 1, 4, 7, and 8, with low overall risk, can focus on optimizing performance and user experience, while maintaining a vigilant security posture to prevent future threats. This approach balances efficiency with security to ensure ongoing stability.

Customized Strategies

Each cluster's unique characteristics, as highlighted by their key features in the previous slide, should inform a tailored risk mitigation strategy. This approach ensures that each cluster receives the necessary security attention to address its specific vulnerabilities and strengthen its resilience.