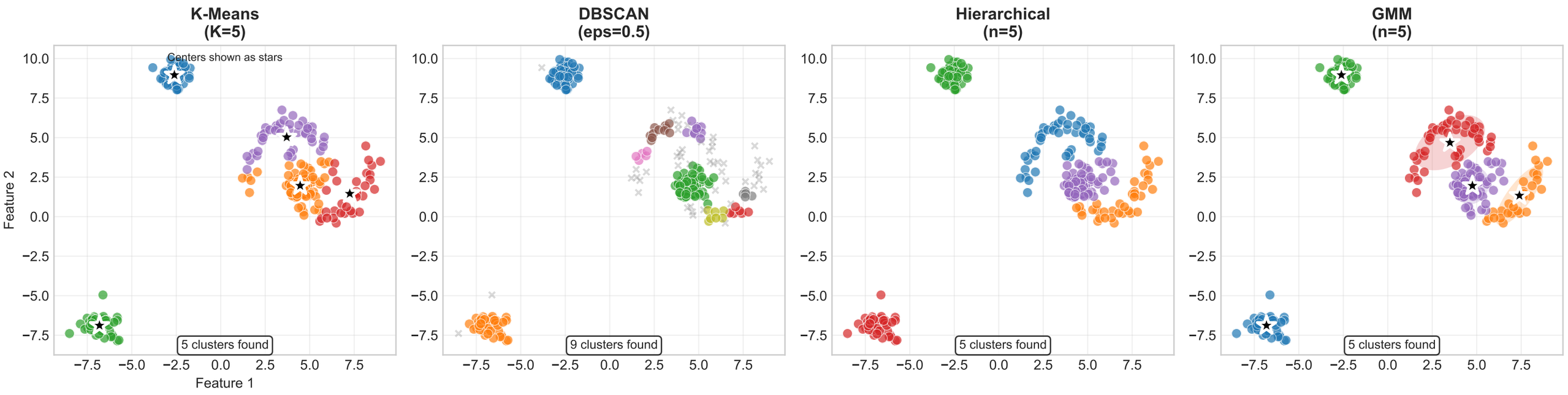
Clustering Algorithms Visual Comparison
Same Data, Different Approaches



K-Means (K=5)

- ✓ Fast and scalable
- ✓ Spherical clusters
- ✗ Fixed K required
- ✗ Sensitive to outliers

Best for: Quick segmentation with known cluster count

Complexity: O(nkt)

DBSCAN (eps=0.5)

- ✓ Finds arbitrary shapes
- ✓ Identifies outliers
- ✓ No K needed
- ✗ Sensitive to parameters

Best for: Anomaly detection and irregular patterns

Complexity: O(n log n)

Hierarchical (n=5)

- ✓ Dendrogram output
- ✓ No K needed initially
- ✓ Interpretable
- ✗ Computationally expensive

Best for: Taxonomies and exploring relationships

Complexity: $O(n^2)$

GMM (n=5)

- ✓ Soft assignments
- ✓ Elliptical clusters
- ✓ Probabilistic
- ✗ Assumes Gaussian distribution

Best for: Overlapping groups and uncertainty modeling

Complexity: O(nkt)

Dataset: Mix of 3 Gaussian blobs and 2 moon-shaped clusters (250 points total)