

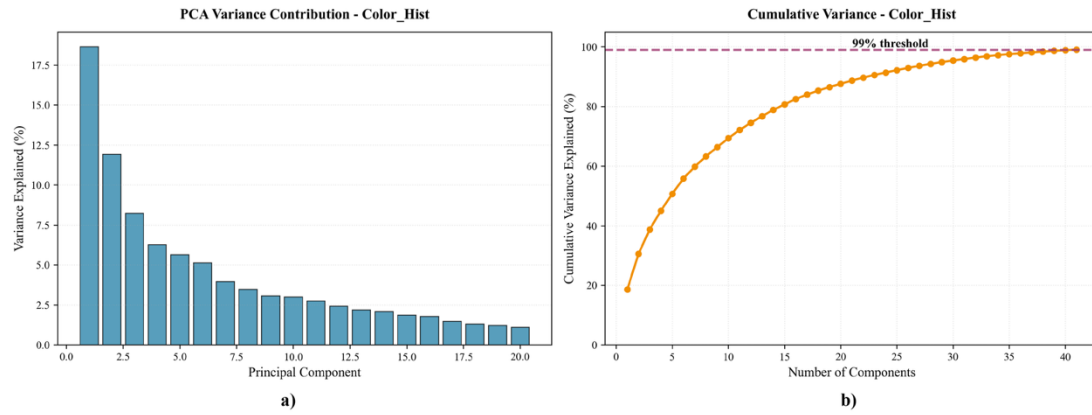
## Supplementary Information

### Unsupervised Clustering of Visual Styles in Tie-Dye Images Using Multiple Feature Representations

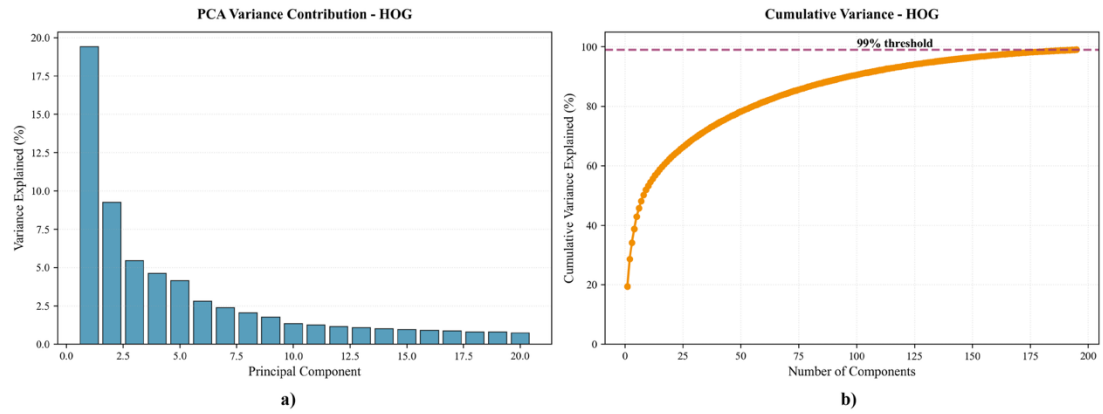
The supplementary analyses used the same representation-specific preprocessing and PCA-based dimensionality reduction procedures as those reported in the main text. Clustering-related supplementary results were generated under the common setting of  $K = 5$ . The supplementary figures serve two purposes. First, they provide PCA diagnostics for feature representations not shown in the main text. Second, they present additional low-dimensional projections and cluster-level visual evidence for Color Histogram, HOG, ResNet18, and ResNet50. Cluster labels are representation-specific and should not be interpreted as directly corresponding across methods.

#### S1. Additional PCA diagnostics across feature representations

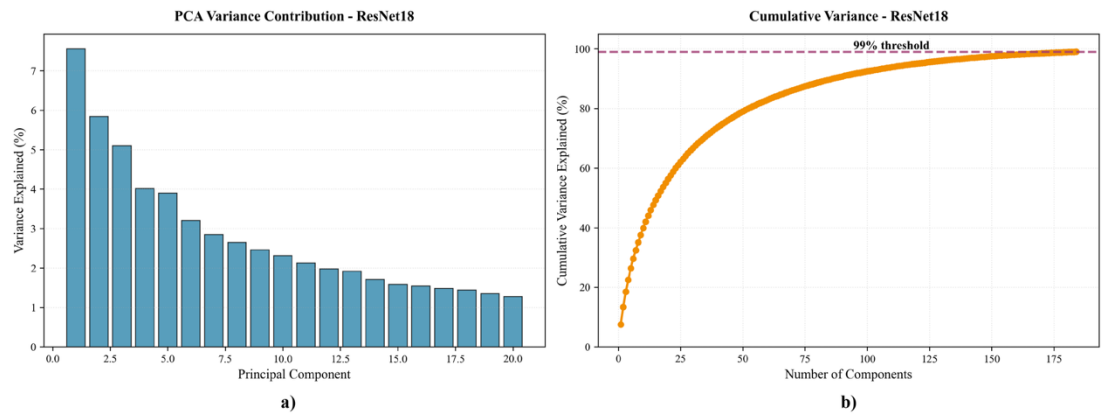
This section provides additional PCA diagnostics for the feature representations whose retained dimensionality is not illustrated in the main text.



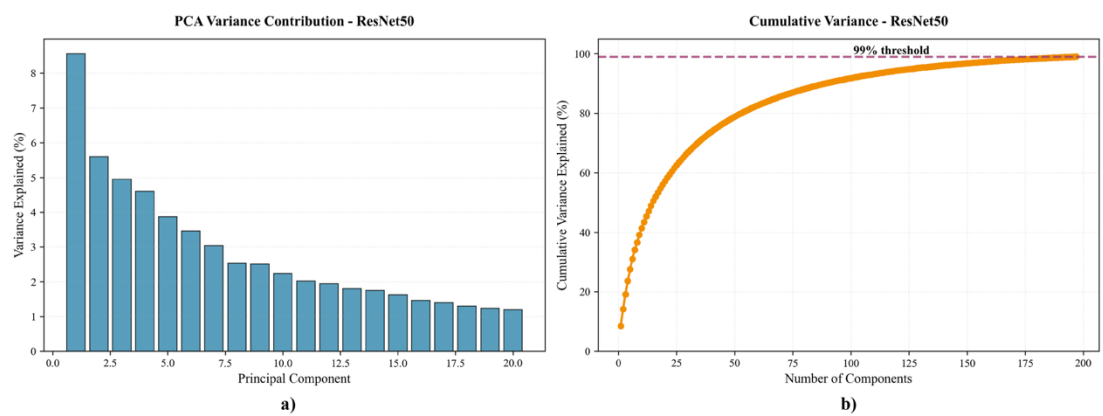
**Figure S1.** PCA analysis of the Color Histogram representation: (a) variance contribution of principal components, (b) cumulative explained variance.



**Figure S2.** PCA analysis of the HOG representation: (a) variance contribution of principal components, (b) cumulative explained variance.



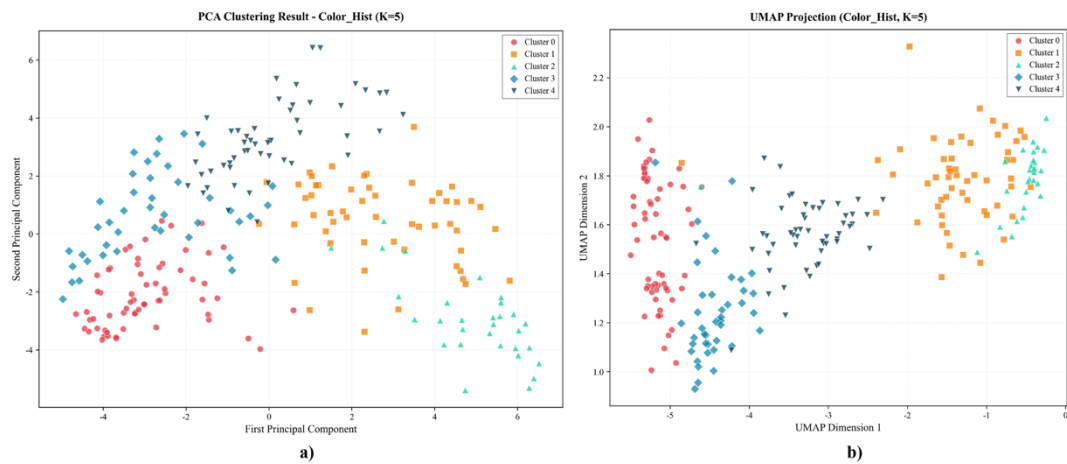
**Figure S3.** PCA analysis of the ResNet18 representation: (a) variance contribution of principal components, (b) cumulative explained variance.



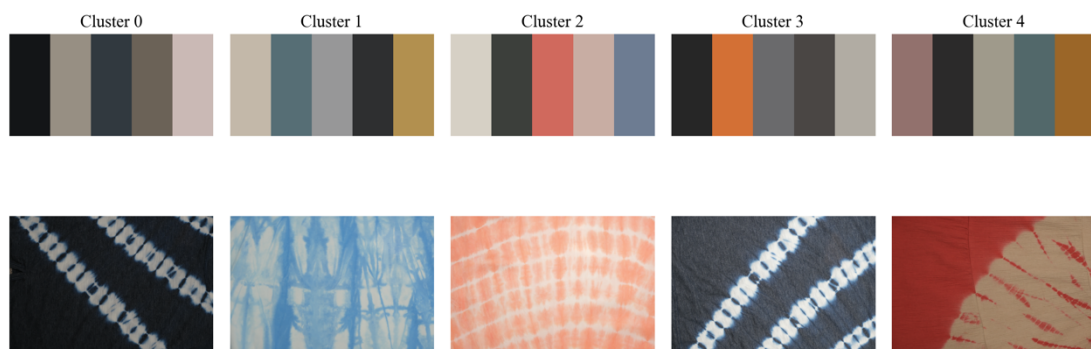
**Figure S4.** PCA analysis of the ResNet50 representation: (a) variance contribution of principal components, (b) cumulative explained variance.

## S2. Additional clustering results for Color Histogram

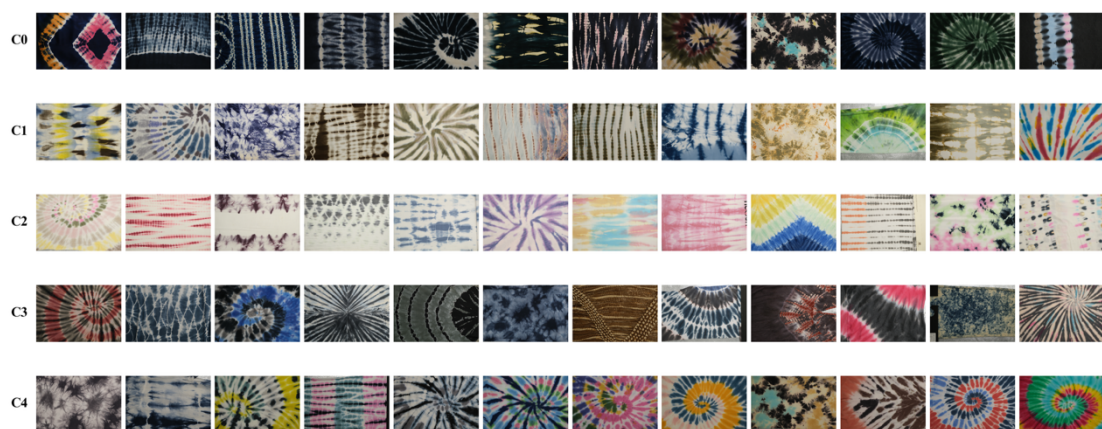
This section presents additional visual evidence for the clustering results obtained by Color Histogram under the unified setting of  $K = 5$ .



**Figure S5.** Low-dimensional visualisations of the clustering result obtained by Color Histogram at  $K = 5$ : (a) PCA projection, (b) UMAP projection.



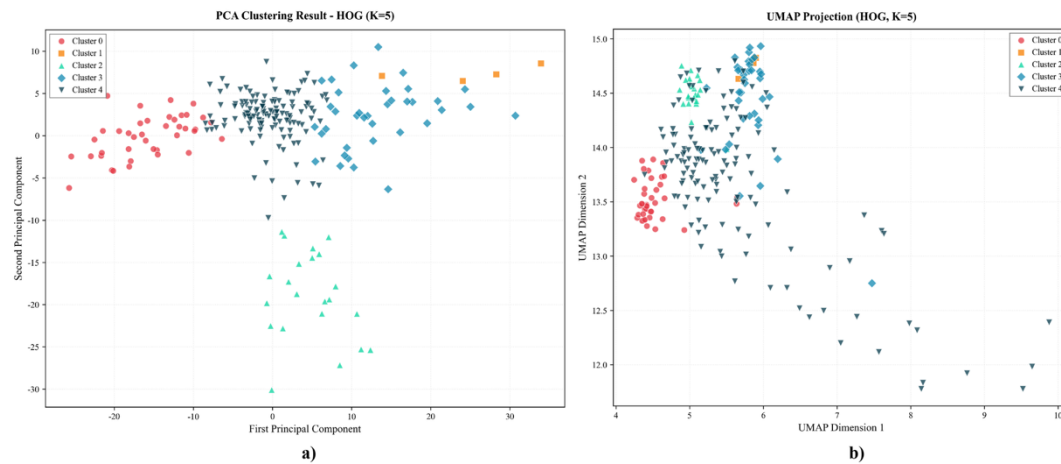
**Figure S6.** Five-colour palettes and centroid-proximal representative images for Color Histogram at  $K = 5$ .



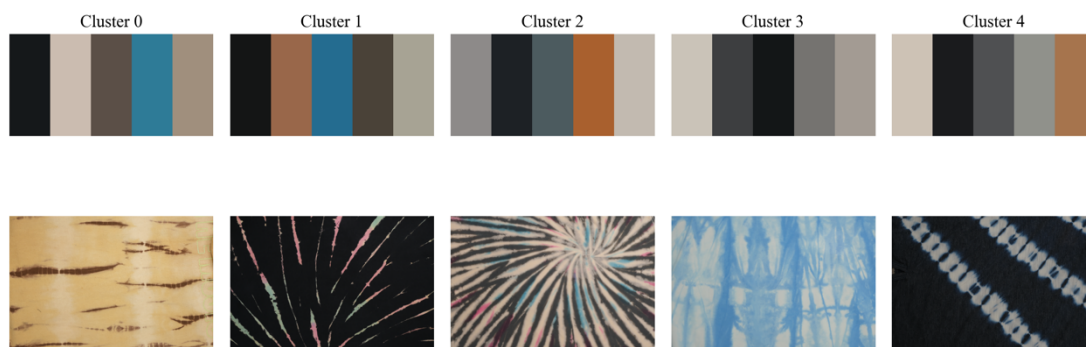
**Figure S7.** Cluster-sample panels for the five Color Histogram clusters at  $K = 5$ .

### S3. Additional clustering results for HOG

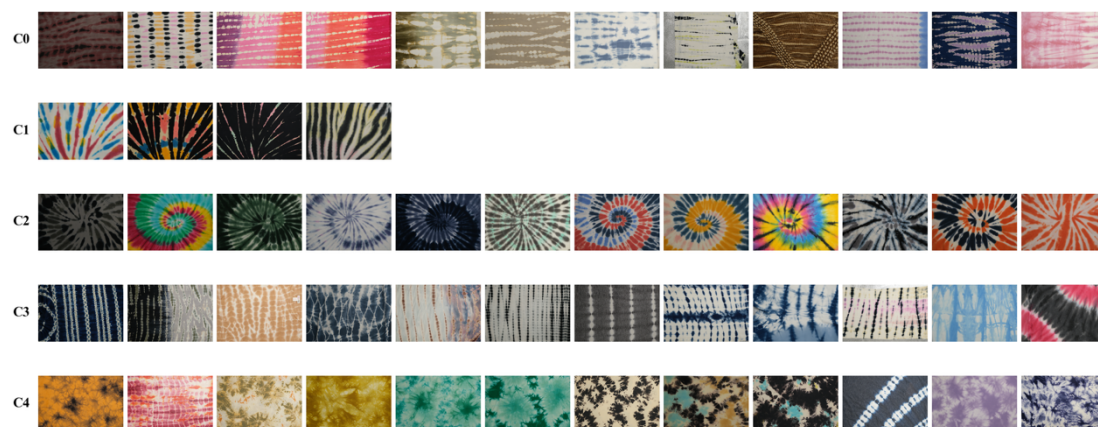
This section presents additional visual evidence for the clustering results obtained by HOG under the unified setting of  $K = 5$ .



**Figure S8.** Low-dimensional visualisations of the clustering result obtained by HOG at  $K = 5$ : (a) PCA projection, (b) UMAP projection.



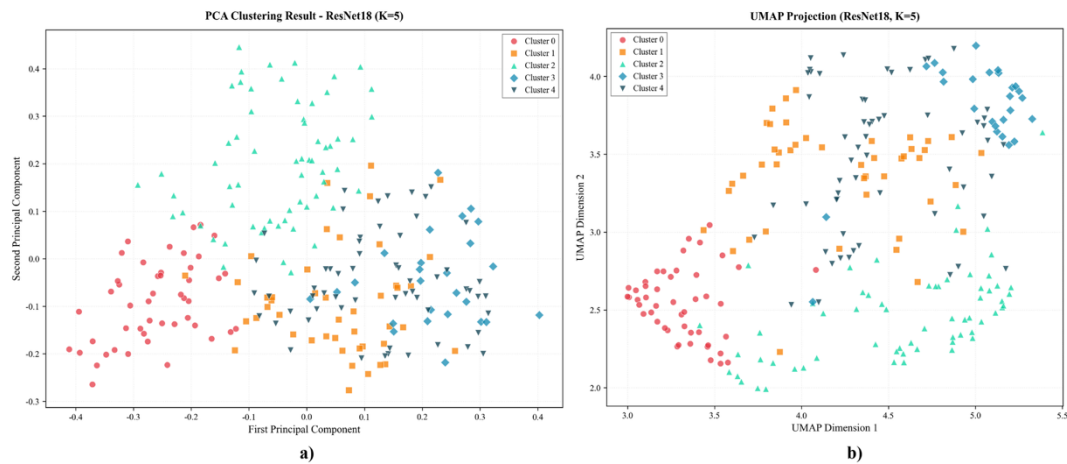
**Figure S9.** Five-colour palettes and centroid-proximal representative images for HOG at  $K = 5$ .



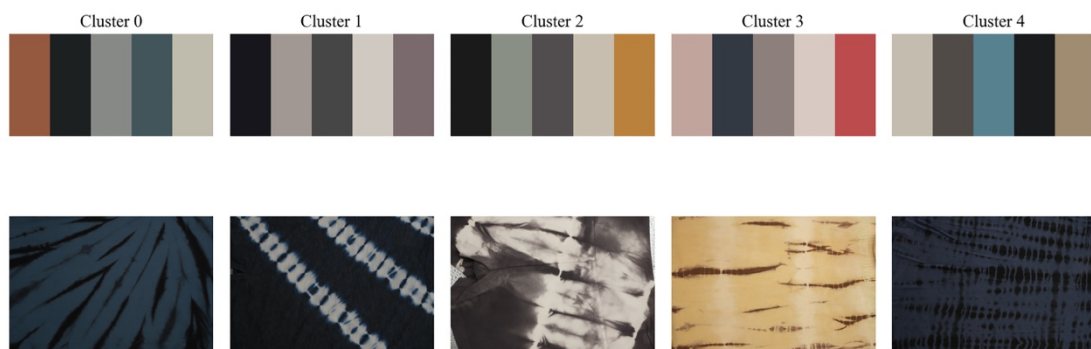
**Figure S10.** Cluster-sample panels for the five HOG clusters at  $K = 5$ .

## S4. Additional clustering results for ResNet18

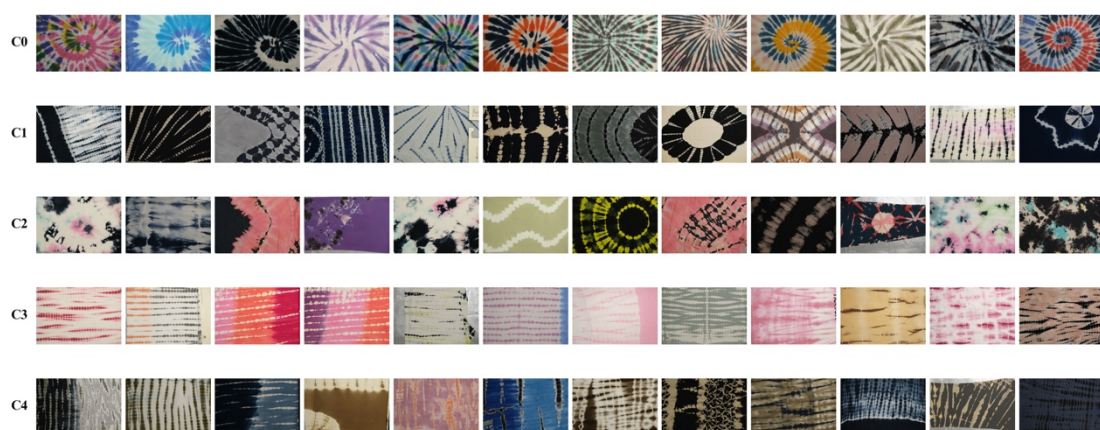
This section presents additional visual evidence for the clustering results obtained by ResNet18 under the unified setting of  $K = 5$ .



**Figure S11.** Low-dimensional visualisations of the clustering result obtained by ResNet18 at  $K = 5$ : (a) PCA projection, (b) UMAP projection.



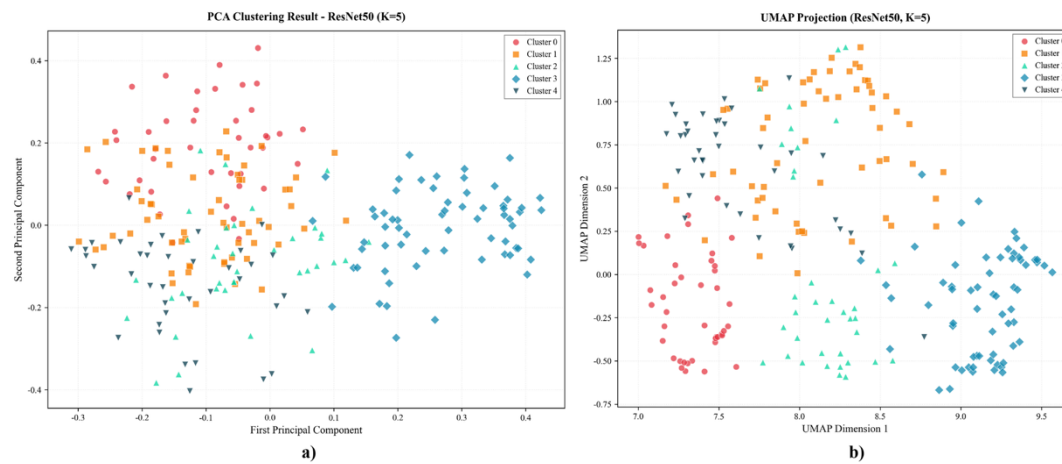
**Figure S12.** Five-colour palettes and centroid-proximal representative images for ResNet18 at  $K = 5$ .



**Figure S13.** Cluster-sample panels for the five ResNet18 clusters at  $K = 5$ .

## S5. Additional clustering results for ResNet50

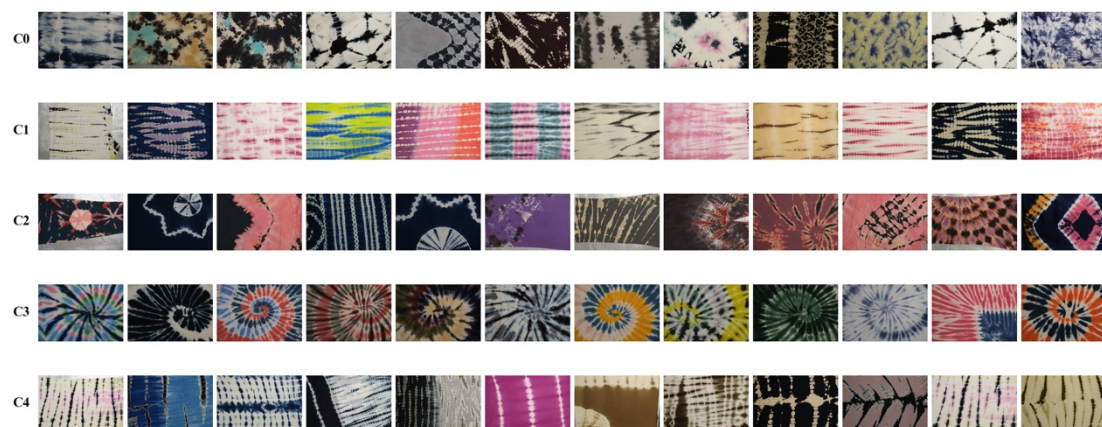
This section presents additional visual evidence for the clustering results obtained by ResNet50 under the unified setting of  $K = 5$ .



**Figure S14.** Low-dimensional visualisations of the clustering result obtained by ResNet50 at  $K = 5$ : (a) PCA projection, (b) UMAP projection.



**Figure S15.** Five-colour palettes and centroid-proximal representative images for ResNet50 at  $K = 5$ .



**Figure S16.** Cluster-sample panels for the five ResNet50 clusters at  $K = 5$ .