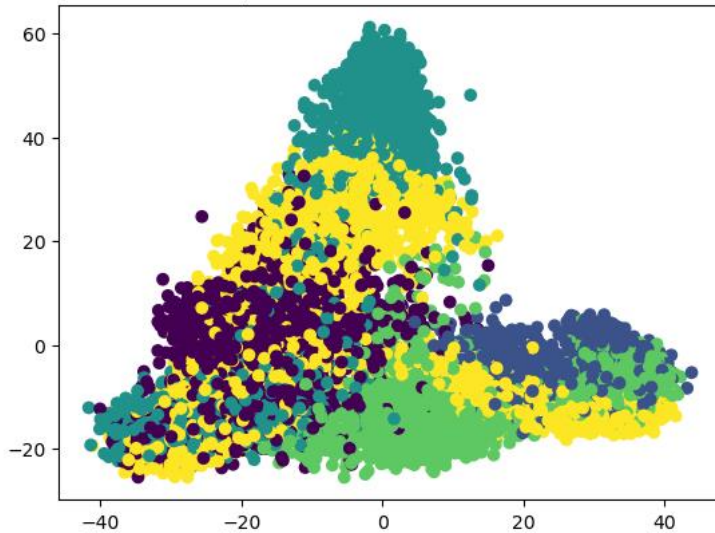


Question4:

PCA plot of features with true labels



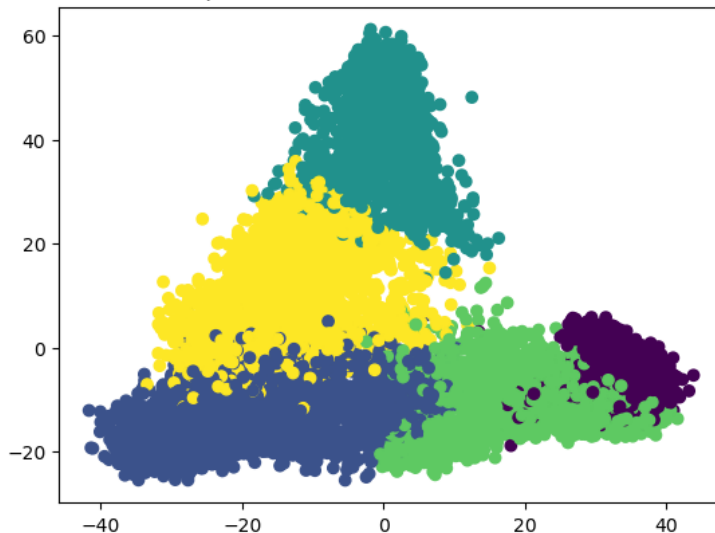
PCA plot of features with true labels interpretation

In this plot, the encoding features of a multi-class classification problem have been visualized using the first two principal components obtained from PCA. The plot has five different colors to represent the labels or classes.

The points or clusters that are closer together in the plot represent encoding features that are more similar in nature. Conversely, points that are further apart from each other indicate encoding features that are more distinct from each other.

The fact that some clusters are overlapping suggests that the features belonging to those classes are not clearly separable based on the first two principal components. This indicates that the classification model may have difficulty in accurately distinguishing between those classes based on those features.

PCA plot of features with K-means clusters

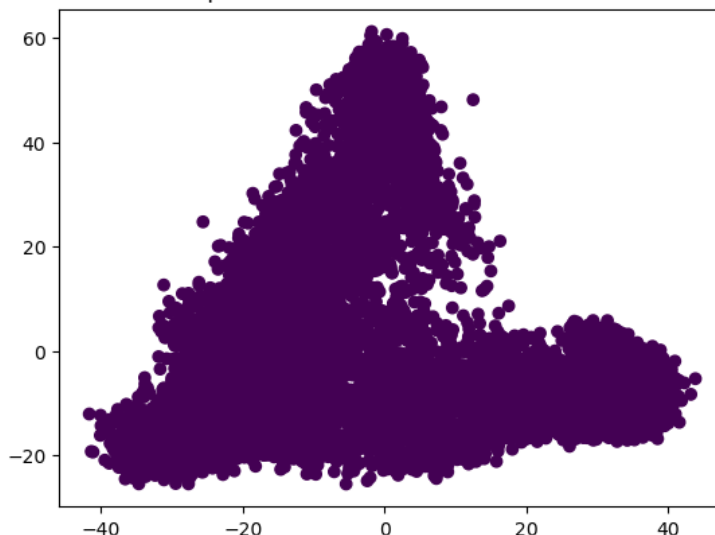


PCA plot of features with K means cluster interpretation.

The PCA plot of features with K-means clustering algorithms shows the distribution of the encoded features after clustering them into 5 different groups using the K-means algorithm. Each data point in the plot represents a single encoded feature and is colored according to its assigned cluster. The plot shows that the clusters are well separated, indicating that the K-means algorithm has successfully grouped similar features together.

The clusters are visually separable, which suggests that the features have been extracted and clustered effectively. The fact that the clusters are not overlapping suggests that the K-means algorithm was able to identify distinct patterns in the feature space. Overall, the plot shows that the encoding and clustering processes were successful and that the resulting clusters are well-defined.

PCA plot of features with DBSCAN clusters



PCA plot of features with DB Scan cluster interpretation.

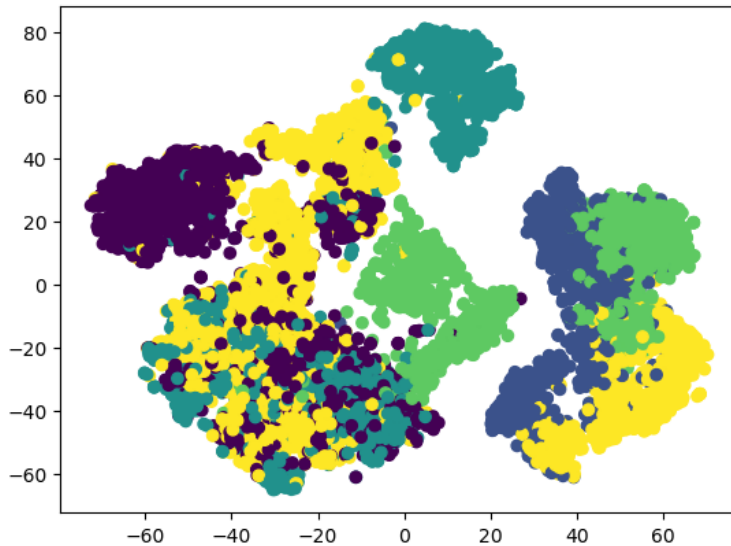
we applied dbscan clustering algorithms on the features extracted from our designed model to cluster the data points based on their similarities.

We visualized the clustering results using a PCA plot of the first two components, with each data point colored according to its true class label.

The plot showed that for the five classes, only one cluster was obtained, indicating that the data points in each class were not well separated based on the selected features.

This suggests that further feature engineering or the use of more sophisticated clustering algorithms may be necessary to achieve better separation and clustering of the data points in this classification task.

t-SNE plot of features with true labels

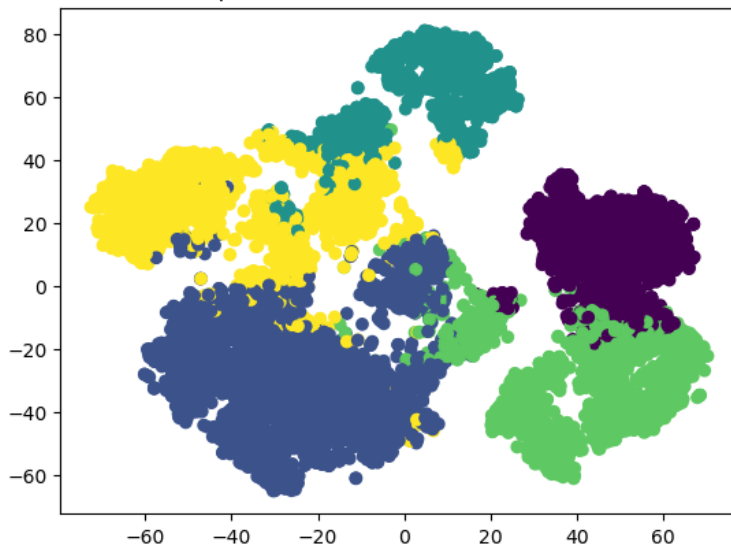


TSNE plot of features with true labels interpretation.

The plot shows the features in a two-dimensional space, where each point represents a feature and the color represents the true label of that feature. There are five classes in the data, and it appears that some of the classes have overlapping points, indicating that the features for those classes may be similar or difficult to distinguish from one another based on the extracted features.

Here, we can see that that features from the few classes are overlapped with each other which indicates that the few encodings of the classes are very similar. For example, sneakers and ankle boots or sweatshirts vs coats.

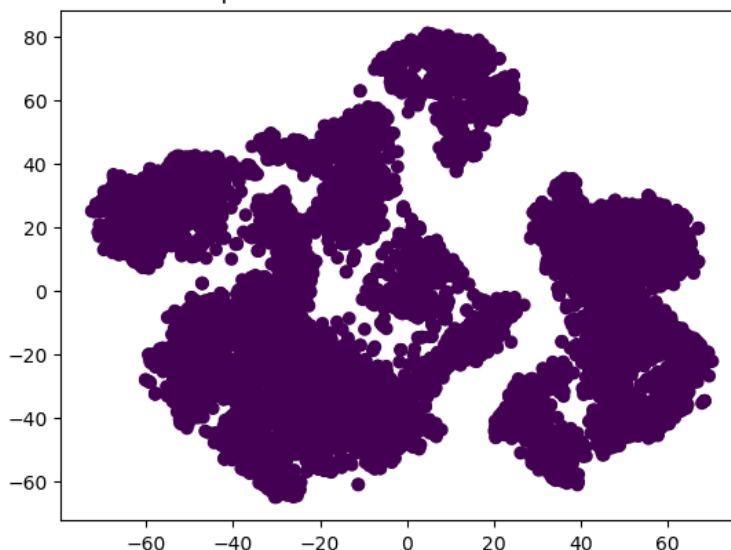
t-SNE plot of features with K-means clusters



TSNE plot of features with K means cluster interpretation.

The resulting plot shows the data points colored according to the K-means clustering algorithm. The plot has 5 classes and it appears that the classes and clusters are well separated, which indicates that the K-means algorithm was able to successfully group similar data points together. This could suggest that the model's feature extraction is effective in separating the different classes, and that K-means clustering is a suitable method for further analysis of the data.

t-SNE plot of features with DBSCAN clusters



TSNE plot of features with DB Scan cluster interpretation.

The t-SNE plot of features with DBSCAN clusters suggests that the DBSCAN algorithm was not able to effectively separate the features into distinct clusters for the five classes. Instead, all the points appear to be grouped into a single cluster. This may indicate that the features are too closely grouped together or that the algorithm was not set up correctly for the given data.

Conclusion:

The results obtained from the different analysis of the given dataset have revealed some interesting findings. The class activation map has provided insights into the 5 classes present in the dataset, namely t shirt, Sandals, trousers, bag, and coats.

based on the results obtained from the PCA plot of features with K-means clustering and t-SNE plots, it can be concluded that the 5 identified classes are valid and well-separated. Class 0 corresponds to tshirt/shirt/top, class 1 to Sandal, class 2 to trousers/pullovers, class 3 to bags/sneakers, and class 4 to coat/dress/ankle boots.

Using the known labels and visualizing the samples.

