Fashion MNIST Classification

Classifying clothing items in the Fashion MNIST dataset using neural network models.

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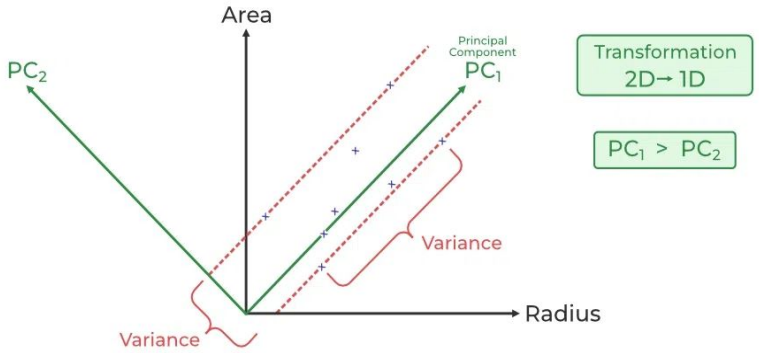
Project Overview

- Approach: Develop two models - one without dimensionality reduction and one with PCA-based dimensionality reduction.

- Objective: Classify clothing items in the Fashion MNIST dataset using neural network models.

Explaining PCA

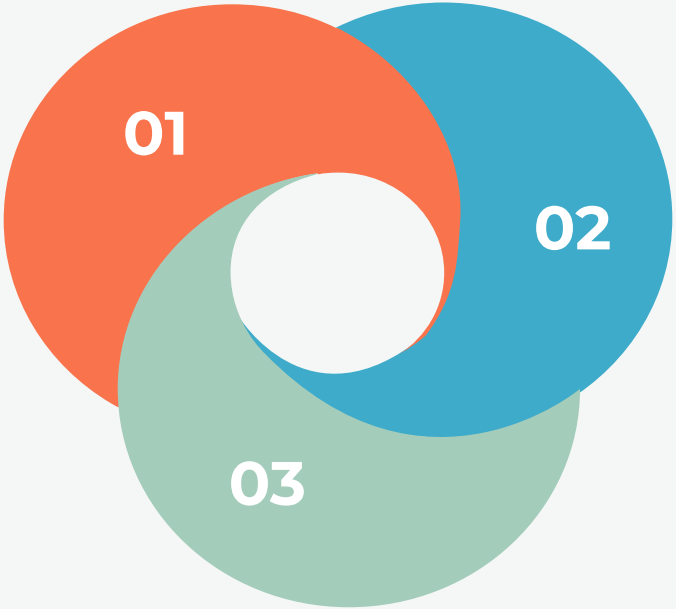


01 PCA is a way to reduce dimensions by casting a ‘view’ on the data

02 Looking at it diagrammatically helps us understand it better

Data Loading and Preprocessing

Loaded Fashion MNIST dataset using TensorFlow.



Normalized pixel values to a range between 0 and 1.

Split data into training (70%), validation (15%), and test sets (15%).

Model 1 - Baseline NN

- Designed a simple neural network architecture for classification with 128 neurons in the middle layer
- Trained the model on the training data with appropriate hyperparameter tuning and such as choosing appropriate activation function(relu & softmax)
- Achieved a validation accuracy of approximately 88.64%.
- Test accuracy: 88.11%.

Model 2 - PCA-NN

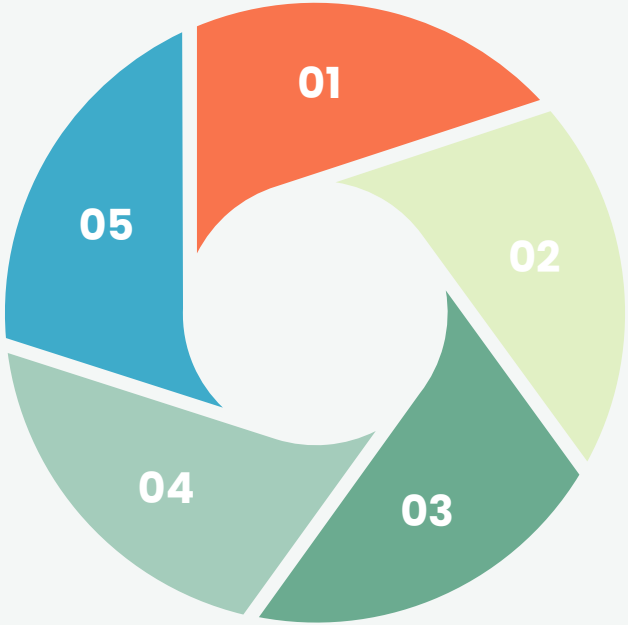
01 Applied PCA to the training data for dimensionality reduction.

02 Chose a suitable number of principal components based on explained variance analysis.

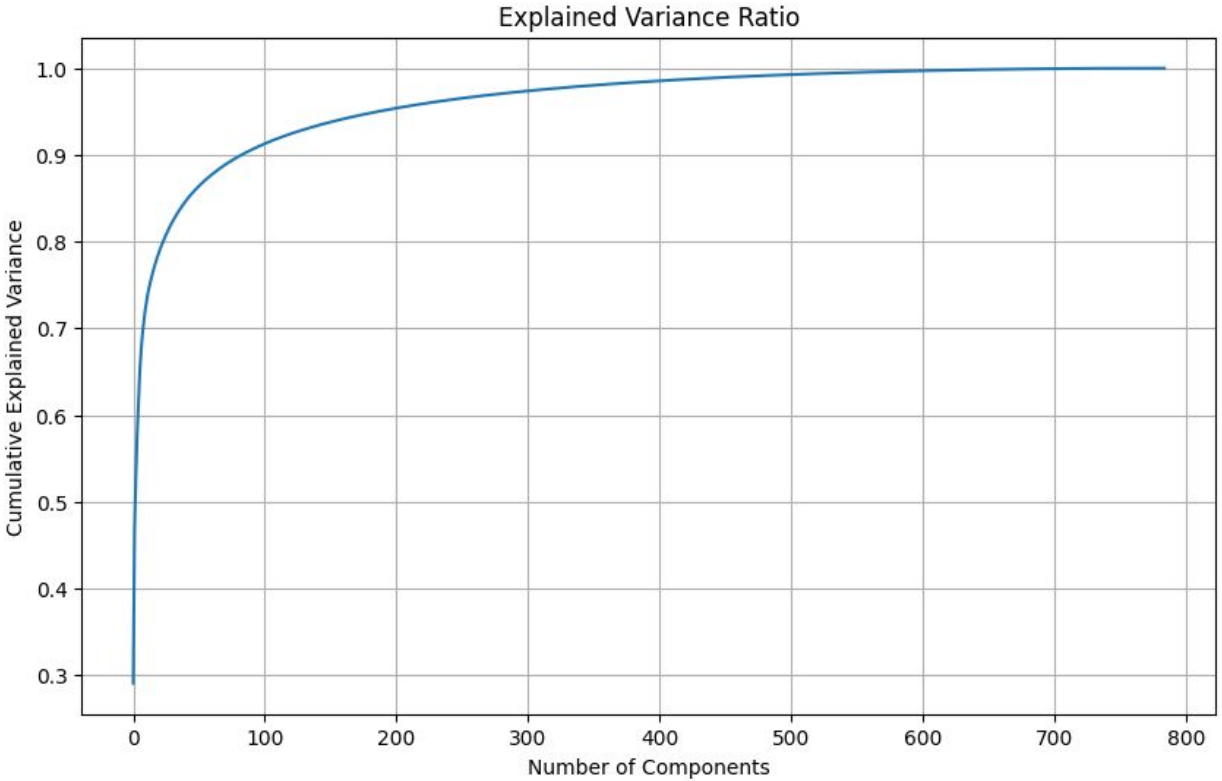
03 Test accuracy: 88.75%.

04 Achieved a validation accuracy of approximately 88.83%.

05 Trained a new neural network model using the transformed data.

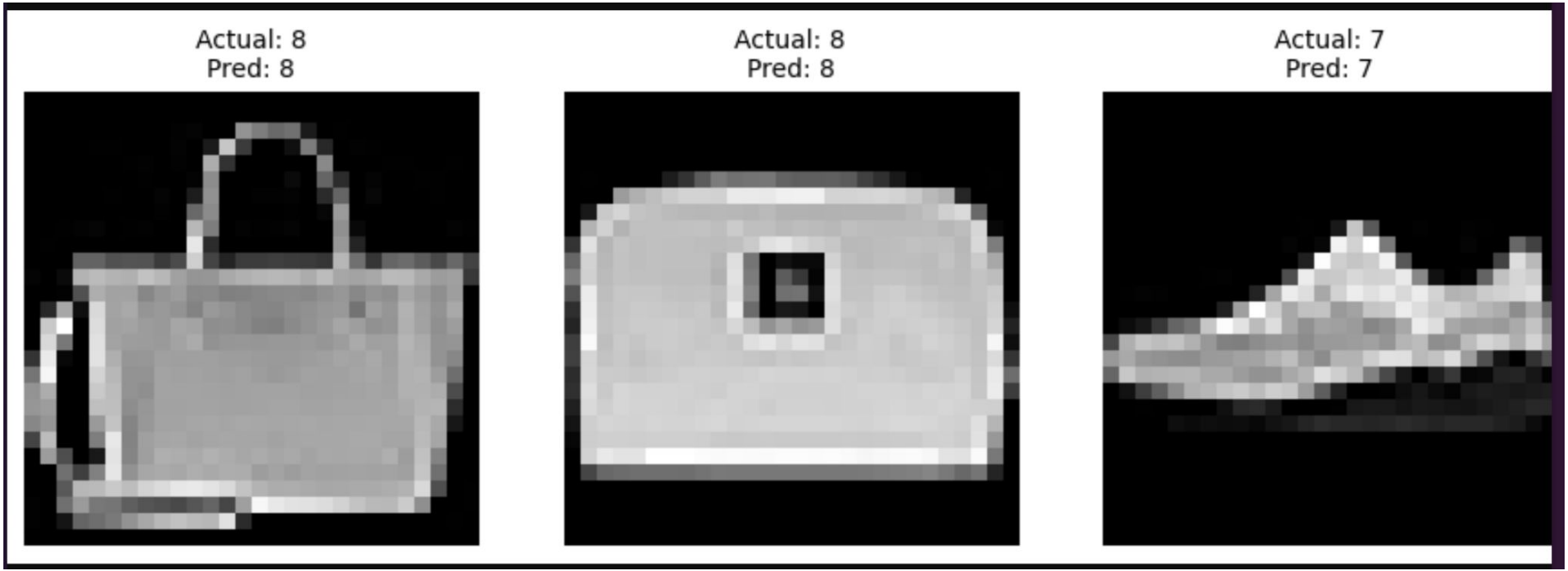


Explaining the Variance Curve

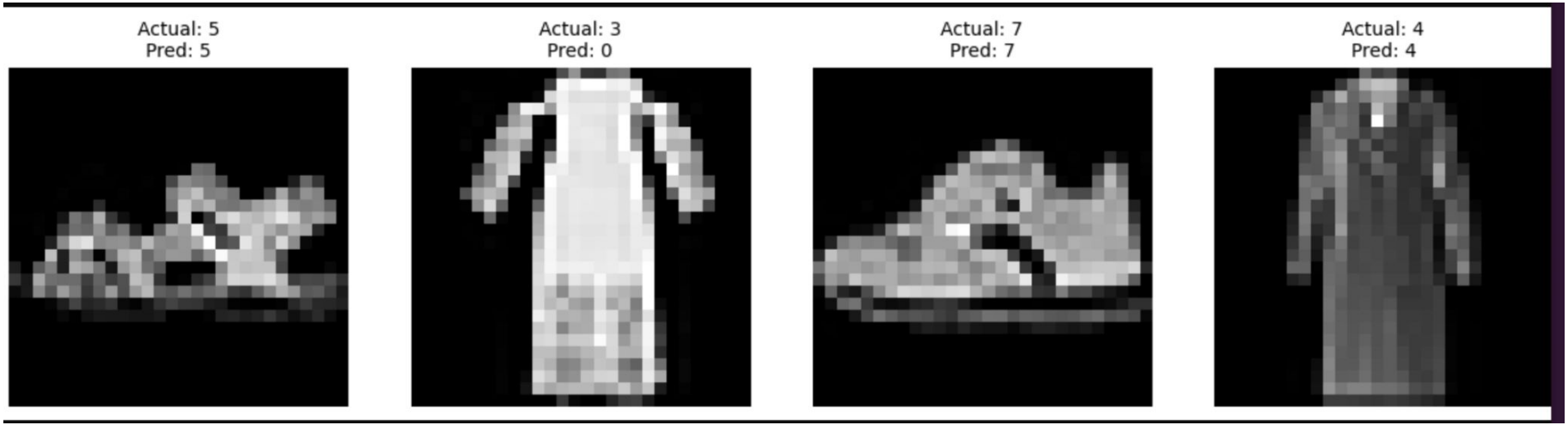


Comparing Samples

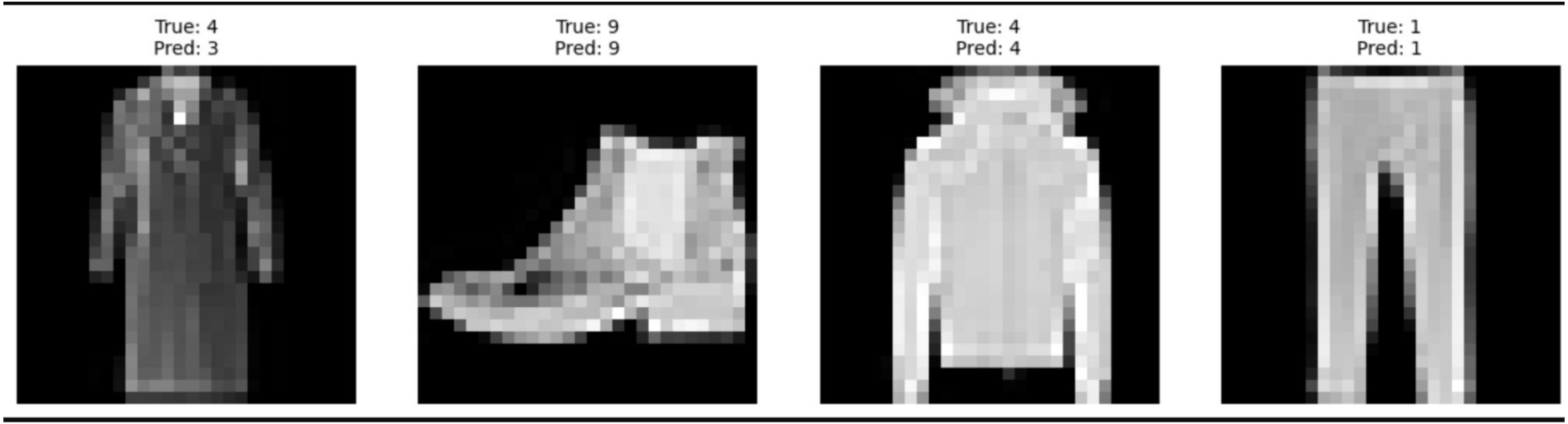
Non-PCA NN:



Non PCA NN:



PCA NN:



Comparison and Analysis

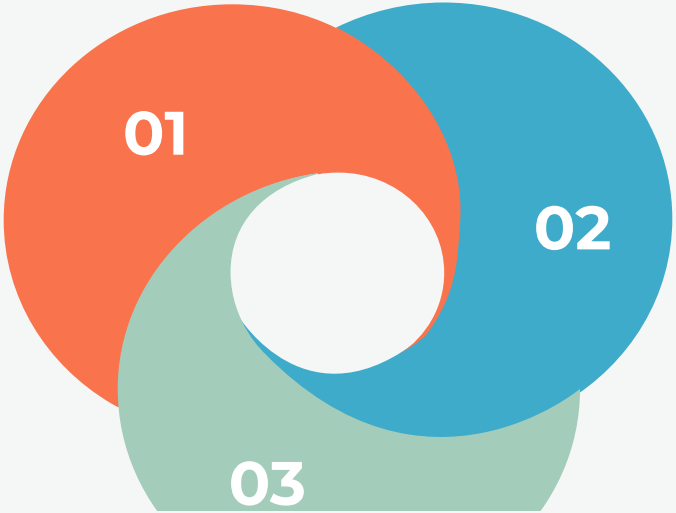
01 Dimensionality reduction via PCA improved computational efficiency without significantly impacting accuracy.

02 Both models achieved similar accuracies on the test set.

03 The PCA-NN model exhibited shorter training time compared to the non-PCA NN model (39.03 seconds vs. 68.27 seconds).

Conclusion

- PCA proved effective for enhancing the efficiency of neural network models in classifying Fashion MNIST images.



- The PCA-NN model achieved comparable accuracy to the non-PCA NN model while requiring less training time.

- Dimensionality reduction techniques like PCA offer practical solutions for improving the scalability and efficiency of machine learning models.

Questions