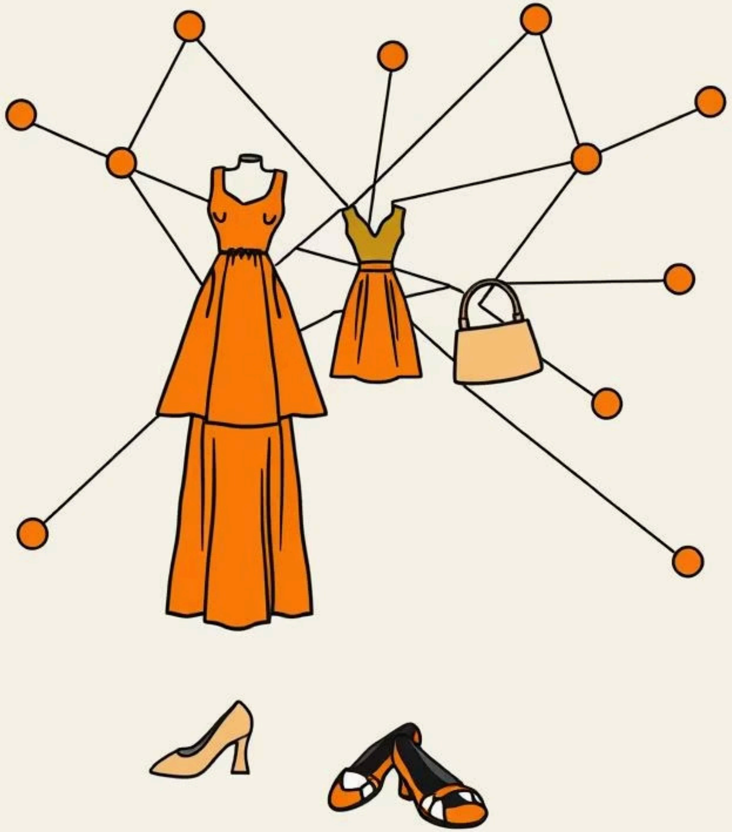


Deep Learning Classification with Fashion-MNIST

Unveiling the power of Convolutional Neural Networks (CNNs) for image classification on the Fashion-MNIST dataset.

Introduction to Fashion-MNIST

A Modern Benchmark

- Replacing the traditional MNIST, Fashion-MNIST offers a more challenging yet realistic benchmark for image classification algorithms.
- Comprises 70,000 grayscale images of clothing items across 10 categories, each 28x28 pixels.

Dataset Overview and Preprocessing

Data Loading

Utilising Keras/TensorFlow to load the 60,000 training and 10,000 test images.

Image Reshaping

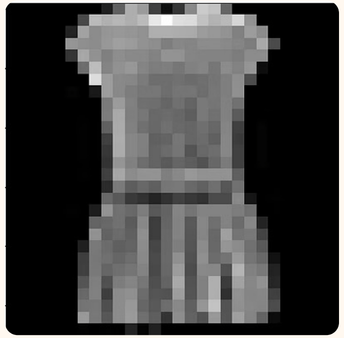
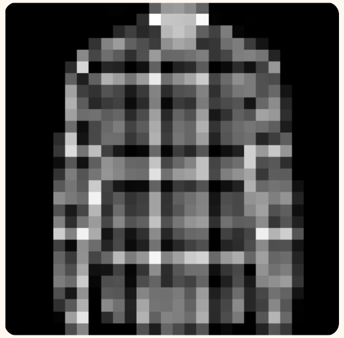
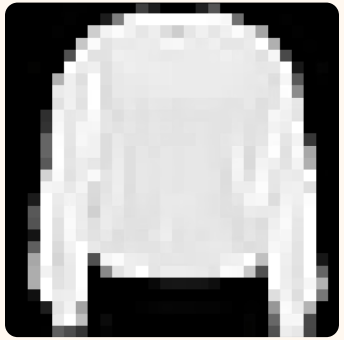
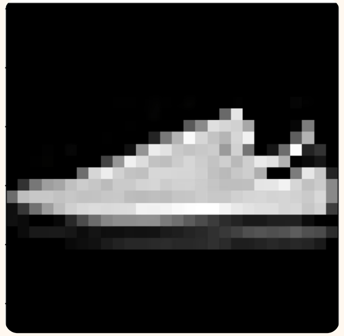
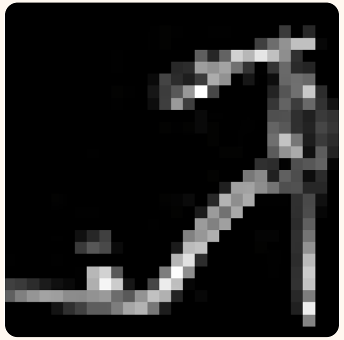
Reshaping images to (28, 28, 1) for CNN compatibility, adding the channel dimension.

Pixel Normalization

Scaling pixel values from [0, 255] to [0, 1] for stable training and improved performance.

Data Exploration: Visualising the Dataset

A glimpse into the diversity and complexity of the Fashion-MNIST dataset.


Convolutional Neural Network (CNN) Architecture

Our chosen CNN architecture for effective feature extraction and classification.

Input Layer

Receives 28x28 grayscale images.

Convolutional Layers (x4)

Progressive feature extraction with ReLU activation, followed by MaxPooling layers for downsampling.

Flatten Layer

Converts 2D feature maps into a 1D vector for input to the dense layers.

Dense Layers

Fully connected layers for learning complex patterns.

Output Layer

10 neurons with Softmax activation for multi-class classification.

Model Configuration and Training

Optimizer

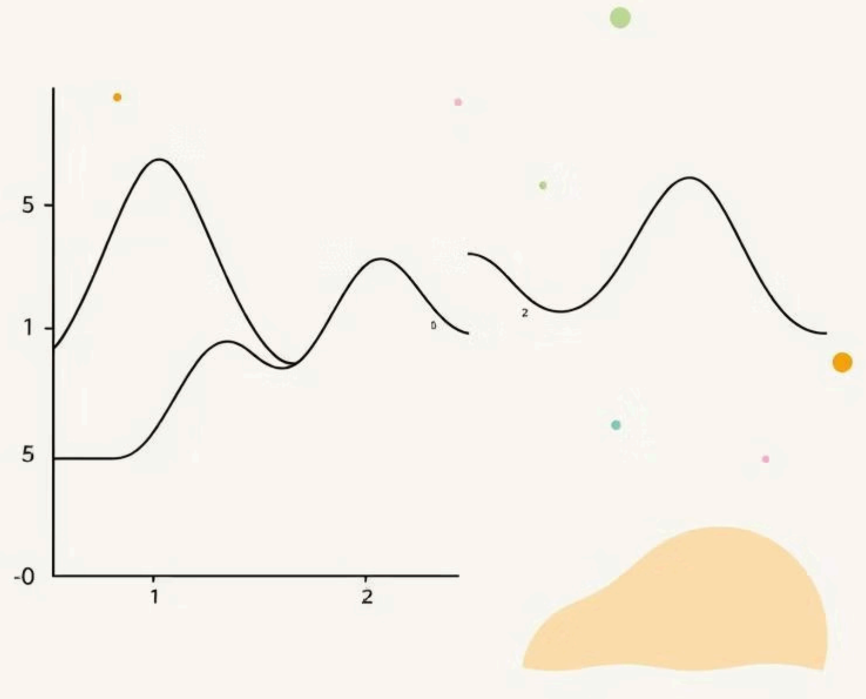
Adam optimizer selected for its efficiency and effectiveness in deep learning.

Loss Function

Sparse Categorical Crossentropy for handling integer-encoded labels in multi-class problems.

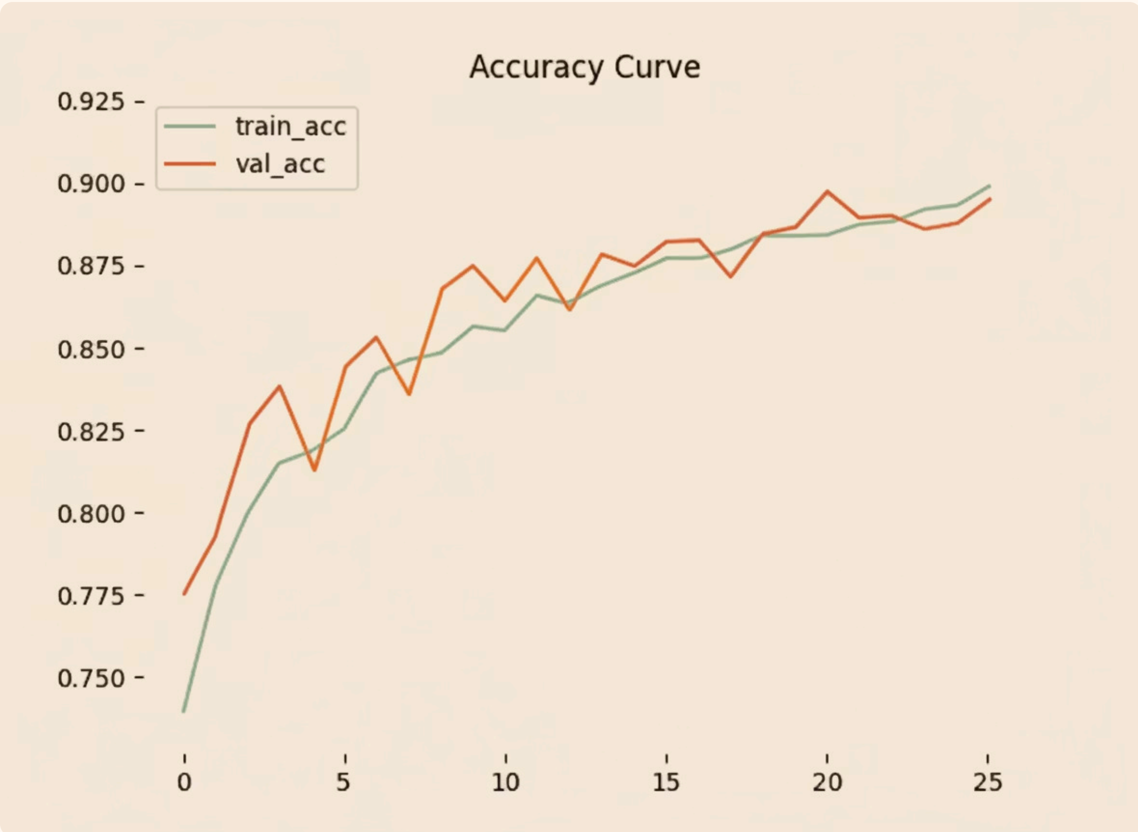
Metrics

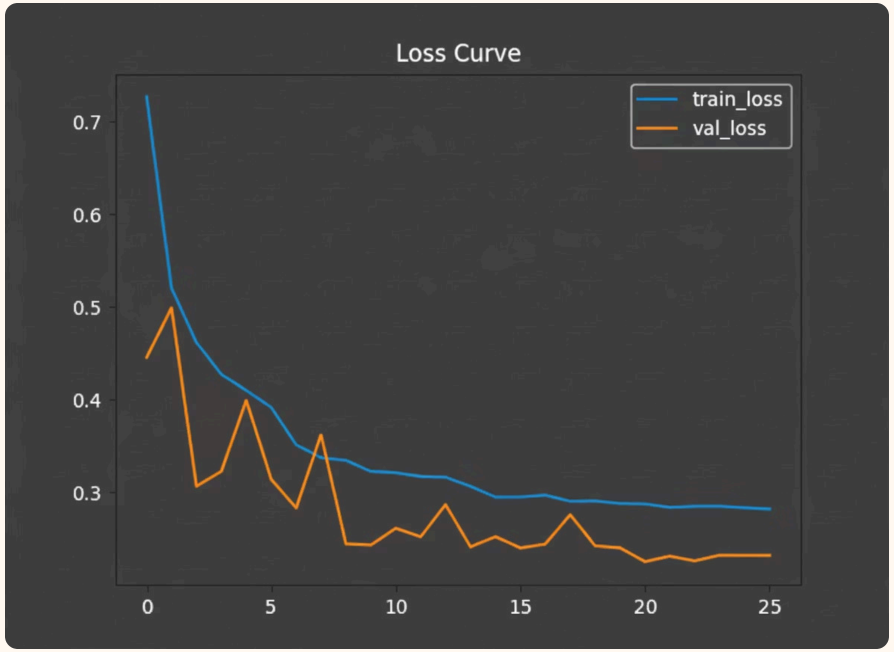
Accuracy metric to evaluate the model's performance during training and testing.



Training Progress: Loss and Accuracy

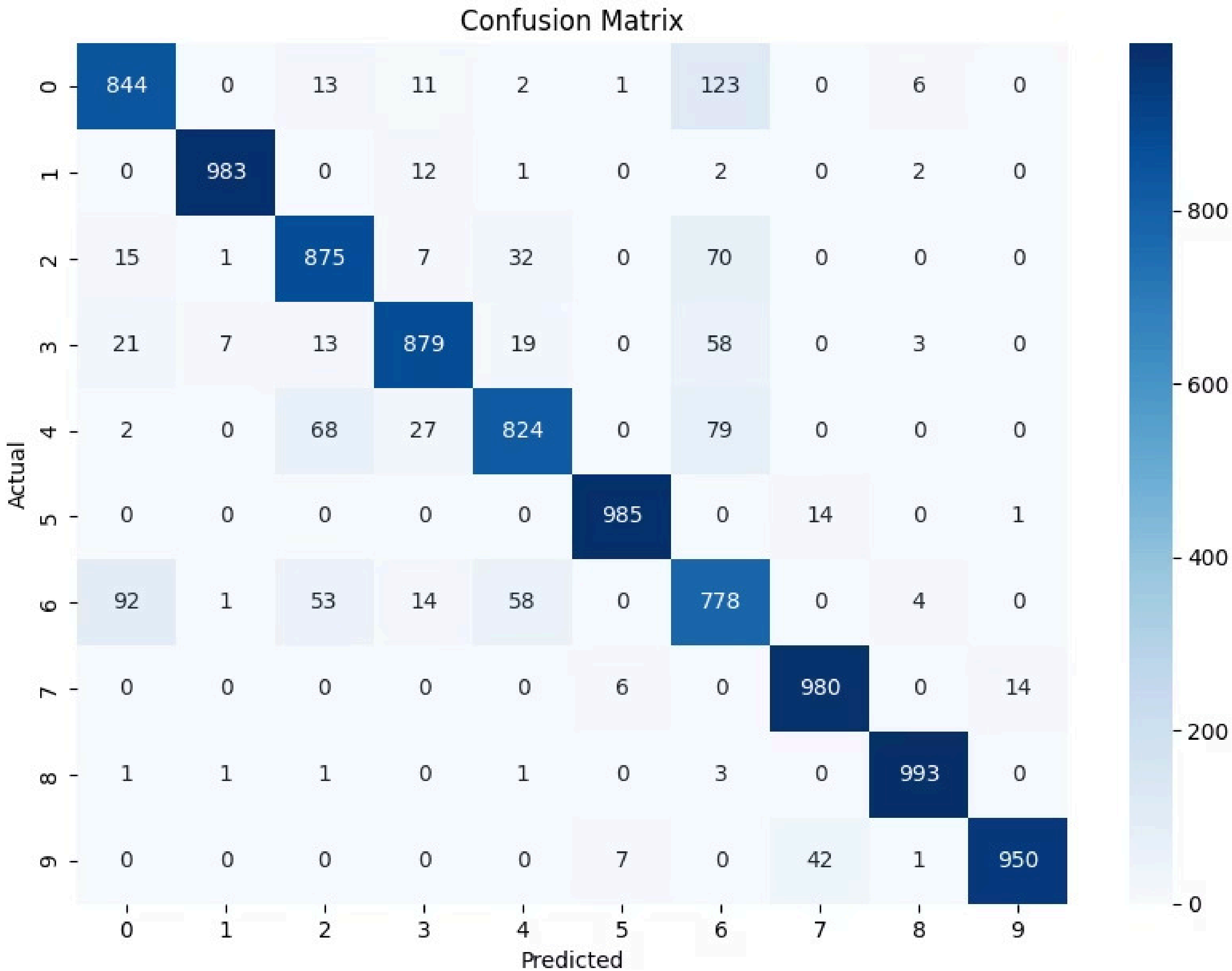
Visualising the model's learning journey over epochs.

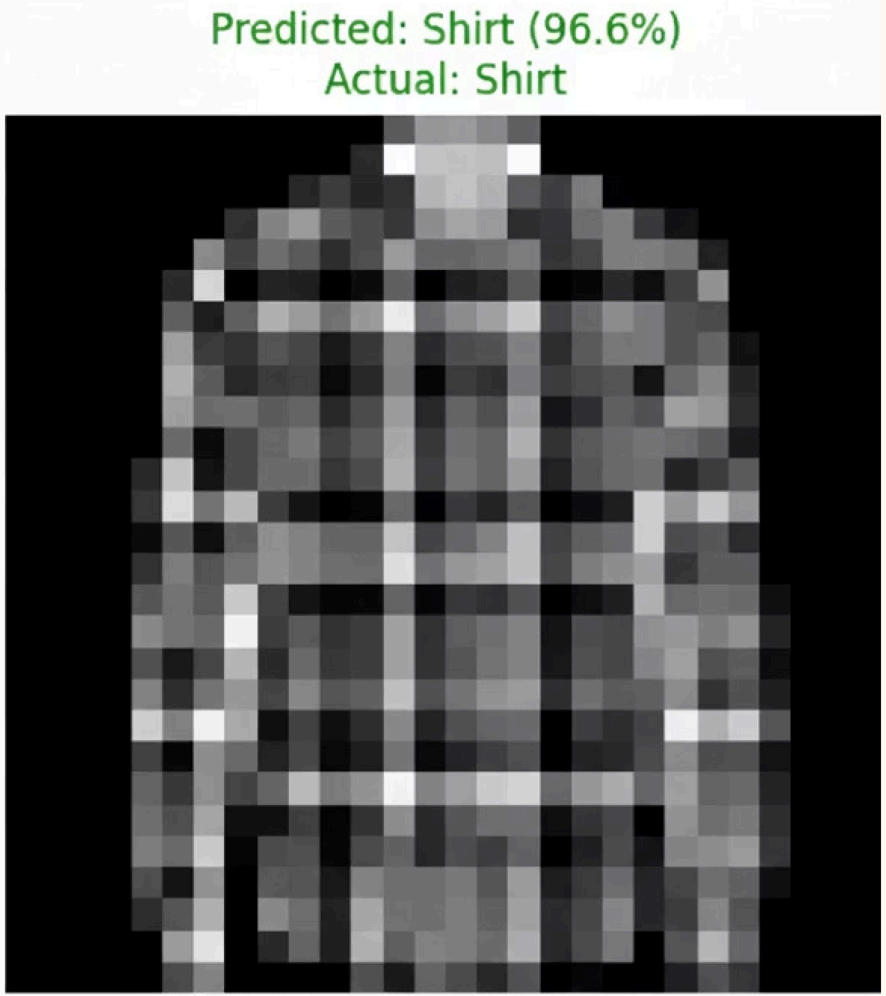




Training and validation loss decreasing, while accuracy increases, indicating effective learning.

confusion Matrix





Test Results: Performance Snapshot

91%

Test Accuracy

The model achieved a robust 91% accuracy on unseen test data, demonstrating strong generalization capabilities.

4

CNN Layers

A relatively simple CNN with four

convolutional layers proved effective for this task.

10

Categories

Successful classification across all ten distinct fashion item categories.

Conclusions and Future Work

Successful Classification

Our simple CNN model effectively classified Fashion-MNIST images, achieving 91% test accuracy using Keras/TensorFlow.

Potential Enhancements

Further improvements could involve data augmentation, more complex architectures (e.g., ResNet), or transfer learning.

Real-world Applications

This project lays the groundwork for practical applications in e-commerce product recognition and fashion recommendation systems.

Project Team 4

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