Tech Horizon Internship Tasks

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Introduction

This report summarizes my approach, challenges, and outcomes for the three final tasks completed as part of the Tech Horizon deep learning internship.

Task 1: Handwritten Digit Classification (MNIST)

Approach: Built a custom neural network model to classify handwritten digits using the MNIST dataset. Data was normalized and reshaped to fit the model input. The model achieved high accuracy on the test set.
Challenges: Ensuring the correct input shape, dealing with overfitting, and determining the optimal architecture. I experimented with different numbers of neurons in each layer, multiple configurations of layers, and trained the model multiple times to find the best performing setup. Overfitting was mitigated through normalization and careful tuning of epochs.
Outcome: Successfully trained and saved the model, later integrated into a Streamlit-based web app for live digit prediction.

Task 2: Image Classification using MobileNetV2

Approach: Used MobileNetV2 pre-trained on ImageNet for direct image classification without additional finetuning. The model was loaded with `MobileNetV2(weights='imagenet')` and applied to a set of test images. A preprocessing pipeline was created to resize images to 224x224, convert them into arrays, normalize them using `preprocess_input`, and pass them to the model for prediction. The top 3 predicted classes were extracted using `decode_predictions`.
Challenges: Ensuring that all input images were compatible with MobileNetV2's expected format, which included resizing to the exact target size and applying the correct preprocessing. Another challenge was visualizing both the original images and their predictions in a clean layout, which required working with Matplotlib subplot arrangements.
Outcome: Successfully classified test images with high accuracy and displayed both the preview of input images and their predicted labels with confidence scores.

Task 3: Digit Recognition Web Application

Approach: Developed a Streamlit app that allows users to draw digits on a canvas, processes the drawing, and uses the trained MNIST model for prediction. Displayed the predicted digit, confidence level, and class probability chart.
Challenges: The most time-consuming challenge was that initially, when drawing on the canvas, the image was processed as a white background with a black digit, while the MNIST model expected a black background with a white digit. This mismatch caused the model to predict the digit '3' almost every time. It Page 1
took approximately three days to identify and fix this issue by inverting the colors to match the MNIST format. Other challenges included reshaping the image to match model input dimensions and handling preprocessing steps efficiently.
Outcome: Fully functional app with clean UI, real-time predictions, and graphical visualization, solving all preprocessing issues.

Conclusion

These tasks enhanced my skills in deep learning, transfer learning, and full-stack AI application development. I learned to address both modelling and deployment challenges, creating solutions that are accurate, efficient, and user-friendly.