Assignment-4

Course: 2025W-T3 AML 3104 - Neural Networks and Deep Learning 01

Name: Devansh Patel (C0928483)

Submitted to: Ishant Gupta

1. Introduction

This project involves building a Convolutional Neural Network (CNN) to classify images from the Intel Image Classification dataset. The dataset includes 25,000 images across six categories: buildings, forest, glacier, mountain, sea, and street.

2. Data Loading and Preprocessing

ImageDataGenerator was used to load the dataset, rescaling the pixel values to fall between 0 and 1.

- Training (80%) and validation (20%) sets of data were separated.
- For the last assessment, the test set was loaded independently.
- To verify correct data loading, some photos with labels were shown.

3. Model Architecture

The following layers were included in the CNN model's design:

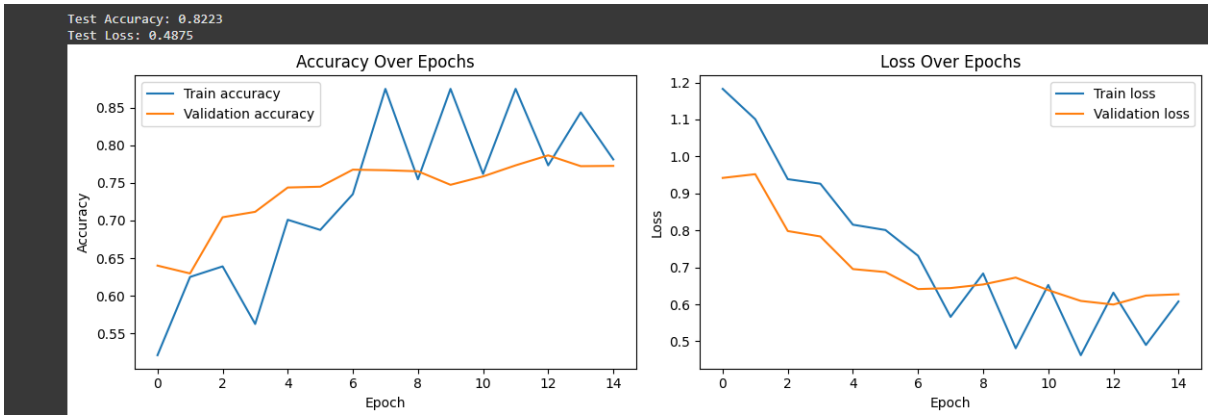
- **Input Layer:** Shape (150, 150, 3) for RGB pictures is the input layer.
- **Convolutional Layers:** MaxPooling layers come after three convolution layers with 32, 64, and 128 filters.
- **Dropout Layer:** To avoid overfitting, a dropout layer was added.
- **Dense and Flatten Layers:** ReLU-activated layers that are fully connected.
- **Output Layer:** For multi-class classification, a dense layer with Softmax activation is used.

Compilation Details:

- **Loss Function:** categorical_crossentropy
- **Optimizer:** adam
- **Metrics:** accuracy

4. Model Training

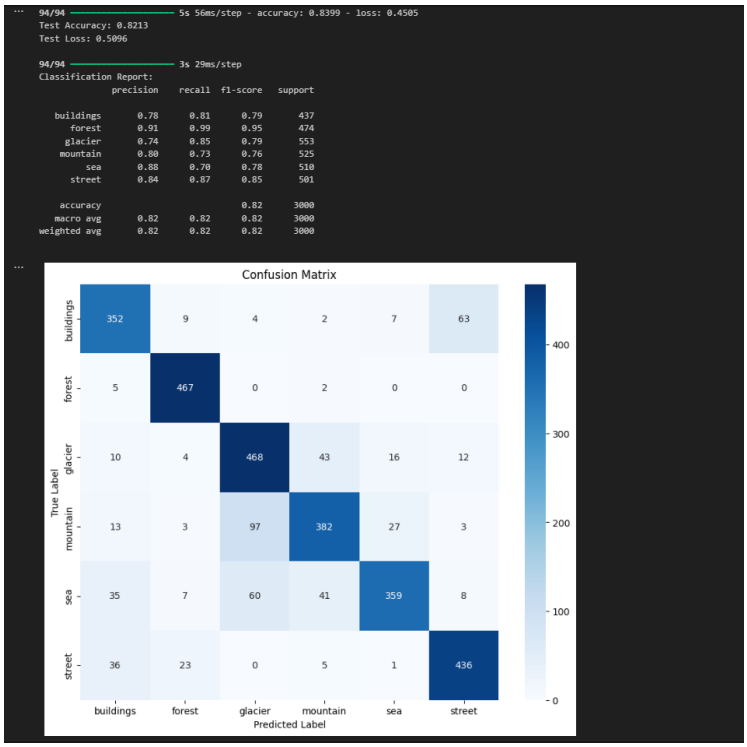
- The model was trained for **15 epochs** with a **batch size of 32.**
- Accuracy and loss graphs for both training and validation were plotted.



5. Model Evaluation

- On the test set, the model achieved a **test accuracy of 82.13%.**
- A **confusion matrix** was generated to analyze misclassified images.
- Precision, recall, and F1-score metrics were included to provide deeper insights into performance.

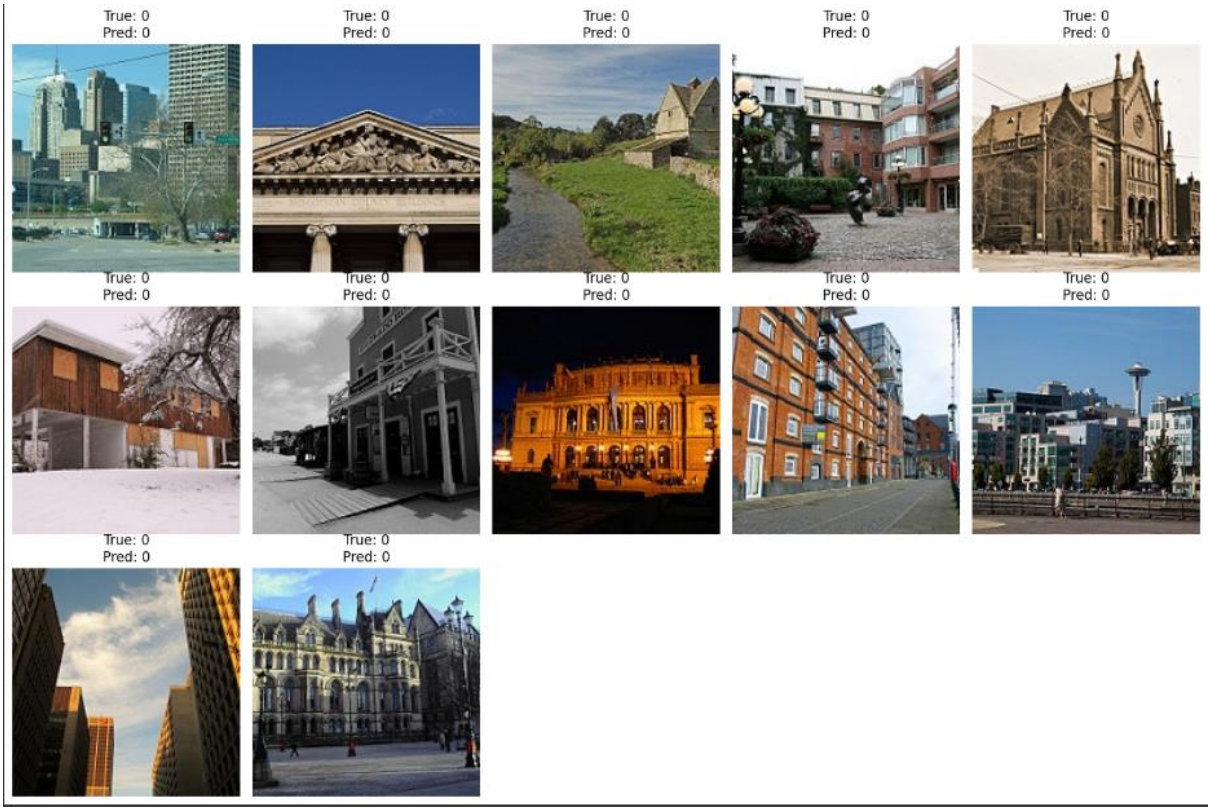
Confusion Matrix:



6. Visualization and Interpretation

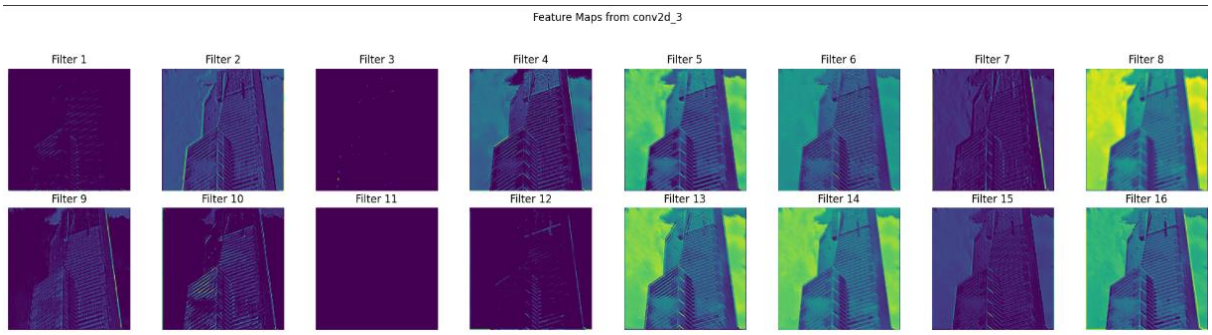
- Misclassified images were displayed alongside their actual and predicted labels for analysis.

Misclassified Image:



- Feature maps from the first convolutional layer were visualized to observe feature extraction patterns.

Feature map:



7. Conclusion

With encouraging findings, this experiment successfully used a CNN to identify photos of real-world scenes. For increasingly difficult datasets, more enhancements can be investigated to increase model performance.