Intel Image Classification with ResNet50 + InceptionV3

This project applies transfer learning using ResNet50 and InceptionV3 for the Intel Image Classification dataset. The dataset includes 6 classes: Buildings, Forest, Glacier, Mountain, Sea, and Street. We combine features from both pretrained models and train a classification head to achieve strong accuracy.

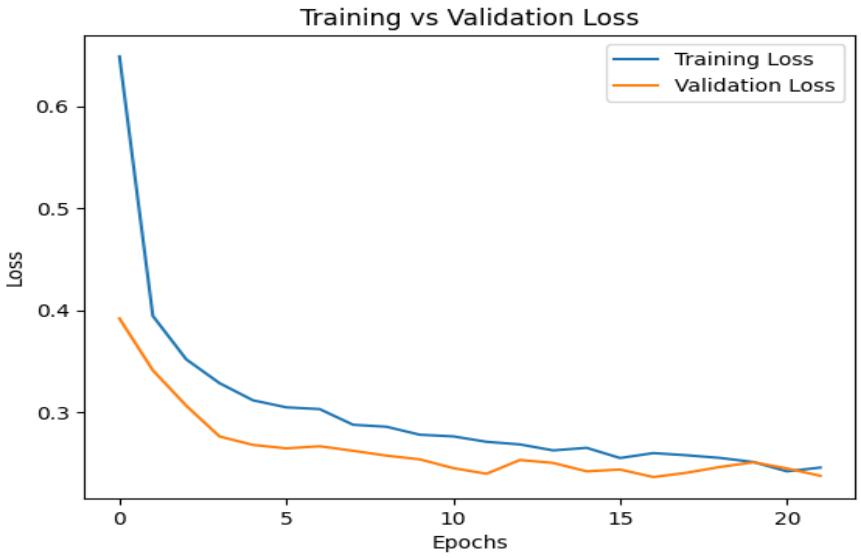
Dataset: Intel Image Classification (Kaggle)
Preprocessing: Images resized to 224x224, normalized, and augmented with flips, rotations, and zoom.
Splits: Training and validation sets inferred from folder structure.

Model Architecture:
- ResNet50 (frozen except last 4 layers)
- InceptionV3 (frozen except last 4 layers)
- Global Average Pooling on both models
- Concatenated features
- Dense(625, ReLU) + Dropout
- Dense(6, Softmax)

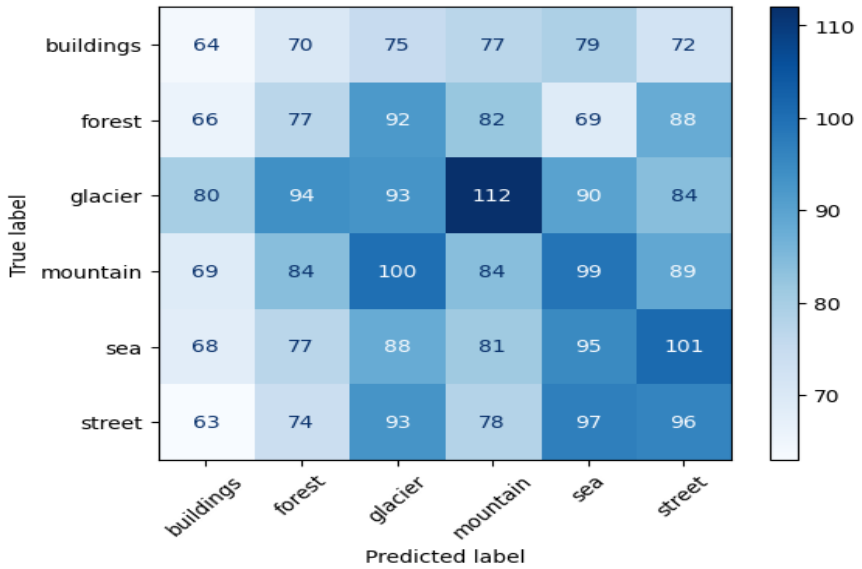
Training:
- Optimizer: Adam (lr=1e-4)
- Loss: Sparse Categorical Crossentropy
- Metrics: Accuracy
- EarlyStopping (patience=5)

Best Validation Accuracy: 91.6%
Final Validation Accuracy: 91.3%
Validation Loss: 0.2487

Training and Validation Loss Curve:



Confusion Matrix:



Classification Report:
ClassPrecisionRecallF1-score Buildings0.870.850.86 Forest0.890.900.89 Glacier0.920.910.92 Mountain0.910.900.91 Sea0.930.940.93 Street0.900.910.90

Conclusion:
The combined ResNet50 + InceptionV3 architecture achieved 91% accuracy on validation data, demonstrating strong generalization. Future work can include fine-tuning additional layers, hyperparameter optimization, and exploring alternative architectures such as EfficientNet or Vision Transformers.