

Report - Project 2 CIFAR-10 Image Classification

Project Goal

Build, compare, and analyze different deep learning models to classify images from the CIFAR-10 dataset into 10 predefined categories.

Data Preprocessing

- **Dataset:** CIFAR-10 (60,000 color images, 10 classes)
 - **Normalization:** Pixel values scaled to [0, 1]
 - **Resizing:** Images resized to 160x160 for MobileNetV2
 - **Data pipeline:** tf.data API used for performance optimization
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Model Architectures

1. Custom CNN (from scratch)

- Layers:
 - 2 Convolutional + MaxPooling layers
 - Flatten layer
 - Dense layer with Dropout
- Performance:
 - Test Accuracy: ~70%-75%

2. Transfer Learning (MobileNetV2)

- Base Model: MobileNetV2 pretrained on ImageNet
 - Head: GlobalAveragePooling + Dense(128) + Dropout(0.3) + Dense(10)
 - Strategy:
 - Freeze base initially
 - Fine-tune top 50 layers
 - Performance:
 - Test Accuracy: ~90%-91%
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Training Details

- Optimizer: Adam
 - Batch Size: 32 for MobileNetV2, 64 for Custom CNN
 - Epochs: 10 + fine-tuning (MobileNetV2), 20 (CNN)
 - EarlyStopping used for stabilization
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Evaluation Metrics

- Accuracy score
 - Confusion Matrix
 - Classification Report (Precision, Recall, F1-Score)
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Best Model

- **MobileNetV2** (Transfer Learning)
 - Fine-tuning significantly improved results
 - Robust against overfitting
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Files Overview

- `Project2_G2.ipynb`: Main final model
 - `Project2_G2_other_models.ipynb`: Additional experiments
 - `requirements.txt`: Package dependencies
 - `REPORTmd.md` and `REPORTpdf.pdf`: Project report
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End of Report