

Image Classification

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Background

The owner of this project loves photography and travelling, so he has a lot of photos. The project will create a model that can sort the owner's pictures automatically.

Reference: <https://www.kaggle.com/datasets/duttadebadri/image-classification>

Methodology

Neural Network

Feed Forward Neural Network

Training Process

1. Epoch Training
2. Data Augmentation
3. Forward Pass
4. Clear grad (which tell how to improve the weight in the model)
5. Loss Calculation
6. Backpropagation
7. Parameter Update

Convolutional Neural Network (CNN)

Specialized for spatial data. Learns hierarchical features. Effective for image-like representations. Uses convolution and pooling layers **to represent some sub areas within images.**

Pre-trained Model

ResNet with Semantic Similarity

Incorporate widely used model in computer vision field that has been trained on huge dataset. This for solving the limitation data that we have (35k images for 4 classes).

Semantic Similarity

Predict the labels using:

Cosine similarity - Euclidean distance (predicted labels from ResNet & predefined our class labels)

Transfer Learning

Fine-tune ResNet using our dataset by incorporating 1 additional layer in the end of the model. Benefit: **Requires less training data & potentially have good accuracy.**

Result

Exploratory Data Analysis

Train dataset: 35,093

Validation dataset: 122

Test dataset: 10

Classes: 4

Modeling

Model	Accuracy
Feed Forward	20%
CNN	60%
ResNet	70%
Fine-tuned ResNet	90%

Highlight points

- Overfitting set the epochs too high

```
[43]: import matplotlib.pyplot as plt
plt.plot(history_train_loss, label='train')
plt.plot(history_val_loss, label='validation')
plt.legend()
plt.ylabel('Loss')
plt.xlabel('Epoch')
plt.show()
```

