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MLP Image Recognition Project Report

Project Overview

This project aims to develop a Multi-Layer Perceptron (MLP) model to recognize and classify images of four different shapes: circles, squares, stars, and triangles. The model is trained using a dataset organized in a specific folder structure, and it is capable of predicting the shape of a new image.

Dataset Structure

The dataset is organized as follows:

```
train data/
    circle/
        1.png
        2.png
        ...
    square/
        1.png
        2.png
        ...
    star/
        1.png
        2.png
        ...
    triangle/
        1.png
        2.png
        ...
```

Each shape type has its own folder containing images of that shape.

Steps Involved

1. Data Preparation

- **Loading Data**: A function was created to load images from the specified folder structure. The images are resized to 64x64 pixels for uniformity.
- **Normalization**: The pixel values of the images are normalized to a range of [0, 1] to improve model performance.

- **Label Encoding**: The shape labels are encoded using `LabelBinarizer` to convert them into a format suitable for training.

2. Model Design

- **Architecture**: The MLP model consists of:
  - An input layer with 128 neurons and ReLU activation.
  - A hidden layer with 64 neurons and ReLU activation.
  - An output layer with softmax activation corresponding to the number of shape classes.

3. Model Training

- The dataset is split into training and testing sets (80% training, 20% testing).
- The model is compiled using the Adam optimizer and categorical cross-entropy loss function.
- The model is trained for 20 epochs with a batch size of 32, and validation is performed during training.

4. Model Evaluation

- The model's performance is evaluated on the test set, and the accuracy is printed.

5. Shape Prediction

- A function is provided to predict the shape of a single image. The image is preprocessed similarly to the training images, and the model outputs the predicted class.

Conclusion

This project successfully demonstrates the use of a Multi-Layer Perceptron for image recognition tasks. The model can classify images of different shapes with reasonable accuracy, and it can predict the shape of new images based on the trained model.