

Machine Learning Project Report

Handwritten Text Recognition Model

1. Introduction

Problem Statement

The project focuses on Handwritten Text Recognition (HTR), a significant application of machine learning. The primary goal is to develop an HTR model capable of accurately transcribing handwritten text into digital form.

2. Data

Dataset Details

The dataset used in this project consists of a collection of handwritten text samples in English language. It comprises approximately 529 images, each containing sentences, words, or isolated characters. The images are grayscale and vary in size.

(Please note that as the dataset size is very large to upload on the portal, we have added the link to the dataset.

<https://drive.google.com/drive/folders/1zucmnAPQ5OKapd8IzHt96NKQUlbTrscD?usp=sharing>)

Data Preprocessing

To prepare the dataset for model training, the following preprocessing steps were applied:

- Image resizing to a standard size of 128x128 pixels.
- Normalization of pixel values to the range [0, 1].
- Conversion of text labels into numerical representations.

3. Methodology

Machine Learning Algorithms

The primary machine learning algorithm used in this project is the VGG16 convolutional neural network (CNN). VGG16 is a deep learning model known for its effectiveness in image recognition tasks. Transfer learning was applied by fine-tuning the top layers of VGG16 on the HTR dataset.

4. Implementation

Implementation Walkthrough

The implementation followed these key steps:

- Data preprocessing, including resizing, normalization, and label encoding.
- Model selection: VGG16 with fine-tuned top layers.
- Model training and evaluation.
- Hyperparameter tuning to optimize performance.

Challenges Faced

One major challenge was limited computational resources due to memory constraints. As a result, batch size had to be reduced to 16 during training to avoid memory overflow.

5. Results

Model Performance

The VGG16-based HTR model achieved an accuracy of 0.6998 on the test dataset, demonstrating its effectiveness in transcribing handwritten text.

Discussion

The results indicate that the model performs reasonably well in recognizing handwritten text. However, further improvements can be explored to enhance accuracy and address challenges related to limited computational resources.

6. Future Recommendations

Future Work

Future work should focus on:

- Exploring more advanced deep learning architectures tailored to HTR.
- Data augmentation techniques to increase the diversity of training data.
- Addressing resource constraints by optimizing model architecture for efficiency.

7. Code Submission with Comments

Codebase

The complete codebase of the HTR project is provided, organized into logical sections with detailed comments for clarity.

(Code is given in a file named Project Model)

Instructions

Following are some instructions that are required to run the code.

- Necessary libraries are need to be imported
- As the dataset is in image form, so dataflow from dataframe is required.

8. Conclusion

In conclusion, this project successfully tackled the task of Handwritten Text Recognition using the VGG16 model. While achieving a reasonable accuracy of 0.6998, there is room for further enhancements, making this an exciting area for future research and development.