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CSCI 184, Applied Machine Learning

Project Proposal: Machine Learning for Alphanumeric Character Classification

Team Member:

I will be working alone.

Data Set:

I will be using the [English Handwritten Characters](#). It includes 3,410 images of handwritten characters in English: 55 images of each class in alphanumeric symbols (0-9, A-Z, a-z).

Project Idea:

During college, I recognized that different individuals have unique ways of writing their work, and some might be difficult to recognize. Based on my experience, sometimes it can take a pretty long time for me to recognize other's work when they have different written habits with mine. In this project, I want to employ various machine learning algorithms for classifying handwritten words into the right corresponding mathematical symbols. This model can significantly help in transferring handwritten math notes into printed versions and assisting educational tools.

The primary objective is to classify a wide variety of English alphanumeric characters from images. I will explore various machine learning algorithms, including k-Nearest Neighbors

(k-NN), Support Vector Machines (SVM), Convolutional Neural Networks (CNNs), and other deep learning models. I will evaluate the performance of each algorithm to determine the most effective approach for this classification task. Appropriate data preprocessing, model training, and evaluation will be performed to ensure optimal results.

Proposed Methodology:

Software Used:

- Python: Primary programming language for data science and machine learning.
- Pandas and NumPy: For data manipulation and numerical computations.
- TensorFlow and Keras: For building and training deep learning models.
- OpenCV: For image preprocessing and augmentation.
- Scikit-learn: For traditional machine learning models and evaluation metrics.
- Matplotlib and Seaborn: For data visualization and exploratory data analysis.
- Jupyter Notebooks: For interactive development and documentation.

Data Preprocessing

- Normalization: Scale pixel values to a range of 0-1 to ensure uniformity in data.
- Data Augmentation: Apply transformations such as rotation, scaling, and translation to increase dataset diversity.
- Label Encoding: Convert symbol labels into numerical format for model training.

Papers to Read:

1. ["Handwritten Character Recognition Using Machine Learning"](#).

2. “[Advancements and Challenges in Handwritten Text Recognition: A Comprehensive Survey](#)”.