# Project Work-1

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Handwritten Text Recognition


A Synopsis
for
Project Work-1


BACHELOR OF TECHNOLOGY in COMPUTER SCIENCE &
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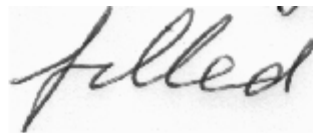
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## Introduction

Offline Handwritten Text Recognition (HTR) systems transcribe text contained in scanned images into digital text. We will build a Neural Network (NN) which is trained on word-images from the IAM dataset. The IAM Handwriting Database contains forms of handwritten English text which can be used to train and test handwritten text recognizers and to perform writer identification and verification experiments. As the input layer can be kept small for word-images, NN-training is feasible on the CPU (of course, a GPU would be better).

The word beam search decoder can be used instead of the two decoders shipped with TF. Words are constrained to those contained in a dictionary, but arbitrary non-word character strings (numbers, punctuation marks) can still be recognized. The following illustration shows a sample for which word beam search is able to recognize the correct text, while the other decoders fail.



## Literature Overview

1. Understanding of a convolutional neural network | IEEE Conference Publication | IEEE Xplore

One of the most popular deep neural networks is the Convolutional Neural Network (CNN). CNN has an excellent performance in machine learning problems. Specially the applications that deal with image data, such as the largest image classification data set (Image Net), computer vision, and natural language processing (NLP) and the results achieved were very amazing.

2. IET Digital Library: Handwriting recognition using CNN and its optimization approach (theiet.org)

Publication Date: October 2021

3. Exploration of CNN Features for Online Handwriting Recognition | IEEE Conference Publication | IEEE Xplore
Published in: 2019 International Conference on Document Analysis and Recognition (ICDAR)

4. Offline Handwritten Numeral Recognition using Combination of Different Feature Extraction Techniques

A handwritten numeral recognition system using a combination of different feature extraction techniques has been presented in this paper. SVM classifier has been considered for classification purposes. For experimental results, 6000 samples of isolated handwritten numerals have been considered. The proposed system achieves maximum recognition accuracy of 96.3% using a five-fold cross-validation technique.

5. Handwritten Character Recognition in English: A Survey

This paper presents a comprehensive review of Handwritten Character Recognition (HCR) in the English language. Handwritten character recognition has been applied in a variety of applications like Banking sectors, Health care industries, and many such organizations where handwritten documents are dealt with. Handwritten Character Recognition is the process of conversion of handwritten text into machine-readable form. For handwritten characters, there are difficulties like it differs from one writer to another, even when the same person writes the same character there is a difference in shape, size, and position of the character. The latest research in this area has used different types of methods, classifiers, and features to reduce the complexity of recognizing handwritten text.

## Problem Definition

People make notes on pen and paper. Everyone does not have the access to products through which they can create handwritten notes in a digital file. They have to manually type the written notes into a digital file. It is a very cumbersome process as it wastes manpower and time.

## Objective

To provide an easy-to-use application which would convert handwritten images into digital and editable form. To save time and resources by providing a platform which will convert a tedious manual task into an easy to click process.

## Methodology

1. Deep Learning: Deep learning is a machine learning technique that teaches computers to do what comes naturally to humans: learn by example. Deep learning is a key technology behind driverless cars, enabling them to recognize a stop sign or to distinguish a pedestrian from a lamppost. Deep learning is a branch of machine learning that uses neural networks with many layers. A deep neural network analyzes data with learned representations similar to the way a person would look at a problem.

2. Convolutional Neural Network (CNN): It is a Deep Learning algorithm that can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image, and be able to differentiate one from the other. It is specifically used for image recognition and tasks that involve the processing of pixel data.

3. Recurrent Neural Network(RNN): Recurrent Neural Network is a type of neural network used to deal specifically with sequential data. RNN works on the principle of saving the output of a particular layer and feeding this back to the input in order to predict the output of the layer.

4. Git: Git is a version control system used for tracking changes in computer files. It is generally used for source code management in software development. Git is used to track changes in the source code. Usually used for coordinating work among programmers collaboratively developing source code during software development.

5. Streamlit: Streamlit is an open-source app framework in Python language. It helps us create web apps for data science and machine learning in a short time. It is compatible with major Python libraries such as `Scikit-learn`,`Keras`, `PyTorch`, `SymPy(latex)`, `NumPy`, `pandas`, `Matplotlib`, etc.

6. Docker*: It is an open platform for developing, shipping, and running applications. Docker enables us to separate our applications from our infrastructure so, we can deliver software quickly. With Docker, we can manage our infrastructure in the same ways we manage our applications.

> Docker*: Experimental Feature

# Reference

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- API Documentation  |  TensorFlow v2.11.0
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- Obsidian Help
- Docker Documentation | Docker Documentation
- Git - Documentation (git-scm.com)
- Medium – Where good ideas find you.