Year 4 Project Proposal

Project Title: Handwriting to Text Converter
Student Name: Conor Hanlon
Student ID: 15445378
Stream: CASE
Project Supervisor Name: Ray Walshe

General Outline

Handwritten notes and essays are a key part of the academic environment. While the digital world is constantly growing, a lot of students, lecturers and professors still prefer writing notes by hand. This has its drawbacks, such as pages possibly being lost or hard to find and not being able to search through notes instantly to find keywords.

My project is centered around converting a user's handwriting to a digital format. I plan to create and train a neural network model that will be able to identify different characters and words in images uploaded by the user and convert this into a text document. The machine learning process will use convolutional and recurrent neural networks to process the training images. The model will be deployed and utilised by a simple web application. Any person can open up the application and upload images of their handwritten notes. They will be given the option to just download the generated documented, or they can save it to their Google Drive if they are signed into their Google account. It will also be possible to share the document via email. This application will help users keep track of any handwritten notes or essays they may want to keep safe for future use. I plan to use the IAM handwriting dataset, which contains ~1500 pages of text, ~13000 lines of text and ~113000 individual words.

Tech Stack

- **Python:** Programming language with many libraries useful for modelling a neural network as well as training the network.
- **PIP:** Package manager for Python.
- **Tensorflow:** Used to train deep neural network through Python.
- **Numpy:** Python library with functions helpful for training the network.
- **Flask:** Micro web framework for Python that I will use to deploy the neural network model.

- **Docker:** Open source software that provides containerization. I will create a container on an Amazon Web Services EC2 instance to set up and configure the training environment.
- **OpenCV:** Computer vision library useful for training convolutional neural networks.
- **Ember.js:** Javascript framework for building web applications.
- **HTML/CSS/Bootstrap:** Used to model and style the web application.
- **Google APIs:** Used for session persistence with login and saving documents to Google Drive.

Learning Challenges

This project presents a lot of learning challenges for me. It is the first time I will be creating my own neural network from scratch and implementing the training process. The Tensorflow, OpenCV and Flask libraries are both new to me as well as the Ember.js framework, so I will have to research best practices to ensure that I use them to the best of their ability. It will also be challenging to work with such a large dataset of images, as this is my first exposure to convolutional neural networks.

Hardware / Software Requirements

My dataset requires large processing power to train the neural network with all the images of handwritten words. I plan to use AWS to obtain this processing power. They provide elastic GPUs which enhance the performance of your EC2 instance running the application. The pricing to rent these GPUs start at $0.05 per hour, which is quite cheap considering the quality of the service that AWS provide.

The development environment will be set up on my local machine.