Recognising handwriting is a complex matter due to the various styles that it can be written in. Three main styles of handwriting are cursive, print, and modern cursive. Modern cursive is different to cursive at is simpler and an uncluttered version of cursive that easier to learn.

Text, letter

Description automatically generatedText, letter

Description automatically generatedText, letter

Description automatically generated

*Figure 1) The three handwriting styles: cursive, modern cursive, and print*

There are two ways to base the handwriting recogniser system off, constrained and unconstrained handwriting. Constrained handwriting is a literary technique in which the writer is bound by some condition that forbids them from certain things, such as writing in a one certain style. On the other hand, unconstrained handwriting is when the writer can freely write without any restrictions. This is the most common type of handwriting you’ll see. Typically, when creating a program to recognise handwriting, the aim is to accurately identify unconstrained handwriting as this will mean its use won’t be limited. To create such a program, the recognition consists of analysing a text image and outputs a sequence of characters corresponding to that text image. But this task can be quite difficult due to variety in size, language or writing style from one writer to another. In addition, some artefacts can make the work more complex such as overlapping texts, non-character elements or a low-resolution image. Whereas, detecting digits and characters are substantially easier.

To tackle this problem, there have been several approaches. A well-known testbed for isolated handwritten character recognition is the UNIPEN database. such as Optical character recognition (OCR), a writer independent approach based on hidden Markov models (HMMs), etc. These handwriting recognition systems tend to work but have some drawbacks. In HMMs, they assume that probability of each observation depends on the current state, which makes contextual effects difficult to model. Another is that HMMs are generative, while discriminative models generally give better performance in labelling and classification tasks. These are just two of the problems that are associated with HMMs. OCR also has its problems, but this where we turn our attention to deep learning and using neural networks to solve this problem. Deep learning has increasingly been showing promise in all types of object recognition, such as pictures to identify animals, objects, buildings, etc. It can also be used to detect minute details in fabrics to determine whether it has a defect or not. There are three neural networks you can look at: Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM) and Convolutional Neural Networks (CNN). The following sections will go into detail on how these work and how they relate to handwriting recognition.