Types of Neural Networks in Python



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# Abstract

The technology of all kind plays a significant role in society and technology can be considered an important, almost essential part of modern life. The advancements that are made in the last few years are phenomenal. In this project, I will build three different types of Neural Networks using the High-level programming language Python. Neural Networks have gained popularity in recent years even though much of the theory is being evolved since the 1950s. Platforms such as TensorFlow and Keras are allowing many developers to divulge into Neural Networks. These are end-to-end open source platforms that allow for easier machine learning. A decade ago we thought that getting a computer to tell the distinction between one object and another would be almost unbelievable. Now we have trained Neural networks that can tell the difference with a precision of greater than 80 percent accuracy. Neural Networks have been around since the 1950s and has increased in popularity every year. The Project aims to compare the different types of neural networks which would provide a clear image of the differences and similarities between them. This project is a research project which would allow me to better comprehend the different types of neural networks. In the dissertation, I will be assessing the tasks of planning and developing, as well as design and implementation of all the components that make up my project. This project supports for further development and insertion of new components such as more types of neural networks. The proposed solution will be comprised of a command line application, which will give the user the ability to test the neural network and train the neural network. The project will also implement the crud functionalities and allow the user to login and save the user details.

# Introduction

In the beginning of Year 4, We were given the opportunity to work in a team or individually to develop a final year project. In the past three years I have only done group projects and this time I wanted to challenge myself and try something new. Initially the idea of the project was to create a Convolutional Neural Network and use the Django Framework to make a web application. However due to time constrains and this being an individual project I decided to keep working on the neural network. Even though the initial idea was very interesting, but it became very clear that I did not have enough programming in it. So, I scraped the original plan and decided to build three different types of Neural Networks. The project is intended for the research purposes with a goal that would allow me to better understand how Neural Networks work.

## Idea Raised

This is a project about machine learning named Python Neural Networks. The project uses Keras which runs on top of TensorFlow. Keras was created with an attention on enabling fast experimentation. The idea for undertaking this project stems from me wanting to figure out how uniquely different Neural Networks work. There are various types of Neural networks that I could have utilized in my project yet I for the most part uncovered into three fundamental ones. Toward the beginning of the project it was extremely difficult to pick which kinds of neural networks to use. During my research the different types of Neural Networks I came across were Recursive neural network (RNN), Convolutional neural network (CNN), Multilayer perceptron, Recurrent neural network (RNN) and k-nearest Neighbours (KNN). The three Neural Networks I chose to work with were Multilayer perceptron, Convolutional neural network (CNN) and k-nearest Neighbours (KNN). The figures below show how each of the Neural Networks work. I will cover about Neural Networks more in dept later in my dissertation.

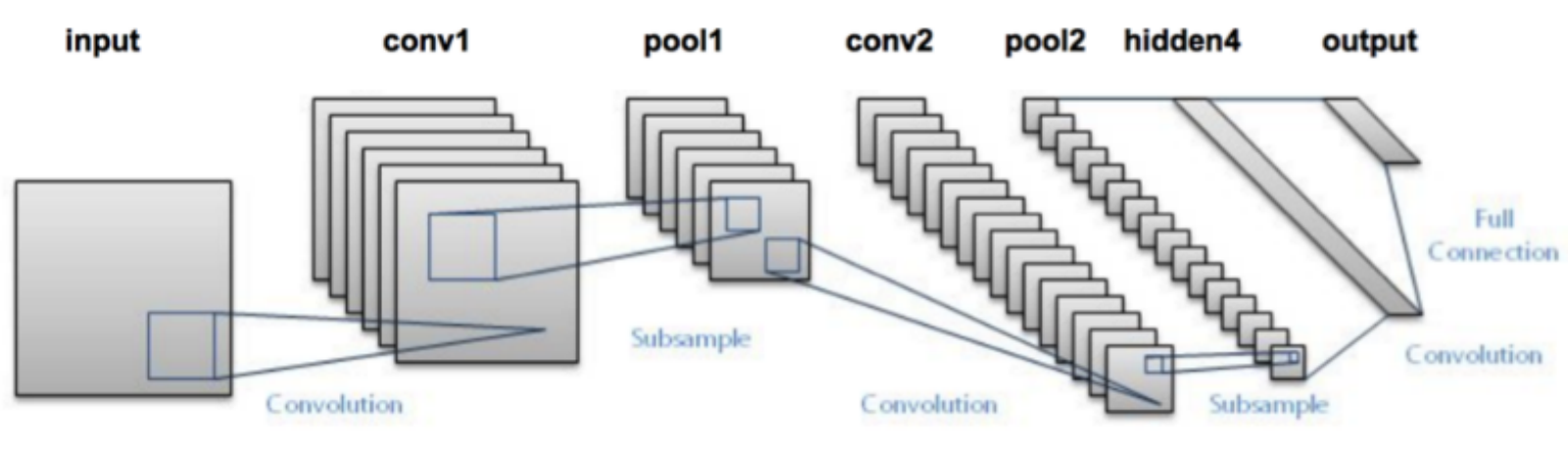


Figure 1.1: Convolutional neural network (CNN)

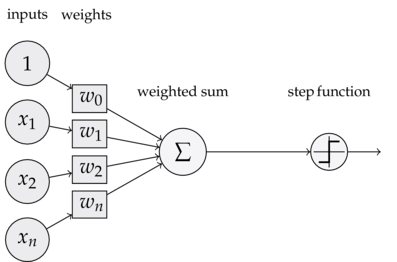


Figure 1.2: Multilayer Perceptron

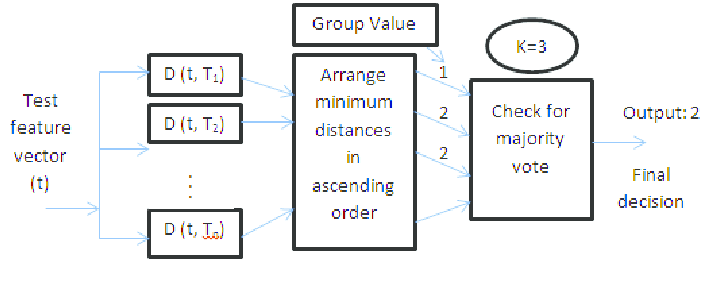


Figure 1.3: k-nearest Neighbours (KNN)

## The Solution

Neural Networks in Python is a project involving APIs, Python, MongoDB and cloud technology. The Implementation of the project is a command line interactive project that trains and tests the three types of neural networks with the support of a log in service. The log in service authenticates a user and allows to be able to train and test the Neural Networks. You can create a user which is saved in MongoDB in cloud. At the point when the client is logged you can see the three diverse choices for testing the distinctive sorts of neural networks. Each option leads into a different menu. For example, if you select the multilayer perceptron then this would lead into another menu. This menu allows you to test the multilayer perceptron with your own unique set of values.

Furthermore, the context of this project revolves around the user being able to test the different types of Neural Networks and perceive how each type of Neural Network produces an outcome.

## Objectives

The undertaking of this project will require several objectives to be attained in order to provide a solution that works and is high-performing.

* The first objective will be to build the Convolutional neural network (CNN). The dataset I will use is the MNIST Fashion Dataset. To start the project the first thing I will do is to train and test the dataset. This Neural Network will be able to recognise clothes from an image.
* After building the Convolutional neural network (CNN) I will start the Multilayer Perceptron. The dataset I will use to train my Multilayer Perceptron is the Iris Dataset. The user will be able to enter unique values to test the trained Neural Network.
* Finally, I will have to start the k-nearest Neighbours neural network. This will be for the colour detection in an image. I will have to make my own dataset of colours and train the Neural Network.
* MongoDB database will be used to store the images and user data i.e. their username and password. The MongoDB database must be setup on cloud so its easily accessed from anywhere.
* To store the passwords, I will be using the Hashing Algorithm SHA256. This allows for safe storing of passwords. The hashed string of the password will be stored in the MongoDB. When the user enters the password the it will be hashed and compared with the string from the database.
* Lastly, I will make the command line application more interactive by adding more GUI.

## Overview

As this being a final year project, it required something more intricate than anticipated, that is the reason I endeavour to undertake this project. The dissertation is structured in chapters, each one containing different aspects of the project. The following is a breakdown of what is examined in every section.

* Methodology - This chapter will outline the different Methodologies that were considered to design and implement the solution.
* Technology Review
* Evaluation

# Links / Cite

[1]<https://www.techradar.com/news/what-is-a-neural-network>