

## Convolutional Neural Networks

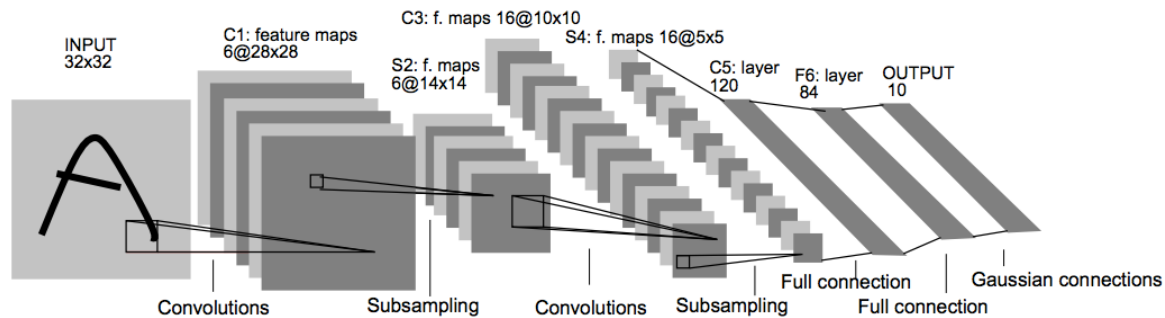


Figure 1 – LeNet [LeCun98] LeCun, Y., Bottou, L., Bengio, Y., and Haffner, P. (1998d). Gradient-based learning applied to document recognition. *Proceedings of the IEEE*, 86(11), 2278–2324.

In this coursework you will utilize Google Colab to generate a Jupyter notebook for exploring the application of Convolutional Neural Networks (CNN) for Image Classification. The task is that you are required to compare two CNN based algorithms (e.g. LeNet and AlexNet). This will involve researching about the two algorithms, providing a simple explanation of the algorithms and critically comparing their performance for a given dataset e.g. (MNIST, Fashion MNIST, Cifar-10). It will be therefore important to include the algorithm training time as part of your consideration for the algorithm as Google Colab provides a limited GPU training time of 12 hours.

The CW submission should be in the format of an ipython notebook and a generated pdf of the notebook.

### Jupyter Notebook

This notebook should provide a discussion and demonstration of the steps you have undertaken to select the algorithms and the dataset, the training and testing of the algorithms and a comparison of the performance of the algorithms on the chosen dataset.

The notebook should include the following:

- Introduction
- The selected dataset for the algorithm comparison
- The algorithms to compare with appropriate reasoning why they were chosen
- The training and testing of the algorithms
- Algorithmic performance evaluation and comparison
- Conclusion

It is not expected that the student develops the software for the algorithm implementation, it is totally acceptable to utilize open-source software. It is required to detail each of the steps that you have undertaken to utilize the software, demonstrate the complete workflow, documentation and any appropriate visualizations as required to demonstrate the algorithm performance.

Coursework reports should be submitted to GCULearn via Turnitin no later than **Saturday, 20th August 2022 23:59pm**.

Please note that only one submission can be made so please make sure you are happy with your notebook and pdf of the notebook before you submit.

A rubric for this component of the coursework is provided below:

Rubric	Not attempted / insufficient (0-10%)	Basic (10-40%)	Moderate (40-60%)	Good (60-80%)	Excellent (80-100%)
Presentation of information, introduction and conclusion [ /20%]	Not shown or not suitable	Some faults with the presentation	Information presented for most of the material, with some omissions.	Information presented in all cases with some improvements in clarity required.	All information clearly presented.
Details of the selected dataset and why it was chosen [ /10%]	Not shown or not suitable	Dataset choice defined but not justified.	Dataset choice defined with some minor explanations introduced.	All required explanations with some further clarity required.	Detailed explanation as to why the dataset has been chosen, covering appropriate implementation issues.
Algorithm choice and rationale [ /20%]	Not shown or not suitable	Algorithm choice defined but not justified.	Algorithm choice defined with some minor explanations introduced.	All required explanations with some further clarity required.	Detailed explanation as to why the algorithm has been chosen, covering appropriate implementation issues.
Training and Testing Process [ /25%]	Not shown or not suitable	Training and testing process defined but not detailed in the text.	Training and testing defined and detailed in the text with some omissions.	Training and testing defined and detailed and justified in the text. Must utilise GPU.	Training and testing defined and detailed and justified in the text including other potential strategies. Must utilise GPU.
Algorithm performance and comparison [ /25%]	Not shown or not suitable	Performance shown with limited detail.	Performance and comparison described with some omissions.	Performance and comparison detailed with some algorithm performance detailed. Range of experiments covered. Must utilise GPU.	Performance of the algorithms clearly detailed with appropriate algorithm performance comparison. Wide range of experiments detailed with parameters choices and architecture changes detailed. Must utilise GPU.

Figure 2 - Coursework 2 Report rubric