Undergraduate Research Project Proposal
Improving Neural Network based image classifiers

Image classification consists of an algorithm distinguishing between various images, assigning each to a specific class based on patterns and features. For instance, given a dog picture, the algorithm should categorize it as "dog" rather than "cat."

Convolutional neural network (CNN) classifiers have expanded significantly in the past decade; however, a significant challenge emerges in many implementations, how to effectively train a CNN with a limited number of images. This situation often leads to overfitting, where the classifier excels during training but fails the task with new images.

Encouraging preliminary findings suggest that employing simple methods can help to mitigate this problem. Integrating new computer images, even simplistic ones like online drawings or more intricate solutions such as game engine-rendered images or general adversarial neural networks, can counteract overfitting and enhance performance.

This proposal aims to analyse and enhance the training of CNN-based image classifiers. Fundamentals like noise addition, rotation, and image flipping will expand the training dataset. Utilizing images datasets found online or alternative technique-generated images is also considered. Well established neural network models from the existing literature will be used to avoid classifier topology design efforts. Python and TensorFlow serve as the primary tools, possessing the required packages for comprehensive studies and analysis.

(a)

(b)

Fig. 1 – Example of techniques: noise addition in (a). Apple drawing to be used in a fruit classifier in (b).

Special requirements: None. No ethical approval is required.
Supervisor: Dr. Erivelton Nepomuceno
Cosupervisor: Matheus Mulherchen Golz Costa (PhD Student)
Contact: matheus.costa.2024@mumail.ie