ARTEFACT 4 COMMENTARY

This artefact presents my individual presentation on deep learning for object recognition, developed using the CIFAR-10 dataset under Track 2 of the module. The objective was to design, train, and evaluate a neural network capable of classifying images across ten categories. This task provided an opportunity to deepen my understanding of convolutional neural networks (CNNs) and to apply key machine learning principles such as data partitioning, hyperparameter tuning, and model validation.

My workflow followed the structure outlined in the brief. I began with data preparation, creating separate training, validation, and test sets to ensure generalisable model performance. Initially, I built a standard CNN model in Google Colab using TensorFlow/Keras. I experimented with convolutional, pooling, and fully connected layers, ReLU activations, and the Adam optimiser. To extend this, I explored transfer learning through a VGG16 architecture, but encountered GPU and runtime constraints in Colab, which limited training efficiency. Recognising this challenge, I focused on improving my CNN by introducing data augmentation (rotation, flipping, and shifting) to enhance robustness and prevent overfitting.

Hyperparameter tuning involved increasing the epoch count and adjusting batch size to stabilise accuracy. Comparing the non-augmented and augmented CNNs illustrated the measurable benefits of augmentation on validation accuracy and loss reduction. These adjustments aligned with the project's requirement to analyse the impact of architecture and hyperparameters. I also assessed performance using accuracy and confusion matrices, which provided clear insights into classification precision across classes.

The process was not without challenges, particularly runtime failures during training and the initial absence of one-hot encoding in preprocessing, which affected early results. However, re-evaluating my approach strengthened my critical thinking and problem-solving skills. Managing this project while working full-time demanded strong time management and perseverance, both of which I developed significantly.

Beyond technical competence, this project fostered a deeper appreciation for AI's real-world applications. I became especially interested in how CNN-based recognition can be adapted to medical imaging and diagnostic systems, for example, in identifying tumorous or abnormal cells more rapidly than manual inspection. This insight connects my academic learning with my professional goal of advancing healthcare through AI innovation.

Overall, this artefact represents a comprehensive application of deep learning principles, critical analysis, and reflective practice key learning outcomes that have enhanced both my technical and professional confidence.