**CM 3070 Final Year Project**

**Preliminary Report - An Introduction**

In the realm of computer vision and artificial intelligence, the application of deep learning techniques has ushered in a new era of innovation and capability. One such area where these advancements have been particularly impactful is in the domain of vehicle classification, recognition, and detection. This project aims to delve into this fascinating field, leveraging state-of-the-art deep learning methodologies to develop robust systems capable of accurately identifying and localizing vehicles within images.

The motivation behind this project stems from the increasing demand for intelligent systems capable of analysing and understanding visual data in real-time. With the proliferation of surveillance systems, traffic monitoring technologies, and the advent of autonomous vehicles, the need for efficient and reliable vehicle recognition systems has become paramount. By harnessing the power of deep learning, we aim to address the challenges and gaps present in existing methodologies, thereby contributing to the advancement of this critical area of research.

The primary objective of this project is twofold: to enhance vehicle classification and recognition capabilities using deep learning techniques, and to develop efficient object detection algorithms for localizing vehicles within images. By combining image classification with object detection methodologies, we seek to build robust models capable of accurately identifying various types of vehicles and extracting fine-grained attributes such as make, model, colour, and license plate details.

The project draws inspiration from recent advancements in deep learning, particularly in the field of computer vision. With the availability of large-scale datasets such as the Stanford Cars Dataset and the continuous development of sophisticated deep learning architectures, the opportunity to push the boundaries of vehicle recognition capabilities has never been greater. By leveraging transfer learning, fine-tuning techniques, and state-of-the-art object detection algorithms, we aim to achieve significant improvements in accuracy, efficiency, and real-time performance.

The choice of dataset for this project, the Stanford Cars Dataset, provides a rich and diverse set of images spanning various vehicle types, makes, and models. This dataset serves as the foundation upon which we will build and train our deep learning models, ensuring that they are capable of generalizing well across diverse vehicle categories and environmental conditions.

In the subsequent chapters of this report, we will delve into the intricacies of our methodology, detailing the steps involved in dataset collection and preprocessing, model development for vehicle classification and object detection, as well as evaluation and testing of the trained models. Through rigorous experimentation and analysis, we aim to not only demonstrate the effectiveness of our approach but also contribute valuable insights to the broader field of computer vision and deep learning.

In conclusion, this project represents a significant endeavour towards advancing the state-of-the-art in vehicle classification, recognition, and detection using deep learning techniques. With the potential to impact various real-world applications such as traffic management, security surveillance, and autonomous driving, the outcomes of this project hold immense promise for enhancing safety, efficiency, and overall urban mobility in dynamic environments like Singapore.