# Implementing Deep Learning tools and/or techniques in image recognition of humans, animals or plants

Deep learning has transformed image recognition in all aspects, including human, animal, and plant recognition. This literature review critically analyzes studies, methodologies, and technologies employed in deep learning for image recognition.

Recent developments in convolutional neural networks (CNNs), generative adversarial networks (GANs), and transformer-inspired models such as Vision Transformers (ViTs) have achieved more accurate models in image recognition than others.

CNNs are still the core foundation of applications of all types, such as face recognition, wildlife tracking, and plant disease diagnosis. Pre-trained models and transfer learning via VGG16, ResNet, and EfficientNet have further facilitated the efficacy of varied image classification procedures.

Deep learning applications in human identification primarily focus on facial detection and biometric authentication. Studies highlight the performance of CNN-based models like FaceNet and OpenFace. In animal identification, models trained on large-scale data sets like iNaturalist have achieved high accuracy in species classification. In agriculture, deep learning assists in diagnosing plant diseases, with studies employing hybrid CNN and attention mechanisms for enhanced accuracy. Methodologies vary, the most prevalent being supervised learning but with newer trends toward reducing dependency on labeled data in self-supervised and unsupervised learning approaches.

This project will also incorporate cloud computing efficiency techniques such as parallelisation and scalability to effectively read in large volume of data and store data and results in google cloud platform buckets to better handle the large data. Furthermore, there are public GCS buckets available where terabytes of image data is readily available such as the flower dataset. TensorFlow python function will me used to process and decode images into multi-dimensional matrices to give us numerical inputs for machine learning.

While deep learning models have achieved unprecedented success, problems persist. Some studies indicate that CNNs are computationally expensive and require large datasets, whereas transformer-based models, such as ViTs, can potentially reduce these limitations. Debate continues regarding model interpretability, data bias, and ethical concerns in human recognition systems. Researchers emphasize the need for explainable AI (XAI) to improve transparency and fairness in deep learning models.