# Car and Tree Classification

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## I. Introduction

The project is focused on classifying cars and trees using deep learning. The project contain a dataset that composed of 400 images of cars and 400 images of trees collected from two cities Glasgow (city A) and Stirling (city B). The dataset includes cropped images of both classes, in addition, some of the tree images are collected from an open-source website [1].

## II. Proposed Solution with Justifications

The Project is using a convolutional neural network (CNN) model to classify the images. According to Tanishq Gautam [2], This type of model is well-suited for image classification tasks due to its ability to learn spatial hierarchies of features. In image processesing step, All the images first convert to array by using OpenCv library and then reshape with size 256X256 and rescale all images, the images belong to to cars folder assign label 0 ad the images belong from trees folder assign as label 1. The Project having a model architecture consisting of several convolutional and max pooling layers, followed by a dropout layer to reduce overfitting and two dense layers for classification. The model has a total of 8,417,505 trainable parameters. Two different models trained on the data for each city using the Adam optimizer and binary crossentropy loss function.

## III. Results

The results show that the models performs well on both the training and testing data. For city A, the training accuracy is 92.5% and the testing accuracy is 90.05%, with an F1 score of 90.99%. For city B, the training accuracy is 89.50% and the testing accuracy is 86.05%, with an F1 score of 88.0%. When tested on the dataset from the other city, the model for city A achieves an accuracy of 88.05% and an F1 score of 88.99% on the city B dataset, while the model for city B achieves an accuracy of 86.0% and an F1 score of 87.61% on the city A dataset.

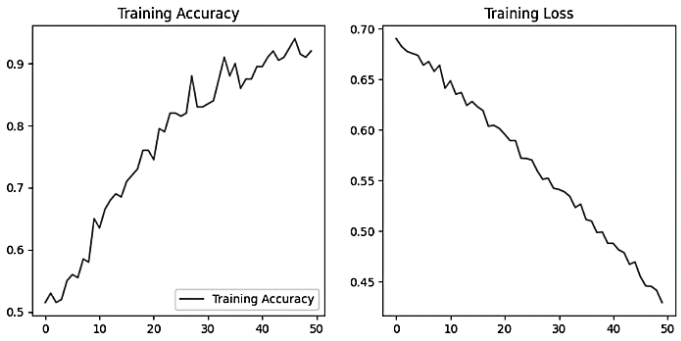


Fig. 1. Training results of city A model

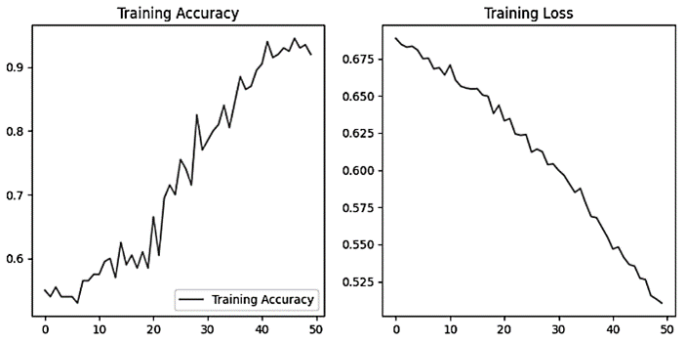


Fig. 2. Training results of city B model

As we can see the both graphs in figure 1 and figure 2 that when the number of epochs increases, the loss is decreasing and accuracy is increasing which indicates that the model is improving in its ability to make accurate predictions.

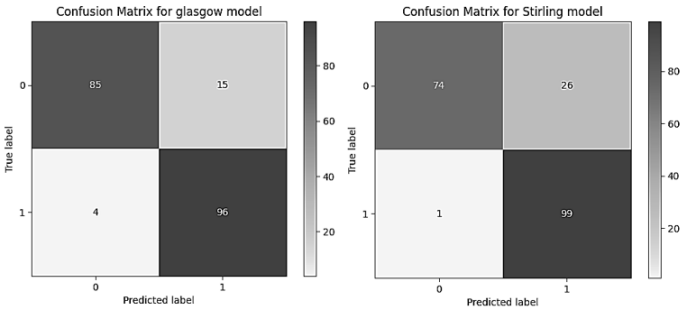


Fig. 3. Testing results of both models

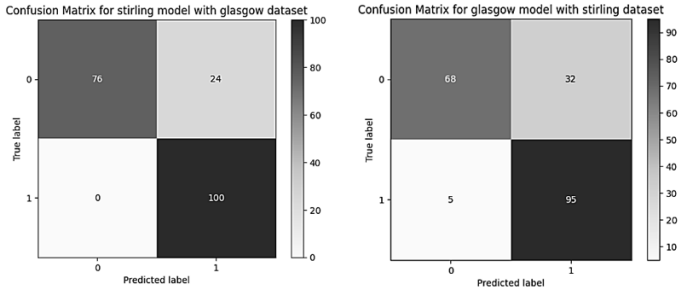


Fig. 4. Testing results of each model with opposite dataset

## IV. Discussion

The Project is using a convolutional neural network (CNN) model to classify cars and trees in two cities, city A and city B. In figure 3 and figure 4 the results show that the model performs well on both the training and testing data for each city, with high accuracy and F1 scores. When tested on the dataset from the other city, the model for city A shows slightly lower performance on the city B dataset, while the model for city B maintains similar performance on the city A dataset. These results suggest that the proposed solution is effective at classifying cars and trees in both cities. However, there may be some differences between the data from the two cities that affect the performance of the model. For example, the images from one city may have different lighting conditions or backgrounds compared to the images from the other city. Further analysis could be done to identify these differences and improve the performance of the model on both datasets.

## V. Conclusion

This project demonstrates the effectiveness of using deep learning for image classification tasks. The proposed CNN model is able to accurately classify cars and trees in two cities, with high accuracy and F1 scores. Further work could be done to finetune the model and improve its performance on both datasets.

## References

[1] Tree labeled image dataset, images, https://images.cv/dataset/tree-image-classification-dataset.

[2] Tanishq Gautam, Create your Own Image Classification Model using Python and Keras, analyticsvidhya, https://images.cv/dataset/tree-image-classification-dataset.