Animal Identification Through Image Analysis

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Introduction

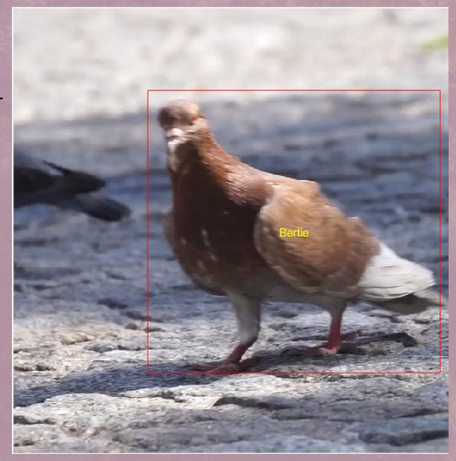
The goal of this project is to create an advanced image analyser which can pick out and identify individual pigeons from a video.

This project may prove to be a useful proof of concept towards an expanded tool for animal monitoring, which is a crucial part of animal conservation.

Methods

This project will be based solely around one particular video, where the pigeons have been identified by bounding boxes (BB).

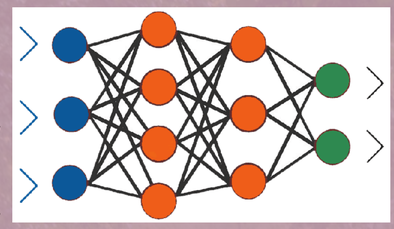
BBs are commonly used in image processing, and identify the smallest area to completely encompass a region of interest in an image.



In this case, the BBs are going to be ready-made and given to the program by means of the size and location of each BB. The program will then use this data to draw and crop each video frame around every BB to use as positive data for training the Neural Network.

Technology

Neural networks (NN) are computing systems with interconnected nodes that function similarly to neurons in a human brain. Through They can learn to recognise patterns of raw data then group and classify it.



This project will be created using 'MATLAB', and in particular make use of its 'Convolutional Neural Networks' in their Deep Learning features.

Training

Training a NN requires positive and negative data. The NN in this project will use the cropped BB images as positive data, and for negative it will use boxes of the same size as the positives, but scattered randomly across the image. By doing this, the NN can learn to tell apart the pigeons from the background.

Then, once it has learnt to identify pigeons, it can be taken a step further and taught to identify an individual pigeon. This would be achieved by changing it's positive data to include images of only one of the pigeons, and it's negative to include images of the other pigeons.

Results

These results of the NN training show the accuracy rapidly improves over the first 50 iterations, before gradually increasing and maintaining around and above 90% accuracy after 180 iterations. The loss rate supports the inverse of this, staying below 1 after 180 iterations. This tells us that the pigeons can get consistently identified after 180 iterations have passed, and can still be somewhat accurately assed after only 20 iterations. A very small number given the number of frames in an average video.

Future Works

This project can serve as a basis for making a larger scale project to potentially identify any animal in an image.

The benefit of using a NN to train this means that it can get more accurate at identifying individual animals the more images of said animal we give to it. So, as the project grows, it will get increasingly better at identification.

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