

Research Proposal Form

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Group:

SWD 6.2A

Research Title:

Maltese Flora Classifier

Hypothesis and/or Research Questions:

With the help of computer vision as a deep learning method, various types of local flora can be classified.

The main target of this research is to deliver a tool that will enable users to identify local flora found in the Maltese islands.

This study will aid to answer a number of research questions such as:

- *How can the required datasets be obtained or created?*
- *Which are the ideal algorithms for this project and how can we identify the most ideal one?*
- *Are the results accurate and efficient?*

Outline of Key Literature:

The human brain is known to recognize objects by evaluating visual information and extracting semantically meaningful features such as shapes, measurements and line-segments. Computer vision on the other hand works differently as they must process other but less meaningful features from visual data such as textures, shades, colours etc. (Zhang, 2010)

The main target of machine learning is to use custom made or past information to solve a given problem. In this scenario, using computer vision, a machine will be trained to recognize patterns in digital visuals by providing it a set of graphical data which is relevant to the desirable result of classification. (Alpaydin, 2010)

For a machine to be trained, it needs to host a model which will later be given datasets to be processed by an algorithm.

Algorithms:

-YOLOv3 is an extremely accurate and quick recognitional algorithm which uses a single neural network on a graphic, divides it into different regions and bounding boxes which will reflect on the result of probability prediction. However, it is considered to be overparameterized as it has over ten million different parameters. Furthermore, small devices aren't capable to host such algorithm as it requires a lot of resources to run. (Krittayanawach and Vateekul, 2019)

- Faster R-CNN is also a very quick and accurate recognitional algorithm. It works by extracting a feature map from the original image and a separate network is used to predict the region proposal. It is later reshaped using region of interest which is later used to classify the image. It is also a resource demanding algorithm and requires a powerful environment to work. (Liu, 2018)

The difference between the two is that Faster R-CNN uses regions to localize an object in an image whilst YOLOv3 uses a single convolutional network to predict the bounding boxes thus resulting in the class probabilities for these boxes. (Gandhi, 2018)

Overview of Methodology:

In order to make use of computer vision, a pipeline is to be followed to help understand the workflow of this project.

Problem Statement > Data Collection > Data Preparation > Model Training > Model Inference

Problem Statement:

- Our problem statement is which computer vision technique to use for such a project. In our case the most ideal technique to use is a classification technique which will enable the machine to understand the key features in an image and classify accordingly.

Data Collection:

-In order to create datasets for this project, two methods are going to be used. The first method is to scrape images from Google and stored depending on their applicability for the project. The second method is to manually take photos of the local flora found on the Maltese islands.

Data Preparation:

- This process involves the preparation of the dataset by interpreting and labelling the pre collected data (images) with a respective label.

Model Training:

-In this stage, the use of Google Colabs environment is crucial as it is powerful enough to host such models. This will allow us to train a model with the prepared datasets gathered beforehand and with the use of a chosen algorithm.

Model Inference:

-In this stage, results are evaluated to determine the level of accuracy and efficiency of the classification of local flora.

Ethical Considerations:

All the material required for this project can be publicly obtained or downloaded from the internet. All images follow the data protection act and does not breach any laws. Furthermore, all research papers referenced in this document and in the final project have been legally obtained, this this research project will not in any way breach any legal or ethical regulations.

References:

Zhang, B., 2010. Computer vision vs. human vision. *9th IEEE International Conference on Cognitive Informatics (ICCI'10)*,.

Alpaydin, E., 2010. *Introduction To Machine Learning*. Cambridge, Mass.: MIT Press.

Gandhi, R., 2018. *R-CNN, Fast R-CNN, Faster R-CNN, YOLO — Object Detection Algorithms*. [online] Medium. Available at: <<https://towardsdatascience.com/r-cnn-fast-r-cnn-faster-r-cnn-yolo-object-detection-algorithms-36d53571365e>> [Accessed 3 April 2020].

Liu, Y., 2018. An Improved Faster R-CNN for Object Detection. *2018 11th International Symposium on Computational Intelligence and Design (ISCID)*,.