Snake Specie Recognition using CNN

A. Problem Statement

Snakebites envenoming is one of the life threatening disease caused by snakebites, especially in developing countries. As per WHO around 4.5 to 5.4 million people get bitten by snake every year, of this around 81,000 to 138,000 people die each year. To treat the venomous snake bite you need to find the right antivenom and correctly identifying snake is very difficult since there are more than 3700 different species of snakes, also it's not very common to have knowledge on snakes in general.We are addressing this challenge by training our model to identify different snake species which can help victim to quickly identify if, the snake was venomous or nonvenomous , also for healthcare personnel to correctly choose antivenom based on the snake species. There would be many challenges in solving the above problem statement such as :

Pixel similarity in foreground and background could lead to misclassification.

Generalisation of object features by the model/architecture is difficult due to wide variation of the same, among objects in different images.

Uneuqal no of images for different classes leads to a bias.

Due to discrepancy in image size across datasets,it would be difficult to generalise transformations/ steps of pre-processing.

The Goal of our application is to identify the right species of snake which in turn help us in deciding the correct antivenom. We are expecting our system to help the healthcare industry and the communities affected by snakebites.

B. Datasets

Name	Total Images	Image Size	Classes
Dataset 1	15000	384*384	5
Dataset 2	12250	384*384	35
Dataset 3	20000	512*512	30

The proposed project uses three datasets from Kaggle each dataset differs from each other in Number of Classes, Types of Classes and Image resolution and they are imbalanced datasets. Our datasets are not balanced so each dataset has different no of images per class i.e, Dataset 1, dataset 2 and dataset 3 has 3200, 350 and 200 images per class on an average respectively. The Dataset 1,2 and 3 are of size 1GB, 921 MB and 750MB respectively.

C. Methods

We will be using three CNN models respectively, In which we will do a comparative analysis of below given models and observe difference in results.

- VGGNet: Our aim is to perform initial study on different flavors of VGGNet as they are relatively simpler architecture and focus on increasing the depth of the network and do not include advance blocks such as skip-connections as in ResNet.Therefore we feel the need of analysing how these simpler architectures perform in our case study.
- ResNet: We aim to study the functionalities of Skip layers, how they improve the performance of the neural network and how it addresses Vanishing gradient problem. We intend to analyze the perturbation issues of the architecture and ways to overcome the same.
- ZF Net: The project focuses on studying the architecture of ZFNet with the help of the paper Visualizing and Understanding Convolutional Networks. We will be studying the transitions on seven layers of ZF net and visualize the intermediate results on each layer. In-depth research will be done on the functionalities of deconvolutional neural networks, how they enhance feature map extractions, and how they are connected to CNNs.

C.1. Preprocessing Steps

As part of preprocessing we are using k-fold cross validation technique since results are less biased and it will provide the average of k folds evaluation to split our data into train and test set. Then we will be using data-augmentation to perform transformations like flipping, scaling, rotation, etc and this will help in preventing our model from learning irrelevant features.

D. Evaluation matrix

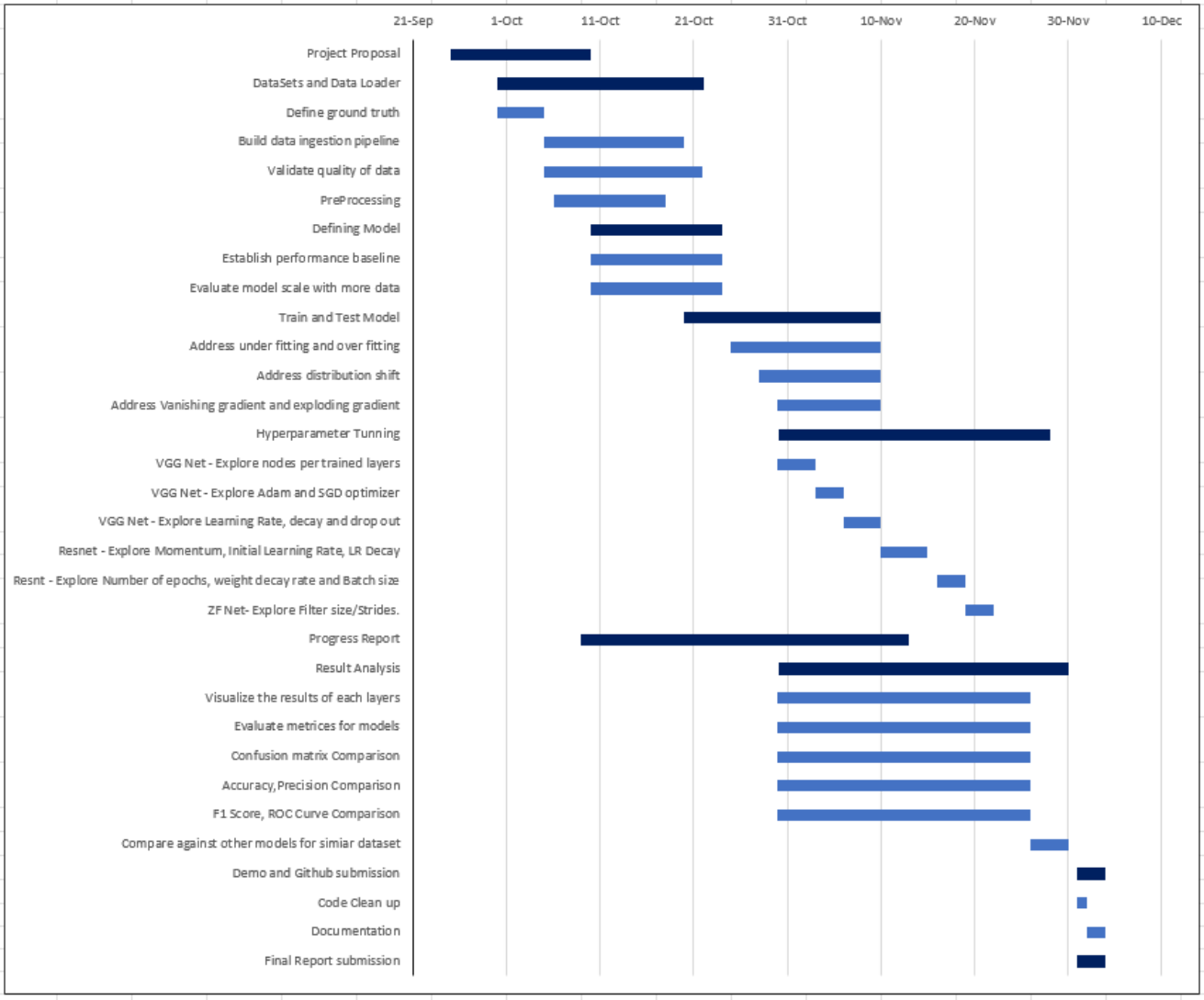
We will be using below metrics to evaluate different models:

- Confusion matrix, Accuracy, Precision, Recall, F1 Score, ROC Curve

E. Expectation

We expect to develop a snake classification system which can help victims to quickly check if the snake was venomous or not and if they need medical attention or not, also for doctors to choose a correct anti-venom based on the snake type.

F. Gantt chart



Milestones

- Milestone 1: In this stage, we are matching the required prerequisites with our problem statement and by the end of this stage we would have our data sets and models and would also have finalized the team as well as their roles.
- Milestone 2: This stage is very important as we will explore our data-set in-depth, find the number of classes, and the size of the image and then will present it in the proposal.
- Milestone 3: In this stage, we are going to study 3 different frameworks, build data pipeline and train our models using 3 different data set.
- Milestone 4: This stage will define the success of our project, we are going to fine tune our model with various hyperparameters. We will compare different matrices obtained from testing and evaluate how different models work with same data and different hyperparameters.
- Milestone 5: At the last stage we will have our final project ready along with a report and presentation on the detail of our model and code and how it works.

References

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