Saving the Earth Starts with You

Poacher Detection

Project description

Poacher Detection

- The model that can alert the forest officers and rangers anytime a poacher is detected in the survellience area by sending them the location, time and images suspecting poaching so that the ranger can take action in time without the loss of endangered species.
- Our model can automate the survellience and can detect in realtime helping forest department to respond faster and prevent hunting before its too late.
- The current dataset is trained with wildlife species found in areas of the state Madhya Pradesh such as Tiger, Leopard, Nilgai, Black buck, Dhole, Sambar, etc. The project is scalable and later extended to all over the country.

TECHNOLOGIES USED

- **OpenCV :** For manipulating and processing Image Networks.
- **YOLOV8 :** For training custom model on focused classes.
- **Label Studio:** For annotating images of various classes manually.

Threats to Wildlife

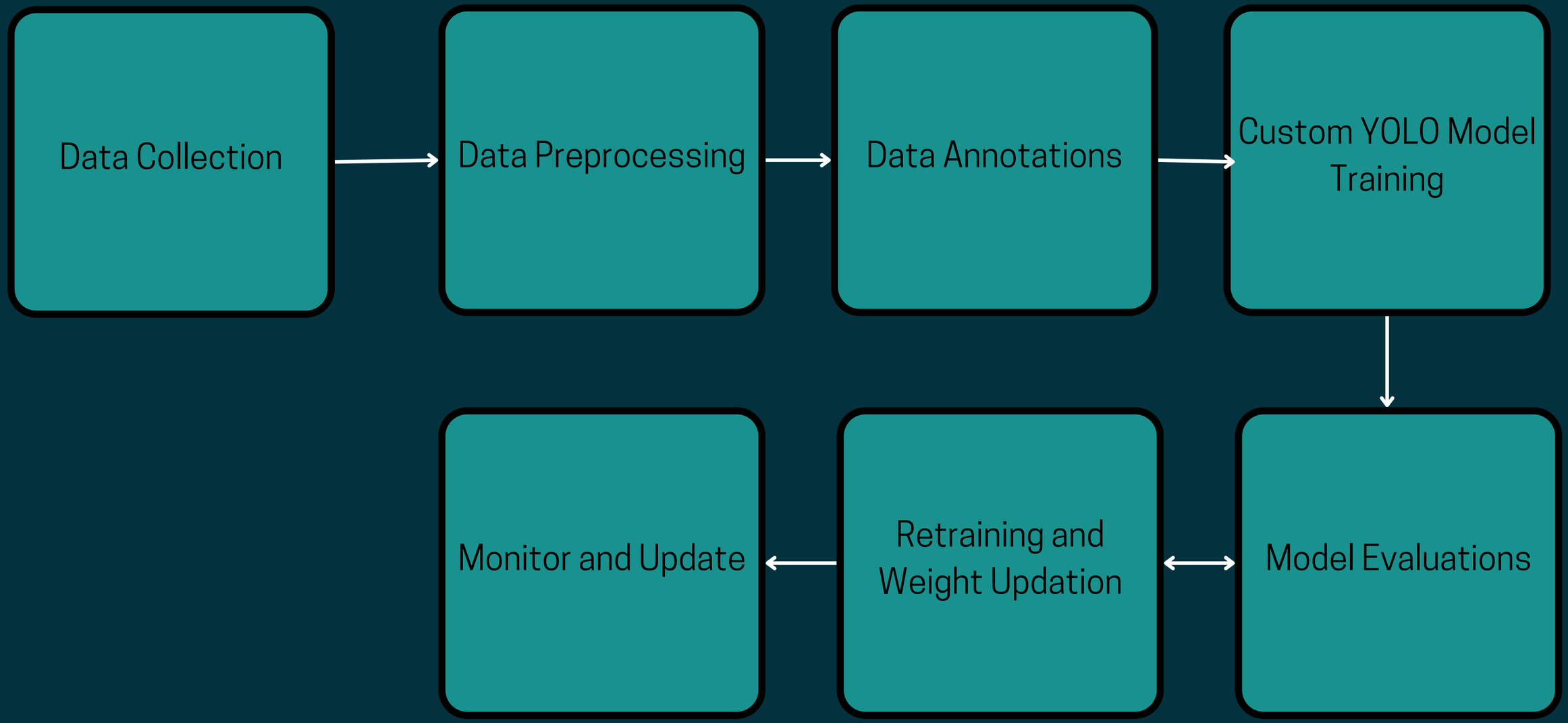
BRINK OF EXTINCTION:

- The International Union for Conservation of Nature (IUCN) estimates that **27,000 species** are at risk extinction.
- Examples of endangered species include Tigers, Leopard, Blackbuck, Sambar deer, Elephants, Rhinos, Lions, Gorillas and many others.

ILLEGAL POACHING

- Wildlife crimes and illegal poaching have increased by **52 % in** India in last 15 years.
- Populations of species on earth declined by an average **47%** between 1970 and 2020 – and the second-biggest direct threat to species survival, after habitat destruction, is wildlife trade.
- Human actions could well exterminate **25%** of the world's species within the next twenty or thirty years. A major part of these extinctions will occur in 'biorich' areas such as tropical forests

Project Work Flow



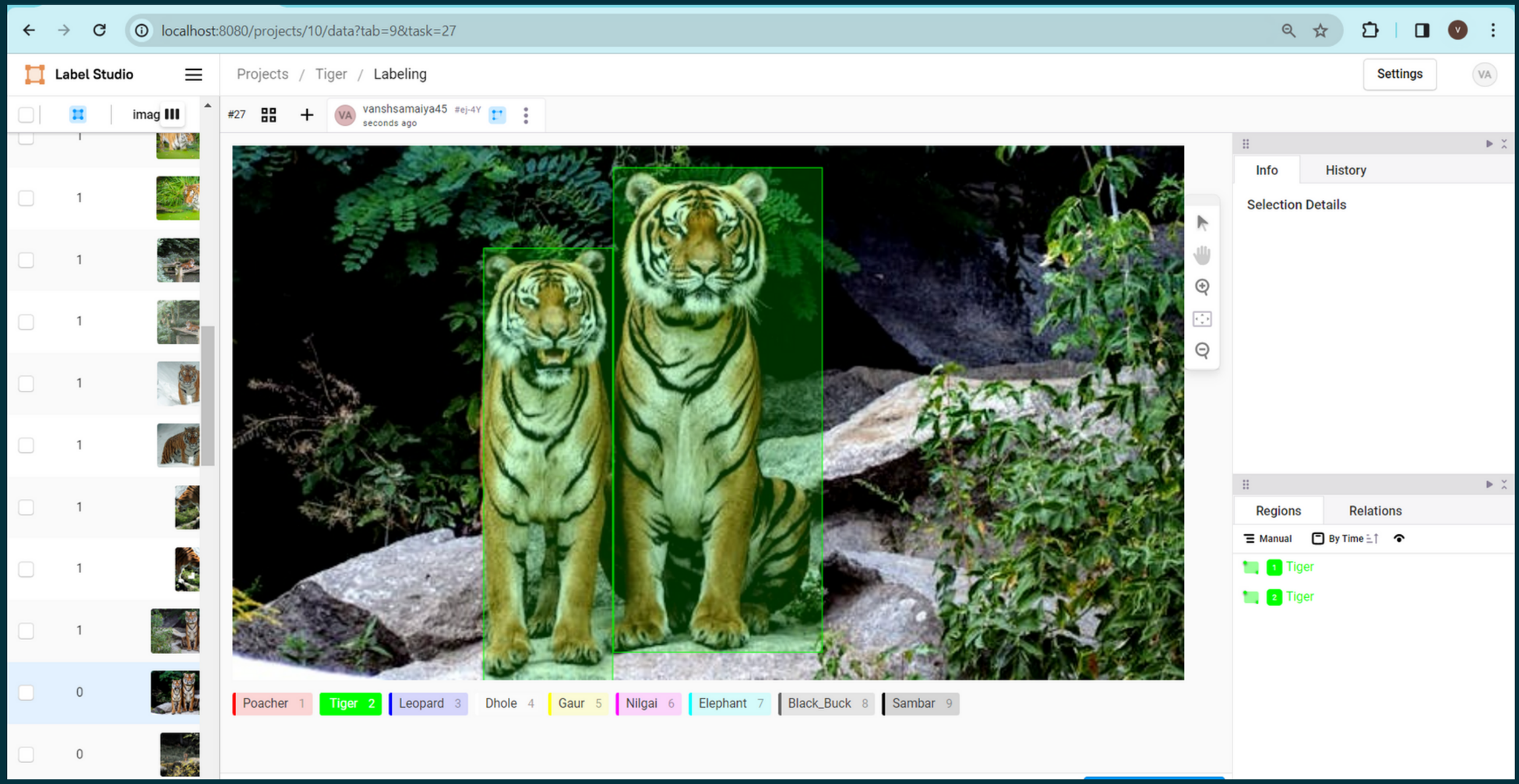
Data Collection

We've gathered data on 8 types of endangered animals found in Madhya Pradesh, including tigers, sambhar deer, black bucks, nilgai, gaurs, dholes, leopards, and elephants. For each of these animal types, we've collected 250 images. Additionally, we've gathered images of poachers for the purpose of detecting them. So, in total, we have 9 categories of images.

To effectively train our detection system, we've divided these images into three sets: training, validation, and testing datasets. This ensures that our system learns from a variety of examples and can accurately identify both endangered animals and potential threats from poachers.

Data Annotations

All the collected images are annoted manually by a local tool Label-Studio which provided each image the coordinates of bounding box and the class of animal in a '.txt' file



8	0.29185504105839416	0.5711678832116788	0.4068282390510949	0.3613138686131386
8	0.6864376140510948	0.4379562043795621	0.45853216240875916	0.5948905109489052

Custom YOLO Model Training

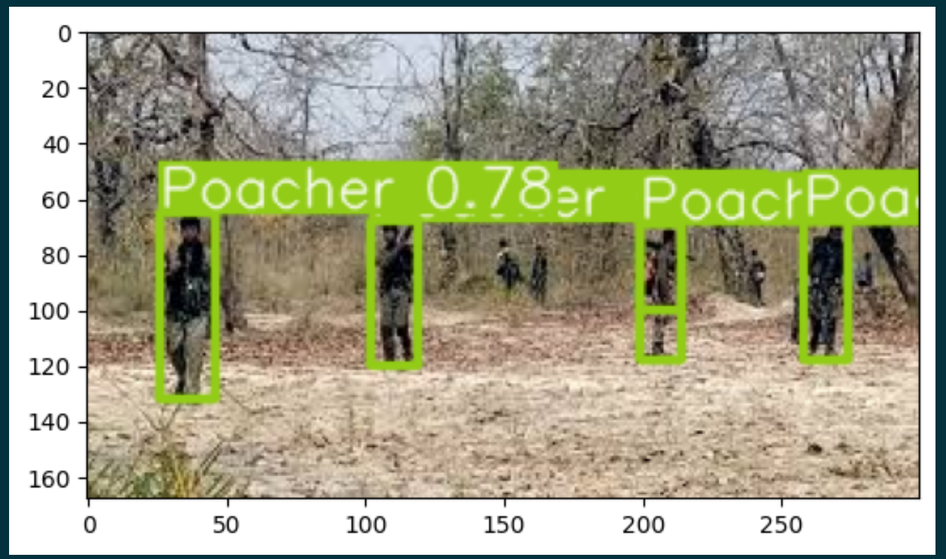
The YOLO v8 model is trained incrementally on 6 sets of equal data batches at a time on google colab which enabled us to use free GPU for faster training but with a time constraint, so we used multiple colab accounts one after another.

The weights at each set is used in the next model and are updated every time capturing the complexity better everytime and distuinguishing each class better on every successing step

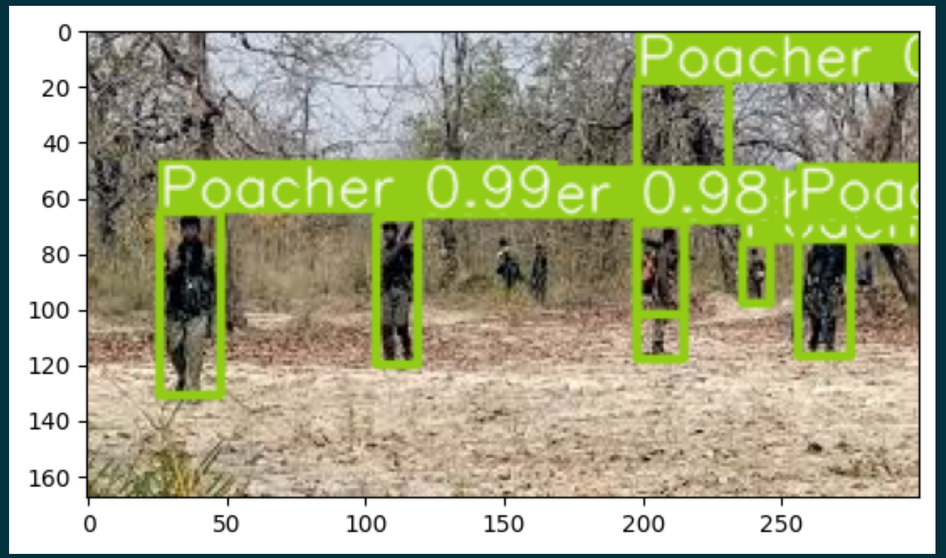
Actual test image

Model Evaluations

After training on 2 sets :
Relatively low confidence and not capturing all instances

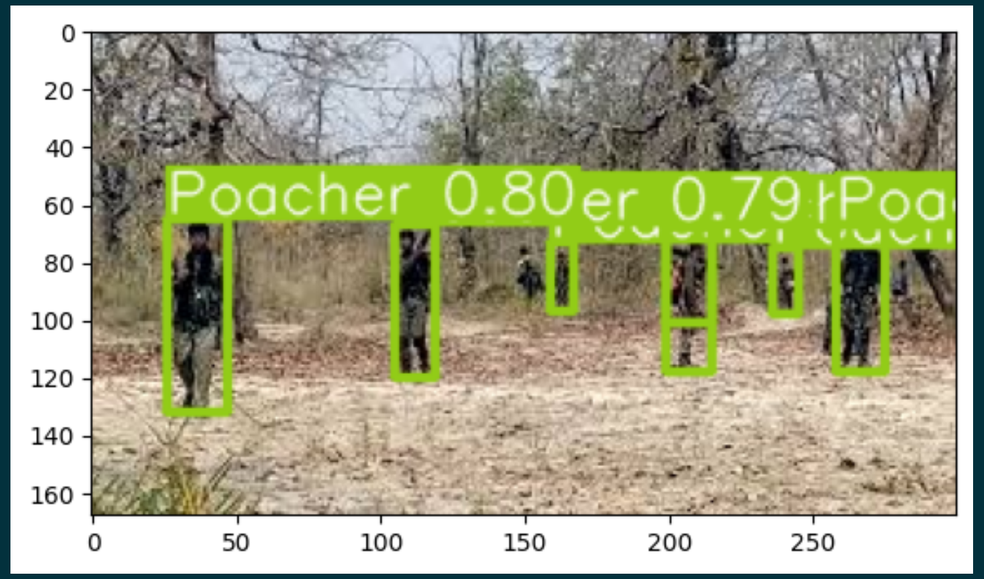


After training on 4 sets :
Relatively high confidence and higher false positives due to overfitting on the data

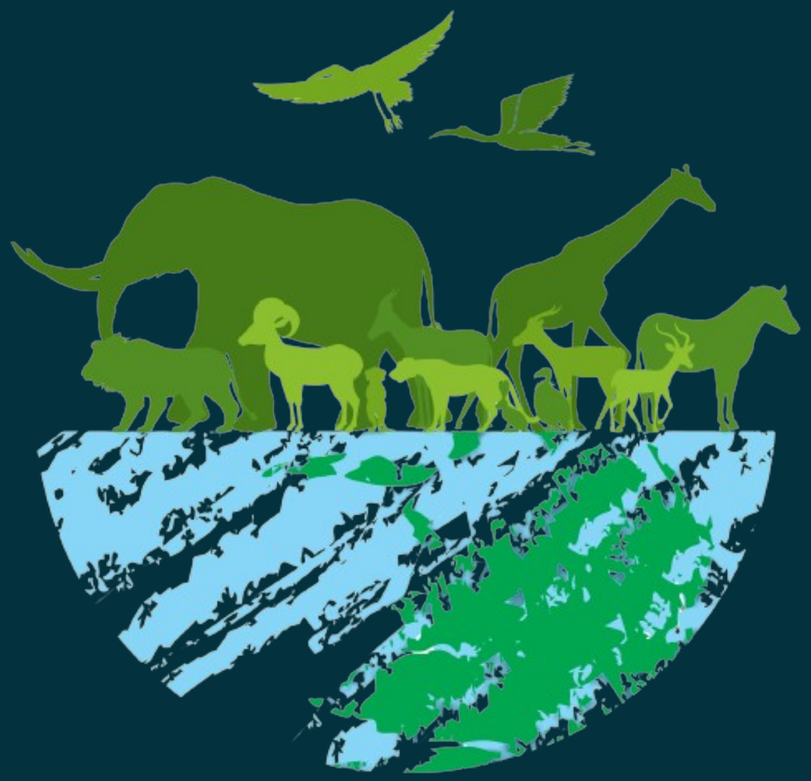


Retraining And Weight Updatation

After training on 6 sets :
Relatively confidence and not capturing details



After incrementally training on six sets of training data, the model's ability to classify positive samples accurately significantly improved. Precision, which measures the ratio of correctly identified positive samples to the total number of positive samples classified (both correctly and incorrectly), saw a noticeable increase which was seen in the precision to confidence graph.



Summary

In conclusion, our project aims at bringing much needed solution to the problem of conservation of endangered species from being hunted and slowly going towards extinction. Our solution uses machine learning and computer vision approach for solving this problem. By harnessing the power of this solution, we can control the killings of these species and preserve our ecosystem and coexist with peace.