Ahmedabad University

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CSE641: Computer Vision : Modern Methods and Applications

Group: RCNN Project no.:13

Weekly Report 1

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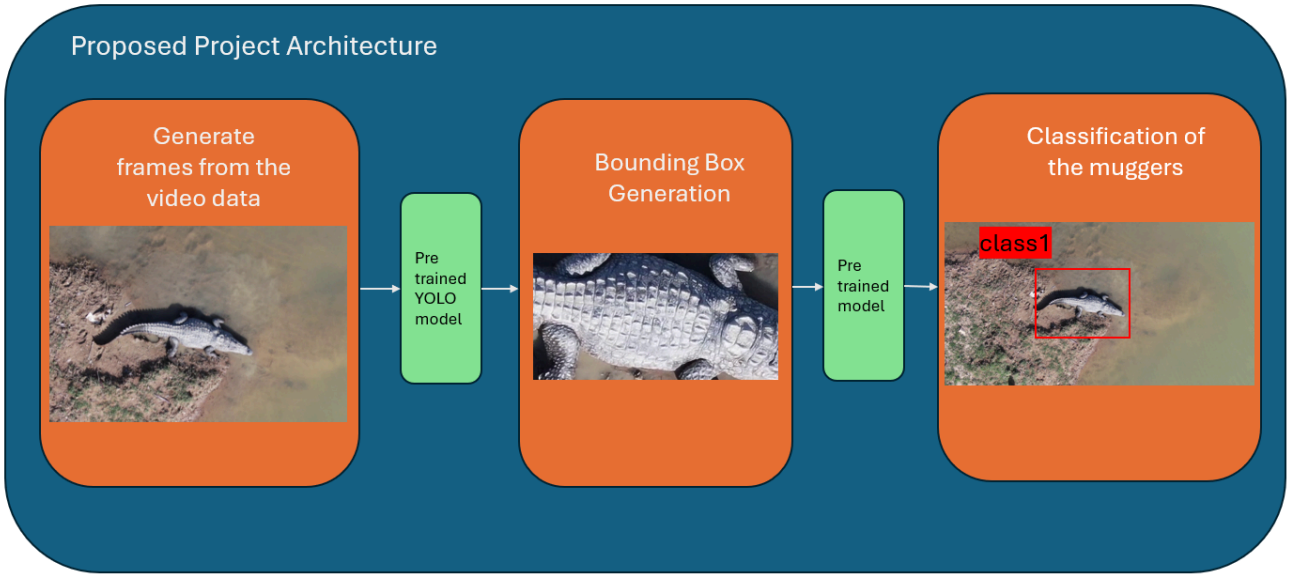
Summary:

The project aims to develop an automated biometric system for identifying Mugger crocodiles (Crocodylus palustris). These crocodiles are endangered in India. Conservation efforts require accurate identification of individuals. Each crocodile has a unique scute pattern on its dorsal side. This pattern serves as a biometric identifier. However, the current CNN-based model struggles to recognize unknown individuals. It leads to high false positive rates.

The project improves identification through data preprocessing, model development, and algorithm optimization. The dataset contains 88.5k drone-captured images from three habitats in Gujarat. Bounding boxes will enhance detection accuracy. The model will use a fine-tuned Inception-based CNN for re-identification. It will also integrate YOLO-based object detection. This combination will help detect and classify scute patterns more accurately.

The final goal is to develop a robust identification algorithm. It will minimize false positives and improve recognition of unknown crocodiles. The system's performance will be evaluated using accuracy, precision, recall, and F1-score.

Flow Chart:



Task completed:

1. Reviewed the data and literature available to us. The base paper proceeds as:
    - **Data Collection** – Used UAVs (drones) to capture images of free-ranging mugger crocodiles.
    - **Dataset Creation** – Built an annotated dataset focusing on the dorsal scute patterns of crocodiles.
    - **Model Selection** – Choose two CNN models: YOLO-v5l (with bounding boxes) and Inception-v3 (without annotations).
    - **Model Training** – Trained both models using 88,000 images from 143 individuals across 19 locations.
    - **Validation** – Evaluated the models using True Positive Rate (TPR) and True Negative Rate (TNR).
    - **Performance Comparison** – Found YOLO-v5l to be more accurate than Inception-v3 in identification and re-identification.
    - **Application & Conclusion** – Demonstrated that UAV imagery and YOLO-based models are effective for non-invasive wildlife monitoring.

2. Implemented the YOLO-v5l model on the annotated dataset, where bounding boxes were applied to mark the crocodile dorsal scute patterns. The algorithm uses multi-scale feature extraction and anchor box regression with confidence thresholding to accurately detect and localize the objects.

Goals for Next week:

1. **Frame Extraction** – Extract frames from the video dataset, ensuring optimal frame rate and resolution for accurate processing.
2. **CSV File Preparation** – Store image paths, extracted feature maps, and relevant metadata in a structured CSV file for efficient analysis.