**IMAGE TAGGING**

**AND ROAD OBJECT DETECTION**

**GROUP 21**

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**Problem Statement:**

In the domain of autonomous driving, the accurate identification and tagging of objects within the BDD100K dataset pose a challenge, particularly in scenarios with smaller objects and complex driving environments. This project aims to enhance image tagging and object detection precision by developing a tailored model for the BDD100K dataset. The focus is on refining algorithms for smaller objects like vehicles, pedestrians, and traffic signs while concurrently exploring parallel processing techniques.

**Literature Review:**

**Business Use Case:**

The developed image tagging and object detection system tailored for the BDD100K dataset holds diverse applications across industries. In autonomous driving, it enhances safety and decision-making by precisely identifying smaller objects in complex environments. Surveillance systems benefit from improved accuracy, ensuring heightened security in crowded public spaces. Municipalities can use it for traffic management, smart cities initiatives, and overall urban planning.

**Data and Data Pre-Processing:**

In this project, we will leverage the BDD100K dataset which was prepared and released by researchers and contributors associated with the Berkeley Artificial Intelligence Research Lab (BAIR) at the University of California, Berkeley. The dataset includes a diverse collection of images captured in different driving scenarios, annotated with information about objects such as cars, pedestrians and traffic signs.

To optimize the data in order to train a robust model we will follow the following data preprocessing steps.

* **Resizing Images:**  
  Uniformly adjust image dimensions to a consistent size (e.g., 600x600 pixels) for model compatibility.
* **Normalizing Pixel Values:**  
  Scale pixel values to a standardized range ( e.g., [0,1]) for consistent data representation.
* **Bounding Box Annotation Transformation:**Adjust object annotations to align with resized images, ensuring accurate training.
* **Handling Missing or Corrupted Data:**Check and address any missing or corrupted data to maintain dataset integrity

**Model and Implementation**

For object detection tasks there are a lot of models available like Viola Jones Detector, RCNN, SPP, Fast RCNN, Faster RCNN, YOLO, SSD and RetinaNet. Out of these the current state of the art models, which are known for their efficiency and accuracy are Faster RCNN and YOLO will be used. Among these two final model will be decided based on the performance of these models on the preliminary training with the random subset dataset.

**Proposed Approaches:**

In this project, we begin by extracting a representative subset from the BDD100K dataset and applying essential preprocessing steps discussed earlier. We then train Faster R-CNN and YOLO models on this subset, evaluating their performance on a validation set to determine the most suitable model based on criterial such as accuracy, speed and resource efficiency.

The selected model undergoes further training on the complete BDD100K dataset to optimize its understanding of the broader dataset. Finally, the trained model is converted to a format compatible with Android deployment, integrated into an Android application and fine-tuned for real-time performance on mobile devices.

If time permits this model will be retrained on the IDD dataset to adapt the model for Indian driving conditions.

**Conclusion**

In conclusion, this project focuses on refining object detection in the BDD100K dataset, with a specific emphasis on smaller objects and potential retraining on IDD dataset.

**Citations**