Project Title: Object Detection for Road Conditions and Turns Sign in Gilgit

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Introduction:

This report presents the outcomes and findings of my project, which was dedicated to the development of an object detection model for the identification of various road conditions and turns in images captured on the roads of Gilgit. This project not only offered a hands-on experience in data collection and labeling but also involved the implementation of object detection models, with a specific focus on the YOLO (V5) algorithm.

Project Phases:

Phase 1: Data Collection: In this initial phase, I collected a diverse dataset of road images from Gilgit, encompassing a wide spectrum of road types, conditions, and weather scenarios. To ensure the dataset's comprehensiveness, I made certain that each class had a minimum of ten images.

Phase 2: Data Labeling:

The meticulous labeling of the collected dataset was carried out, indicating whether each image represented a right turn, left turn, a straight road, or an unexpected road condition, such as landslides. The labeling process was streamlined and enhanced by employing Roboflow's annotation tools.

Phase 3: Data Preparation with Roboflow: To prepare the labeled dataset for model training, I used Roboflow. This step involved converting labels into a YOLO-compatible format and generating configuration files to facilitate model training.

Phase 4: Model Training with Google Colab: Google Colab was utilized to load the prepared dataset using Roboflow's APIs and train a YOLOv5 model. The primary goal was to detect and classify turns and unexpected road conditions in the images.

Phase 5: Model Evaluation: The performance of the YOLOv5 model was evaluated using critical metrics such as Mean Average Precision (mAP) and Intersection over Union (IoU). Based on the evaluation results, I fine-tuned the model to enhance its accuracy and robustness.

Phase 6: Documentation: Comprehensive documentation was maintained throughout the project, which detailed the entire project lifecycle. This included data collection, annotation techniques, model training procedures, and evaluation results. The documentation also included code snippets, visualizations, and accounts of challenges faced during the project.

Resources and Tools:

To accomplish this project, I utilized the following resources and tools:

• Data Collection Resources: Diverse images captured by me.

- Roboflow: Employed for data labeling, data preparation, and dataset management.
- Google Colab: Utilized for model training.
- GitHub: Used for version control and project repository management.
- Documentation Tools: A combination of text editors and Markdown was used for creating the project report.

Conclusion:

This individual project not only provided me with valuable practical experience in the fields of computer vision and deep learning but also underscored the significance of effective tools like Roboflow and cloud-based platforms such as Google Colab. The project's objectives were successfully achieved, resulting in a robust YOLOv5-based object detection model for identifying road conditions and turns in Gilgit. Throughout this project, I gained a deeper understanding of the challenges and complexities associated with developing object detection systems and look forward to applying these skills in future endeavors.

GitHub Link:

https://github.com/shahid786ali/Object-Detection-for-Road-Conditions-and-Turns-Sign-in-Gilgit-using-YOLO.git