Autobrains Data Engineer Project

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Part 2:

Here's an explanation of my code and the logic behind selecting the frames:

1. Data Loading and Preparation:
    - The code begins by loading the ground truth (GT) and detection results from the provided TSV files (‘highend_results.tsv’ and ‘detection_results.tsv’).
    - The ground truth boxes and detection boxes are organized into dictionaries for easier manipulation.
2. Identifying Edge Cases:
    - Edge cases are defined as instances of specialized vehicles or scenarios that are less common but crucial for model improvement. These include vehicles like tractors, kick scooters, trailers, etc.
    - Frames containing these edge case labels are identified by comparing the labels present in the ground truth data against the defined edge case labels.

    Example: (AMBARELLA_3840_1920_1697708889799738.png)

    

    Here we can see a KICK_SCOOTER, which is considered a rare object.

3. Matching Ground Truth and Detection Boxes:
    - An Intersection over Union (IOU) threshold is set (in this case, 0.6) to determine the level of overlap required for a detection box to be considered a match to a ground truth box.
    - Ground truth boxes and detection boxes are matched based on this IOU threshold, ensuring that detections closely align with the actual objects present in the images.
4. Finding Unmatched Boxes:
    - Any ground truth boxes that are not matched with any detection boxes and vice versa are identified. These unmatched boxes represent areas where the model may be performing poorly and requires further training.

Example: (AMBARELLA_3840_1920_1697710529800050.png)

The red boxes are GT boxes that weren't matched to any detection boxes.
The blue boxes are detection boxes that weren't matched to any GT boxes.

5. Selecting Frames for Tagging and Training:
    - Frames are chosen based on the presence of unmatched ground truth or detection boxes, as these represent areas where the model needs improvement.
    - By selecting frames with unmatched boxes, the dataset is tailored to focus on improving the model's performance on edge cases and other challenging scenarios.
6. Data Statistics and Visualization:
    - Various statistics are calculated, such as the number of chosen frames, minimum and maximum heights of objects in these frames, and the average IOU between ground truth and detection boxes.
    - Additionally, a histogram is generated to visualize the distribution of IOU scores, providing insights into the model's performance across different levels of overlap.
7. Copying Chosen Frames:
    - The chosen frames are copied to a new folder ('Q2_chosen_images'), which will be used for further processing, such as tagging and training.
8. Creating Text File with Chosen Frames:
    - The names of the chosen frames are then written to a text file ('Q2_chosen_frames.txt'), which will be used for further processing, such as tagging and training.

By following this methodology, the code effectively selects frames that are crucial for improving the model's performance, particularly in handling edge cases and challenging scenarios. These selected frames will serve as valuable training data for enhancing the model's accuracy and robustness.