Introduction:

The Lyft competition dataset consists of four major structures i.e. scenes, frames, agents and traffic light faces which are stored in zarr files. In Zarr datasets, the arrays are divided into chunks and compressed. A small sample of this data is stored in sample.zarr, which allows us to perform a basic EDA on these structures to understand internal relations.

Agents:

An agent is an observation by the aerial view of some other detected object. Each entry describes the object in terms of its attributes such as position and velocity while also giving the agent a tracking number to track it over multiple frames as well as its most probable label. While there are 17 possible labels numerically only 3 have a name (cyclist, pedestrians and cars) and the others are grouped as unknowns

Schema:

- Centroid - position of agent (Given as x and y separately)
- extent - agent dimension (Given as x and y separately)
- yaw - rotation of an agent with respect to vertical axis. A yaw rotation is a movement around the yaw axis of a rigid body that changes the direction it is pointing, to the left or right of its direction of motion.
- velocity - speed of the agent (Given as x and y separately)
- track_id - unique id to track agent in different frames
- label_probabilities - probability an agent belongs to one of the 17 classes. (We are only given three labels)

As we can see indeed there are only four types of agents provided in the dataset such as Cars, Cyclists, Pedestrians and Unknown. We can see that Unknown label is more as compared to other three agent labels.

Scenes

A scene is identified by the host (i.e. which car was used to collect it) and a start and end time. It consists of multiple frames (=snapshots at discretized time intervals). The scene datatype stores references to its corresponding frames in terms of the start and end index within the frames array (described in dataframe below). The frames in between these indices all correspond to the scene (including start index, excluding end index). Two host cars namely "host-a013" and "host-a101" were utilized to collect the samples for the scenes.

- frame_index_interval - frame index (including start index, excluding end index)
- host - car used to collect data
- start_time - start time of scene
- end_time - end time of scene

Frames

A frame captures all information that was observed at a given instance of time. This includes the following fields:

- timestamp - frame's timestamp
- agent_index_interval - agents (vehicles, cyclists and pedestrians) that were captured by the ego's sensors
- traffic_light_faces_index_interval - traffic light index
- ego_translation - position of host car.
- ego_rotation - rotation of host car (which is collecting data using ego sensors)

Traffic

The traffic light bulbs (red, green, yellow) are referred to as faces.

- face_id - unique id for traffic light bulb
- traffic_light_id - traffic light status
- traffic_light_face_status - out of red/green/yellow which face is active/inactive/unknown

Inferences drawn from EDA

- After plotting the distributions of the extent values, we can see extent distributions are right skewed.
- We can see long tails in a positive direction.
- We can see a linear trend in frame index intervals
- The ego translation distributions (‘ego’ is the name of the sensor utilized to collect data)
    - The X coordinate distribution is left skewed
    - The Z coordinate distribution is right skewed
    - The Y coordinate distribution has a multimodal structure
- The label distribution is as follows (generated using pretty table module):

label	counts
PERCEPTION_LABEL_NOT_SET	0
PERCEPTION_LABEL_UNKNOWN	1324481
PERCEPTION_LABEL_DONTCARE	0
PERCEPTION_LABEL_CAR	519385
PERCEPTION_LABEL_VAN	0
PERCEPTION_LABEL_TRAM	0
PERCEPTION_LABEL_BUS	0
PERCEPTION_LABEL_TRUCK	0
PERCEPTION_LABEL_EMERGENCY_VEHICLE	0
PERCEPTION_LABEL_OTHER_VEHICLE	0
PERCEPTION_LABEL_BICYCLE	0
PERCEPTION_LABEL_MOTORCYCLE	0
PERCEPTION_LABEL_CYCLIST	6688
PERCEPTION_LABEL_MOTORCYCLIST	0
PERCEPTION_LABEL_PEDESTRIAN	43182
PERCEPTION_LABEL_ANIMAL	0
AVRESEARCH_LABEL_DONTCARE	0