AIML Capstone

Autonomous Driving

Business Scenario

This problem statement and objective consists of two parts: Part 1 and Part 2

Problem statement 1:

Autonomous vehicles (AV) and intelligent transport systems (ITS) are the future of road transport. Automatic detection of vehicles on the road in real-time is essential for vehicle tracking, vehicle counting, and road incident response.

Additional Information:

Tesla, Inc. is an American multinational automotive and artificial intelligence company. In October 2020, Tesla started a full self-driving capability beta program in the United States. Tesla has over 100k people in this program.

Business Scenario

Objective part 1:

As the first part of this project, you need to develop an AI model using a deep learning framework that predicts the type of vehicle present in an image as well as localizes the vehicle by rectangular bounding box.

Objective part 2:

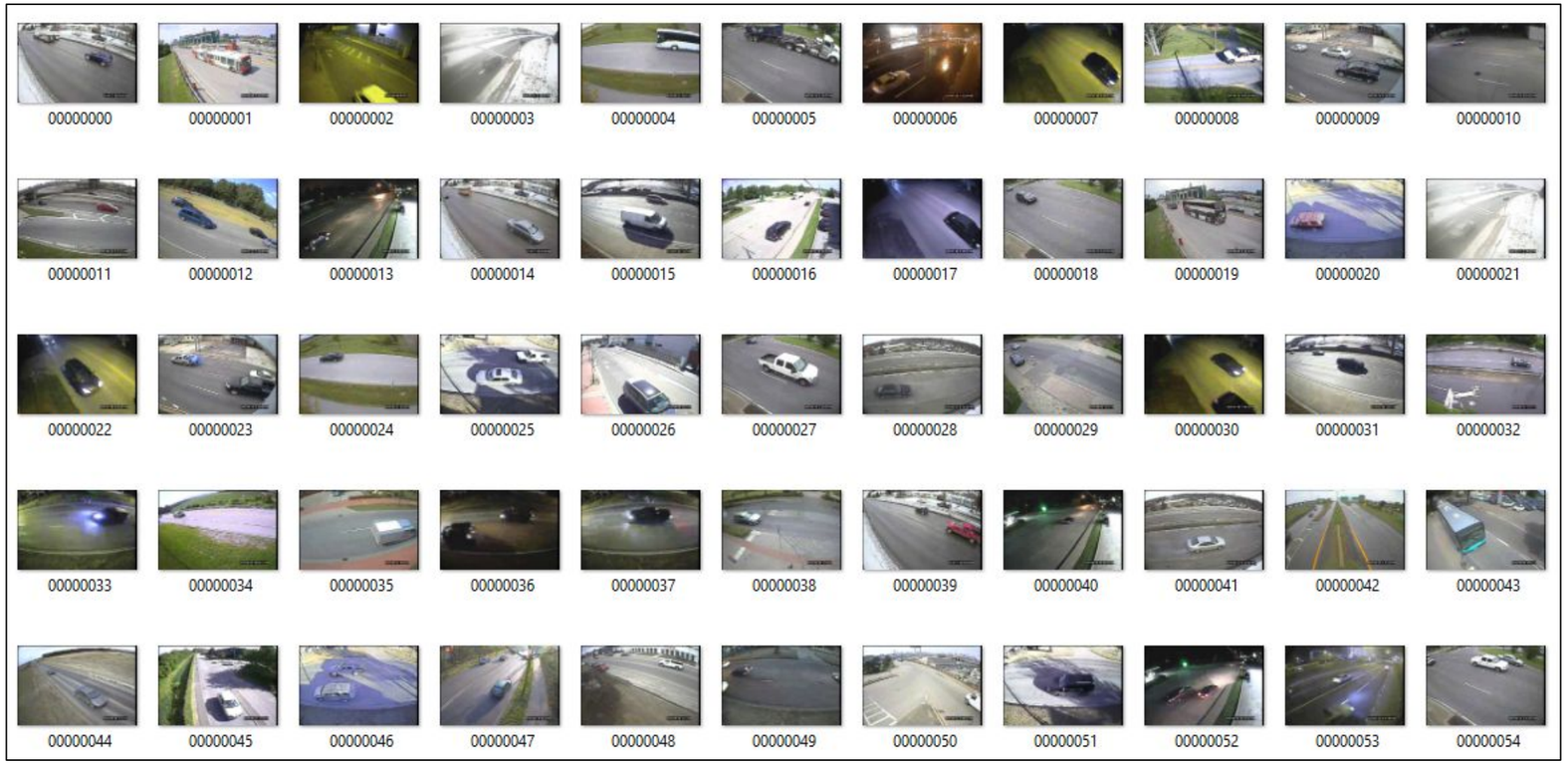
As the second part of this project, you need to analyze the usage of autopilot and its effect on road safety.

Part 1

Dataset Description

Images.zip

This dataset consists of images of autonomous vehicles.



Project Task

Object detection

1. Create a parent folder for custom model training and child folders to store data.
2. Prepare the dataset for model training, keeping the following points in mind:
    - This dataset contains many images, and depending on the compute power of the VM, it might take a long time to unzip this huge amount of data.
3. Create a CNN architecture of your choice for object detection to train an object detection model. Please note that algorithm or architecture selection is a very important aspect of ML model training, and you must choose the one that works best for your dataset.

Project Task

Object detection

4. Evaluate the model and check the test results
5. Run inferences on sample images and see if vehicles are detected accurately

Part 2

Dataset Snapshot

Tesla-Deaths.csv

Case #	Year	Date	Country	State	Descripti	Deaths	Tesla driv	Tesla occ	Other veh	Cyclists/	TSLA+cycl	Model	Autopilot	Verified T	Verified	Tesla Autopilot Death		Source	Note	Dece
294	2022	1/17/2023	USA	CA	Tesla cras	1	1	-	-	-	1	-	-	-	-	https://w	https://w	https://web.archive.org/w		
293	2022	########	Canada	-	Tesla cras	1	1	-	-	-	1	-	-	-	-	https://w	https://w	https://web.archive		Taren
292	2022	########	USA	WA	Tesla hits	1	-	1	-	-	1	-	-	-	-	https://w	https://w	https://web.archive.org/w		
291	2022	12/22/202	USA	GA	Tesla cras	1	1	-	-	-	1	-	-	-	-	https://w	https://w	https://web.archive.org/w		
290	2022	12/19/202	Canada	-	Tesla cras	1	-	-	-	1	1	-	-	-	-	https://w	https://w	https://web.archive.org/w		
289	2022	12/18/202	USA	CA	Tesla hit t	1	-	1	-	-	-	-	-	-	-	https://w	https://w	https://web.archive.org/w		
288	2022	12/17/202	USA	CA	Tesla hits	1	-	-	-	1	1	-	-	-	-	https://w	https://w	https://web.archive.org/w		
287	2022	########	USA	CA	Tesla cras	1	1	-	-	-	-	-	-	-	-	https://w	https://w	https://web.archive		Claris
286	2022	########	USA	MO	Collision	1	-	-	1	-	-	-	-	-	-	https://w	https://w	https://www.ky3.cc		Rita D
285	2022	########	Canada	-	Tesla vee	1	1	-	-	-	-	-	-	-	-	https://w	https://w	https://www.tvanouvelle		
284	2022	11/28/202	China	-	Tesla run	2	-	-	2	-	-	Y	-	-	-	https://w	https://w	https://web.archive.org/w		
283	2022	11/27/202	USA	CA	Tesla care	1	1	-	-	-	1	-	-	-	-	https://w	https://w	https://web.archive.org/w		
282	2022	11/26/202	USA	AR	Tesla hits	1	-	-	-	1	1	-	-	-	-	https://w	https://w	https://web.archive		Dona
281	2022	11/18/202	China	-	Tesla cras	1	1	-	-	-	1	-	-	-	-	https://w	https://w	https://web.archive.org/w		
280	2022	########	Mexico	-	Tesla hits	1	-	-	1	-	-	-	-	-	-	https://w	https://w	https://web.archive		Carlo
279	2022	########	USA	CA	Multi-veh	1	-	-	1	-	-	-	-	-	-	https://w	https://w	https://web.archive.org/w		
278	2022	########	USA	CA	Tesla hits	1	-	1	-	-	-	-	1	-	-	https://w	https://w	https://web.archive.org/w		
277	2022	########	China	-	Out of co	2	-	-	1	1	1	-	-	-	-	https://w	https://w	https://web.archive.org/w		
276	2022	########	USA	IL	Collision	1	1	-	-	-	1	-	-	-	-	https://w	https://w	https://web.archive		Charl

Dataset Description

Tesla - Deaths.csv

Variables	Description
Case#	Unique identification for the accident case
Year	Year in which the accident occurred
Date	Date of occurrence of the accident
Country	Country where the accident occurred
State	State where the accident occurred
Description	Description of the accident
Deaths	No. of deaths that occurred in the accident
Tesla driver	If there was death of the driver

Dataset Description

Tesla - Deaths.csv

Variables	Description
Tesla Occupant	Unique identification for beneficiary (primary)
Other vehicle	Number of vehicles teslahas collided with
Cyclists/ Peds	Number of cyclists per pedestrian they have collided with
TSLA+cycl / peds	Number of Teslas or bicycles or pedestrians the vehicle collided with
Model	Model of the vehicle
Autopilot claimed	If insurance has been claimed for the vehicle
Verified Tesla Autopilot Deaths	Total number of verified deaths
Verified Tesla Autopilot Deaths + All Deaths Reported to NHTSA SGO	All the verified deaths and the reported deaths to NHSTA SGO

Dataset Description

Tesla - deaths.csv

Variables	Description
Source	Source of the reported accident case
Note	Note of whether the accident was caused by Tesla
Deceased 1	First deceased
Deceased 2	Second deceased
Deceased 3	Third deceased
Deceased 4	Fourth deceased

Project Task

Data science

1. Preliminary Data Inspection and Cleaning
    a. Perform preliminary data inspection, checking for data types, missing values, and duplicates
    b. Remove any columns that might not be relevant for the analysis
2. Exploratory Data Analysis
    a. Perform an in-depth exploratory data analysis on the number of events by date, per year, and per day for each state and country
    b. Analyze the different aspects of the death events. For example:
        - What is the number of victims (deaths) in each accident?
        - How many times did tesla drivers die?
        - What is the proportion of events in which one or more occupants died?
        - What is the distribution of events in which the vehicle hit a cyclist or a pedestrian?
        - How many times did the accident involve the death of an occupant or driver of a Tesla along with a cyclist or pedestrian?
        - What is the frequency of Tesla colliding with other vehicles?

Project Task

Data science

c. Study the event distribution across models
d. Check the distribution of verified Tesla autopilot deaths

Thank You