Analysis

First of all, data is trained using images taken from various resources, especially from drones.

1. First is a screenshot when a clean road image is fed into the system, so below is the result.

Clean road image is given into the system

Result:

Tensorflow with GPU (NVIDIA GeForce 950m) took 1.40 minutes to train the data of (6958 images) with 500 steps, testing (Evaluation Time) is 1.098 seconds.

Training images: 6957

Testing image: 1

2. Fig 2 is a garbage Dataset (120 images) taken as testing purpose. These testing images are taken from various parts like drones (aerial view), internet and considered as garbage containing images by us.

Garbage Images

Result:

Tensorflow with GPU (NVIDIA GeForce 950m) took 1.40 minutes to train the data of (6958 images) with 500 steps, testing (Evaluation Time) is 1.147 seconds.

Training images: 6758

Testing image: 200

3. Fig 3 is a small Potholes Dataset (50 images) taken as testing purpose. These testing images are taken from various parts like drones (aerial view), internet and considered as garbage containing images by us.

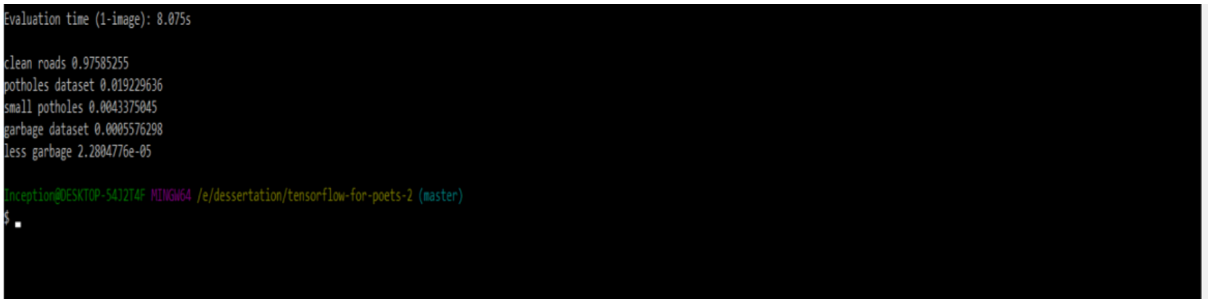
Potholes

Result: Tensorflow with GPU (NVIDIA GeForce 950m) took 1.40 minutes to train the data of (6958 images) with 500 steps, testing (Evaluation Time) is 1.314 seconds.

Training images: 6908

Testing image: 50

4. Fig 4 is a clean road Dataset (500 images) taken as testing purpose. These testing images are taken from various parts like drones (aerial view), internet and considered as garbage containing images by us.



Clean Roads

Result: Tensorflow with GPU (NVIDIA GeForce 950m) took 3.40 minutes to train the data of (6958 images) with 1000 steps, testing (Evaluation Time) is 8.705 seconds.

Training images: 6458

Testing image: 500

5. Fig 5 is a small clean road Dataset (350 images) taken as testing purpose. These testing images are taken from various parts like drones (aerial view), internet and considered as garbage containing images by us.

Less Garbage

Result: Tensorflow with GPU (NVIDIA GeForce 950m) took 3.40 minutes to train the data of (6958 images) with 1000 steps, testing (Evaluation Time) is 1.190 seconds.

Training images: 6608

Testing image: 350

6. Fig 6 is street_1(consists of 500 images) taken as testing purpose. This testing image is taken from the drone.

Street 1

Result: Tensorflow with GPU (NVIDIA GeForce 950m) took 3.40 minutes to train the data of (6958 images) with 1000 steps, testing (Evaluation Time) is 1.190 seconds.

Training images: 6958

Testing image: 500

7. Fig 7 is street_2(consists of 800 images) taken as testing purpose. This testing image is taken from the drone.

Street 2

Result: Tensorflow with GPU (NVIDIA GeForce 950m) took 3.40 minutes to train the data of (6958 images) with 1000 steps, testing (Evaluation Time) is 1.165 seconds.
Training images: 6958

Testing image: 800

8. Fig 8 is street_2(consists of 250 images) taken as testing purpose. This testing image is taken from the drone.

Garbage Dataset

Result: Tensorflow with GPU (NVIDIA GeForce 950m) took 3.40 minutes to train the data of (6958 images) with 1000 steps, testing (Evaluation Time) is 1.160 seconds.

Training images: 250

Testing image: 800

After the analysis, we have made an analysis table, table 3 comprising an analysis table.

No of experiments	No of training images: All 5 categories are trained	Types of testing images: taken from the various resources: drone, internet, mobile	Result after evaluation: Probability
1	6558	Garbage Dataset:400	**Garbage dataset 0.9999995 Potholes dataset:4.35966e-07 Clean roads 4.2900403e-08 Small potholes 3.220000e-07 Less garbage 2.44444542e-09**
2	6200	One street drone data:	**Clean roads 0.997109 Garbage dataset 0.002041588 Potholes dataset 0.0008436 Small potholes 8.563290e-07 Less garbage 2.584832de-09**
3	6000	Pothole dataset: taken from the internet, mobile :958	**Potholes dataset 0.999675 Garbage dataset 8.90435e-06 Clean roads 1.2984551e-03 Small potholes 2.42000e-06 Less**

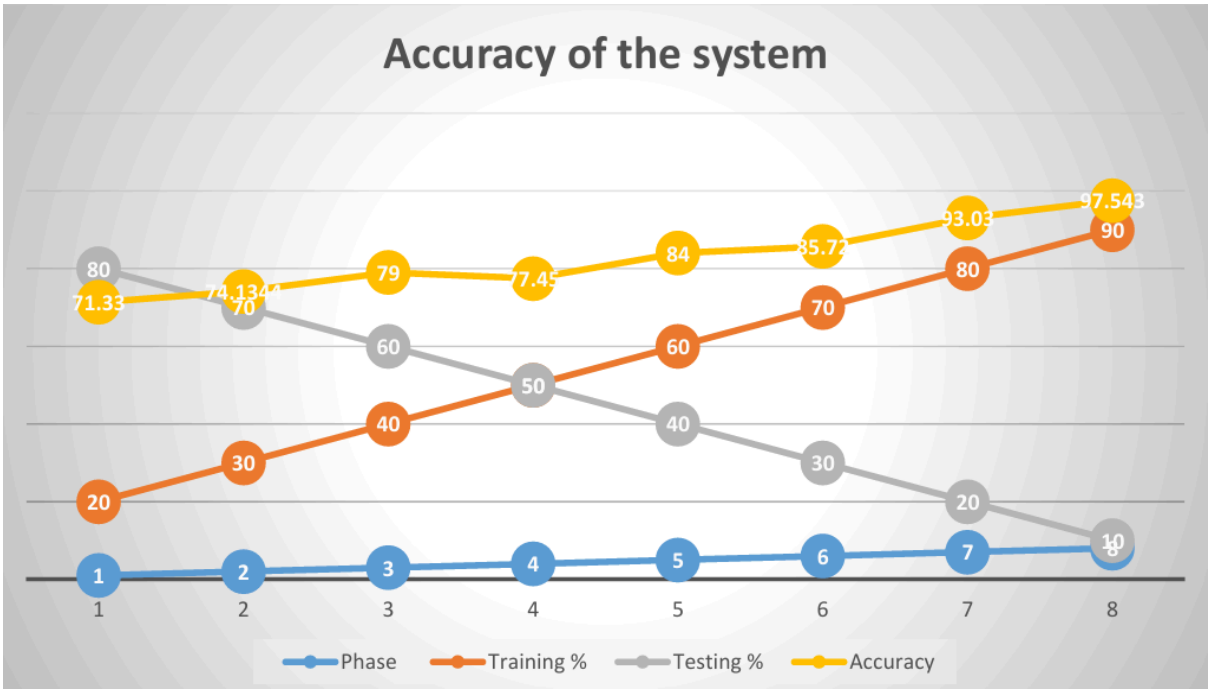
			garbage 7.3567542e-05
4	4000	Street_2 images:2500	**Clean roads 0.9909473 Garbage dataset 0.00202323 Potholes dataset 0.0008823 Small potholes 1.520000e-07 Less garbage 5.5349842e-04**
5	5000	Small Pothole: images: 400	**Small potholes 0.93067473 Clean roads 1.11113e-02 Garbage dataset 0.00011442 Potholes dataset 0.00091311 Less garbage 1.55392e-05**
6	5500	Less Garbage: images taken from internet for	**Less garbage 0.9999995 Clean roads 0.24746e-01 Garbage dataset 0.0674829**
		experiment purpose:200	**Potholes dataset 2.75966e-08 Small potholes 3.220000e-07**
7	4200	Street_3 images:700	**garbage dataset 0.9564556 Potholes dataset 2.32116e-08 Clean roads 3.12121e-05 Small potholes 4.43433e-07 Less garbage 1.49293e-09**
8	2000	Clean Roads: Taken from the internet, mobile:620	**Clean roads 0.960323 Garbage dataset 0.00011192 Potholes dataset 0.00043272 Small potholes 3.121210e-07 Less garbage 6.2312639e-04**

9	6000	Street_2: 500	**Clean roads 0.9999995 Garbage dataset 2.6829e-09 Potholes dataset 2.76575e-08 Small potholes 3.220000e Less garbage 1.4465542e-09**

Analysis of accuracy of the system is given below,

Phase	Training %	Testing %	Accuracy of the system
1	20	80	71.33
2	30	70	74.1344
3	40	60	79
4	50	50	77.45
5	60	40	84
6	70	30	85.72
7	80	20	93.03
8	90	10	97.543

Below is a better view of the table above.



After the training is done if the waste is detected, a message is sent to the worker, there will be an image id and location and if the location has garbage then the message is being sent to the worker. The table below will clear the picture.