FLARE PATH – ADVANCED VEHICLE FIRE SAFETY AND MONITORING WITH RAPID EMERGENCY DISPATCH SOLUTIONS

R24-058

Status Document-2

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B.Sc. (Hons) Degree in Information Technology specializing in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

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Group Details

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Co-supervisor – Mr. Deemantha Nayanajith Siriwardana

External Supervisor – Mr. Onray Sahinda

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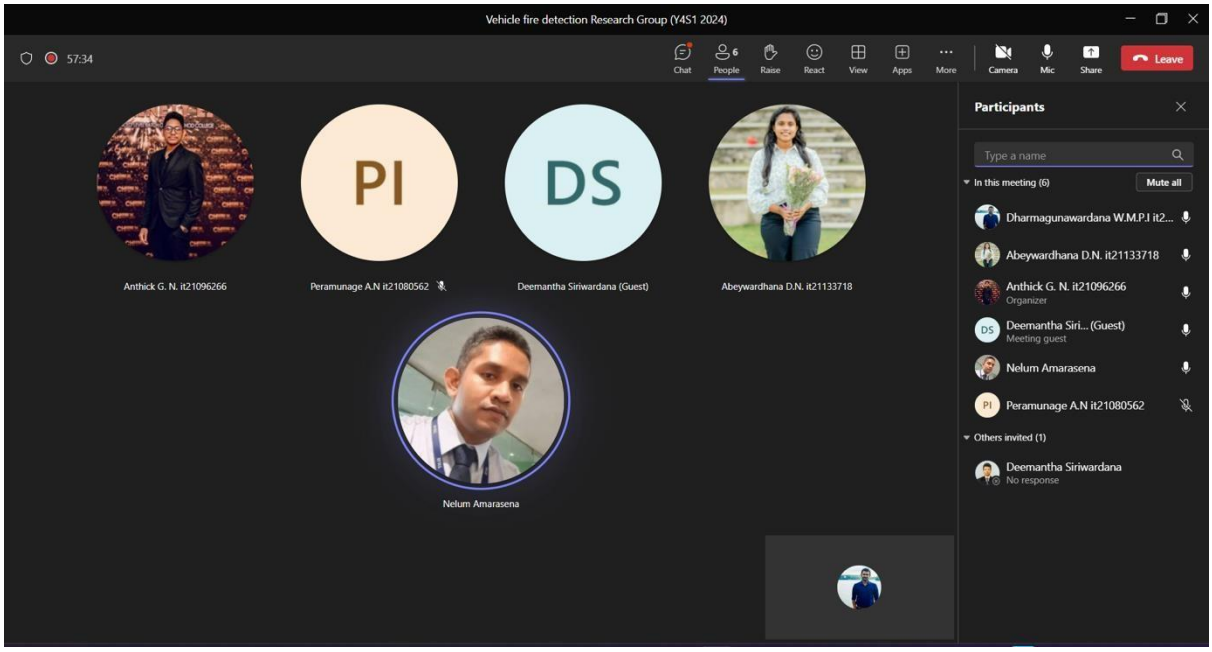
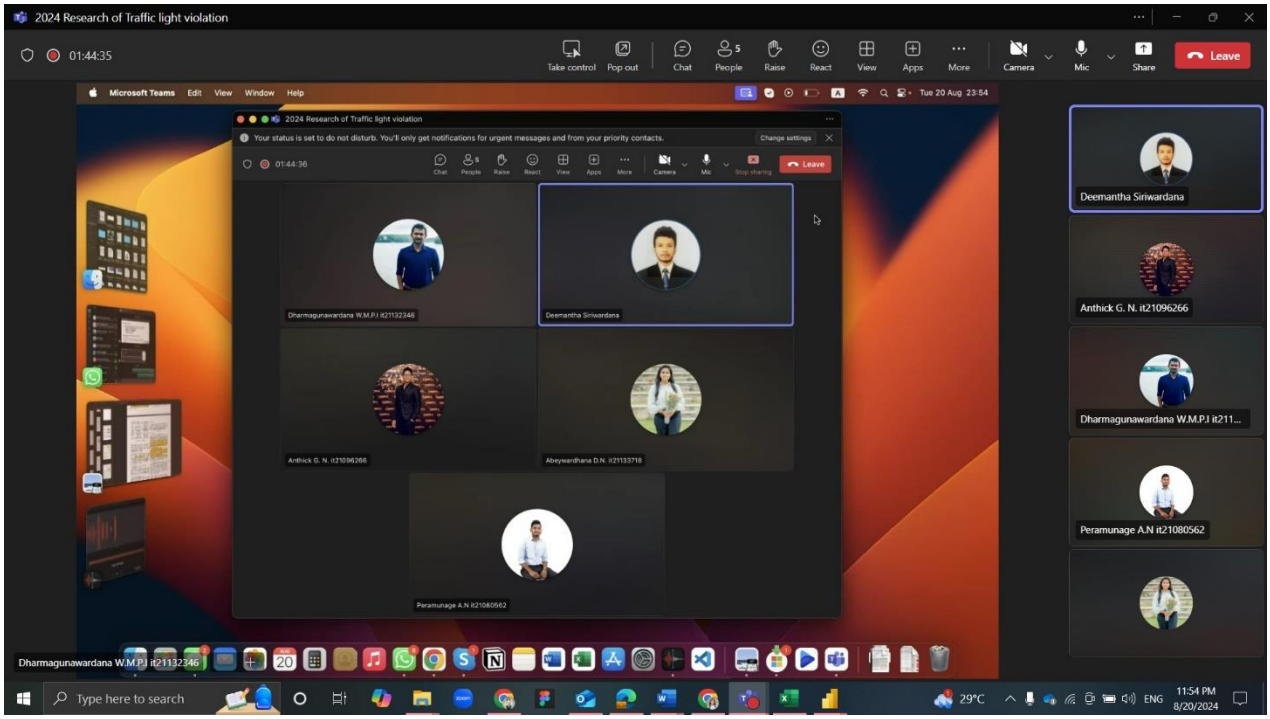
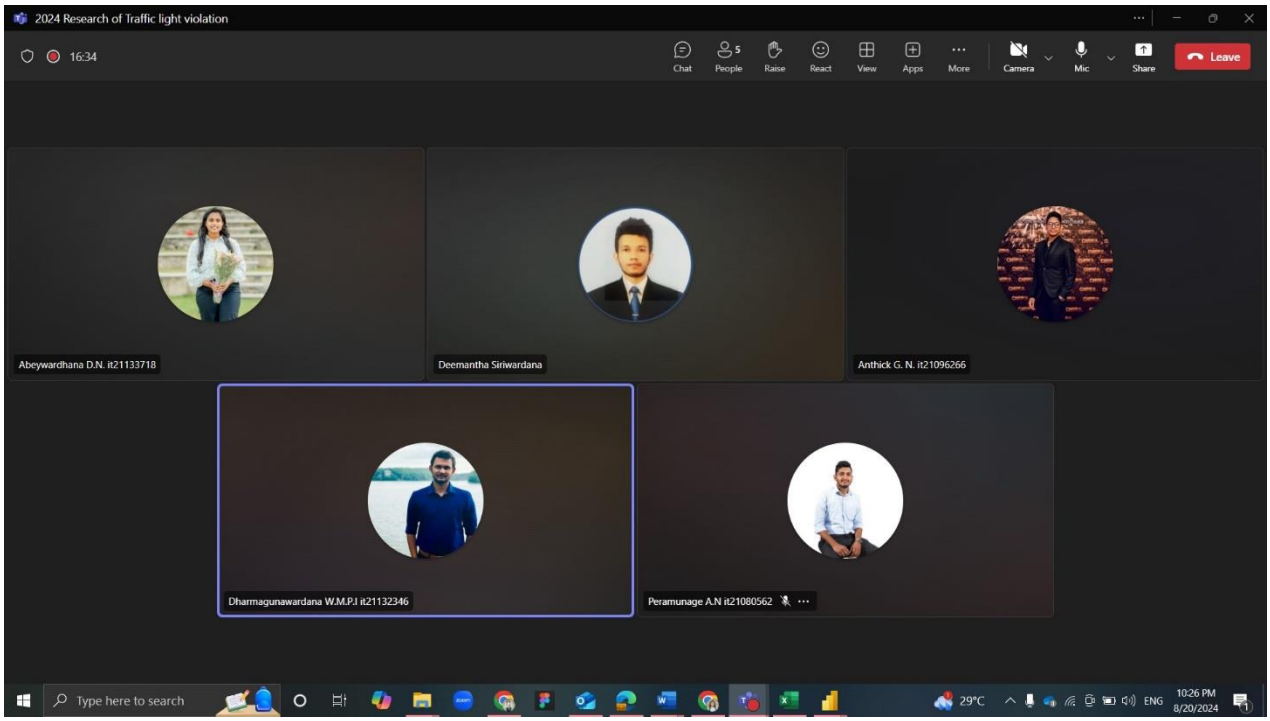
Meetings & Calls

Meetings with supervisor and co-supervisor

Meeting with both supervisor and co-supervisor about the project progress and improvements that we need to do to our project.






2024 Research of Traffic light violation
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Chat
People
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Abeywardhana D.N. it21133718
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Anthick G. N. it21096266
Dharmagunawardana W.M.P.I it21132346
Peramunage A.N it21080562
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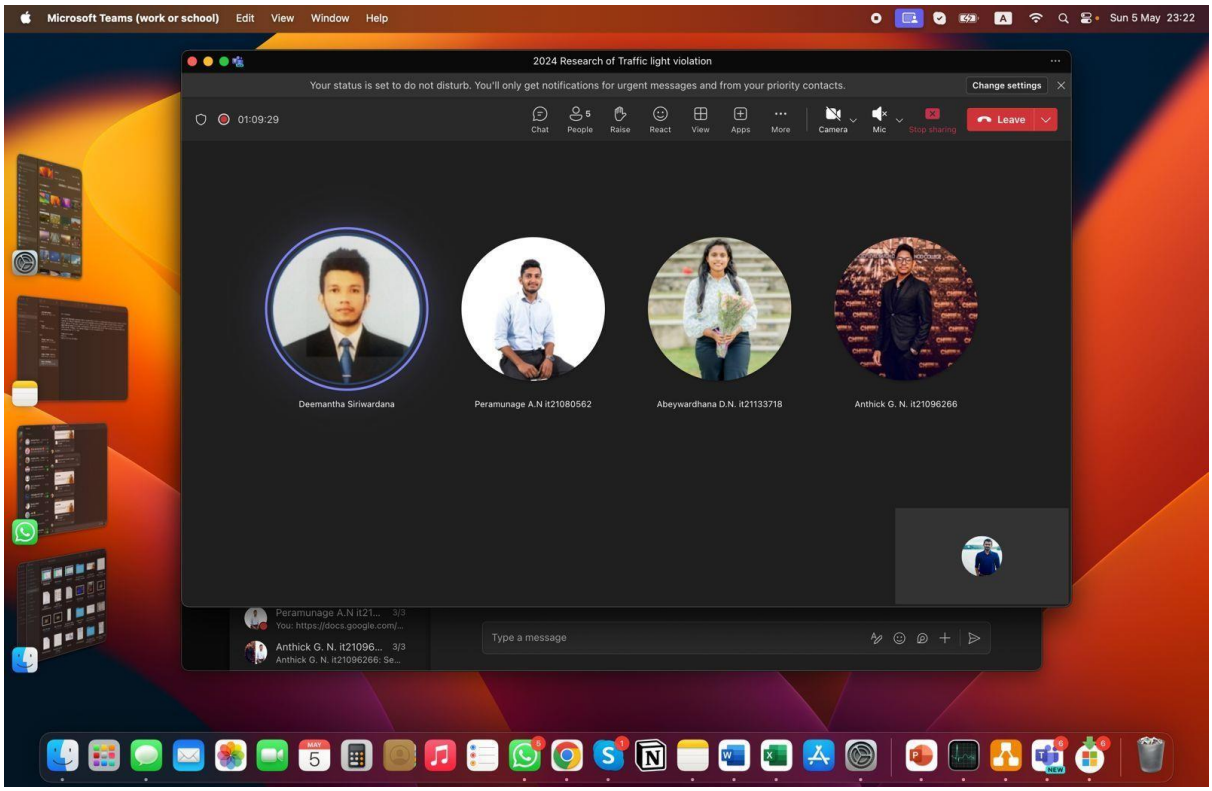
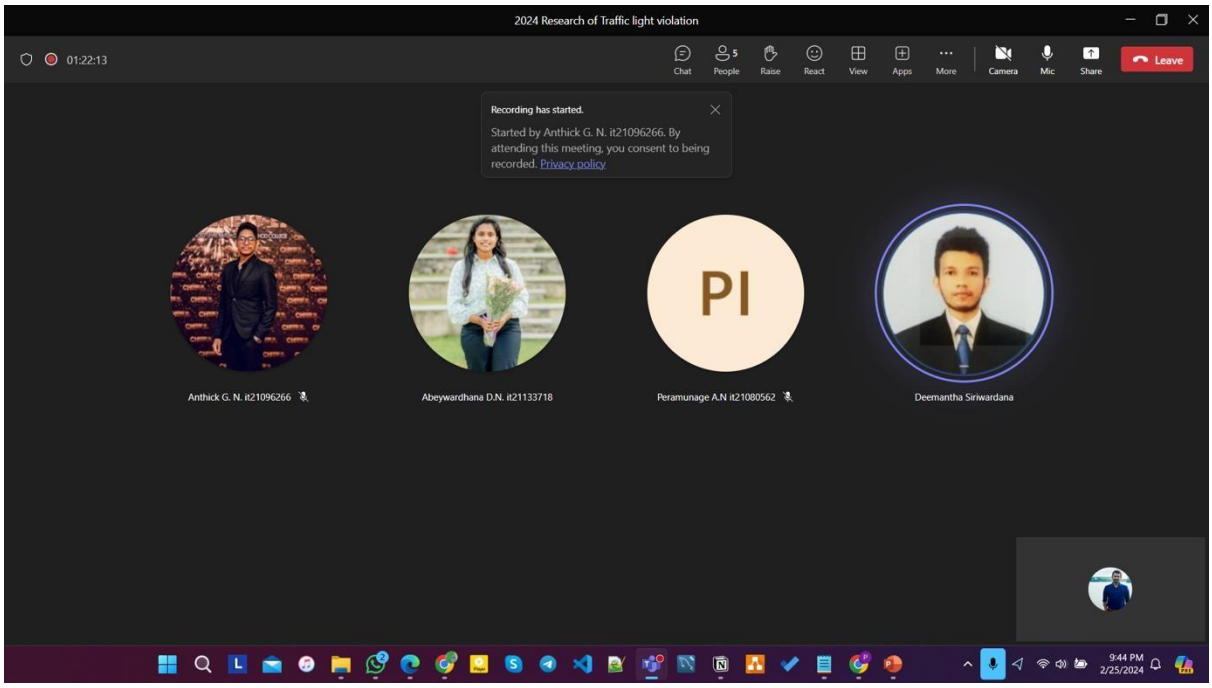
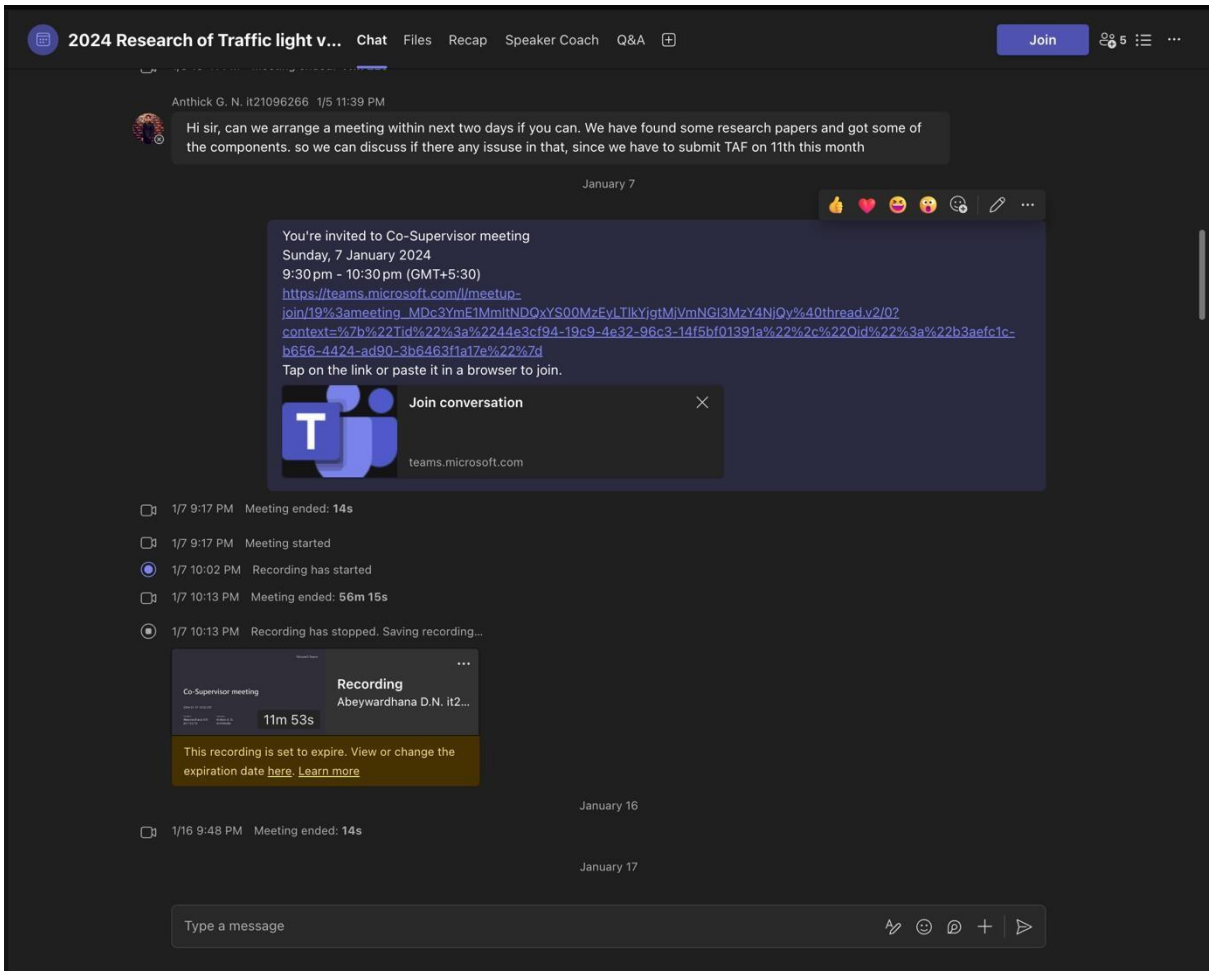
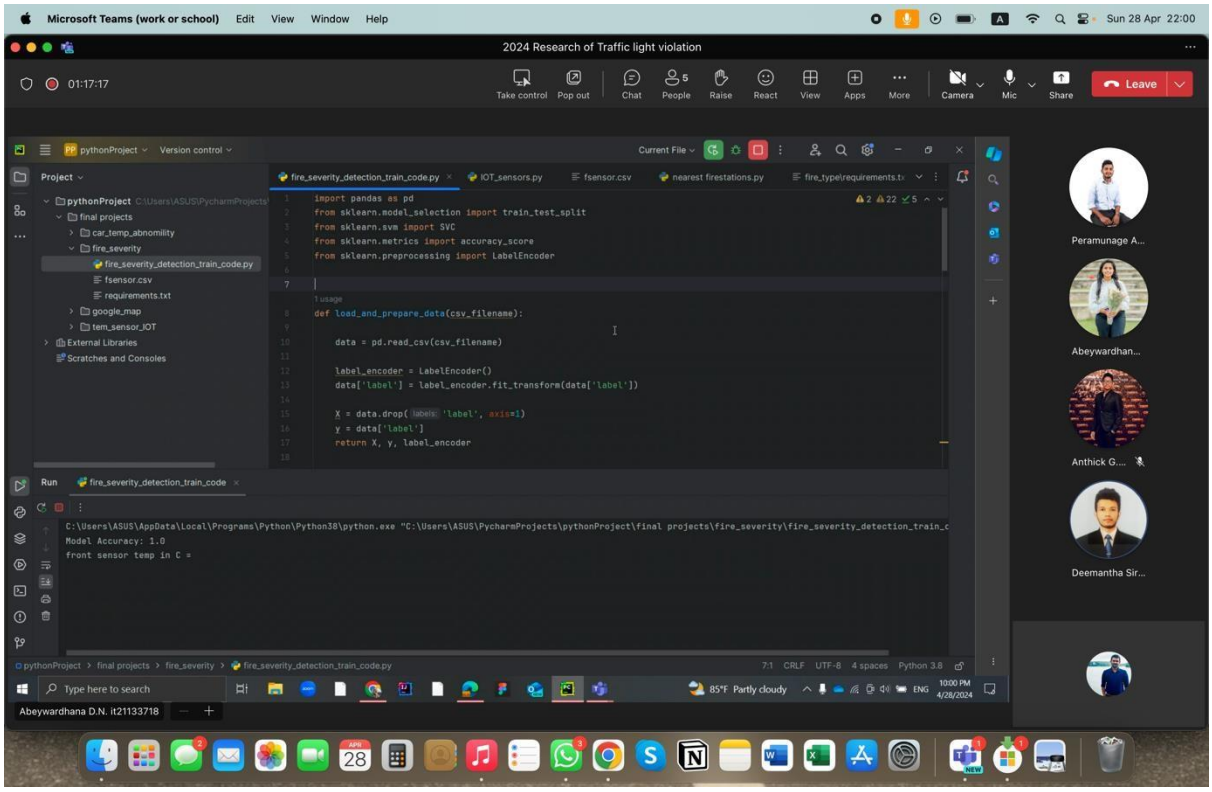

Microsoft Teams (work or school)
Edit
View
Window
Help
Sun 5 May 23:22
2024 Research of Traffic light violation
Your status is set to do not disturb. You'll only get notifications for urgent messages and from your priority contacts.
Change settings
01:09:29
Chat
People
Raise
React
View
Apps
More
Camera
Mic
Stop sharing
Leave
Deemantha Siriwardana
Peramunage A.N it21080562
Abeywardhana D.N. it21133718
Anthick G. N. it21096266
Type a message

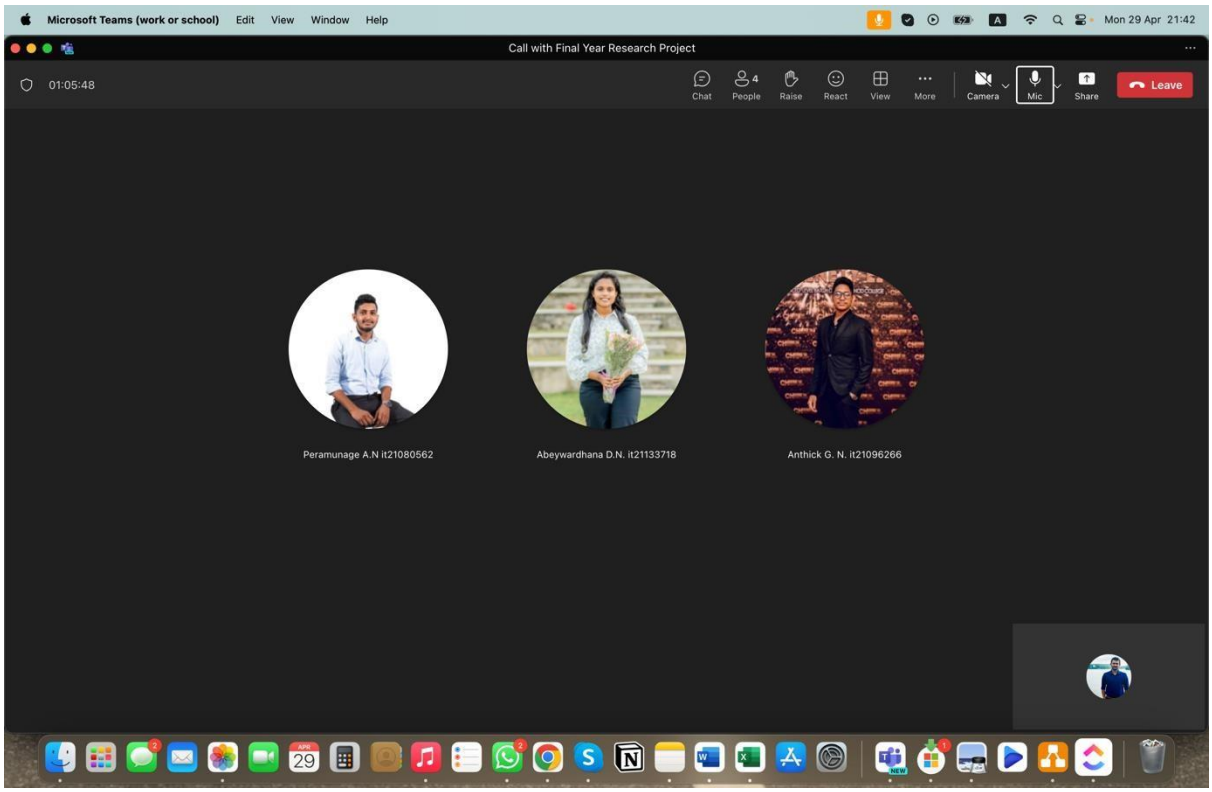




Code review with co-supervisor.

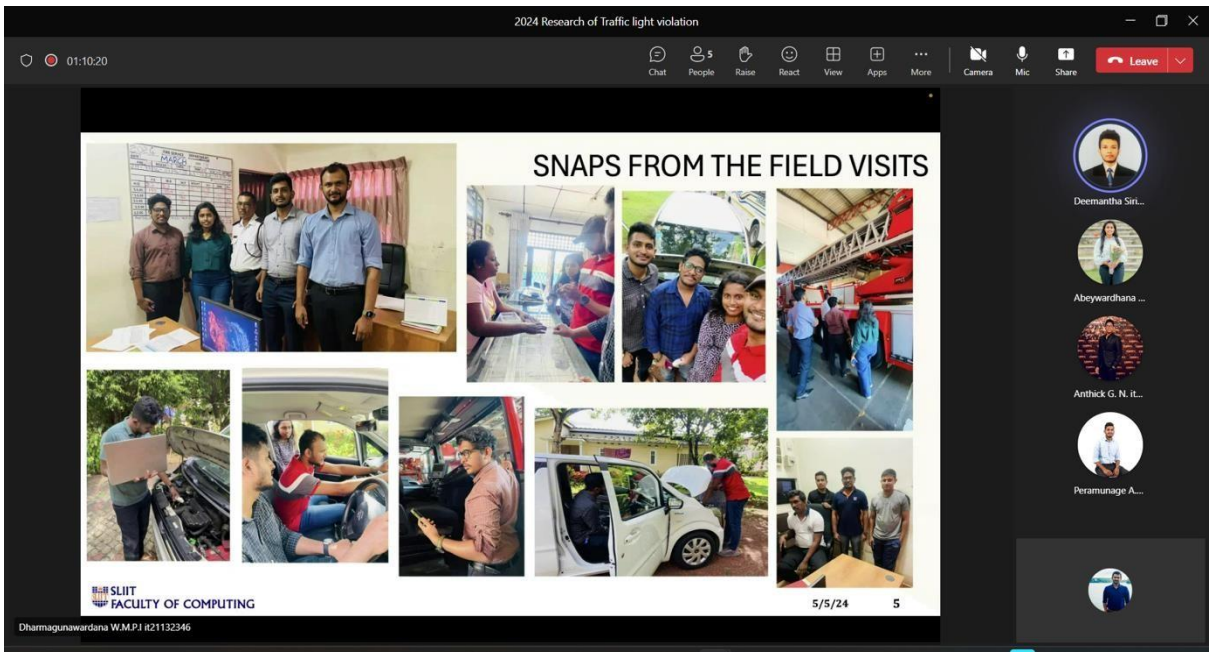


Group meeting with group members.



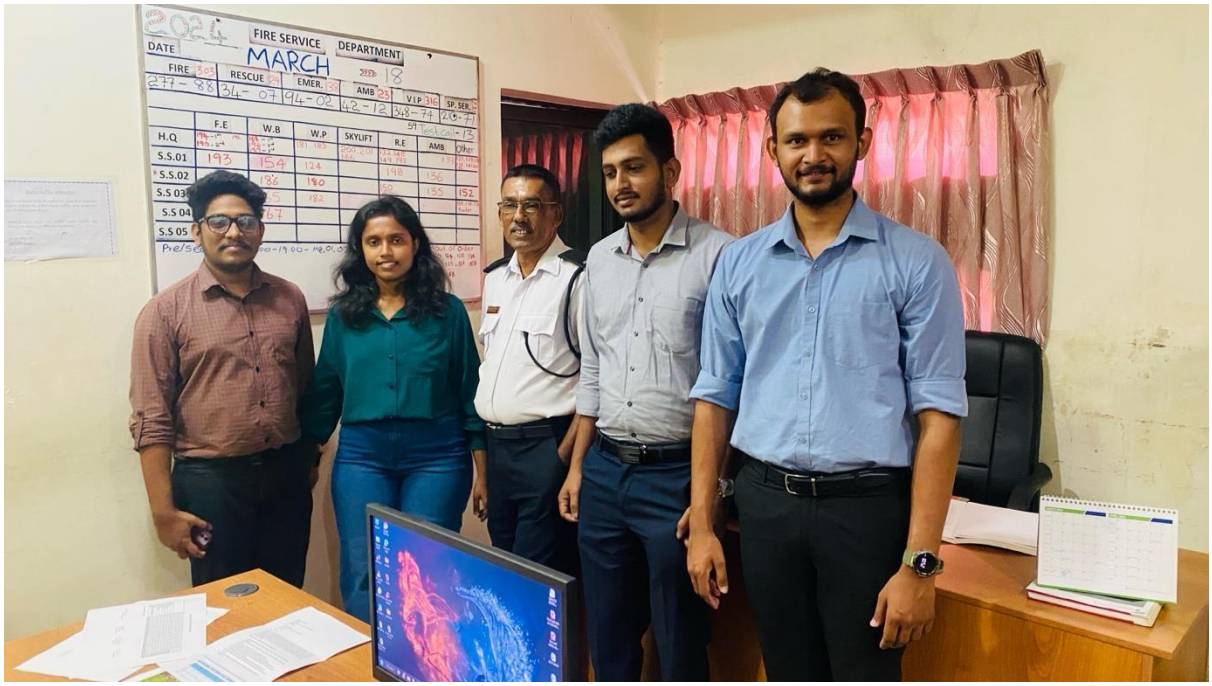
Presentation review with supervisor

Meet Co-supervisor before the demonstration

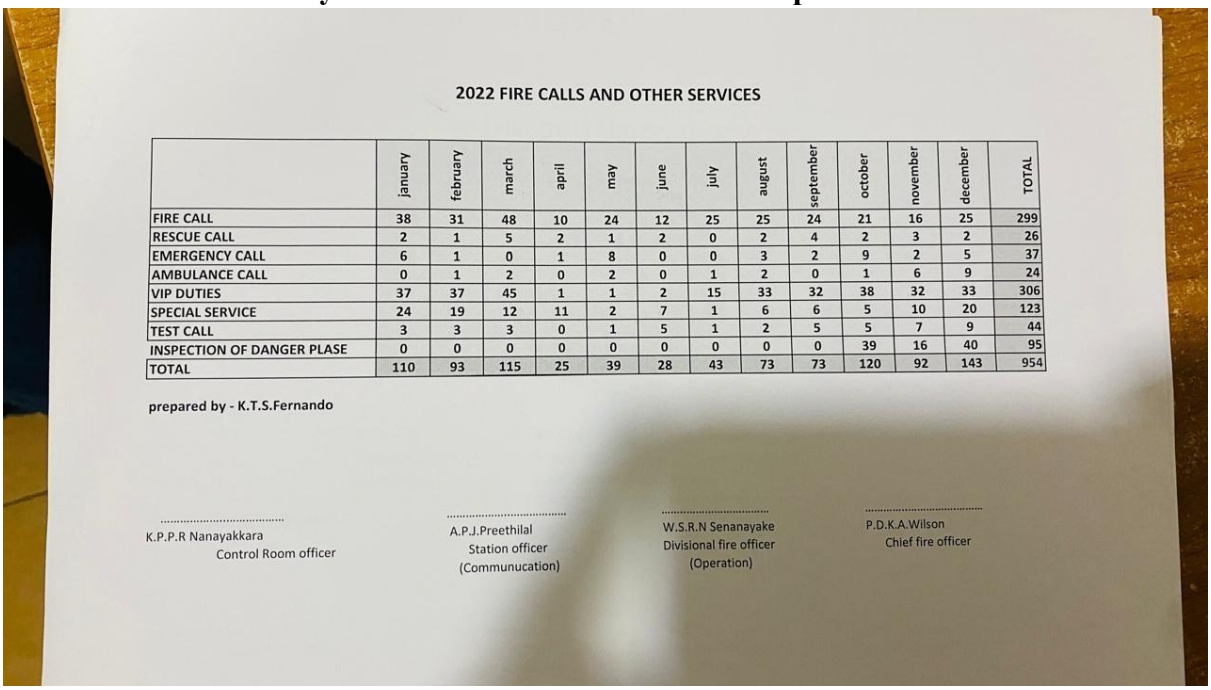


Meetings with Domain Experts

Meeting With Fire department officers and staff. As well we discussed about the domain knowledge and requirements related to fire department.



Mr. Nanayakkara the chief officer of Fire department



2022 FIRE CALLS AND OTHER SERVICES

	january	february	march	april	may	june	july	august	september	october	november	december	TOTAL
FIRE CALL	38	31	48	10	24	12	25	25	24	21	16	25	299
RESCUE CALL	2	1	5	2	1	2	0	2	4	2	3	2	26
EMERGENCY CALL	6	1	0	1	8	0	0	3	2	9	2	5	37
AMBULANCE CALL	0	1	2	0	2	0	1	2	0	1	6	9	24
VIP DUTIES	37	37	45	1	1	2	15	33	32	38	32	33	306
SPECIAL SERVICE	24	19	12	11	2	7	1	6	6	5	10	20	123
TEST CALL	3	3	3	0	1	5	1	2	5	5	7	9	44
INSPECTION OF DANGER PLASE	0	0	0	0	0	0	0	0	0	39	16	40	95
TOTAL	110	93	115	25	39	28	43	73	73	120	92	143	954

prepared by - K.T.S.Fernando

K.P.P.R Nanayakkara
Control Room officer

A.P.J.Preethilal
Station officer
(Communucation)

W.S.R.N Senanayake
Divisional fire officer
(Operation)

P.D.K.A.Wilson
Chief fire officer

Manual statistical system of fire department

Snapshots from Field Visit


MAN Truck & Bus SE
WMA52WZZ9LL076990
R134a
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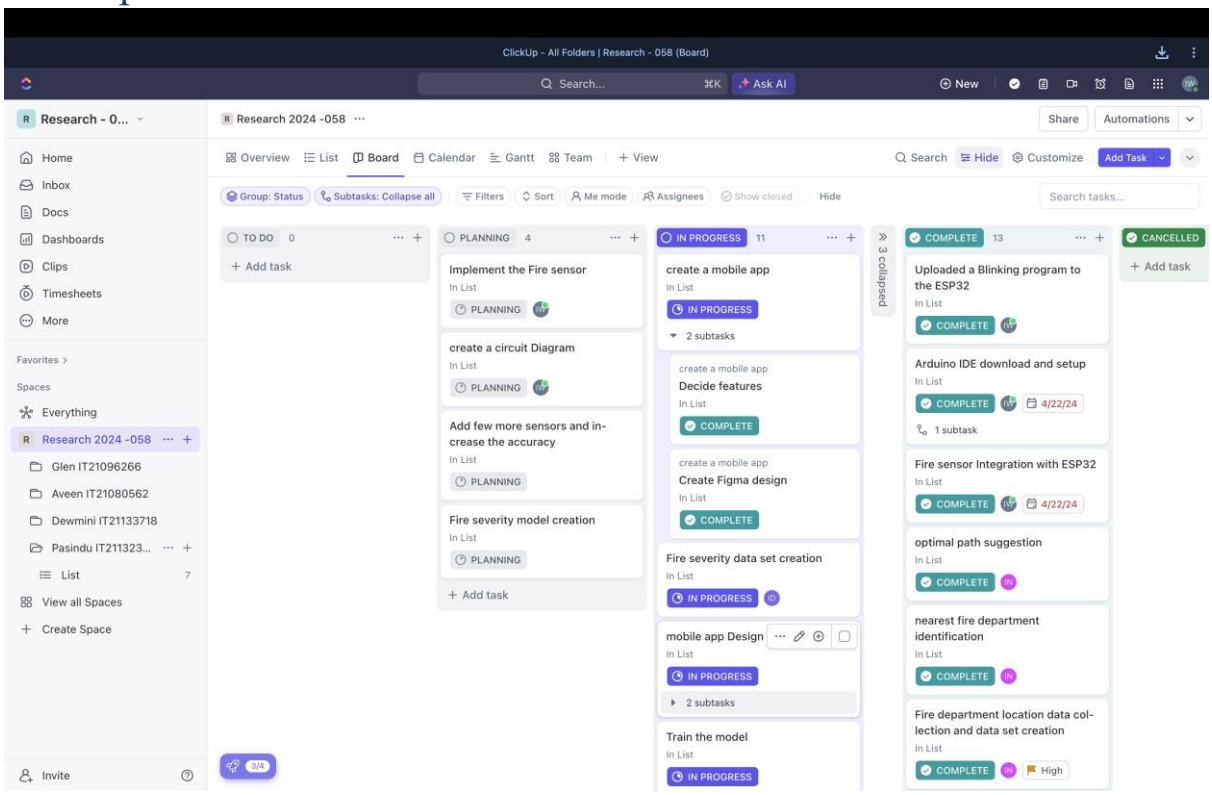
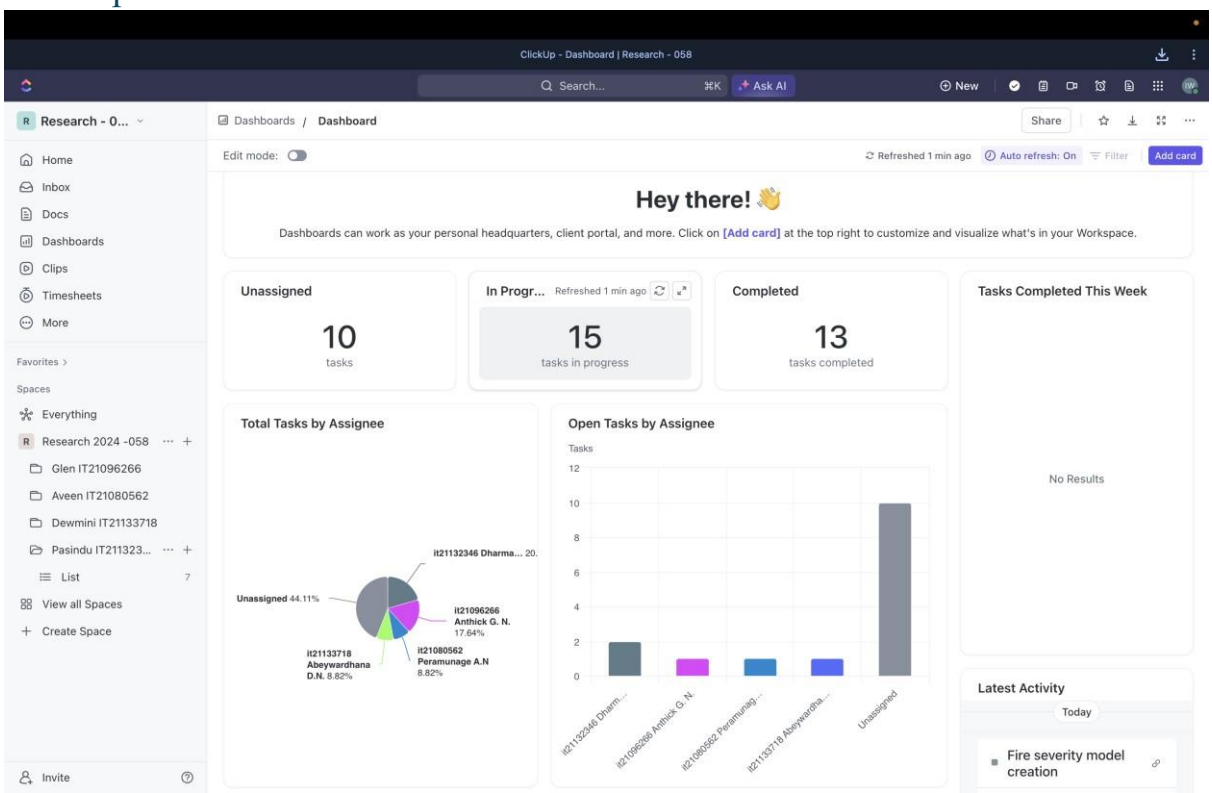
COLOMBO
MUNICIPAL
COUNCIL

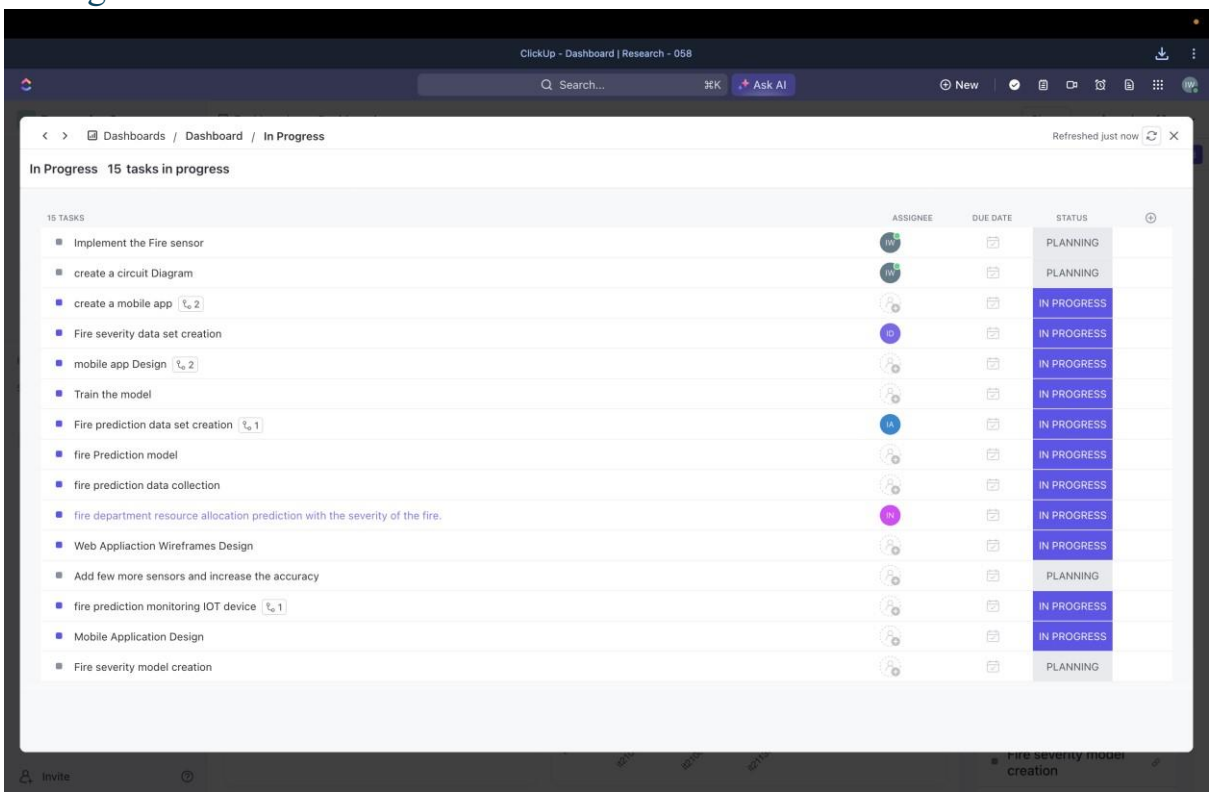
Click up Tasks Allocation



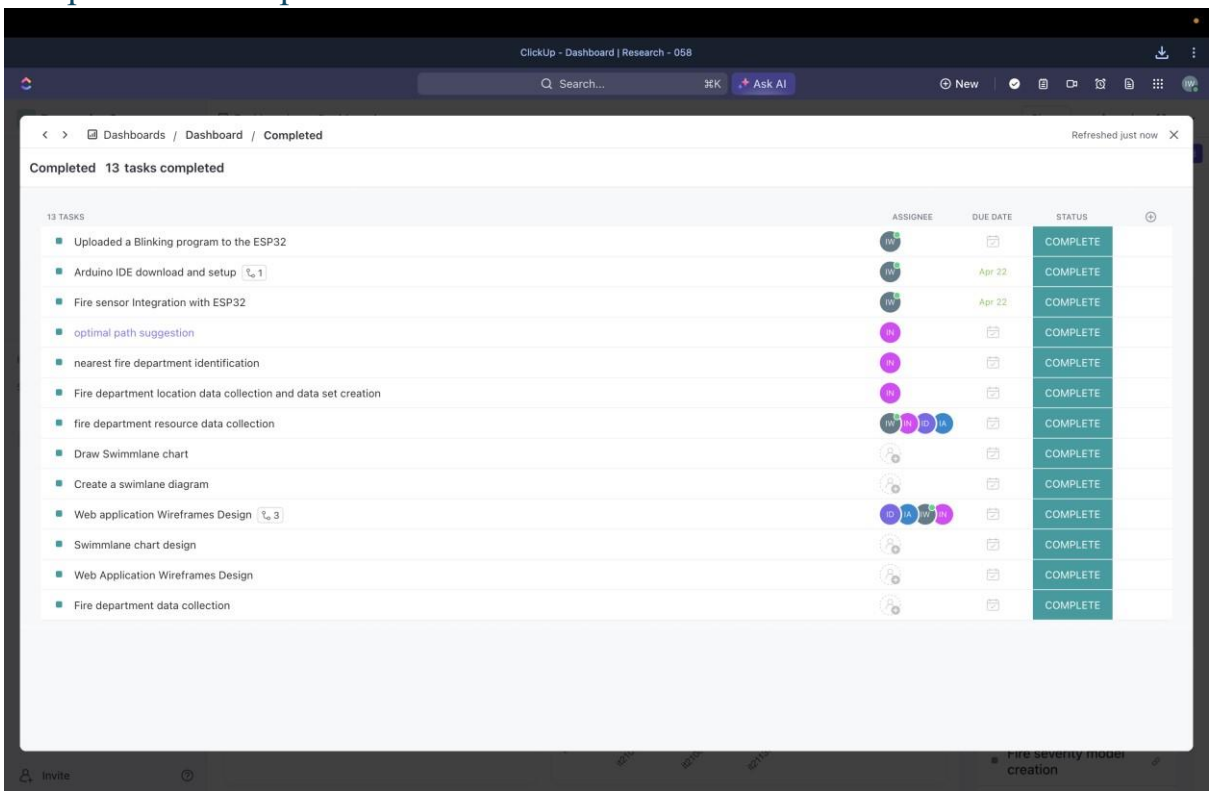
Click Up Dashboard



In Progress Tasks



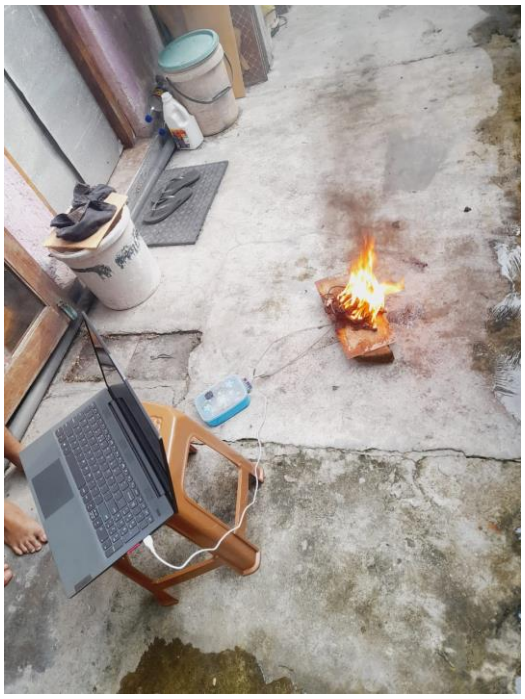
Completed Tasks up to PP2



Project Implementation

Data Collection

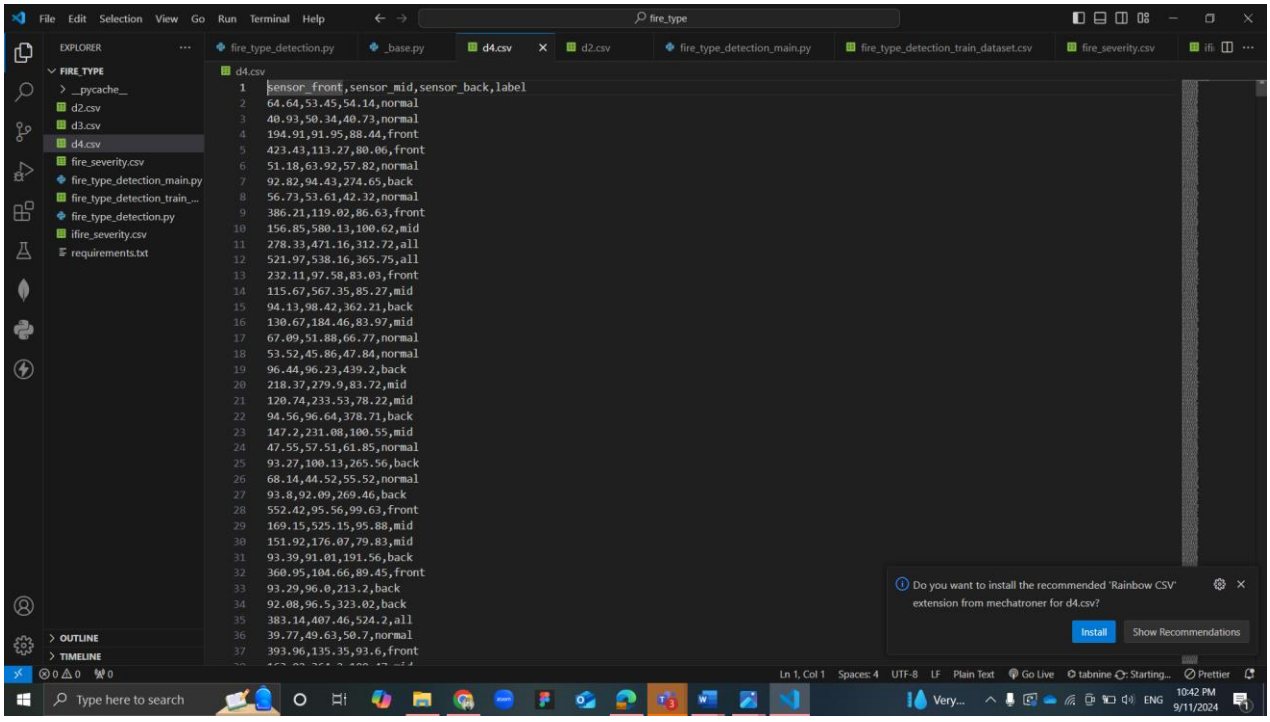
Collecting data related to temperature and RPM using the thermometer and an RPM gauge.



Fire severity Assessment for emergency services.

Data Collection

A	B	C	D	E	F	G	H	I	J	K	L
1000_rpm	1000_rpm	2000_rpm	2000_rpm	3000_rpm	3000_rpm	4000_rpm	4000_rpm	5000_rpm	5000_rpm	cabin_with	rear_witho
1006	63.9	2051	64.4	3017	70.4	4019	74.5	5047	77	35.6	35
1026	62.8	2049	70.9	2991	67.6	4059	75.9	5008	76.8	34.1	34.7
1019	61.8	2037	66.1	3033	67.1	4010	75.5	5030	76.6	35.2	35.3
999	64.7	2025	66	2998	69.9	4018	75.1	4994	75.2	35.9	35.7
1053	63.7	1979	69.7	3005	67.4	4044	73.4	5030	73.8	34.9	36.4
999	63.2	2046	68.6	3004	70.4	4005	75.2	5041	75.1	35	34.8
1039	62.5	2020	67.9	3000	68.7	4030	75.5	5034	74.7	35.2	34.7
992	61.6	2032	67.8	2982	69.8	4065	74.7	5051	75.3	35.7	35.7
1049	63.1	2001	65.2	2982	68.6	4006	75.2	5010	76	34.7	35.3
1040	61.9	1979	65.8	3024	67.4	4008	72.1	4995	75.6	35.8	35.7
974	64.5	1996	65.2	3005	69.8	4049	74.7	5017	74.7	34.7	35.5
1044	62.4	1999	68.2	2994	68.5	4048	73.5	5051	74.7	35.2	35.9
1008	64.9	2014	67.9	3012	71.7	4005	74.8	5012	74.5	34.3	36.2
969	61.2	1997	64.1	3021	68.5	4034	74.5	5013	76.7	35.1	36.4
1008	62.5	2033	64.9	3018	69.4	3996	74.7	5005	75	35.7	35.6
1030	62.3	2052	70.3	3014	70.2	4051	73.9	5042	73.7	34.9	35.7
967	63.1	2045	64.4	3023	67.9	4066	72.1	5006	73.2	34.1	34.3
999	62.9	2044	66.8	2976	71.3	4061	74.9	4990	76.9	34.2	36.5
1017	63	2004	64.7	3009	67.1	4063	73.8	4988	76.3	34.1	35.1



Data preprocessing

jupyter Linear Regression 1.2 Last Checkpoint: 44 minutes ago (autosaved)

Logout

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Not Trusted | Python 3 (ipykernel)

Run Code

In [1]:
```
#Import Dependencies
import pandas as pd   #Data manupulation $ Analysis
import numpy as np    #Numerical computation
import matplotlib.pyplot as plt  #Visualizations
import seaborn as sns   #Informative statistical graph
```

In [2]:
```
#Load Data To the pandas frame
vehicle_data = pd.read_csv('rpm_temp_dataset.csv')
```

In [5]:
```
# Display the first five rows
print(vehicle_data.head())
```

```
   1000_rpm  1000_rpm_temprature  2000_rpm  2000_rpm_temprature  3000_rpm  \
0      1006                 63.9      2051                 64.4      3017
1      1026                 62.8      2049                 70.9      2991
2      1019                 61.8      2037                 66.1      3033
3       999                 64.7      2025                 66.0      2998
4      1053                 63.7      1979                 69.7      3005

   3000_rpm_temprature  4000_rpm  4000_rpm_temprature  5000_rpm  \
0                 70.4      4019                 74.5      5047
1                 67.6      4059                 75.9      5008
2                 67.1      4010                 75.5      5030
3                 69.9      4018                 75.1      4994
4                 67.4      4044                 73.4      5030

   5000_rpm_temprature  cabin_without_ac_sunny_day  rear_without_ac_sunny_day
0                 77.0                        35.6                       35.0
1                 76.8                        34.1                       34.7
2                 76.6                        35.2                       35.3
3                 75.2                        35.9                       35.7
4                 73.8                        34.9                       36.4
```

In [7]:
```
#To view the last few rows
vehicle_data.tail()
```

jupyter Linear Regression 1.2 Last Checkpoint: an hour ago (autosaved)

Logout

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Not Trusted | Python 3 (ipykernel)

Run Code

Out[7]:

	1000_rpm	1000_rpm_temprature	2000_rpm	2000_rpm_temprature	3000_rpm	3000_rpm_temprature	4000_rpm	4000_rpm_temprature	5000_rpm	5000_rpm_
995	990	63.5	1999	64.4	2996	68.2	4038	73.3	5009	
996	968	63.5	2039	66.6	2996	67.5	3999	73.0	5036	
997	996	64.4	2016	65.7	2978	71.8	4011	75.4	4989	
998	1014	63.4	2053	65.6	3003	68.3	4023	74.6	5012	
999	1007	61.7	2052	67.4	2976	70.7	4056	73.2	5030	

In [9]:
```
#Get the column headings of the data set
vehicle_data.columns.values
```

Out[9]:
```
array(['1000_rpm', '1000_rpm_temprature', '2000_rpm',
       '2000_rpm_temprature', '3000_rpm', '3000_rpm_temprature',
       '4000_rpm', '4000_rpm_temprature', '5000_rpm',
       '5000_rpm_temprature', 'cabin_without_ac_sunny_day',
       'rear_without_ac_sunny_day'], dtype=object)
```

In [11]:
```
#Explore the data types of the columns
vehicle_data.dtypes
```

Out[11]:
```
1000_rpm                      int64
1000_rpm_temprature         float64
2000_rpm                      int64
2000_rpm_temprature         float64
3000_rpm                      int64
3000_rpm_temprature         float64
4000_rpm                      int64
4000_rpm_temprature         float64
5000_rpm                      int64
5000_rpm_temprature         float64
cabin_without_ac_sunny_day  float64
rear_without_ac_sunny_day   float64
dtype: object
```

jupyter Linear Regression 1.2 Last Checkpoint: an hour ago (autosaved)

Logout

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Run Code

In [12]:
```
# Check for missing values
missing_data = vehicle_data.isnull().sum()
print(missing_data)
```

```
1000_rpm                    0
1000_rpm_temprature         0
2000_rpm                    0
2000_rpm_temprature         0
3000_rpm                    0
3000_rpm_temprature         0
4000_rpm                    0
4000_rpm_temprature         0
5000_rpm                    0
5000_rpm_temprature         0
cabin_without_ac_sunny_day  0
rear_without_ac_sunny_day   0
dtype: int64
```

In [13]:
```
# Drop rows with missing values if any
# if missing_data.sum() > 0:
#     vehicle_data = data.dropna()
```

In [15]:
```
#Describe the data set
vehicle_data.describe()
```

Out[15]:

	1000_rpm	1000_rpm_temprature	2000_rpm	2000_rpm_temprature	3000_rpm	3000_rpm_temprature	4000_rpm	4000_rpm_temprature	5000_rp
count	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.00000	1000.00000
mean	1011.881000	63.040800	2014.489000	67.539100	3004.837000	69.467800	4026.409000	73.98490	5022.64100
std	25.545595	1.134788	22.030916	2.056952	17.258455	1.445902	24.302929	1.13687	20.74291
min	967.000000	61.000000	1976.000000	64.000000	2976.000000	67.000000	3986.000000	72.00000	4987.00000
25%	990.000000	62.100000	1996.000000	65.800000	2990.000000	68.275000	4006.000000	73.00000	5005.00000
50%	1012.000000	63.100000	2013.500000	67.600000	3005.000000	69.400000	4026.000000	73.90000	5023.00000
75%	1035.000000	64.000000	2034.000000	69.400000	3020.000000	70.700000	4048.000000	75.00000	5040.00000

Model

jupyter Linear Regression 1.2 Last Checkpoint: an hour ago (unsaved changes)

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Run Code

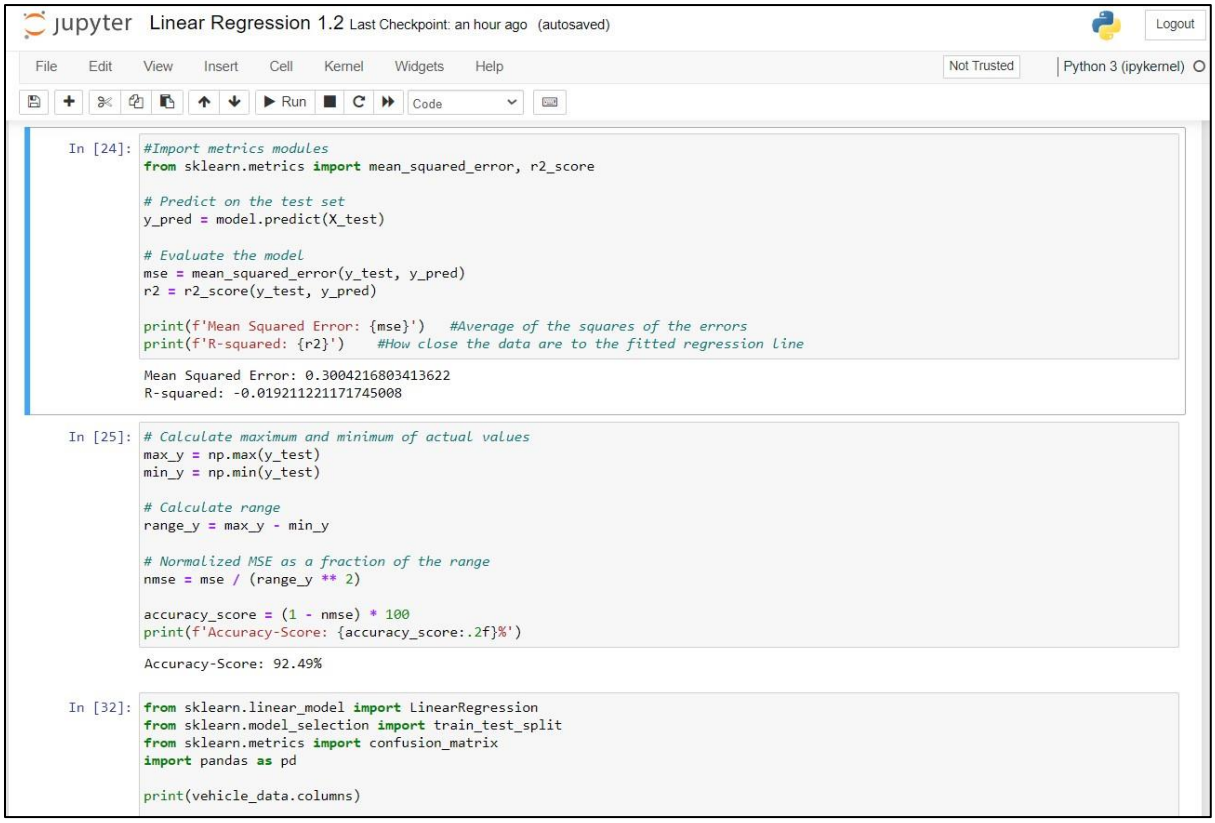
In [19]:
```
#Import libraries for scalling data and transform
from sklearn.preprocessing import StandardScaler

# Scaling the features
scaler = StandardScaler()
features_scaled = scaler.fit_transform(features)
```

In [22]:
```
#Import libraries fore training an testing subsets of data
from sklearn.model_selection import train_test_split

# Splitting the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(features_scaled, target, test_size=0.2, random_state=0)
```

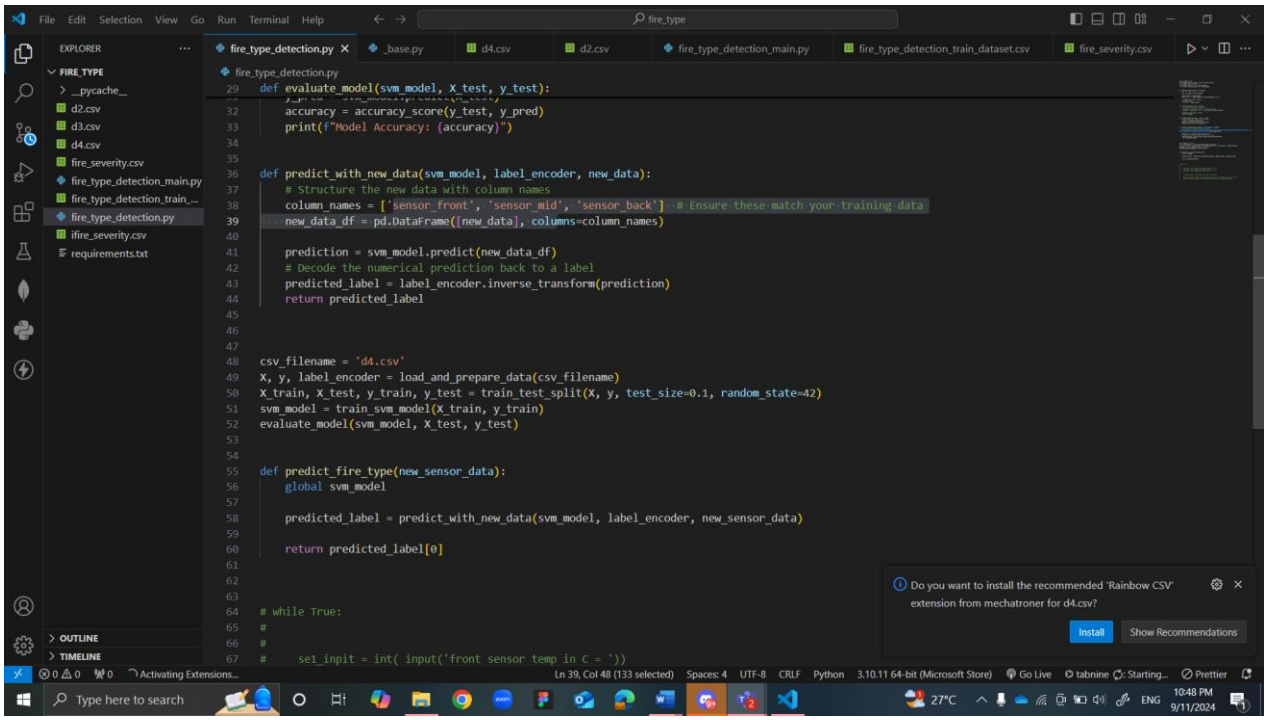
In [33]:
```
#Import libraries for linear regression class
from sklearn.linear_model import LinearRegression

# Initialize and train the linear regression model
model = LinearRegression()
model.fit(X_train, y_train)
```

Out[33]:
```
▾ LinearRegression
LinearRegression()
```

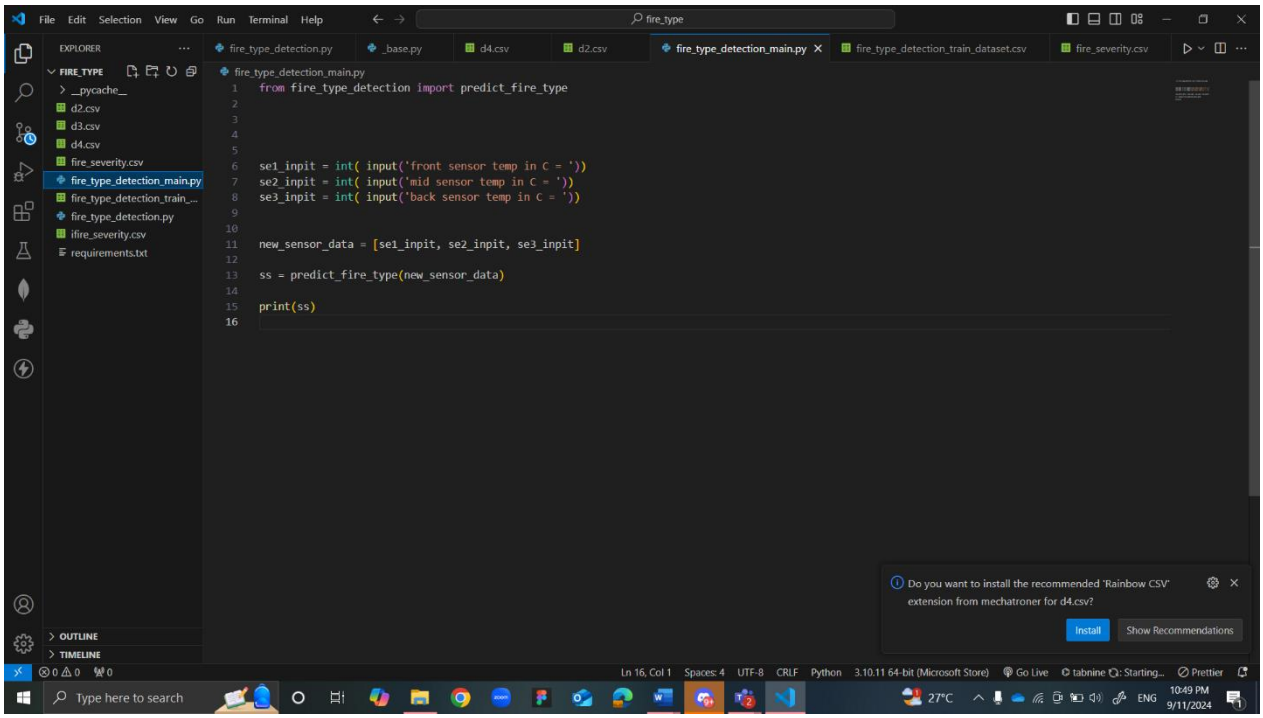
In [24]:
```
#Import metrics modules
from sklearn.metrics import mean_squared_error, r2_score

# Predict on the test set
y_pred = model.predict(X_test)

# Evaluate the model
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)

print(f'Mean Squared Error: {mse}')   #Average of the squares of the errors
```


jupyter Linear Regression 1.2 Last Checkpoint: an hour ago (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Not Trusted
Python 3 (ipykernel)
Run
Code
In [24]:
#Import metrics modules
from sklearn.metrics import mean_squared_error, r2_score
# Predict on the test set
y_pred = model.predict(X_test)
# Evaluate the model
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)
print(f'Mean Squared Error: {mse}') #Average of the squares of the errors
print(f'R-squared: {r2}') #How close the data are to the fitted regression line
Mean Squared Error: 0.3004216803413622
R-squared: -0.019211221171745008
In [25]:
# Calculate maximum and minimum of actual values
max_y = np.max(y_test)
min_y = np.min(y_test)
# Calculate range
range_y = max_y - min_y
# Normalized MSE as a fraction of the range
nmse = mse / (range_y ** 2)
accuracy_score = (1 - nmse) * 100
print(f'Accuracy-Score: {accuracy_score:.2f}%')
Accuracy-Score: 92.49%
In [32]:
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix
import pandas as pd
print(vehicle_data.columns)


In [12]:
Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(features_scaled, target, test_size=0.2, random_state=0)
In [13]:
# Initialize and train the SVM model
svm_model = SVR(kernel='rbf') # You can experiment with different kernels like 'linear', 'poly', 'rbf'
svm_model.fit(X_train, y_train)
Out[13]:
SVR
SVR()
In [14]:
# Predict on the test set
y_pred = svm_model.predict(X_test)
# Evaluate the model
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)
print(f'Mean Squared Error: {mse}')
print(f'R-squared: {r2}')
Mean Squared Error: 0.3364807877582887
R-squared: -0.14154542442567974
In [15]:
# Calculate the range of actual values
max_y = np.max(y_test)
min_y = np.min(y_test)
range_y = max_y - min_y
# Normalized MSE as a fraction of the range
nmse = mse / (range_y ** 2)
accuracy_score = (1 - nmse) * 100
print(f'Accuracy-Score: {accuracy_score:.2f}%')
Accuracy-Score: 91.59%

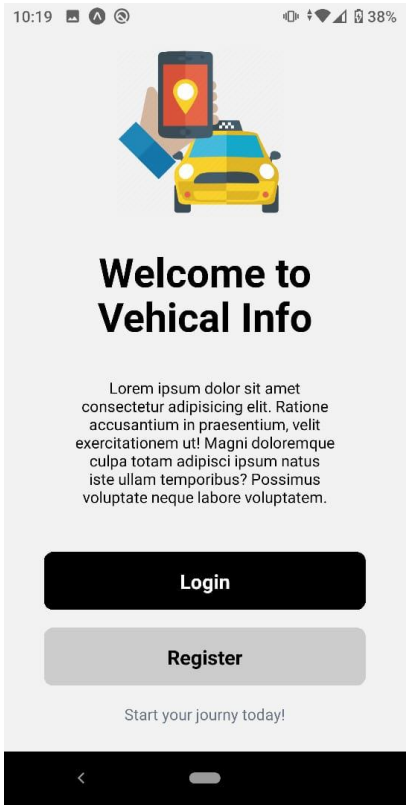


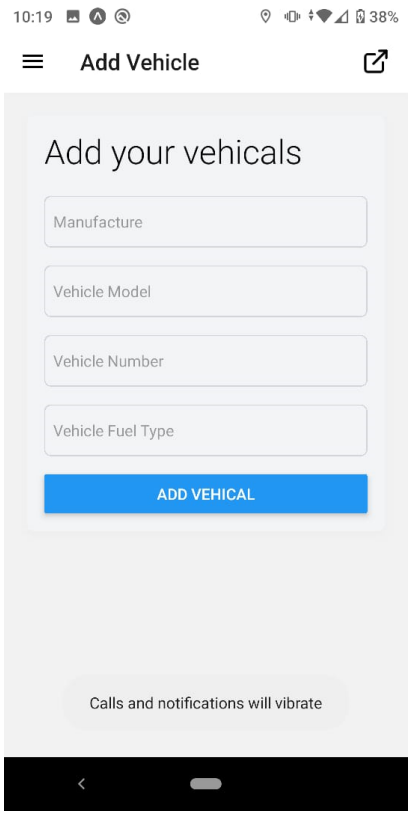
```
def evaluate_model(svm_model, X_test, y_test):
    accuracy = accuracy_score(y_test, y_pred)
    print(f"Model Accuracy: {accuracy}")


def predict_with_new_data(svm_model, label_encoder, new_data):
    # Structure the new data with column names
    column_names = ['sensor_front', 'sensor_mid', 'sensor_back']  # Ensure these match your training data
    new_data_df = pd.DataFrame([new_data], columns=column_names)

    prediction = svm_model.predict(new_data_df)
    # Decode the numerical prediction back to a label
    predicted_label = label_encoder.inverse_transform(prediction)
    return predicted_label



csv_filename = 'd4.csv'
X, y, label_encoder = load_and_prepare_data(csv_filename)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.1, random_state=42)
svm_model = train_svm_model(X_train, y_train)
evaluate_model(svm_model, X_test, y_test)


def predict_fire_type(new_sensor_data):
    global svm_model

    predicted_label = predict_with_new_data(svm_model, label_encoder, new_sensor_data)

    return predicted_label[0]



# while True:
#
#
#     se1_inpit = int( input('front sensor temp in C = '))
```

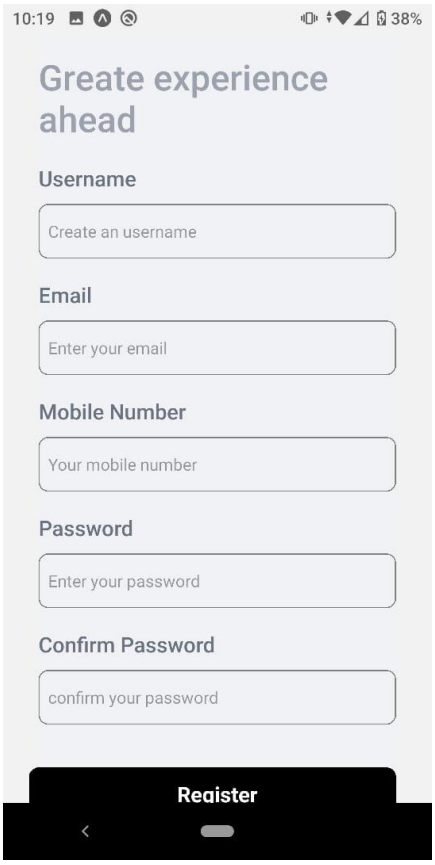


```
from fire_type_detection import predict_fire_type



se1_inpit = int( input('front sensor temp in C = '))
se2_inpit = int( input('mid sensor temp in C = '))
se3_inpit = int( input('back sensor temp in C = '))


new_sensor_data = [se1_inpit, se2_inpit, se3_inpit]

ss = predict_fire_type(new_sensor_data)

print(ss)

```

Mobile Application UI/UX Design







UI/UX Designs Flows

Work Breakdown Structure