Expurgo Re-Tyre

Draft for
NASA Space App Challenge

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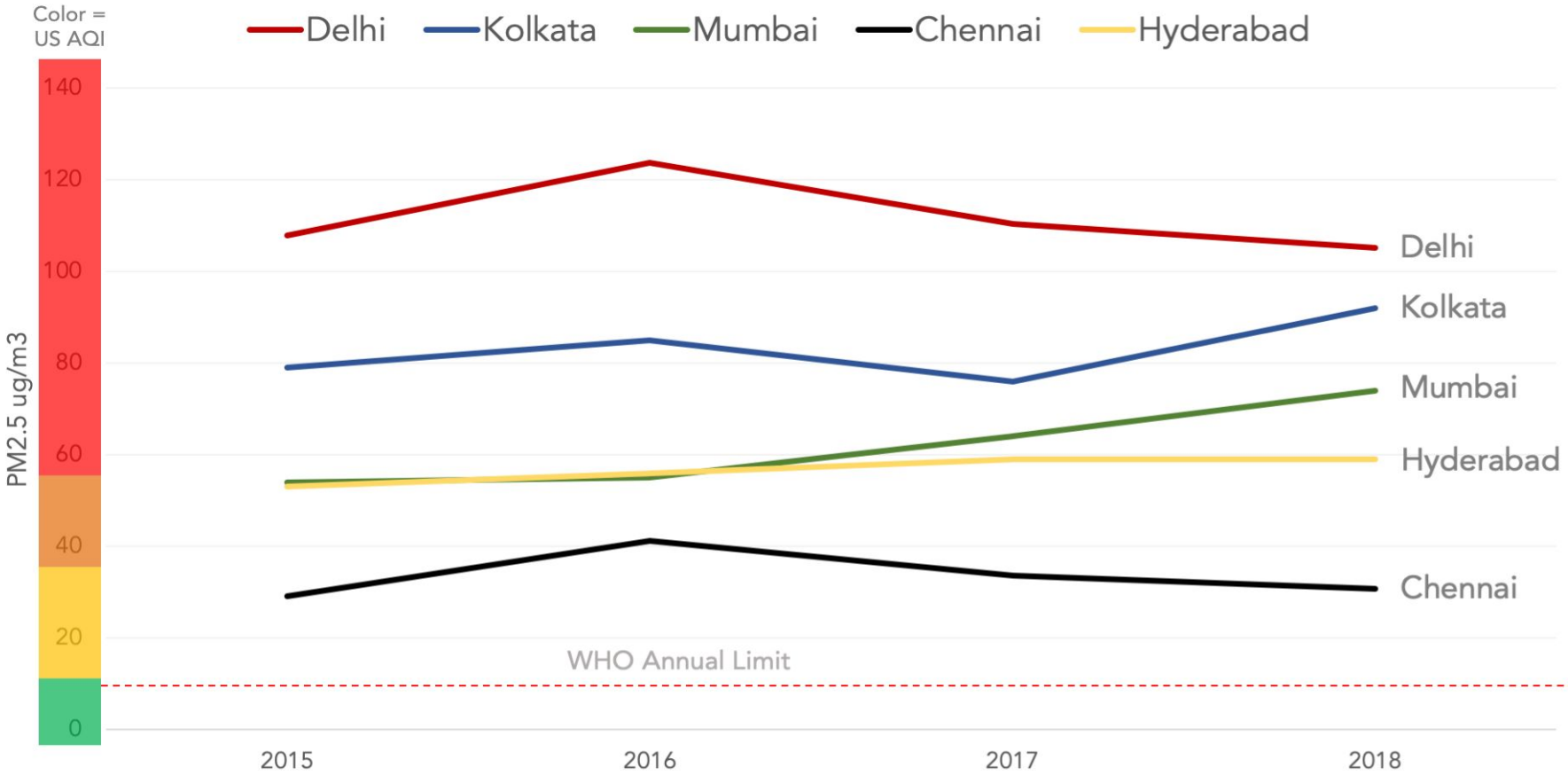
Note: *This is a selected draft excerpt shared for reference. The complete presentation is available upon request. Citations, references, and fully functional working code can also be provided upon request.*

The Ever Increasing Pollution Problem

PM2.5 Pollution in Major Indian Cities: 2015-2018



Data: US Embassy and Consulates

Analysis: Smart Air smartairfilters.com

76% Indians live in places that do not meet national air quality standards.

New research indicates that air pollution impacts birth weight, child growth, obesity, and bladder cancer.

Children and elderly are disproportionately affected.

Our Solution

A strap-on, multi-layered, emission absorbing pad which can be fitted on the tyres of a vehicle

The function of this pad is to absorb harmful gases like CO2, CO, SO2 from the environment around it.

It has three layers, each with a unique function as can be seen in the figure.

Advantages of Tyre-pad

Statistically, the hydrated sodium carbonate can achieve a very high CO2 absorption capacity of 282 mg/g within 60 min proving the viability of the product.

Easy to install.

Cost effective and active pollution control product.

Recyclable.

Emission Absorbing Tyre Pad

Features

Real time tracking through sensors.

Processing the data on the cloud using a machine learning model to come up with user specific analysis.

Analysis visualized for the users through the use of graphs and various diagrams.

Gamification methods to engage and educate users

Gamification

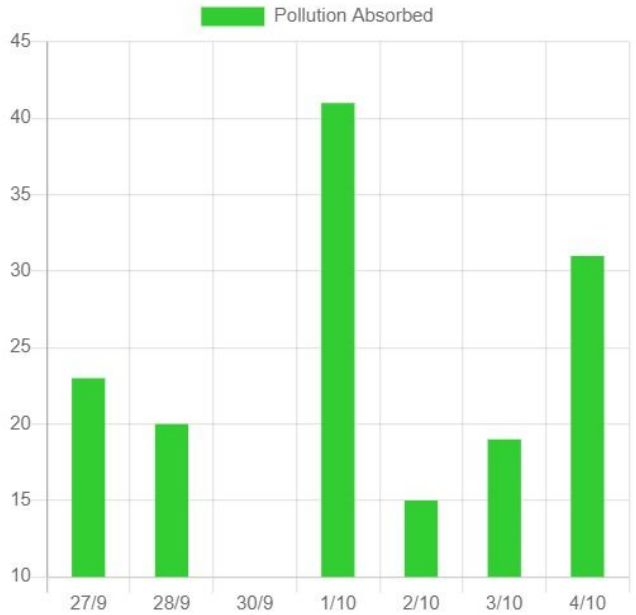
Research shows that people from all age groups from a child to an old person, all of them learn and understand quickly through visualizations.

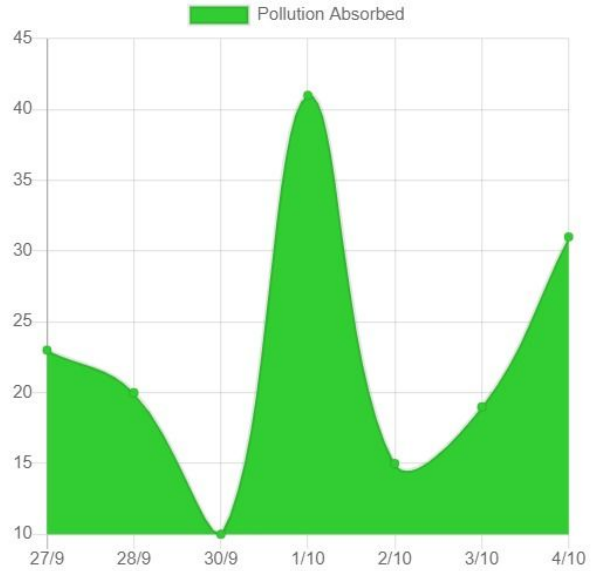
Our app shows Data Visualizations of the gases absorbed by their tyre pad and hence each person can know how they have contributed in reducing pollution.

Also here the gamification idea is to give people badges which they can share on their social media and show to the world the how many lives they saved.

Even if not for the reason of reducing pollution there is a high probability people will use the app for flaunting on social media.

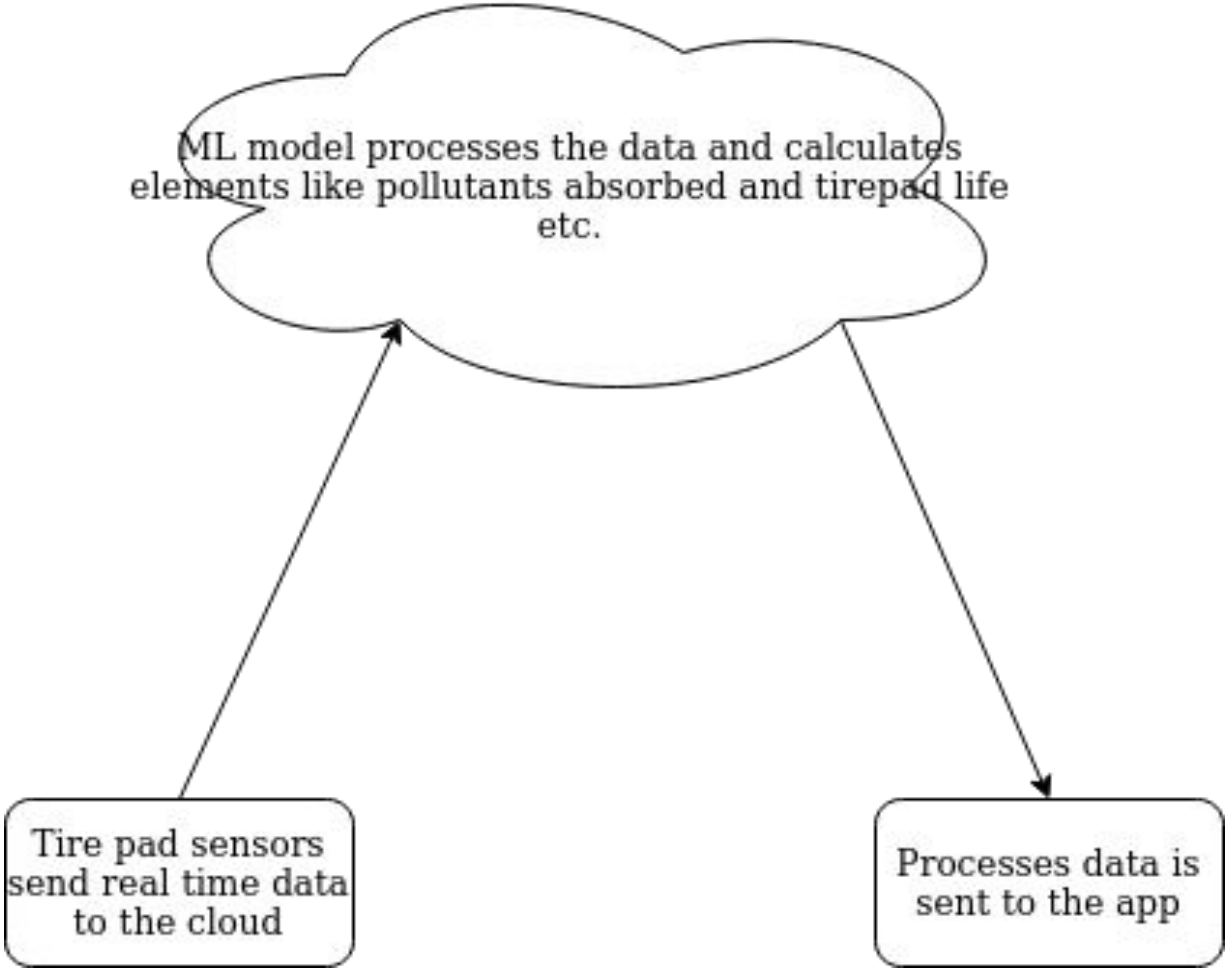
Data visualization in the App



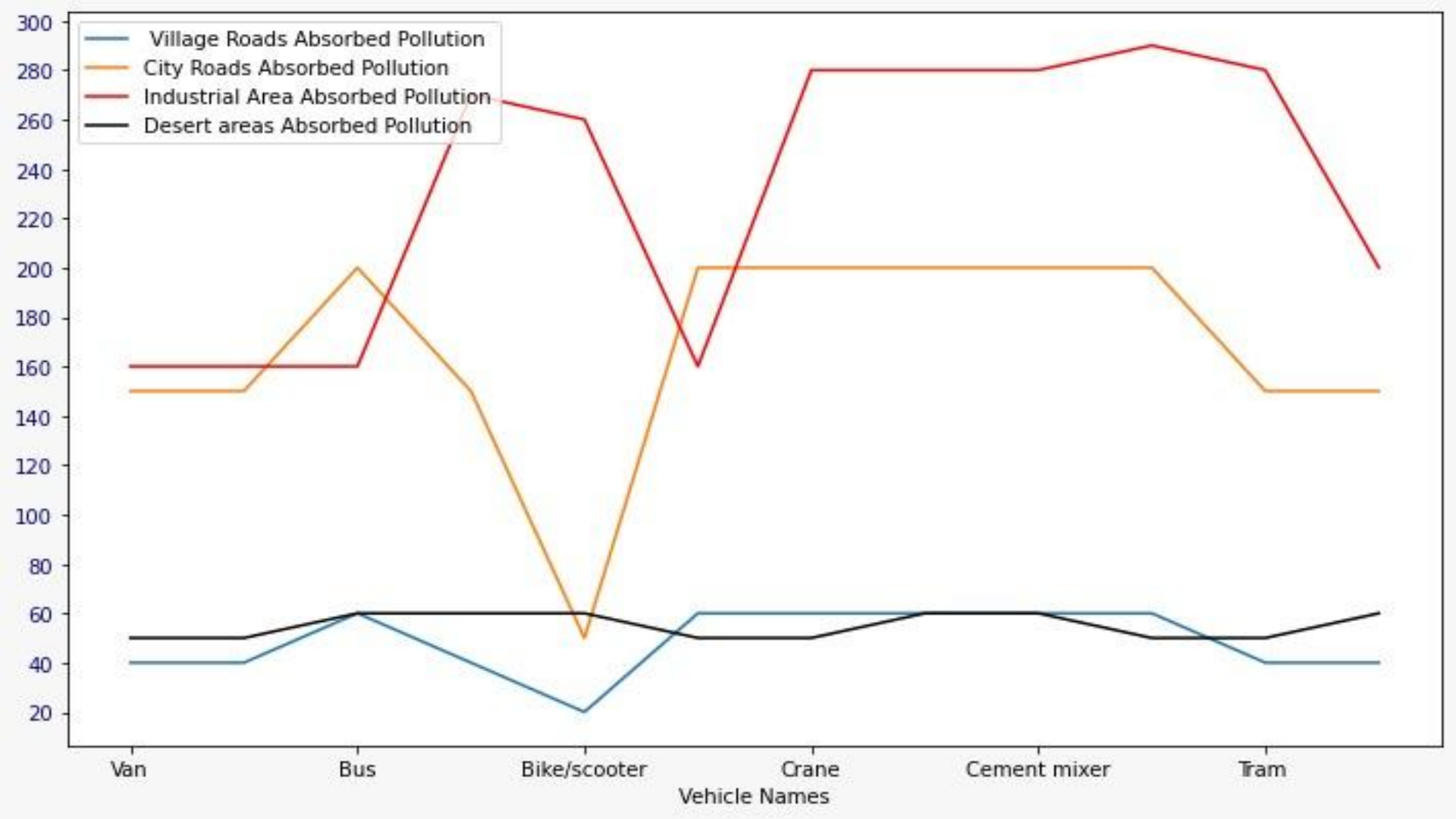


Route Tracking Feature

Flow Diagram


ML model processes the data and calculates elements like pollutants absorbed and tirepad life etc.
Tire pad sensors send real time data to the cloud
Processes data is sent to the app

Projected Absorption


Village Roads Absorbed Pollution
City Roads Absorbed Pollution
Industrial Area Absorbed Pollution
Desert areas Absorbed Pollution
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
Van
Bus
Bike/scooter
Crane
Cement mixer
Tram
Vehicle Names

Tech Stack

React Native for front-end.

Google cloud services.

Python + SQL for machine learning model

NASA dataset: Air pollution

A User-friendly website with an option to download the app

Expurgo

Home | Data Visualization | Features | Images | Route-Tracking | Team | Contact

Get Support

EXPURGO Re-Tyre

Download the app for easy tracking of your contribution towards saving environment!

Download

A snapshot of the ML code

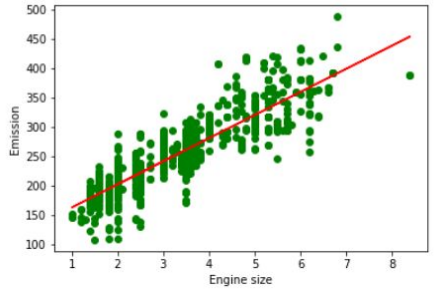
Out[88]:
```
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None, normalize=False)
```

In [89]:
```
print ('Coefficients: ', regr.coef_)
print ('Intercept: ',regr.intercept_)
```

```
Coefficients:  [[39.32849986]]
Intercept:  [123.79644573]
```

In [90]:
```
plt.scatter(train.ENGINESIZE, train.CO2EMISSIONS,  color='green')
plt.plot(train_x, regr.coef_[0][0]*train_x + regr.intercept_[0], '-r')
plt.xlabel("Engine size")
plt.ylabel("Emission")
```

Out[90]:
```
Text(0, 0.5, 'Emission')
```



In [91]:
```
from sklearn.metrics import r2_score

test_x = np.asanyarray(test[['ENGINESIZE']])
test_y = np.asanyarray(test[['CO2EMISSIONS']])
test_y_ = regr.predict(test_x)

print("Mean absolute error: %.2f" % np.mean(np.absolute(test_y_ - test_y)))
print("Residual sum of squares (MSE): %.2f" % np.mean((test_y_ - test_y) ** 2))
print("R2-score: %.2f" % r2_score(test_y_ , test_y) )
```

```
Mean absolute error: 22.64
```

Conclusion

Statistics shows only 19% Indians are aware and understand the severity of air pollution.

Hence the proposed solution of this absorbent tyre pad offers an easy and reliable solution to curb the increasing pollution.

The unique features of this app like route tracking, data visualization, life expectancy updates ensure that the people will be engaged and educated in the right direction.

Thank You!