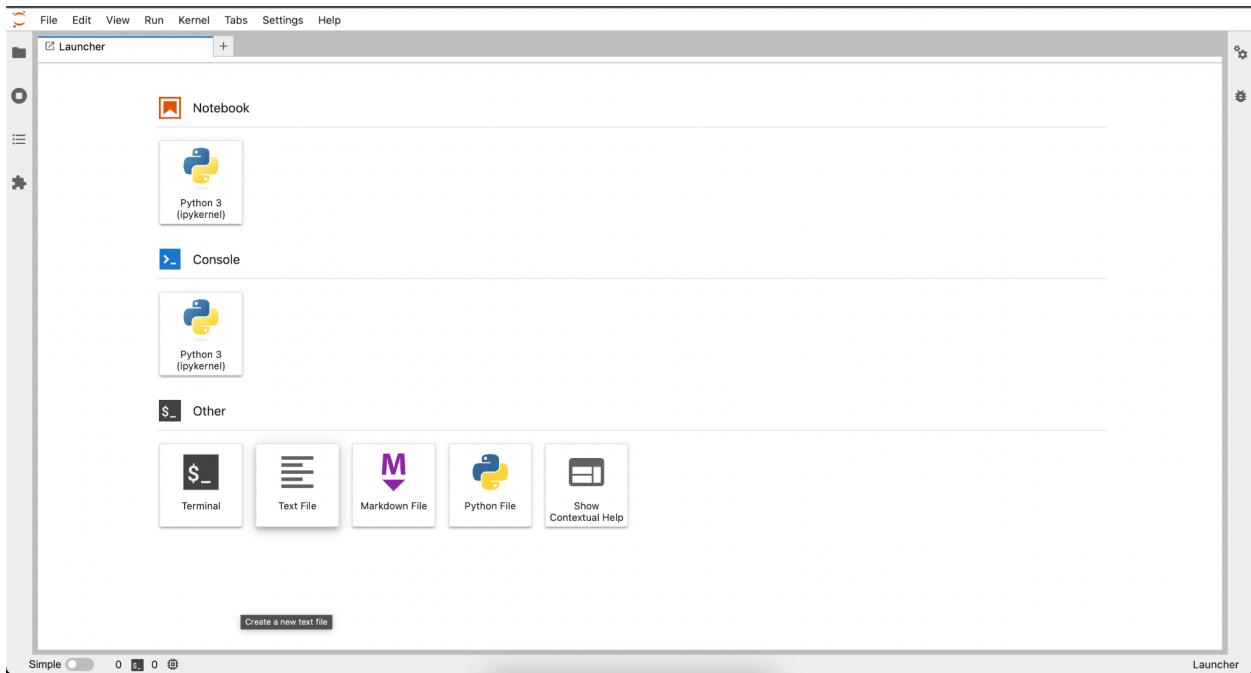


# Pre-requisite

## Packages

click	8.1.3
contourpy	1.0.6
cycler	0.11.0
Flask	2.2.2
fonttools	4.38.0
itsdangerous	2.1.2
Jinja2	3.1.2
joblib	1.2.0
kiwisolver	1.4.4
MarkupSafe	2.1.1
matplotlib	3.6.2
numpy	1.23.4
packaging	21.3
pandas	1.5.1
Pillow	9.3.0
pip	22.2.2
pyparsing	3.0.9
python-dateutil	2.8.2
pytz	2022.6
scikit-learn	1.1.3
scipy	1.9.3
seaborn	0.12.1
setuptools	65.4.1
six	1.16.0
sklearn	0.0
threadpoolctl	3.1.0
Werkzeug	2.2.2
wheel	0.37.1

# Anaconda



## Data Collection

	A	B	C	D	E	F	G	H
1	mileage	vehicle_w	payload_w	distance	avg_speed	road_type	fuel_type	consume
2	16	4	4	11	63	asphalt	SP98	0.67
3	7	11	6	62	22	mud	SP98	8.02
4	11	4	1	358	58	asphalt	SP98	31.35
5	7	5	1	86	26	mud	SP98	11.66
6	3	8	5	104	29	mud	SP98	31.81
7	9	11	1	37	22	asphalt	E10	4.45
8	3	12	3	355	28	mud	SP98	122.71
9	5	1	0	75	36	mud	E10	13.5
10	16	8	7	285	48	mud	SP98	18.29
11	3	2	5	21	20	mud	SP98	7.44
12	10	8	1	491	68	mud	E10	44.6
13	8	5	6	328	98	asphalt	SP98	39.27
14	9	9	2	73	35	asphalt	E10	7.71
15	7	9	0	384	28	mud	E10	53.15
16	7	7	4	548	59	mud	SP98	85.22
17	7	1	6	197	84	asphalt	E10	25.93
18	4	1	6	88	48	asphalt	SP98	22.74
19	4	8	0	337	55	mud	E10	77.73
20	6	11	1	324	61	mud	SP98	56.98
21	12	1	0	96	41	asphalt	E10	7.57
22	7	3	3	96	28	asphalt	SP98	12.64
23	6	4	8	130	33	asphalt	E10	20.25
24	7	1	2	368	55	asphalt	SP98	48.5
25	8	5	0	170	77	asphalt	E10	19.44

# Pre Process the Data

## 1. Import Required Libraries

### Import Libraries

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import sklearn
from sklearn.preprocessing import LabelEncoder
```

## 2. Read The Datasets

```
data = pd.read_csv(r"C:\Users\ADMIN\Documents\python\dataset-generator\generated.csv")
```

```
data.head()
```

	mileage	vehicle_weight	payload_weight	distance	avg_speed	road_type	fuel_type	consume
0	13	6	2	79	24	mud	SP98	6.31
1	6	9	1	274	53	mud	SP98	42.18
2	8	8	10	9	34	mud	SP98	0.97
3	9	12	7	341	32	asphalt	E10	41.48
4	15	1	12	68	52	mud	E10	3.75

## 3. Check Null Values

```
data.isnull().any()
```

```
mileage           False
vehicle_weight    False
payload_weight    False
distance          False
avg_speed         False
road_type         False
fuel_type         False
consume           False
dtype: bool
```

#### 4. Removing Null Values

No null values in Dataset

#### 5. Handling Null Values

No null values in Dataset

## Model Building

#### 1. Separating Independent And Dependent Variables

### Split the data into x(independent) and y(dependent)

```
y = data['consume']
data1 = data.drop(['consume'], axis = 1)
x = data1
```

#### 2. Splitting Data Into Train And Test

### Split x and y into train and test

```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size = 0.3, random_state = 1)
```

```
print('x_train =',x_train.shape)
print('x_test =',x_test.shape)
```

```
x_train = (7000, 7)
x_test = (3000, 7)
```

#### 3. Applying Linear Regression

```
from sklearn.linear_model import LinearRegression
mlr = LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None, normalize=False)

mlr.fit(x_train,y_train)
```

```
C:\Users\ADMIN\anaconda3\lib\site-packages\sklearn\linear_model\_base.py:148: FutureWarning:
ion 1.0 and will be removed in 1.2. Please leave the normalize parameter to its default valu
ult behavior of this estimator is to not do any normalization. If normalization is needed pl
dardScaler instead.
  warnings.warn(
```

```
LinearRegression(normalize=False)
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.  
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

```
pred = mlr.predict(x_test)
```

# Application Building

## 1. Build a Python Flask Application

```
app.py 2 x
Final Deliverables > server > app.py > ...
5
6 from utils.helper import process_metadata
7 from utils.models import db
8 from utils.np_encoder import NpEncoder
9 from utils.prediction import DataSet, MultiModel
10 from utils.report_generator import PDF
11 import atexit
12 from utils.scheduled_jobs import start_jobs
13 from utils.metadata import MetaData
14 from ibm_db import connect
15 app = Flask(__name__)
16
17
18 CORS(app, resources={**{"origins": "*"}})
19 app.config['SECRET_KEY'] = 'secret_key_hkr'
20 app.config['SQLALCHEMY_DATABASE_URI'] = 'postgresql://postgr
21 app.config['SQLALCHEMY_TRACK_MODIFICATIONS'] = True
22 app.config['FRONTEND_URL'] = 'http://localhost:3000'
23
24 app.config['GOOGLE_CLIENT_ID'] = ''
25 app.config['GOOGLE_CLIENT_SECRET'] = ''
26 db.init_app(app)
27
28 with app.app_context():
29     db.create_all()
30
31 dataset = DataSet()
32 model = MultiModel()
33 # model.train_model()
34 metadata = process_metadata()
35
36
37
38 @app.route('/metadata', methods=['GET'])
39 def get_metadata():
40     return json.dumps(metadata, cls=NpEncoder) , 200
41
42
43 # import all routes
44 import routes.auth
45 import routes.prediction
46 import routes.user
47
48 thread = start_jobs(app=app)
49
50
51 def cleanOnExit():
52     print("Cleaning Thread")
53     thread.set()
54
55 atexit.register(cleanOnExit);
```

## 2. Build a HTML Page

```
index.jsx x
Final Deliverables > frontend > src > Components > Dashboard > index.jsx > ...
25 <Box sx={{bgcolor: "#F3E5F5"}}>
26   <Header />
27   <Grid container sx={{ minHeight: 'calc(100vh - 48px)' }}>
28     <Grid item xs={12}>
29       <Grid>
30         <Grid item container>
31           <Grid>
32             item
33             xs={12}
34             md={3}
35             lg={1.5}
36             paddingLeft="10px"
37             sx={{
38               borderRight: {
39                 sx: "none",
40                 // s: "3px solid black",
41                 // md: "3px solid black",
42                 lg: "3px solid black",
43                 height: "95%",
44               },
45             }}
46           <Sidebar />
47         </Grid>
48         <Grid item xs={12} md={9} lg={10} sx={{ height: '100%' }}>
49           <Outlet />
50         </Grid>
51       </Grid>
52     </Grid>
53   </Box>
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```

### 3. Run the Application

- \* Serving Flask app "app" (lazy loading)
- \* Environment: production  
**WARNING: This is a development server. Do not use it in a production deployment.**  
Use a production WSGI server instead.
- \* Debug mode: on
- \* Restarting with stat
- \* Debugger is active!
- \* Debugger PIN: 301-111-576
- \* Running on http://0.0.0.0:5000/ (Press CTRL+C to quit)

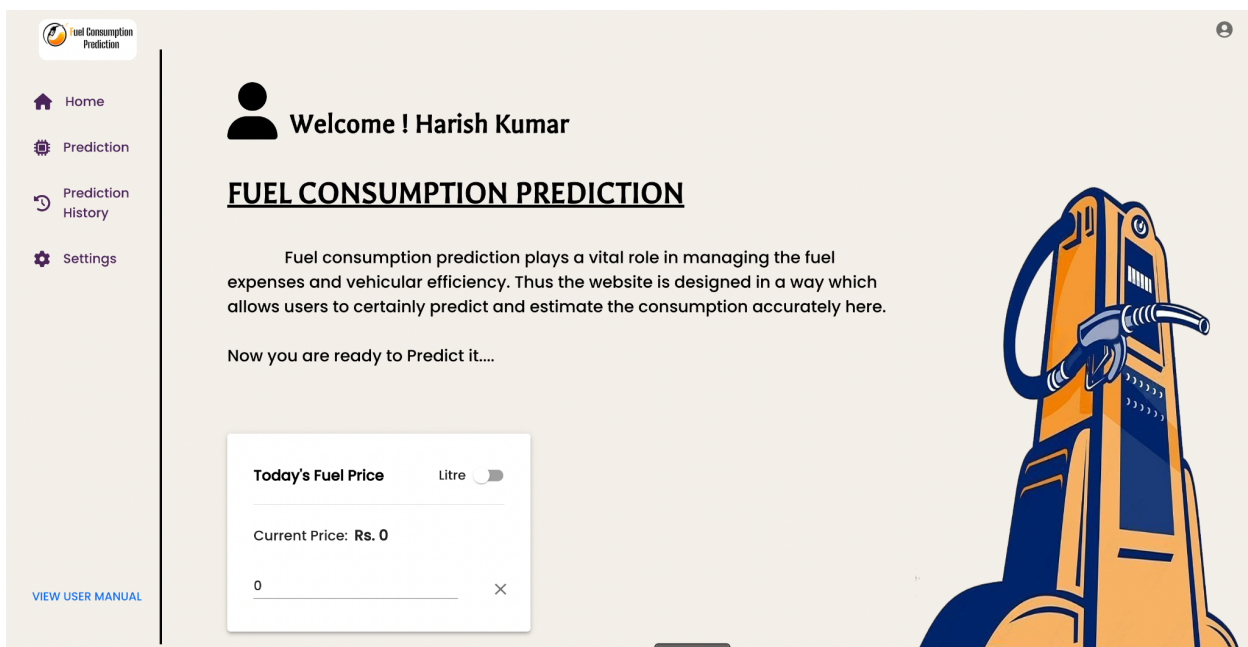
Compiled successfully!

You can now view **frontend** in the browser.

Local: http://localhost:3000  
On Your Network: http://192.168.43.27:3000

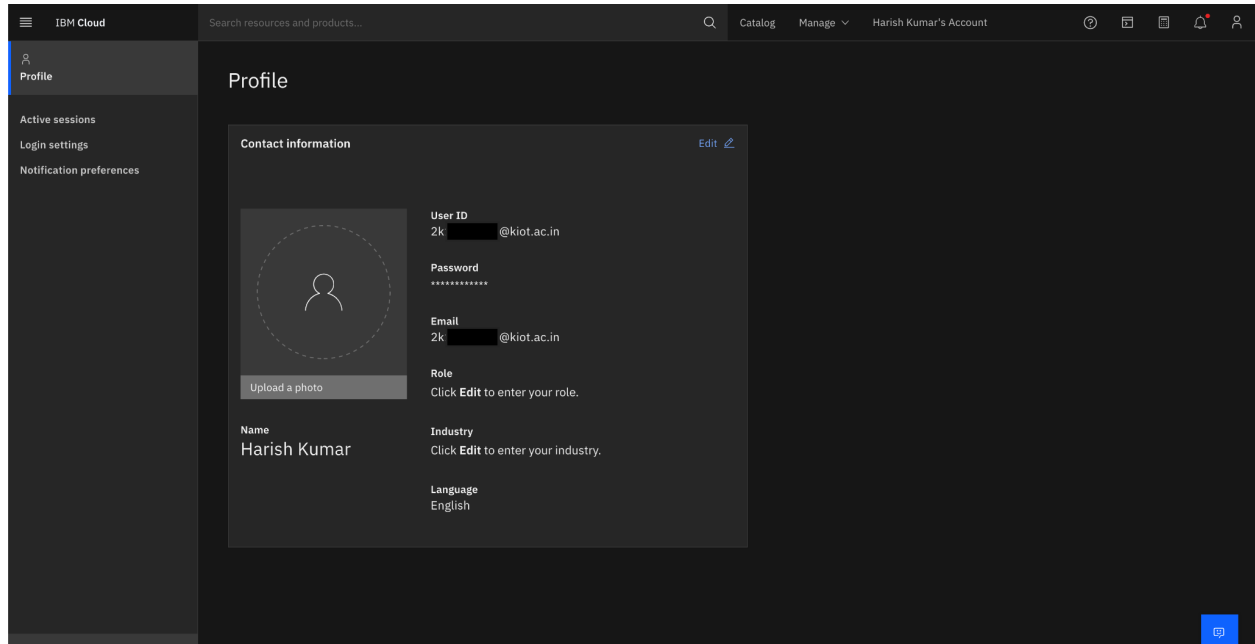
Note that the development build is not optimized.  
To create a production build, use `npm run build`.

webpack compiled successfully

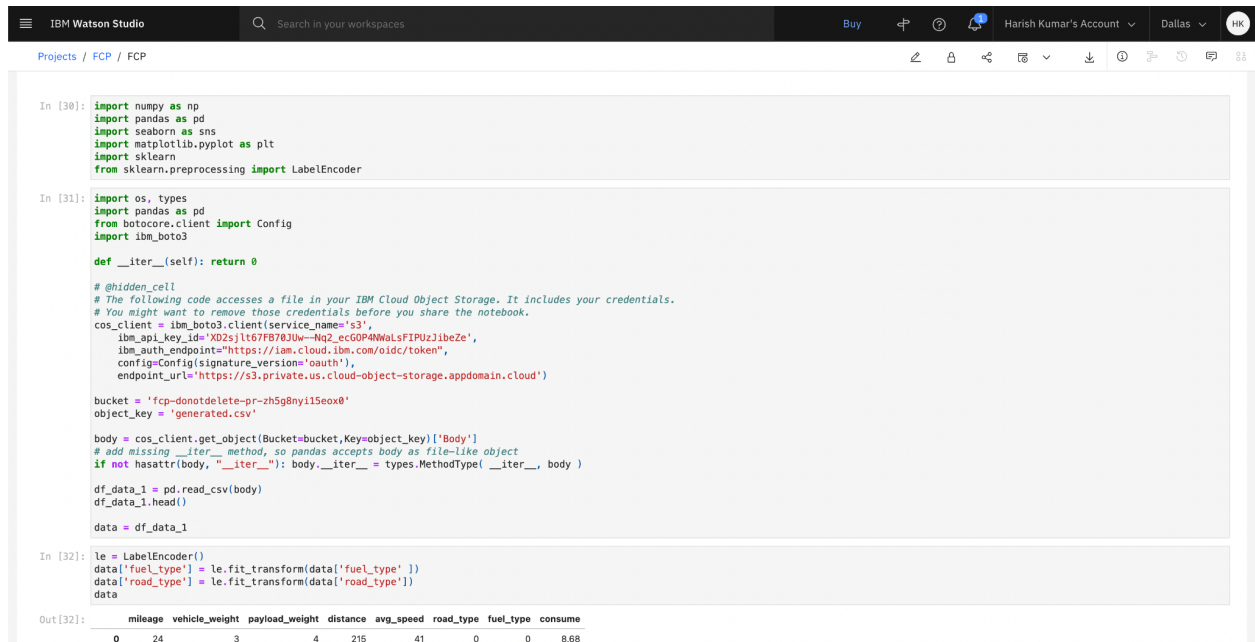


# Train the Model on IBM

## 1. Register For IBM Cloud

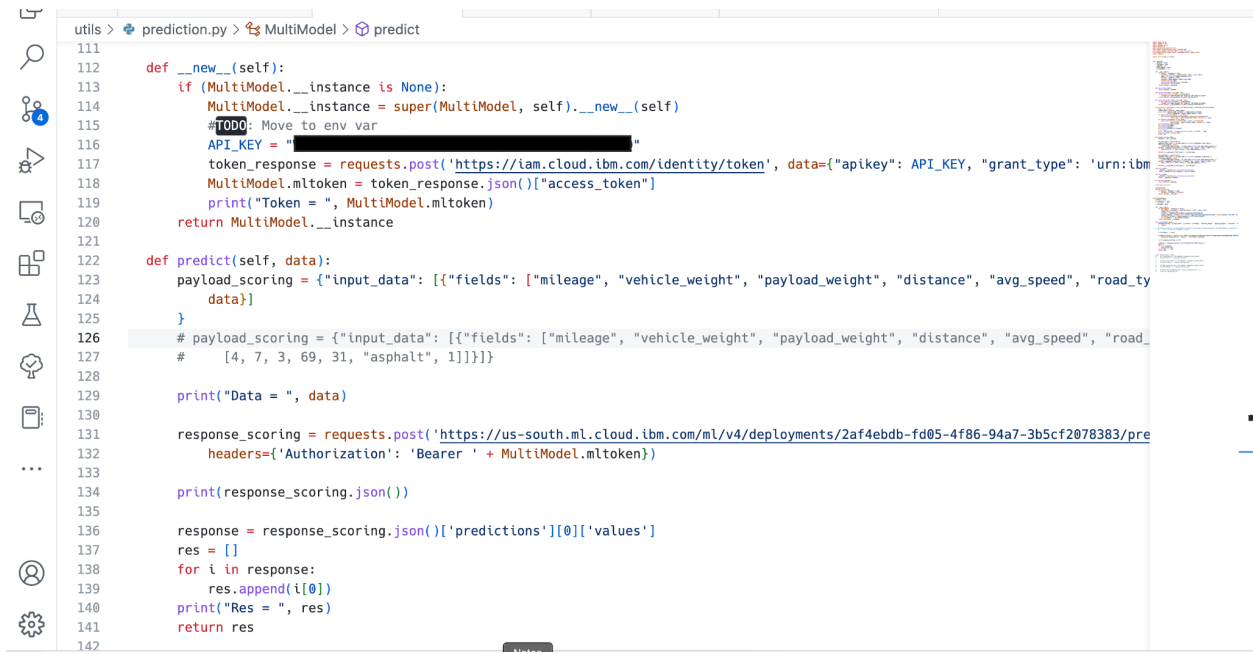


## 2. Train the IBM Model on IBM





### 3. Integrate Flask With Scoring End Point



```
utils > prediction.py > MultiModel > predict
111
112 def __new__(self):
113     if (MultiModel.__instance is None):
114         MultiModel.__instance = super(MultiModel, self).__new__(self)
115         #TODO: Move to env var
116         API_KEY = " "
117         token_response = requests.post('https://iam.cloud.ibm.com/identity/token', data={"apikey": API_KEY, "grant_type": 'urn:ibm
118         MultiModel.mtoken = token_response.json()["access_token"]
119         print("Token = ", MultiModel.mtoken)
120     return MultiModel.__instance
121
122 def predict(self, data):
123     payload_scoring = {"input_data": [{"fields": ["mileage", "vehicle_weight", "payload_weight", "distance", "avg_speed", "road_ty
124     data]}]}
125 }
126 # payload_scoring = {"input_data": [{"fields": ["mileage", "vehicle_weight", "payload_weight", "distance", "avg_speed", "road
127 # [4, 7, 3, 69, 31, "asphalt", 1]]}}
128
129 print("Data = ", data)
130
131 response_scoring = requests.post('https://us-south.ml.cloud.ibm.com/ml/v4/deployments/2af4ebdb-fd05-4f86-94a7-3b5cf2078383/pre
132 headers={"Authorization": 'Bearer ' + MultiModel.mtoken})
133
134 print(response_scoring.json())
135
136 response = response_scoring.json()["predictions"][0]["values"]
137 res = []
138 for i in response:
139     res.append(i[0])
140 print("Res = ", res)
141 return res
142
```