In [2]:
```python
# libraries
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler
from sklearn.linear_model import LinearRegression
# necessary libraries will be imported further
```

PART 0 : Reading the Data

In [3]:
```python
#reading csv
data=pd.read_csv(r'C:\Users\ajay\Downloads\Fytlyff_DS_Interview.csv')
```

In [4]:
```python
#head
data.head(3)
```

Out[4]:

	Year	Month	MobileWeb_or_Web	Type_of_Customers?	Where_Are_They_comming_from?	Which_Place_in_India?	How_many_Landed_on_our_Pa
0	2019	Jan	Desktop_Website	Existing_Customer	Came_From_Google	Bangalore	N
1	2019	Jan	Desktop_Website	Existing_Customer	Came_From_Google	Chennai	N
2	2019	Jan	Desktop_Website	Existing_Customer	Came_From_Google	Dehradun	N

In [5]:
```python
#shape of data
data.shape
```

Out[5]:
```
(2160, 10)
```

Observe the column names and the data types in each column

In [6]:
```python
#data info
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2160 entries, 0 to 2159
Data columns (total 10 columns):
 #   Column
                 Non-Null Count  Dtype
---  ------
                 --------------  -----
 0   Year
                 2160 non-null   int64
 1   Month
                 2160 non-null   object
 2   MobileWeb_or_Web
                 2160 non-null   object
 3   Type_of_Customers?
                 2160 non-null   object
 4   Where_Are_They_comming_from?
                 2160 non-null   object
 5   Which_Place_in_India?
                 2160 non-null   object
 6   How_many_Landed_on_our_Page?
                 1080 non-null   float64
 7   How_many_Landed_on_the_our_Page_and_clicked_on_a_button?
                 1080 non-null   float64
 8   How_many_Landed_on_the_our_Page_and_clicked_on_a_button_and_started_filling_the_Form?
                 2160 non-null   int64
 9   How_many_Landed_on_the_our_Page_and_clicked_on_a_button_and_started_filling_the_Form_and_Completed_and_sub
mited_the_form?  2160 non-null   int64
dtypes: float64(2), int64(3), object(5)
memory usage: 168.9+ KB
```

```
Data has null values
```

Part 1 :Data Cleaning

Write a function called data_cleaning() which, when called, would perform the following activity:

1. Replaces the NA values with 0s in the data\
2. In column 'B' replace Jan with 1, feb with 2, march with 3 and so on...\
3. In column 'E' Replace "Came_From_Google" with "Google" and "Landed_on_the_page_Directly" with "Direct_traffic"

In [7]:
```python
# function
def data_cleaning(df):
    # replace NaN values with
    dat=df.fillna(0)

    #In column 'B' replace Jan with 1, feb with 2, march with 3 and so on…
    for i,j in enumerate(dat['Month'].unique()):
        dat=dat.replace({'Month':{j:i+1}})

    # In column 'E' Replace "Came_From_Google" with "Google" and "Landed_on_the_page_Directly" with "Direct_tra
    dat=dat.replace({'Where_Are_They_comming_from?':{'Came_From_Google':'Google',
                                                                      'Landed_on_the_page_Directl

    return dat
```

In [8]:
```python
# testing function and cleaning data

data=data_cleaning(data)
```

```
Working Well!
```

Part 2: Descriptive statistics

- Write a function called descriptive_stats() which, when called, would perform the following activity:

1. Generates the summary statistics (Mean, Median, Quartile, standard deviation) of all the numerical columns
2. Produce a list of all the unique values & data types present in the non-numeric columns

In [9]:
```python
# function
def descriptive_stats(df,type=None):                # here we have to pass which type of features we want stas
    if type=='object':
        return df.describe(include=['O'])
    elif type=='num':
        return df.describe(include=['int','float'])
    else:
        return df.describe(include=['O','int','float'])
```

In [10]:
```python
# test function
descriptive_stats(data,'object')
```

Out[10]:

	MobileWeb_or_Web	Type_of_Customers?	Where_Are_They_comming_from?	Which_Place_in_India?
count	2160	2160	2160	2160
unique	2	2	3	5
top	Desktop_Website	Existing_Customer	Google	Bangalore
freq	1080	1080	720	432

In [11]:
```python
data.describe()
```

Out[11]:

	Year	Month	How_many_Landed_on_our_Page?	How_many_Landed_on_the_our_Page_and_clicked_on_a_button?	How_many_Lan
count	2160.000000	2160.000000	2.160000e+03	2.160000e+03	
mean	2020.000000	6.500000	3.922474e+05	1.792281e+05	
std	0.816686	3.452852	9.555773e+05	3.951562e+05	
min	2019.000000	1.000000	0.000000e+00	0.000000e+00	
25%	2019.000000	3.750000	0.000000e+00	0.000000e+00	
50%	2020.000000	6.500000	1.228350e+04	4.212500e+03	
75%	2021.000000	9.250000	3.816422e+05	1.730452e+05	
max	2021.000000	12.000000	1.127413e+07	4.079301e+06	

Part 3: Prescriptive statistics

Can you write code and present the data which would help us answer (Text in "" are column names) :

1. "Which_Place_in_India?" has the highest "How_many_Landed_on_the_our_Page?"
2. "How_many_Landed_on_the_our_Page_and_clicked_on_a_button_and_started_filling_the_Form_and_Completed_and_submited_the_form?" divided by "How_many_Landed_on _our_Page?" is highest for "Which_Place_in_India?"

In [12]:
```python
# 1. "Which_Place_in_India?" has the highest "How_many_Landed_on_the_our_Page?"

data.groupby(['Which_Place_in_India?'])['How_many_Landed_on_our_Page?'].sum().reset_index().sort_values('How_ma
```

Out[12]:

	Which_Place_in_India?	How_many_Landed_on_our_Page?
4	Pune	319132898.0

In [13]:
```python
# 2 ."How_many_Landed_on_the_our_Page_and_clicked_on_a_button_and_started_filling_the_Form_and_Completed_and_su

    # lets make a dataframe first which will include average landed on page of  every place
average_landed=data.groupby('Which_Place_in_India?')['How_many_Landed_on_our_Page?'].mean().reset_index()

    # let's make another dataframe which will include sum of last column i.e landed to submit
sum_submit=data.groupby('Which_Place_in_India?')['How_many_Landed_on_the_our_Page_and_clicked_on_a_button_and_s

    # last dataframe which will tell highest
pd.DataFrame({'Place':average_landed['Which_Place_in_India?'],
              'Highest':sum_submit['How_many_Landed_on_the_our_Page_and_clicked_on_a_button_and_started_filling_
```

Out[13]:

	Place	Highest
0	Bangalore	85.330440
1	Chennai	69.368575
2	Dehradun	60.873038
3	Indore	80.684003
4	Pune	47.452202

```
Highest is in Bangalore
```

Part 4: Simple Machine learning questions

Write a function called pred_future() which, when called, would perform the following activity:

1. Predict "How_many_Landed_on_the_our_Page_and_clicked_on_a_button_and_started_filling_the_Form_and_Completed_and_submited_the_form?" for the complete year of 2022
2. Generate the overall MAPE of your prediction for the year 2021

```
For creating and applying model we need to do feature engineering and feature scaling first
```

Feature Engineering\ . Feature Engineering and feature scaling is must for implementing a Model.

In [14]:
```python
data.head()
```

Out[14]:

	Year	Month	MobileWeb_or_Web	Type_of_Customers?	Where_Are_They_comming_from?	Which_Place_in_India?	How_many_Landed_on_our_Pa
0	2019	1	Desktop_Website	Existing_Customer	Google	Bangalore	
1	2019	1	Desktop_Website	Existing_Customer	Google	Chennai	
2	2019	1	Desktop_Website	Existing_Customer	Google	Dehradun	
3	2019	1	Desktop_Website	Existing_Customer	Google	Indore	
4	2019	1	Desktop_Website	Existing_Customer	Google	Pune	

In [15]:
```python
# binary encoding

#MobileWeb_or_web
data=data.replace({'MobileWeb_or_Web':{'Desktop_Website':0,
                                       'Mobile_website':1}})
#Type_of_Customers?
data=data.replace({'Type_of_Customers?':{'Existing_Customer':0,
                                         'New_Customer':1}})

#Where_Are_They_comming_from
data=data.replace({"Where_Are_They_comming_from?":{'Google':0,
                                                   'Direct_traffic':1,
                                                   'Unidentified_Sources':2}})

#Which_Place_in_India?
data=data.replace({'Which_Place_in_India?':{'Bangalore':0,
                                            'Chennai':1,
                                            'Dehradun':2,
                                            'Indore':3,
                                            'Pune':4}})
```

In [16]:
```python
#data sample
data.sample(3)
```

Out[16]:

	Year	Month	MobileWeb_or_Web	Type_of_Customers?	Where_Are_They_comming_from?	Which_Place_in_India?	How_many_Landed_on_our
2154	2021	12	1	1	1	4	62
1217	2020	9	0	1	0	2	1
127	2019	3	0	0	1	2	

In [17]:
```python
x=data.iloc[:,:-1]
y=data.iloc[:,-1]
```

Train Test Split

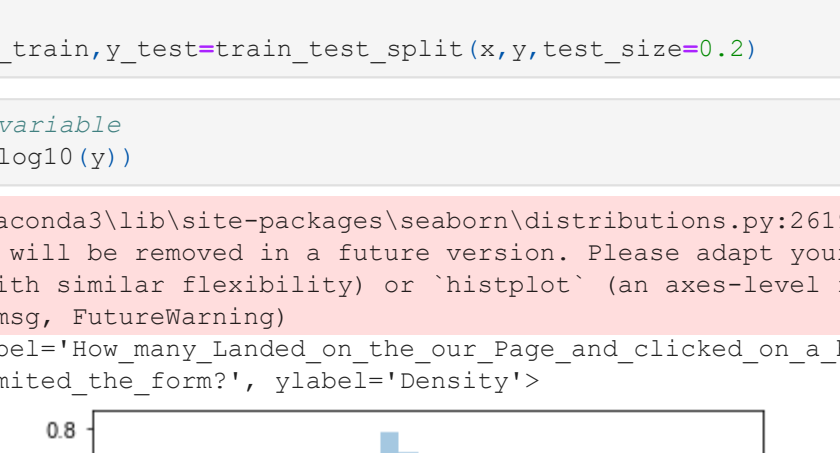
In [18]:
```python
#library
from sklearn.model_selection import train_test_split

x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2)
```

In [19]:
```python
#plot dependent variable
sns.distplot(np.log10(y))
```

```
C:\Users\ajay\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a depreca
ted function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-
level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

Out[19]:
```
<AxesSubplot:xlabel='How_many_Landed_on_the_our_Page_and_clicked_on_a_button_and_started_filling_the_Form_and_C
ompleted_and_submited_the_form?', ylabel='Density'>
```



Feature Scaling

In [20]:
```python
#library
from sklearn.preprocessing import MinMaxScaler

scaler=MinMaxScaler()

# independet feature scaling
x_train.iloc[:,6:]=scaler.fit_transform(x_train.iloc[:,6:])
x_test.iloc[:,6:]=scaler.fit_transform(x_test.iloc[:,6:])

#dependent feature scaling
y_train=np.log10(y_train)
y_test=np.log10(y_test)
```

In [21]:
```python
# Linear Regression

from sklearn.linear_model import LinearRegression

model=LinearRegression()

model.fit(x_train,y_train)
```

Out[21]:
```
LinearRegression()
```

NOTE: *I am skipping some steps like outlier check , multicolinearity check etc and directly coming into main goal i.e Part 4 of this project. Therefore performance of model may vary.*

In [22]:
```python
# Predict "How_many_Landed_on_the_our_Page_and_clicked_on_a_button_and_started_filling_the_Form_and_Completed_a

# let's make function
def pred_future(test):
    pred_df=x_test.join(pd.Series(y_test,name='actual')).join(pd.Series(model.predict(x_test),index=x_test.inde
    pred_2021=pred_df[pred_df['Year']==2021][['preds']]                        # extracting predictio
    actual_2021=pred_df[pred_df['Year']==2021][['actual']]                     # extracting actual val

    #calculate MAPE for 2021

    mape=np.mean(abs(actual_2021.values-pred_2021.values))*100

    print('MAPE for year 2021 is {}'.format(mape))
    return 'Predction for year 2022 ' ,pred_2021
```

In [23]:
```python
# test for  function
pred_future(x_test)
```

Out[23]:
```
MAPE for year 2021 is 28.701484592725386
('Predction for year 2022 ',
          preds
 1516  4.751989
 2109  4.933594
 1720  3.517433
 1447  4.262495
 1782  3.687246
 ...        ...
 1843  3.848602
 2141  3.670824
 1529  4.308601
 1773  4.523420
 2155  3.824241

 [139 rows x 1 columns])
```

```
Part 4 has been completed
```

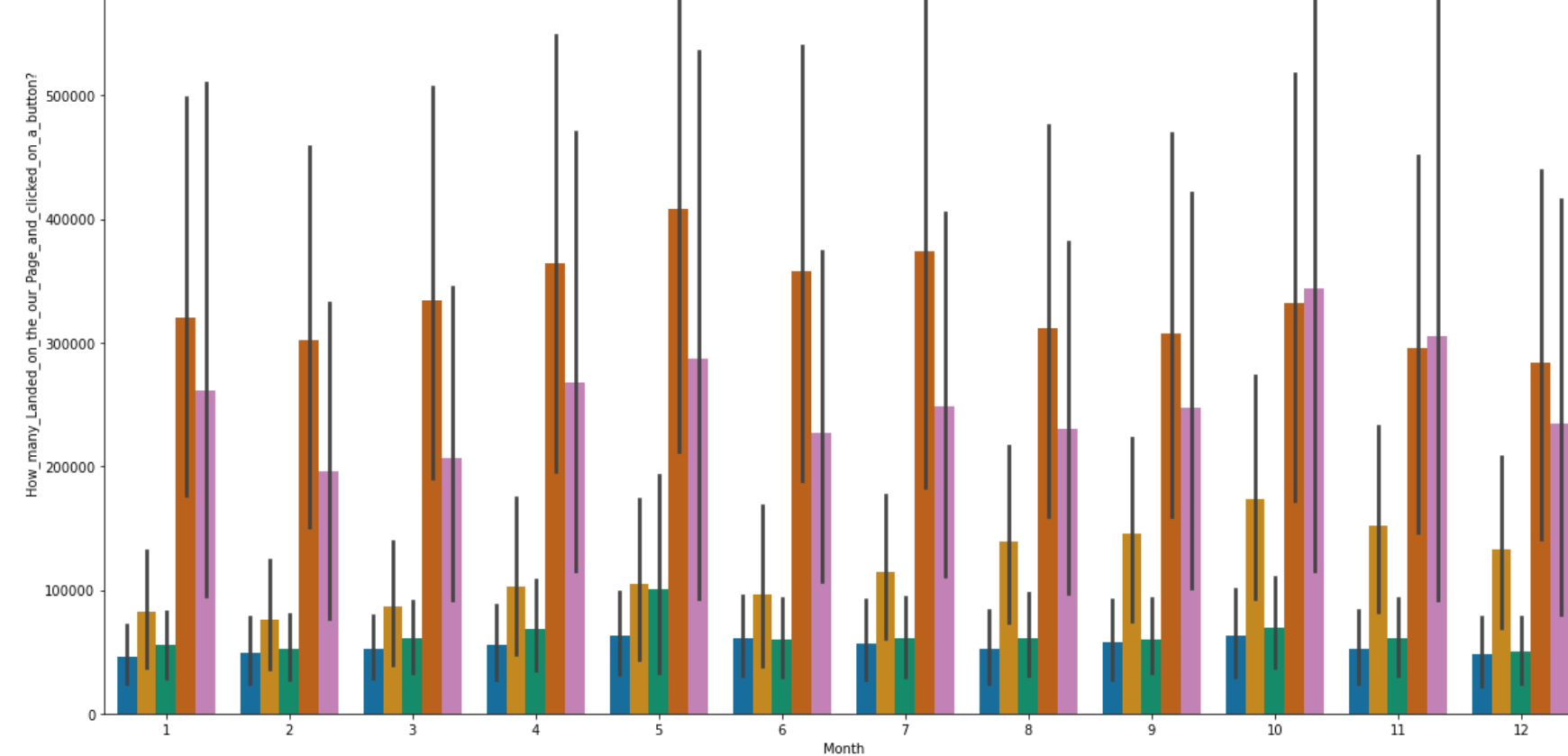
Part 5: Visualization

- Please write a code to display :

1. A line graph for "How_many_Landed_on_the_our_Page_and_clicked_on_a_button?" for the different "Which_Place_in_India?" over the months of the year 2019 & 2020. (Hint : On x axis there should be months for 2019 & 2020 and Y axis should be the "How_many_Landed_on_the_our_Page_and_clicked_on_a_button?" and there should different lines depicting different regions of "Which_Place_in_India?")
2. A line graph of the actual and projected number of "How_many_Landed_on_the_our_Page_and_clicked_on_a_button_and_started_filling_the_Form _and_Completed_and_submited_the_form?" for the months of the year 2021(Actuals values) & 2022 (Predicted values). (Hint : It should be a line graph)

In [34]:
```python
#1.
df19_20=data[(data['Year']==2019) | (data['Year']==2020)]
plt.figure(figsize=(20,12))
labels=['Bangalore','Chennai','Dehradun','Indore','Pune']
sns.barplot(data=df19_20,x='Month',y='How_many_Landed_on_the_our_Page_and_clicked_on_a_button?',hue='Which_Plac
```

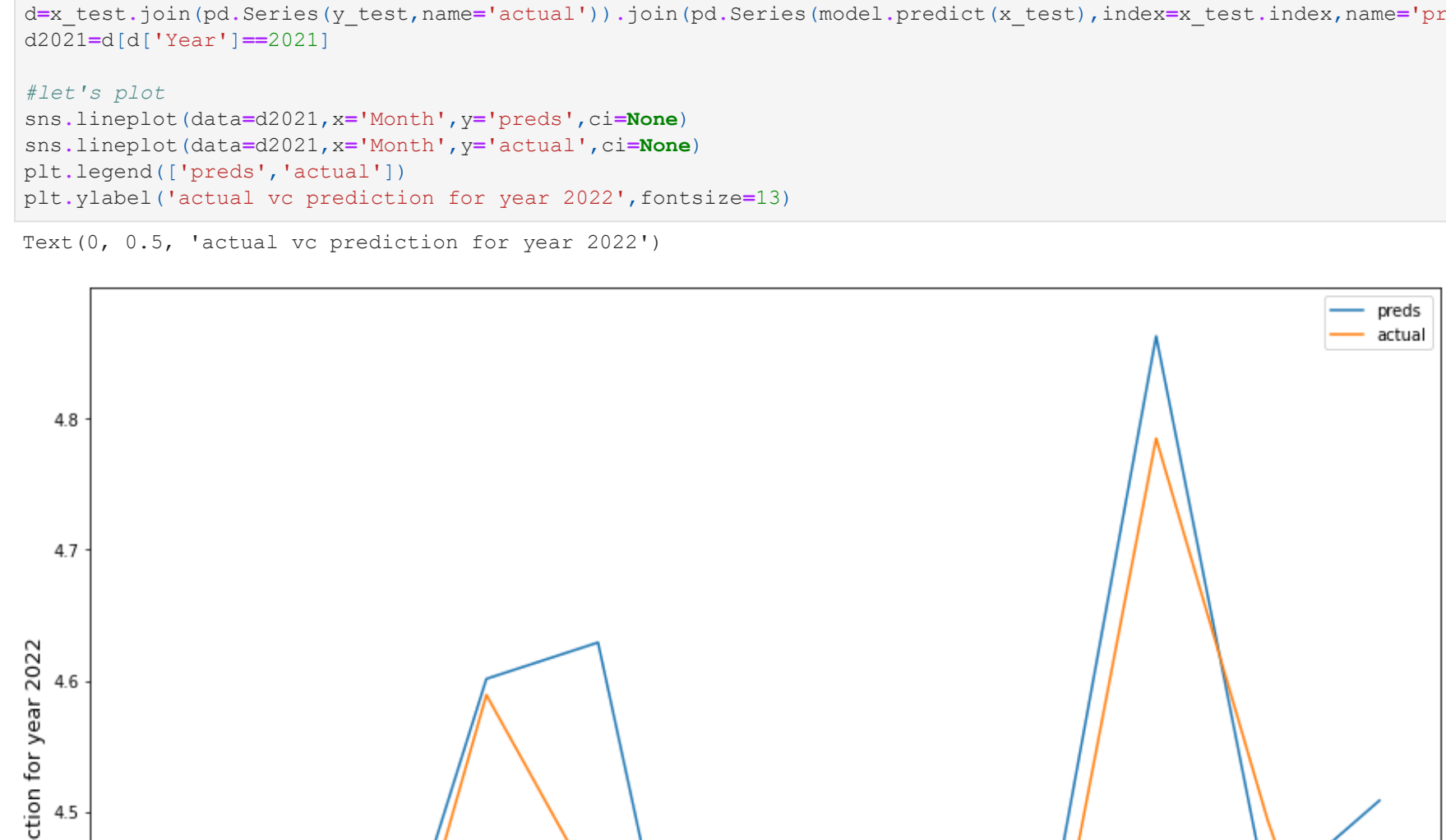
Out[34]:
```
<AxesSubplot:xlabel='Month', ylabel='How_many_Landed_on_the_our_Page_and_clicked_on_a_button?'>
```



In [25]:
```python
#2.
plt.figure(figsize=(15,12))
# first created a dataframe so we could extract year 2021 prediction and actual, values
d=x_test.join(pd.Series(y_test,name='actual')).join(pd.Series(model.predict(x_test),index=x_test.index,name='pr
d2021=d[d['Year']==2021]

#let's plot
sns.lineplot(data=d2021,x='Month',y='preds',ci=None)
sns.lineplot(data=d2021,x='Month',y='actual',ci=None)
plt.legend(['preds','actual'])
plt.ylabel('actual vc prediction for year 2022',fontsize=13)
```

Out[25]:
```
Text(0, 0.5, 'actual vc prediction for year 2022')
```



Part 6: About the Previous projects

- Please describe any interesting project you did in the Data Science domain in more than 250 words. Attach Github links if possible

Project Title : ANDRIOD_AUTHENTICITY_PREDICTION

Problem Statement: This dfset consists of apps needed permissions during installation and run-time. We collect apps from three different sources google play, third-party apps and malware dataset. This file contains more than 30,000 Android apps. features extracted at the time of installation and execution. One file contains the name of the features and others contain .apk file corresponding to it extracted permissions with respective package. Apps are collected from Google's play store, hiapk, app china, Android, mumayi , gfan slideme, and pandaapp. These .apk files collected from the last three years continuously and contain 81 distinct malware families. But, Here you are only supposed to predict whether the app is benign(0) or malware(1).

Attribute Information :

There are total 183 independent variables and 1 dependent feature which are as follows :

1 . App :- Name of the App

2 . Package :- OBB/Data package installed in root folder

3 . Category :- App Category (eg. Entertainment, Adventure, puzzle, Action, Antivirus, etc.)

4 . Description :- App Description

5 . Rating :- Rating out of 5

6 . Number of ratings :- No. of Ratings given by users

7 . Price :- Price of the App

8 . Related apps :- Apps related to installed App

9 . Dangerous (D) permissions count :- No. of Dangerous Permissions allowed by user

10 . Safe (S) permissions count :- No. of Safe Permissions allowed by user

11-183 .are different types of permission

184 . Class :- 0 : Benign , 1 : Malware (***Class variable***)

Primary Goal : As this is a classification problem ,the primary goal of this project was to classify whether the app is malware or not.

Problem Faced :

1. The main issue i faced while doing this project was when i was going through data pre-processing stage,in the stage of outlier removal ,there were total around 800 outlier data point but when i did some EDA ,i came to know that out of 800 outlier ,more than 500 datapoints were related to class 1 which were the malware apps,if i would have removed those outliers ,there would have been an issue of data leakage,therefore i did not removed all the outliers totally.

2. After that ,as we know there are more than 150 independent variable ,so i performed feature extraction and feature selection to ged ridd off from the curse of high dimensionality.

Solution :

1. Performed EDA to get to know about data.
2. Went through Data wrangling and pre-processing stage.
3. Performed Feature Extarction and Feature Selection.
4. Performed feature scaling.
5. train test split
6. applied Ensembling technique called XGBoost
7. Improved f1-score from 74 to 85.

GitHub :https://github.com/ajayn3300/Android-Authenticity-Prediction--Classification-.git

Part 7 : Time management

• Can you please share your thoughts, in less than 120 words, on "If you get selected, how will you manage your time for this full-time internship opportunity"

Look, you know why i am submitting this project on exact the last date of submitting this assigment , even i started doing this project today which is last day of submission because i have already planned in my mind while i was reading about this project,i knew there is nothing that i don't know or that will take time for me to do this ,if i had known already that there are some point or things which i don't know or i have to learn these things ,i would have started this project 2 days ago I ,sacrificing other important things , hope you get it what i am trying to say.Now i will submit this project (time 15:33) and i wish i am the person you are looking for you organisation. Thank you!*

In [ ]: