Plotting the Grow Dataset

Name: Inam Abdul Ghaffar

ID :2495895

Reading the csv data file:

Reading from a CSV file is done using the reader object. The CSV file is opened as a text file with Python's built-in read which is given bellow here I mention first 60 line in head but in original file there is big data.

```
[5]: #Reading the csv data file
data_f = pd.read_csv('D:\\University of Dundee\\Programing Language\\Python\\Assignment 2\\GrowLocations.csv')
#Head 60 mean i want to shwo the first 60 lines just for understanding the clearing rows and columns
data_f.head(60)
```

[5]:

	Serial	Latitude	Longitude	Type	SensorType	Code	BeginTime	
0	PI040298AD5J215142	-7.923	54.980	Thingful.Connectors.GROWSensors.AirTemperature	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	17T13:5
1	PI040298AD5J215142	-7.923	54.980	Thingful.Connectors.GROWSensors.BatteryLevel	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	17T13:5
2	PI040298AD5J215142	-7.923	54.980	Thingful.Connectors.GROWSensors.FertilizerLevel	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	17T13:5
3	PI040298AD5J215142	-7.923	54.980	Thingful.Connectors.GROWSensors.Light	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	17T13:5
4	PI040298AD5J215142	-7.923	54.980	Thingful.Connectors.GROWSensors.SoilMoisture	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	17T13:5
5	PI040298AD5J215142	-7.923	54.980	Thingful.Connectors.GROWSensors.WaterTankLevel	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	17T13:5
6	PI040298AD5J215095	-7.968	54.964	Thingful.Connectors.GROWSensors.AirTemperature	Flower Power	Grow.Thingful.Sensors_fqzb9jsq	2018-10-17T13:31:11.000Z	29T09:4
7	PI040298AD5J215095	-7.968	54.964	Thingful.Connectors.GROWSensors.BatteryLevel	Flower Power	Grow.Thingful.Sensors_fqzb9jsq	2018-10-17T13:31:11.000Z	29T09:4

Remove Bad Values:

Here in screenshot, I have highlighted the values in serial which we don't need so I remove the bad values also in next step.

53	PI040297AD5I209900	0.000	0.000	Thingful.Connectors.GROWSensors.WaterTankLevel	Flower Power	Grow.Thingful.Sensors_5kc81f8r	2018-09-03T19:41:33.000Z	05T17:
54	PI040297AD5J210724.FuturePractice:,Id:382,Lan...	18.414	47.310	Thingful.Connectors.GROWSensors.AirTemperature	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	10T12:
55	PI040297AD5J210724.FuturePractice:,Id:382,Lan...	18.414	47.310	Thingful.Connectors.GROWSensors.BatteryLevel	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	10T12:
56	PI040297AD5J210724.FuturePractice:,Id:382,Lan...	18.414	47.310	Thingful.Connectors.GROWSensors.FertilizerLevel	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	10T12:
57	PI040297AD5J210724.FuturePractice:,Id:382,Lan...	18.414	47.310	Thingful.Connectors.GROWSensors.Light	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	10T12:
58	PI040297AD5J210724.FuturePractice:,Id:382,Lan...	18.414	47.310	Thingful.Connectors.GROWSensors.SoilMoisture	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	10T12:
59	PI040297AD5J210724.FuturePractice:,Id:382,Lan...	18.414	47.310	Thingful.Connectors.GROWSensors.WaterTankLevel	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	10T12:

In bellow there is the code for removing the null values and also removed the values after decimal in Serial column.

```
#Removeing Bad Values like in Serial Column there i will remove the value after decimal or dot
for s in data_f.Serial:
        data_f['Serial']=s.split('.')[0]
        data_f.head(60)
```

```
#Here i just show the 60 lines just for showing that there is no values after dot in serial column..
data_f.head(60)
```

	Serial	Latitude	Longitude	Type	SensorType	Code	BeginTime	EndT
0	PI040297AD5I207980	-7.923	54.980	Thingful.Connectors.GROWSensors.AirTemperature	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	2018 17T13:59:07.
1	PI040297AD5I207980	-7.923	54.980	Thingful.Connectors.GROWSensors.BatteryLevel	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	2018 17T13:59:07.
2	PI040297AD5I207980	-7.923	54.980	Thingful.Connectors.GROWSensors.FertilizerLevel	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	2018 17T13:59:07.
3	PI040297AD5I207980	-7.923	54.980	Thingful.Connectors.GROWSensors.Light	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	2018 17T13:59:07.
4	PI040297AD5I207980	-7.923	54.980	Thingful.Connectors.GROWSensors.SoilMoisture	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	2018 17T13:59:07.
5	PI040297AD5I207980	-7.923	54.980	Thingful.Connectors.GROWSensors.WaterTankLevel	Flower Power	Grow.Thingful.Sensors_5tjrqt1c	2018-10-17T13:14:07.000Z	2018 17T13:59:07.
6	PI040297AD5I207980	-7.968	54.964	Thingful.Connectors.GROWSensors.AirTemperature	Flower Power	Grow.Thingful.Sensors_fqzb9jsq	2018-10-17T13:31:11.000Z	2018 29T09:40:49.
7	PI040297AD5I207980	-7.968	54.964	Thingful.Connectors.GROWSensors.BatteryLevel	Flower Power	Grow.Thingful.Sensors_fqzb9jsq	2018-10-17T13:31:11.000Z	2018 29T09:40:49.

Her you can see there is no bad values in serial and also removed the null number which to making the map.

54	PI040297AD5I207980	18.414	47.310	Thingful.Connectors.GROWSensors.AirTemperature	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	2018 10T12:27:59.
55	PI040297AD5I207980	18.414	47.310	Thingful.Connectors.GROWSensors.BatteryLevel	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	2018 10T12:27:59.
56	PI040297AD5I207980	18.414	47.310	Thingful.Connectors.GROWSensors.FertilizerLevel	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	2018 10T12:27:59.
57	PI040297AD5I207980	18.414	47.310	Thingful.Connectors.GROWSensors.Light	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	2018 10T12:27:59.
58	PI040297AD5I207980	18.414	47.310	Thingful.Connectors.GROWSensors.SoilMoisture	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	2018 10T12:27:59.
59	PI040297AD5I207980	18.414	47.310	Thingful.Connectors.GROWSensors.WaterTankLevel	Flower Power	Grow.Thingful.Sensors_dg502301	2018-10-13T16:28:46.000Z	2018 10T12:27:59.

Define the Bounding Box:

we have to define the Bounding Box. Bounding Box is the area defined by two longitudes and two latitudes that will include all spatial points here longitude min is -10.592 and longitude max 1.6848. latitude min is 50.681 and latitude max 57.985.

B_Box = (-10.592,1.6848,

50.681, 57.985)

Getting the Map:

For getting Desired Map Go to opestreetmap.org website and export the desired map as per longitude and latitude. So I have downloaded the image in PNG form. The output of he PNG map is given bellow.

```
map_image= plt.imread('D:\\University of Dundee\\Programing Language\\Python\\Assignment 2\\map_png.png')
map_image
```

```
[7]: array([[[0.44313726, 0.40784314, 0.41960785, 1.        ],
             [0.43529412, 0.41568628, 0.42745098, 1.        ],
             [0.40784314, 0.40392157, 0.41960785, 1.        ],
             ...,
             [0.40784314, 0.40392157, 0.41960785, 1.        ],
             [0.40784314, 0.40392157, 0.41960785, 1.        ],
             [0.40784314, 0.40392157, 0.41960785, 1.        ]],

            [[0.6156863 , 0.6313726 , 0.64705884, 1.        ],
             [0.6039216 , 0.654902  , 0.6745098 , 1.        ],
             [0.5254902 , 0.6156863 , 0.64705884, 1.        ],
             ...,
             [0.5254902 , 0.6156863 , 0.64705884, 1.        ],
             [0.5254902 , 0.6156863 , 0.64705884, 1.        ],
             [0.5254902 , 0.6156863 , 0.64705884, 1.        ]],

            [[0.75686276, 0.8039216 , 0.8235294 , 1.        ],
             [0.7372549 , 0.8352941 , 0.8627451 , 1.        ],
             [0.63529414, 0.78039217, 0.827451  , 1.        ],
             ...,
             [0.63529414, 0.78039217, 0.827451  , 1.        ],
             [0.63529414, 0.78039217, 0.827451  , 1.        ],
             [0.63529414, 0.78039217, 0.827451  , 1.        ]],

            ...,

            [[0.9372549 , 0.93333334, 0.94509804, 1.        ],
             [0.9372549 , 0.93333334, 0.94509804, 1.        ],
             [0.9372549 , 0.93333334, 0.94509804, 1.        ],
             ...,
```

Plotting:

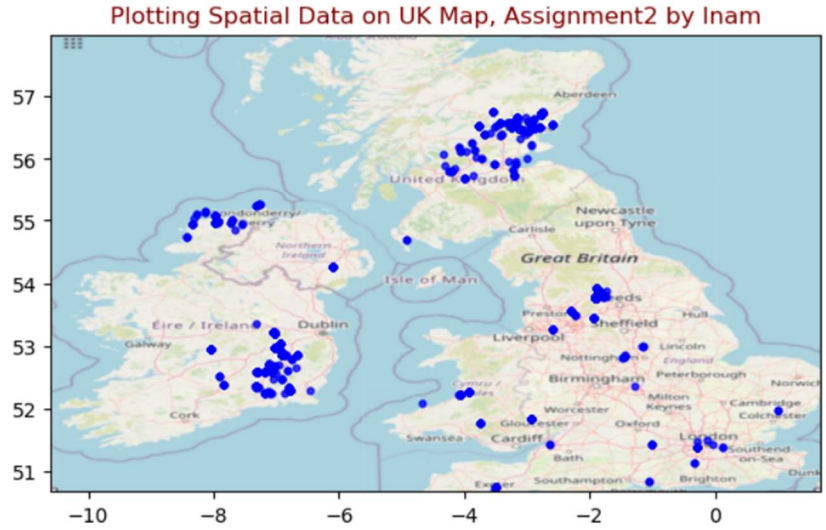
Finally, plot the '*data_f.longitude*' and '*data_f.latitude* coordinates as scatter points on the '*map_image*' . Note that it is important to set up the X-axis and Y-axis as per the bounding box '*BBox*'.so here is the bellow output and finally get the desired plotting as per requirement.

```
#here is define Longitude value.
d_f=data_f[(data_f['Longitude']>=50.681)& (data_f['Longitude']<=57.985)]
```

```
#here is define Latitude value
d_f=data_f[(data_f['Latitude']>=-10.592)& (data_f['Latitude']<=1.6848)]
```

```
#Finally, plot the 'data_f.longitude' and 'data_f.latitude' coordinates as scatter points on the 'map_image'
figre,axis = plt.subplots(figsize = (7,9))
axis.scatter(data_f.Latitude, data_f.Longitude, zorder=1, alpha= 0.2, c='b', s=10)
axis.set_title('Plotting Spatial Data on UK Map, Assignment2 by Inam')
axis.title.set_color('Maroon')
axis.set_xlim(B_Box[0],B_Box[1])
axis.set_ylim(B_Box[2],B_Box[3])
axis.imshow(map_image, zorder=0, extent = B_Box, aspect= 'equal')
```

```
<matplotlib.image.AxesImage at 0x2b4cc495400>
```



References:

These two links Help me for removing the bad values and empty values.

- https://stackoverflow.com/questions/18172851/deleting-dataframe-row-in-pandas-based-on-column-value
- https://www.kaggle.com/code/mryapss/remove-or-modify-empty-values-in-a-csv-dataset/notebook

these links help me for plotting map

- https://www.kaggle.com/code/nehaprabhavalkar/how-to-plot-map-of-india-using-python
- https://towardsdatascience.com/easy-steps-to-plot-geographic-data-on-a-map-python-11217859a2db