EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES PROJECT DEVELOPMENT PHASE

SPRINT 2

|  |  |
| --- | --- |
| Date | 11 November 2022 |
| Team ID | PNT2022TMID01972 |
| Project Name | Emerging Methods For Early Detection Of Forest Fires |
| Team Leader | Kalaiyarasan K |
| Team Members | **Joe Mathew**  **Balaji**  **Sridharan** |

**import** matplotlib.pyplot **as** plt **import** numpy **as** np **import** pandas **as** pd **import** seaborn **as** sns

**from** sklearn **import** metrics **from** sklearn.metrics **import**

classification\_report,confusion\_matrix

**import** warnings warnings**.**filterwarnings(action**=**"ignore")

**%matplotlib** inline sns**.**set\_style('darkgrid') pd**.**set\_option("display.max\_rows",1000) pd**.**set\_option("display.max\_columns",1000)

fires **=** pd**.**read\_csv(r"C:\Users\dhine\Downloads\forestfires.csv\forestfires.csv")

*#show the first 15 instance of dataset* fires**.**head(15)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **0** 7 | | 5 | mar | fri | 86.2 | 26.2 | 94.3 | 5.1 | 8.2 | 51 | 6.7 | 0.0 | 0.0 |
| **1** | 7 | 4 | oct | tue | 90.6 | 35.4 | 669.1 | 6.7 | 18.0 | 33 | 0.9 | 0.0 | 0.0 |
| **2** 7 | | 4 | oct | sat | 90.6 | 43.7 | 686.9 | 6.7 | 14.6 | 33 | 1.3 | 0.0 | 0.0 |
| **3** | 8 | 6 | mar | fri | 91.7 | 33.3 | 77.5 | 9.0 | 8.3 | 97 | 4.0 | 0.2 | 0.0 |
| **4** 8 | | 6 | mar | sun | 89.3 | 51.3 | 102.2 | 9.6 | 11.4 | 99 | 1.8 | 0.0 | 0.0 |
| **5** | 8 | 6 | aug | sun | 92.3 | 85.3 | 488.0 | 14.7 | 22.2 | 29 | 5.4 | 0.0 | 0.0 |
| **6** 8 | | 6 | aug | mon | 92.3 | 88.9 | 495.6 | 8.5 | 24.1 | 27 | 3.1 | 0.0 | 0.0 |
| **7** | 8 | 6 | aug | mon | 91.5 | 145.4 | 608.2 | 10.7 | 8.0 | 86 | 2.2 | 0.0 | 0.0 |
| **8** 8 | | 6 | sep | tue | 91.0 | 129.5 | 692.6 | 7.0 | 13.1 | 63 | 5.4 | 0.0 | 0.0 |
| **9** | 7 | 5 | sep | sat | 92.5 | 88.0 | 698.6 | 7.1 | 22.8 | 40 | 4.0 | 0.0 | 0.0 |
| **10** 7 |  | 5 | sep | sat | 92.5 | 88.0 | 698.6 | 7.1 | 17.8 | 51 | 7.2 | 0.0 | 0.0 |
| **11** | 7 | 5 | sep | sat | 92.8 | 73.2 | 713.0 | 22.6 | 19.3 | 38 | 4.0 | 0.0 | 0.0 |
| **12** 6 |  | 5 | aug | fri | 63.5 | 70.8 | 665.3 | 0.8 | 17.0 | 72 | 6.7 | 0.0 | 0.0 |
| **13** | 6 | 5 | sep | mon | 90.9 | 126.5 | 686.5 | 7.0 | 21.3 | 42 | 2.2 | 0.0 | 0.0 |

fires**.**shape

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| In [8]: *#sho*  Out[8]: | *w t*  **X** | *he*  **Y** | *last 10*  **month** |  | *inst*  **day** | *ances*  **FFMC** | *of dat*  **DMC** | *aset* f  **DC** | ires**.**  **ISI** | tail(15  **temp** | )  **RH** | **wind** | **rain** | **area** |
| **502** | 4 | 4 | aug |  | tue | 96.1 | 181.1 | 671.2 | 14.3 | 20.7 | 69 | 4.9 | 0.4 | 0.00 |
| **503** | 2 | 4 | aug |  | wed | 94.5 | 139.4 | 689.1 | 20.0 | 29.2 | 30 | 4.9 | 0.0 | 1.95 |
| **504** | 4 | 3 | aug |  | wed | 94.5 | 139.4 | 689.1 | 20.0 | 28.9 | 29 | 4.9 | 0.0 | 49.59 |
| **505** | 1 | 2 | aug |  | thu | 91.0 | 163.2 | 744.4 | 10.1 | 26.7 | 35 | 1.8 | 0.0 | 5.80 |
| **506** | 1 | 2 | aug |  | fri | 91.0 | 166.9 | 752.6 | 7.1 | 18.5 | 73 | 8.5 | 0.0 | 0.00 |
| **507** | 2 | 4 | aug |  | fri | 91.0 | 166.9 | 752.6 | 7.1 | 25.9 | 41 | 3.6 | 0.0 | 0.00 |
| **508** | 1 | 2 | aug |  | fri | 91.0 | 166.9 | 752.6 | 7.1 | 25.9 | 41 | 3.6 | 0.0 | 0.00 |
| **509** | 5 | 4 | aug |  | fri | 91.0 | 166.9 | 752.6 | 7.1 | 21.1 | 71 | 7.6 | 1.4 | 2.17 |
| **510** | 6 | 5 | aug |  | fri | 91.0 | 166.9 | 752.6 | 7.1 | 18.2 | 62 | 5.4 | 0.0 | 0.43 |
| **511** | 8 | 6 | aug |  | sun | 81.6 | 56.7 | 665.6 | 1.9 | 27.8 | 35 | 2.7 | 0.0 | 0.00 |
| **512** | 4 | 3 | aug |  | sun | 81.6 | 56.7 | 665.6 | 1.9 | 27.8 | 32 | 2.7 | 0.0 | 6.44 |
| **513** | 2 | 4 | aug |  | sun | 81.6 | 56.7 | 665.6 | 1.9 | 21.9 | 71 | 5.8 | 0.0 | 54.29 |
| **514** | 7 | 4 | aug |  | sun | 81.6 | 56.7 | 665.6 | 1.9 | 21.2 | 70 | 6.7 | 0.0 | 11.16 |
| **515** | 1 | 4 | aug |  | sat | 94.4 | 146.0 | 614.7 | 11.3 | 25.6 | 42 | 4.0 | 0.0 | 0.00 |

**516** 6 3 nov tue 79.5 3.0 106.7 1.1 11.8 31 4.5 0.0 0.00

# In [9]:

fires**.**info()

<class 'pandas.core.frame.DataFrame'> RangeIndex: 517 entries, 0 to 516 Data columns (total 13 columns):

# # Column Non-Null Count Dtype





1. X 517 non-null int64

# Y 517 non-null int64

1. month 517 non-null object

# day 517 non-null object

1. FFMC 517 non-null float64 5 DMC 517 non-null float64

# DC 517 non-null float64

* 1. ISI 517 non-null float64

# temp 517 non-null float64

* 1. RH 517 non-null int64

# wind 517 non-null float64

* 1. rain 517 non-null float64

# area 517 non-null float64 dtypes: float64(8), int64(3), object(2) memory usage: 52.6+ KB

*#generate descriptive statistics of each attribute* fires**.**describe()**.**T

In [10]:

# Out[10]:

### count

**mean std min 25% 50% 75% max**

**X** 517.0 4.669246 2.313778 1.0 3.0 4.00 7.00 9.00

**FFMC** 517.0 90.644681 5.520111 18.7 90.2 91.60 92.90 96.20

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Y** | 517.0 | 4.299807 | 1.229900 | 2.0 | 4.0 | 4.00 | 5.00 | 9.00 |

**DMC** 517.0 110.872340 64.046482 1.1 68.6 108.30 142.40 291.30 **DC** 517.0

547.940039 248.066192 7.9 437.7 664.20 713.90 860.60

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| fires['area']**.**values[fires['area']**.**values **>**0] **=** 1  *#renaming the area attribute to output for clear understanding*  fires **=** fires**.**rename(columns**=**{'area': 'output'}) fires**.**head(10) | | | | | | | | | | | | | | |
| **ISI** | 517.0 |  | 9.021663 |  | 4.559477 0.0 |  | 6.5 |  | 8.40 |  | 10.80 |  | 56.10 |  |

**temp** 517.0 18.889168 5.806625 2.2 15.5 19.30 22.80 33.30

**RH** 517.0 44.288201 16.317469 15.0 33.0 42.00 53.00 100.00

**wind** 517.0 4.017602 1.791653 0.4 2.7 4.00 4.90 9.40

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **rain** | 517.0 | 0.021663 | 0.295959 0.0 | 0.0 | 0.00 | 0.00 | 6.40 |
| In [11]: | **area** | 517.0 | 12.847292 | 63.655818 0.0 | 0.0 | 0.52 | 6.57 | 1090.84 |

### Out[11]: X Y month day FFMC DMC DC ISI temp RH wind rain output

0 7 5

4

1 7

4

2 7 6

3 8 6

6

4 8

6

mar fri oct tue oct sat mar fri mar sun aug sun

aug mon aug mon

sep tue

86.2

90.6

90.6

91.7

89.3

92.3

92.3

26.2 94.3 5.1

35.4 669.1 6.7

43.7 686.9 6.7

33.3 77.5 9.0

51.3 102.2 9.6

85.3 488.0 14.7

88.9 495.6 8.5

8.2 51

18.0 33

14.6 33

8.3 97

11.4 99

22.2 29

24.1 27

6.7

0.9

1.3

4.0

1.8

5.4

3.1

0.0

0.0

0.0

0.2

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

5 8 6

6 8 6

5

7 8

8 8

sep sat

91.5 145.4 608.2 10.7

91.0 129.5 692.6 7.0

92.5 88.0 698.6 7.1

8.0 86

13.1 63

22.8 40

2.2

5.4

4.0

0.0

0.0

0.0

0.0

0.0

0.0

9 7

fires**.**corr()

# In [12]:

Out[12]:

### X

**Y FFMC DMC DC ISI temp RH wind**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **X** 1.000000 | 0.539548 | -0.021039 | -0.048384 | -0.085916 | 0.006210 | -0.051258 | 0.085223 | 0.018798 | 0.065 |
| **Y** 0.539548 | 1.000000 | -0.046308 | 0.007782 | -0.101178 | -0.024488 | -0.024103 | 0.062221 | -0.020341 | 0.033 |
| **FFMC** -0.021039 | -0.046308 | 1.000000 | 0.382619 | 0.330512 | 0.531805 | 0.431532 | -0.300995 | -0.028485 | 0.056 |
| **DMC** -0.048384 | 0.007782 | 0.382619 | 1.000000 | 0.682192 | 0.305128 | 0.469594 | 0.073795 | -0.105342 | 0.074 |
| **DC** -0.085916 | -0.101178 | 0.330512 | 0.682192 | 1.000000 | 0.229154 | 0.496208 | -0.039192 | -0.203466 | 0.035 |
| **ISI** 0.006210 | -0.024488 | 0.531805 | 0.305128 | 0.229154 | 1.000000 | 0.394287 | -0.132517 | 0.106826 | 0.067 |
| **temp** -0.051258 | -0.024103 | 0.431532 | 0.469594 | 0.496208 | 0.394287 | 1.000000 | -0.527390 | -0.227116 | 0.069 |
| **RH** 0.085223 | 0.062221 | -0.300995 | 0.073795 | -0.039192 | -0.132517 | -0.527390 | 1.000000 | 0.069410 | 0.099 |
| **wind** 0.018798 | -0.020341 | -0.028485 | -0.105342 | -0.203466 | 0.106826 | -0.227116 | 0.069410 | 1.000000 | 0.061 |
| **rain** 0.065387 | 0.033234 | 0.056702 | 0.074790 | 0.035861 | 0.067668 | 0.069491 | 0.099751 | 0.061119 | 1.000 |

**output** 0.062491 0.056892 0.073823 0.062672 0.096724 0.035663 0.076047 -0.035587 0.055702 0.025

# In [15]:

numerical\_feature **=** fires**.**describe(include**=**["int", "float"])**.**columns

*# Print it in list type ..*

print(list(numerical\_feature))

['X', 'Y', 'FFMC', 'DMC', 'DC', 'ISI', 'temp', 'RH', 'wind', 'rain', 'output']

# In [16]:

sns**.**set\_style('darkgrid') *# Find the relation # plt.subplot(fires)*

sns**.**pairplot(fires[["temp", "wind", "rain","DC"]]) plt**.**show()