davis_eda

May 16, 2024

[1]:
```
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
import seaborn as sns
```

[28]:
```
#Load the previously isolated data with YYYYMMDD format for date column
df = pd.read_csv('Davis.csv', parse_dates=['date'])
```

[29]:
```
#Examine the first few rows of the data
df.head()
```

[29]:
```
   Unnamed: 0 hospital       date  year  monthday  month  day  attendences  \
0       14610    davis 2009-01-01  2009       101      1    1        180.0
1       14611    davis 2009-01-02  2009       102      1    2        193.0
2       14612    davis 2009-01-03  2009       103      1    3        171.0
3       14613    davis 2009-01-04  2009       104      1    4        151.0
4       14614    davis 2009-01-05  2009       105      1    5        177.0

   min   max  …  Nov  Dec  Year_1  Year_2  Year_3  Year_4  Year_5  Year_6  \
0  4.0   6.0  …    0    0       1       0       0       0       0       0
1  3.0   9.0  …    0    0       1       0       0       0       0       0
2  1.0  11.0  …    0    0       1       0       0       0       0       0
3 -4.0  10.0  …    0    0       1       0       0       0       0       0
4  5.0   7.0  …    0    0       1       0       0       0       0       0

   Year_7  Year_8
0       0       0
1       0       0
2       0       0
3       0       0
4       0       0

[5 rows x 44 columns]
```

[5]:
```
df.describe()
```

[5]:
```
              year     monthday        month          day  attendences  \
count  2922.000000  2922.000000  2922.000000  2922.000000  2922.000000
```

```
mean   2012.501027   668.022587     6.522930    15.729637   197.363792
std       2.291829   345.134194     3.449293     8.801598    28.764388
min    2009.000000   101.000000     1.000000     1.000000   107.000000
25%    2011.000000   402.000000     4.000000     8.000000   177.000000
50%    2012.500000   702.000000     7.000000    16.000000   197.000000
75%    2014.750000  1001.000000    10.000000    23.000000   218.000000
max    2016.000000  1231.000000    12.000000    31.000000   283.000000

               min          max         aver  Hosp_ID      Time_ID  …  \
count  2922.000000  2922.000000  2922.000000   2922.0  2922.000000  …
mean      9.488364    23.873374    16.431211      6.0  1461.500000  …
std       5.324721     8.507949     6.500274      0.0   843.653069  …
min      -6.000000     4.000000     1.000000      6.0     1.000000  …
25%       6.000000    17.000000    11.000000      6.0   731.250000  …
50%      10.000000    24.000000    17.000000      6.0  1461.500000  …
75%      14.000000    32.000000    22.000000      6.0  2191.750000  …
max      22.000000    42.000000    32.000000      6.0  2922.000000  …

               Nov          Dec       Year_1       Year_2       Year_3  \
count  2922.000000  2922.000000  2922.000000  2922.000000  2922.000000
mean      0.082136     0.084873     0.124914     0.124914     0.124914
std       0.274618     0.278741     0.330678     0.330678     0.330678
min       0.000000     0.000000     0.000000     0.000000     0.000000
25%       0.000000     0.000000     0.000000     0.000000     0.000000
50%       0.000000     0.000000     0.000000     0.000000     0.000000
75%       0.000000     0.000000     0.000000     0.000000     0.000000
max       1.000000     1.000000     1.000000     1.000000     1.000000

            Year_4       Year_5       Year_6       Year_7       Year_8
count  2922.000000  2922.000000  2922.000000  2922.000000  2922.000000
mean      0.125257     0.124914     0.124914     0.124914     0.125257
std       0.331066     0.330678     0.330678     0.330678     0.331066
min       0.000000     0.000000     0.000000     0.000000     0.000000
25%       0.000000     0.000000     0.000000     0.000000     0.000000
50%       0.000000     0.000000     0.000000     0.000000     0.000000
75%       0.000000     0.000000     0.000000     0.000000     0.000000
max       1.000000     1.000000     1.000000     1.000000     1.000000

[8 rows x 41 columns]
```

A good amount of the feature engineering has been done already. Date is broken up into date, year, monthday, month, day, and Time_ID (number of days since beginning of dataset) as well as one-hot encoded day of week, month of year, and year.

There is also weather data (min/max/average temp and 3 day average temp).

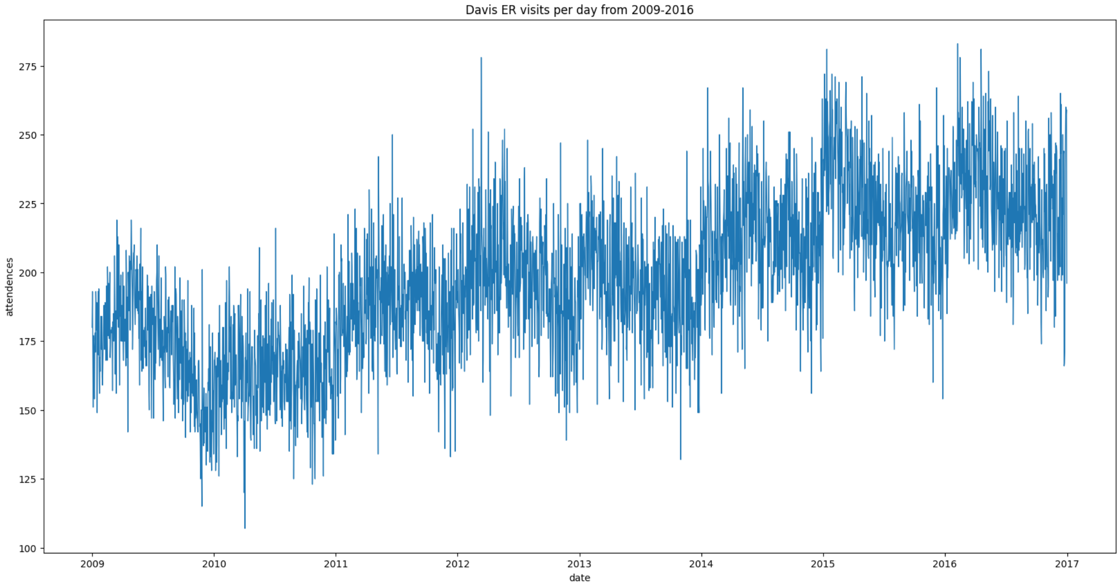
Additional features to consider pulling in/creating: - [ ] Holidays - [ ] rolling average of visits - [ ] prior week visits for the day - [ ] prior year visits for the day - [ ] precipitation (with lag?) - [ ] air quality (with lag?)

But first, let's visualize the data a bit.

1 Data Visualization

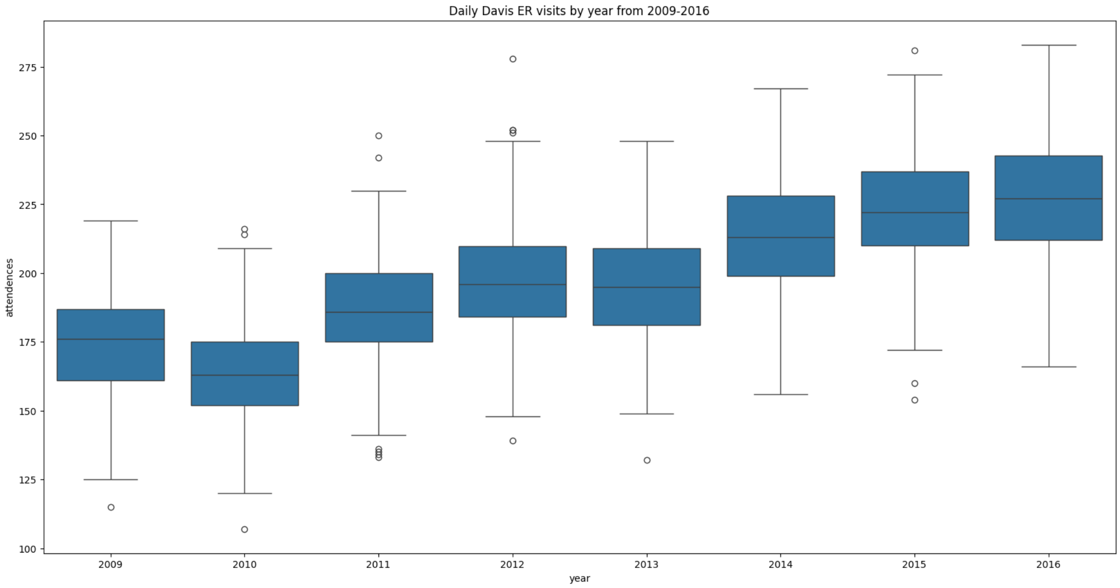
```
[35]: plt.figure(figsize=(20, 10))
      sns.lineplot(data=df, x='date', y='attendences', linewidth=1)
      plt.title('Davis ER visits per day from 2009-2016')
```

```
[35]: Text(0.5, 1.0, 'Davis ER visits per day from 2009-2016')
```



```
[37]: plt.figure(figsize=(20, 10))
      sns.boxplot(data=df, x='year', y='attendences')
      plt.title('Daily Davis ER visits by year from 2009-2016')
```

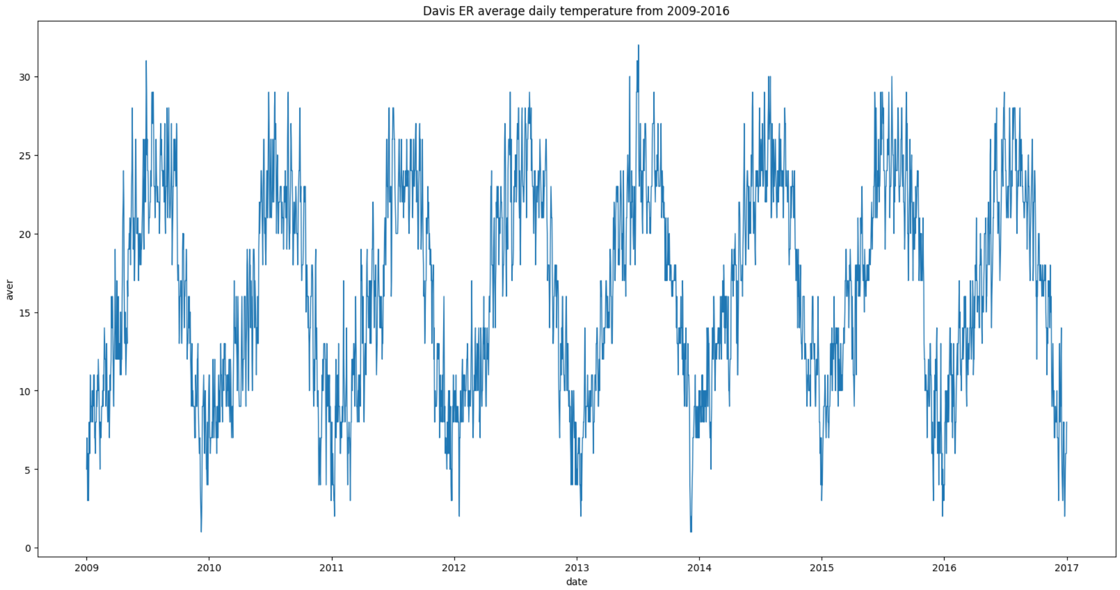
```
[37]: Text(0.5, 1.0, 'Daily Davis ER visits by year from 2009-2016')
```



The number of visits per day has trended upwards over time. We will have to keep this in mind when developing our model.

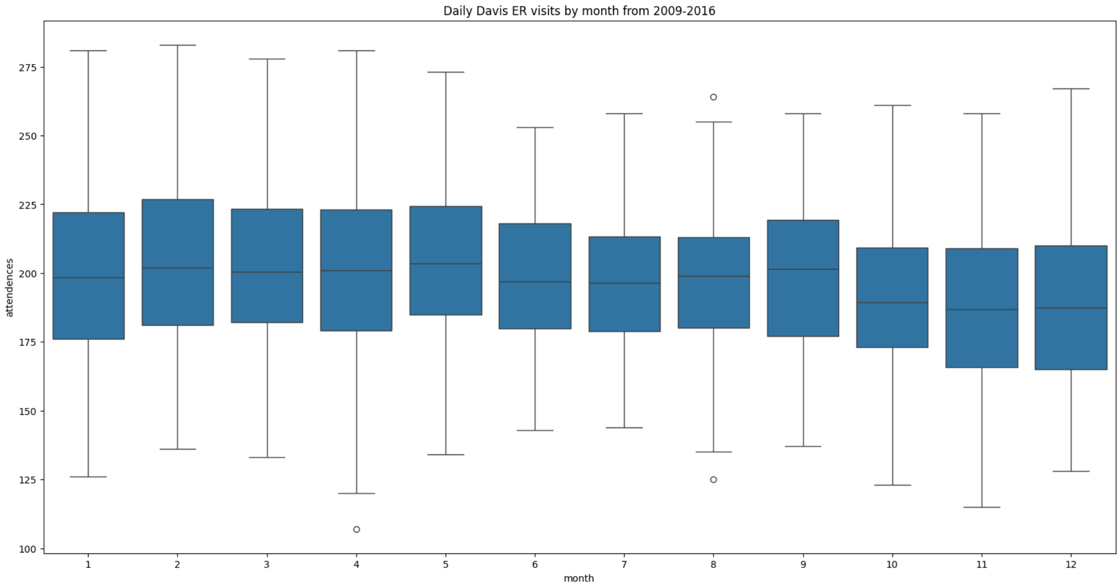
```
[38]: plt.figure(figsize=(20, 10))
      sns.lineplot(data=df, x='date', y='aver', linewidth=1)
      plt.title('Davis ER average daily temperature from 2009-2016')
```

```
[38]: Text(0.5, 1.0, 'Davis ER average daily temperature from 2009-2016')
```



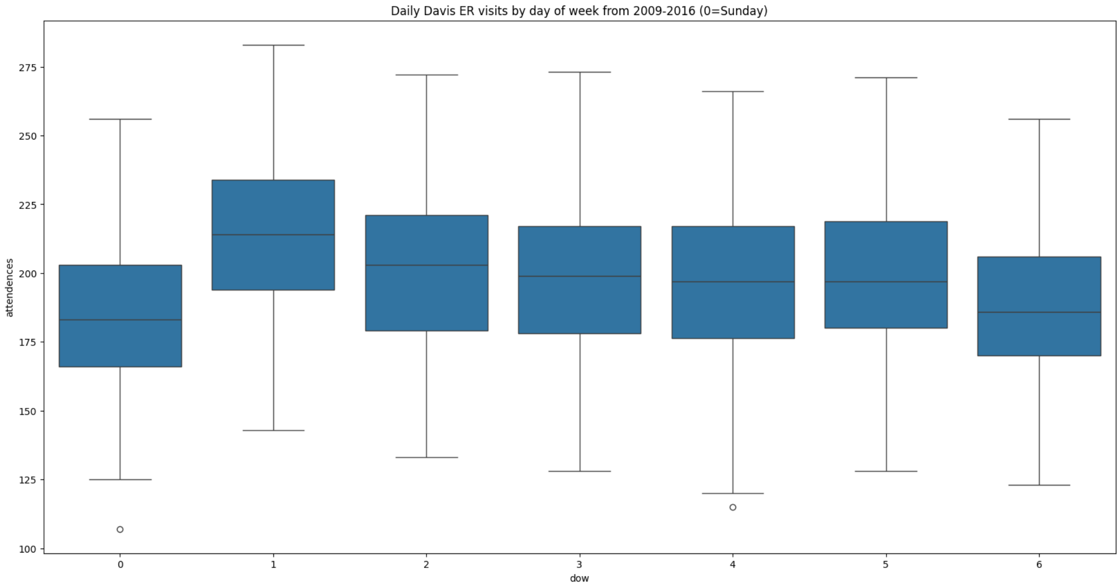
```
[39]: plt.figure(figsize=(20, 10))
      sns.boxplot(data=df, x='month', y='attendences')
      plt.title('Daily Davis ER visits by month from 2009-2016')
```

```
[39]: Text(0.5, 1.0, 'Daily Davis ER visits by month from 2009-2016')
```



```
[41]: plt.figure(figsize=(20, 10))
      sns.boxplot(data=df, x='dow', y='attendences')
      plt.title('Daily Davis ER visits by day of week from 2009-2016 (0=Sunday)')
```

```
[41]: Text(0.5, 1.0, 'Daily Davis ER visits by day of week from 2009-2016 (0=Sunday)')
```



Variation of patient visits to the ED on different days of the week