KEY Lesson17B LineGraphs

February 4, 2020

1 Line Graphs

Line graphs are often used to show the change in a single variable over time. In this lesson we're going to learn how to make and customize linegraphs using a **package** called **seaborn**, which we will give the nickname **sns**.

```
[17]: # import seaborn and nickname it sns
# import matplotlib.pyplot as plt
# set up inline figures
import seaborn as sns
import numpy as np
```

seaborn is mainly a package for plotting, but we can also load some built-in datasets using the load_dataset function.

```
[27]: # load fmri dataset
fmri = sns.load_dataset("fmri")
# preview fmri dataset
fmri.head()
fmri.tail()
```

```
[27]:
           subject
                    timepoint event
                                         region
                                                   signal
      1059
                s0
                                 cue
                                        frontal 0.018165
      1060
               s13
                             7
                                        frontal -0.029130
                                 cue
                             7
      1061
               s12
                                 cue
                                        frontal -0.004939
      1062
               s11
                             7
                                        frontal -0.025367
                                 cue
      1063
                             0
                                 cue parietal -0.006899
                 s0
```

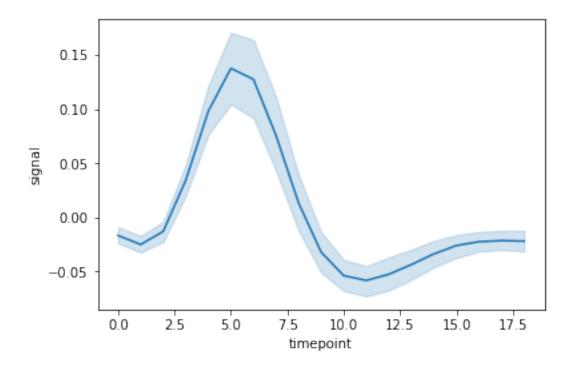
```
[28]: np.unique(fmri['subject'])
```

```
[28]: array(['s0', 's1', 's10', 's11', 's12', 's13', 's2', 's3', 's4', 's5', 's6', 's7', 's8', 's9'], dtype=object)
```

This data contains fMRI signals in the frontal and parietal regions of the brain over time for 14 subjects (s0 - s13). To illustrate how this signal changes over the timeframe of the fMRI scan, let's make our first line graph.

```
[29]: # line graph of fmri signal over time
sns.lineplot(x="timepoint", y="signal", data=fmri)
```

[29]: <matplotlib.axes._subplots.AxesSubplot at 0x1a24ec12b0>



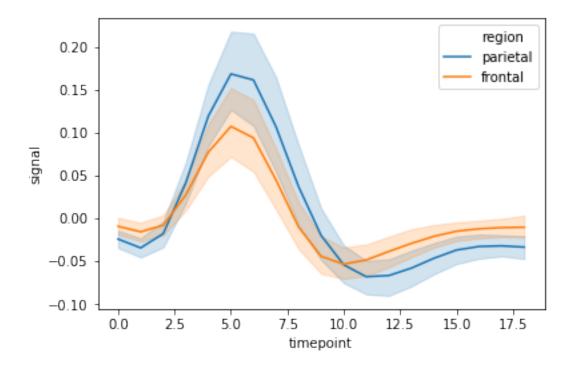
Can you guess why this plot returns both a line and a shaded area?

If we look back at our data preview, we can see that the fmri dataset contains data for several subjects, regions and events - meaning each timepoint has not just one, but multiple corresponding signal values. When this happens, seaborn knows to take the mean of the data (shown as the single line), but also report the spread of the data (here, the *confidence interval*, shown in the shaded band) to give us a sense of how similar/different the signal is across our subjects/regions/events.

But what if we wanted to visualize the *difference* between the signal in the frontal region vs. parietal region? seaborn lets us do this really simply with the hue parameter:

```
[30]: # separate plot by event column sns.lineplot(x="timepoint", y="signal", hue="region", data=fmri)
```

[30]: <matplotlib.axes._subplots.AxesSubplot at 0x1a251387b8>

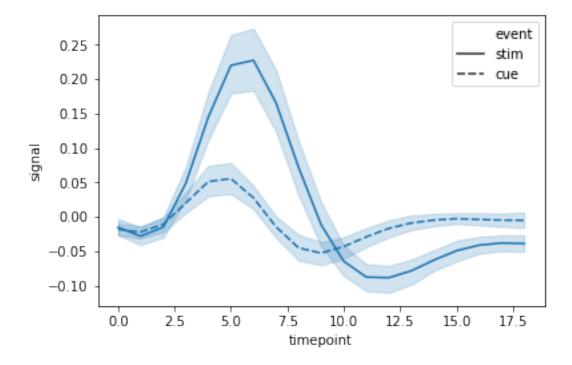


Based on this plot what can we infer about the two regions in this fMRI scan? By separating the signal in the two regions we can easily see that the spike in signal is not as strong in the frontal region (orange) as it is in the parietal region (blue).

What if we now wanted to separate the plot by the event column to see the differences between the *cue* and *stim* conditions? We could change the value of the hue parameter, or we could use another parameter - style.

```
[31]: # separate and style plot by event column sns.lineplot(x="timepoint", y="signal", style="event", data=fmri)
```

[31]: <matplotlib.axes._subplots.AxesSubplot at 0x1a25076710>

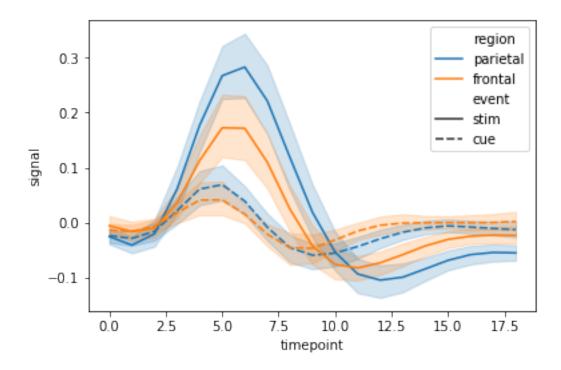


As you can see the style parameter separates our plot using different line styles, rather than different color lines. Based on this plot we can see the signal has a much higher spike in the *stim* condition than in the *cue* condition.

Finally, we can combine the hue and style parameters to separate our plot even more granularly.

```
[32]: # separate and style plot by event column sns.lineplot(x="timepoint", y="signal", hue="region", style="event", data=fmri)
```

[32]: <matplotlib.axes._subplots.AxesSubplot at 0x1a252918d0>



What can you infer based on this plot?

In this lesson you learned: * plotting line graphs the seaborn package * separating the graph by another variable using colors (hue) * separating the graph by another variable using line type (style) * separating the graph by multiple variables (combine hue and style)