Lecture 02 - Student Notebook

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import scipy as sp
from scipy import stats
from scipy.stats import skewnorm
import seaborn as sns
import numpy as np
from sklearn.feature_selection import mutual_info_classif,
mutual_info_regression
from sklearn.preprocessing import LabelEncoder
```

```
DATA_DIR = "./../../data"
```

Download the data from the Drive folder and put it in the data folder.

```
# Aggregated features
df = pd.read_csv('{}/aggregated_fc.csv'.format(DATA_DIR))
df.head()
```

```
   user  grade gender       category        year  sessions
time_in_problem  \
0     0   4.50    NaN            NaN  Y2-2018-19      19.0
23344.0
1     1   4.50      M  Suisse.Autres  Y2-2018-19      34.0
16984.0
2     2   5.25      M     Suisse.PAM  Y2-2018-19      53.0
23406.0
3     3   4.50      F  Suisse.Autres  Y2-2018-19      28.0
27371.0
4     4   4.75      F         France  Y2-2018-19      25.0
37873.0

   time_in_video  lecture_delay  content_anticipation
mean_playback_speed  \
0        29518.0   55068.387500              0.006061
0.968519
1        92278.0   -2883.367738              0.009091
1.122014
2       108013.0   10027.216667              0.237488
0.807090
3        81855.0   27596.864484              0.011879
0.500000
4        70400.0    -914.633333              0.290421
0.846794
```

```
   relative_video_pause  submissions  submissions_correct
clicks_weekend  \
0              0.137436         30.0                 20.0
168.0
1              0.361389         90.0                 59.0
40.0
2              0.272210         61.0                 30.0
946.0
3              0.151223         46.0                 32.0
135.0
4              0.196403          3.0                  1.0
584.0

   clicks_weekday
0           381.0
1          1794.0
2          1292.0
3           464.0
4           649.0
```

```
# Time series features
ts = pd.read_csv('{}/time_series_fc.csv'.format(DATA_DIR))
ts.head()
```

```
   week  user  sessions  time_in_problem  time_in_video  lecture_delay
\
0     0     0       4.0           5682.0         6417.0  -24339.200000

1     0     1       7.0            326.0        15525.0    4492.833333

2     0     2       4.0           1224.0        12209.0   -8998.000000

3     0     3      11.0           3517.0        26500.0  -33102.111111

4     0     4       4.0           1294.0        12037.0   -9146.333333


   content_anticipation  mean_playback_speed  relative_video_pause  \
0              0.015152             1.539474              0.315217
1              0.090909             1.319288              0.345528
2              0.060606             1.000000              0.230415
3              0.045455             1.000000              0.301887
4              0.181818             1.184140              0.267606

   submissions  submissions_correct  clicks_weekend  clicks_weekday
0          8.0                  4.0            12.0           102.0
1          7.0                  4.0            40.0           227.0
2         13.0                  8.0             1.0           258.0
3         17.0                 10.0            10.0           141.0
4          3.0                  1.0           140.0            46.0
```

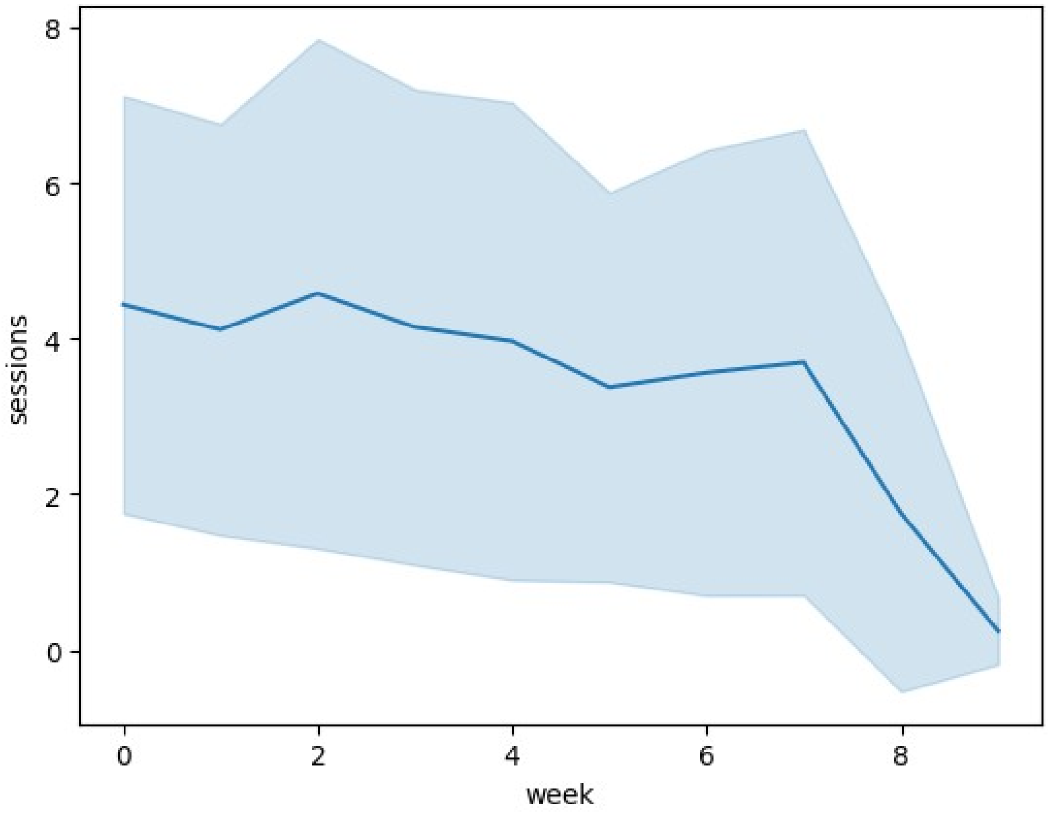
Some useful functions

```
def plot_features(df, hue = None):
    continuous_cols = list(df._get_numeric_data().columns)
    categorical_cols =
list(df.select_dtypes(include=['O']).columns.values)

    rows = np.ceil(len(df.columns)/3).astype(int)
    fig, axes = plt.subplots(rows, 3, figsize=(15,5*rows))
    for i, col in enumerate(df.columns):
        ax = axes[i // 3, i % 3]
        if col in continuous_cols:
            sns.histplot(data=df, x = col, ax=ax,  kde=True, hue= hue)

        elif col in categorical_cols:
            sns.countplot(data=df, x=col, ax=ax, hue = hue)
        else:
            print(col)
        ax.set(xlabel=col, ylabel='Count', title= 'Distribution
{}'.format(col))

    fig.tight_layout()
    plt.show()


def plot_time_series(df, hue=None):
    continuous_cols = list(df._get_numeric_data().columns)

    rows = np.ceil(len(continuous_cols)/3).astype(int)
    fig, axes = plt.subplots(rows, 3, figsize=(15,5*rows))
    for i, col in enumerate(continuous_cols):
        ax = axes[i // 3, i % 3]
        sns.lineplot(data=df, x="week", y=col, ax = ax, errorbar='sd',
hue=hue)
        ax.set(xlabel="week", ylabel=col, title= 'Time series
{}'.format(col))

    fig.tight_layout()
    plt.show()
```

Example Questions

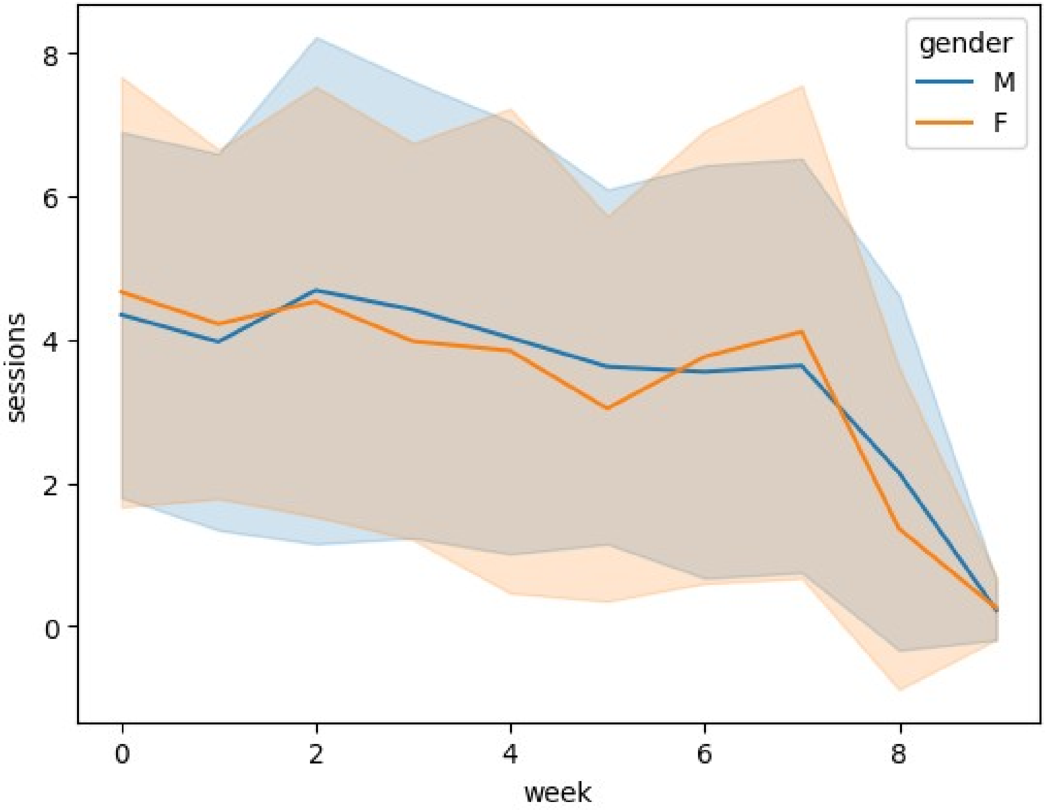
H1: Students will work more at the beginning of the semester (due to decreasing motivation over the course of the semester).

```
ax = sns.lineplot(data=ts, x="week", y="sessions", errorbar='sd')
plt.show()
```



H2: There is no difference between males and females in terms of the number of sessions.

```
ts = ts.merge(df[['user','gender']], how='left', on='user')

ax = sns.lineplot(data=ts, x="week", y="sessions",errorbar='sd', hue = 
'gender')
```



Your turn

```python
import requests

exec(requests.get("https://courdier.pythonanywhere.com/get-send-code").content)

npt_config = {
    'session_name': 'lecture-02',
    'session_owner': 'mlbd',
    'sender_name': input("Your name: "),
}
```

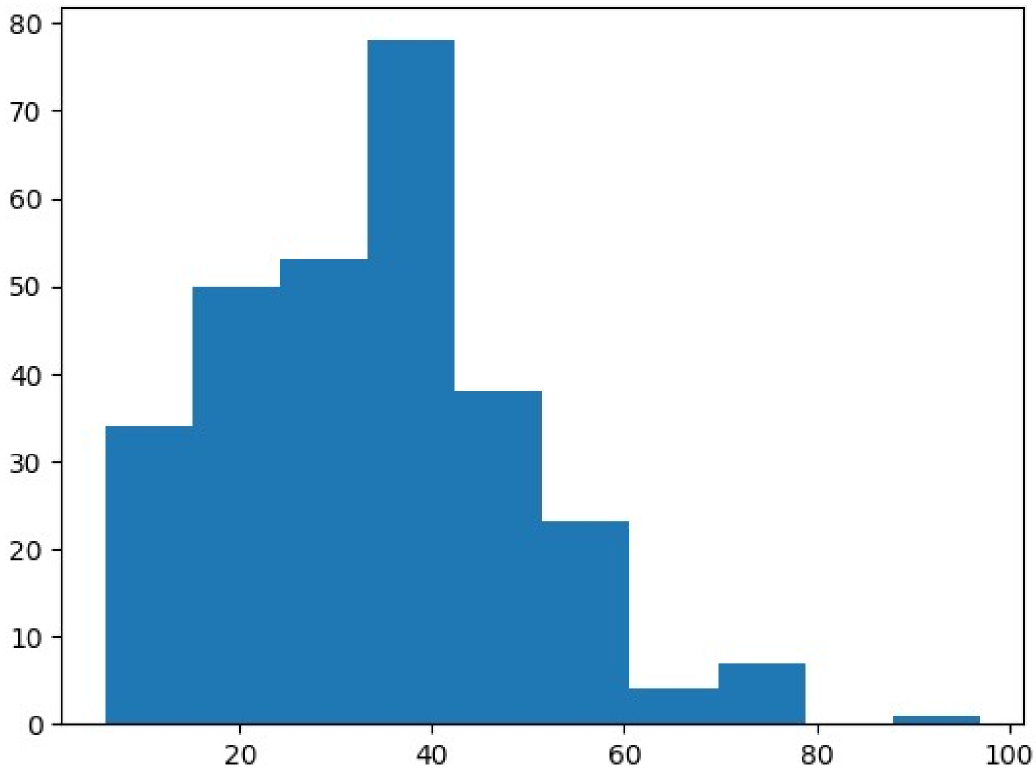
```
Your name:  Paola
```

```python
### Write briefly your question or hypothesis as a string
rq = """
This is an example hypothesis
"""

### Share it with us
send(rq, 1)
```

```
<Response [200]>
```

```python
### Plot it and share it with us

# Example plot (do a better one!)
plt.hist(df.sessions)

send(plt, 2)
plt.show()

### Discuss briefly as a string what you observed: can you confirm
your hypothesis?
hy = """This is an example discussion"""

### Share it with us
send(hy, 3)
```

```
<string>:57: MatplotlibDeprecationWarning: savefig() got unexpected
keyword argument "quality" which is no longer supported as of 3.3 and
will become an error in 3.6
```



```
<Response [200]>
```