Session 13: Analyzing Text Data in Pandas (with Solutions)

Setting up

```
[1]: import pandas as pd
     courses=pd.read_excel('Marshall_Course_Enrollment_1516_1617.xlsx')\
         [['Course','First Instructor','First End Time','First Days','First Room','Term','Tit
     courses.columns=['course','instructor','end_time','days','room','term','title']
     courses['end_time']=courses['end_time'].astype(str)
     courses.head()
```

```
     course          instructor  end_time days    room   term  \
0  ACCT-370  Hopkins, Merle, W  11:50:00    F  SLH200  20153
1  ACCT-370  Hopkins, Merle, W  09:50:00   MW  ACC303  20153
2  ACCT-370  Hopkins, Merle, W  11:50:00   MW  ACC303  20153
3  ACCT-370  Hopkins, Merle, W  13:50:00   MW  ACC303  20153
4  ACCT-371                NaN  11:50:00    F  SLH200  20153

                                 title
0  External Financial Reporting Issues
1  External Financial Reporting Issues
2  External Financial Reporting Issues
3  External Financial Reporting Issues
4   Introduction to Accounting Systems
```

```
[2]: instructors=courses['instructor'].drop_duplicates().head()
     instructors
```

```
0          Hopkins, Merle, W
4                        NaN
5      Porter, Leslie, Robert
9            Karuna, Christo
13           Layton, Rose, M
Name: instructor, dtype: object
```

1. Applying a Function to an Entire Series

```
[3]: s=instructors[0]
     s
```

```
'Hopkins, Merle, W'
```

```
[4]: s.split(',')
```

```
['Hopkins', ' Merle', ' W']
```

```
[5]: l=s.split(',')
     l[1].strip()
```

```
'Merle'
```

```
[6]: from numpy import nan
     def getFirst(s):
         if type(s)!=str:
             return nan
         l=s.split(',')
         if len(l)<=1:
             return nan
         return l[1].strip()
     getFirst('Shi, Peng')
```

```
'Peng'
```

```
[7]: getFirst(nan)
```

```
nan
```

```
[8]: getFirst('Shi')
```

```
nan
```

```
[9]: instructors.apply(getFirst)
```

```
0       Merle
4         NaN
5      Leslie
9     Christo
13       Rose
Name: instructor, dtype: object
```

Q1: Create the following columns in the DataFrame "courses":

- first_name: the first name of the instructor. Use NaN if not available.
- last_name: the last name of the instructor. Use Nan if not available.

```
[10]: courses['first_name']=courses['instructor'].apply(getFirst)
```

```
[11]: def getLast(s):
          if type(s)!=str:
              return nan
          l=s.split(',')
          if len(l)<=1:
              return nan
          return l[0].strip()
      courses['last_name']=courses['instructor'].apply(getLast)
```

```
[12]: # Alternative method using one function for both
      def getName(s,kind):
          if type(s)!=str:
              return nan
          l=s.split(',')
          if len(l)<=1:
              return nan
          if kind=='first':
              return l[1].strip()
          else:
              return l[0].strip()
      courses['first_name']=courses['instructor'].apply(getName,kind='first')
      courses['last_name']=courses['instructor'].apply(getName,kind='last')
```

```
[13]: courses[['instructor','first_name','last_name']].head()
```

```
         instructor first_name last_name
0  Hopkins, Merle, W      Merle   Hopkins
1  Hopkins, Merle, W      Merle   Hopkins
2  Hopkins, Merle, W      Merle   Hopkins
3  Hopkins, Merle, W      Merle   Hopkins
4                NaN        NaN       NaN
```

Q2: Extract the hour from the column "end_time", and convert it to integers using "pd.to_numeric" (with errors='coerce'). Then create a columns called "evening" in the DataFrame "courses", corresponding to whether the hour is greater than or equal to 18.

```
[14]: from numpy import nan
      def getHour(s):
          if type(s)!=str:
              return nan
          l=s.split(':')
          if len(l)>=3:
              return l[0]
          else:
              return nan
      getHour('10:00:00')
```

```
'10'
```

```
[15]: getHour('TBA')
```

```
nan
```

```
[16]: hours=pd.to_numeric(courses['end_time'].apply(getHour),errors='coerce')
      hours.head()
```

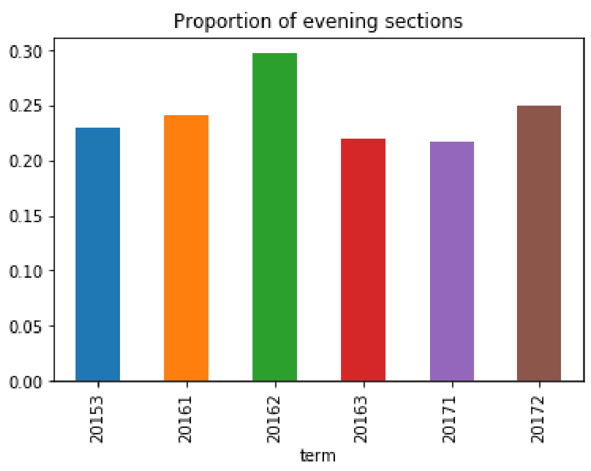
```
0    11.0
1     9.0
2    11.0
3    13.0
4    11.0
Name: end_time, dtype: float64
```

```
[17]: courses['evening']=(hours>=18)
```

Once you have created the column, you can compute the proportion of evening courses for each term.

```
[38]: courses.groupby('term')['evening'].mean()\
          .plot(kind='bar',title='Proportion of evening sections')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f7606ceab00>
```



2. Vectorized String Methods in Pandas

```
[19]: room=courses['room'].drop_duplicates()
      room.head()
```

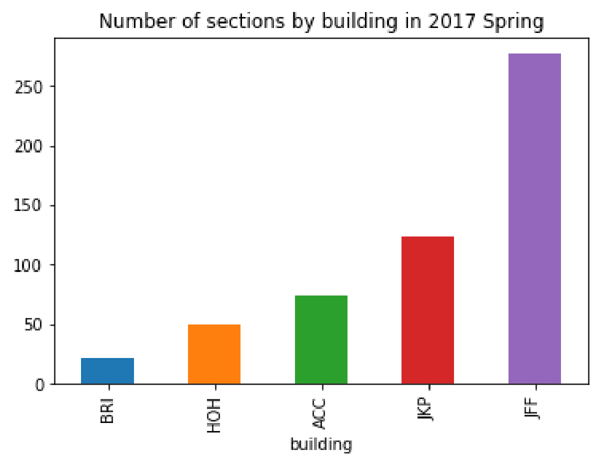
```
0      SLH200
1      ACC303
8     HOH EDI
9      ACC310
22     HOH305
Name: room, dtype: object
```

```
[20]: room.str[:3].head()
```

```
0     SLH
1     ACC
8     HOH
9     ACC
22    HOH
Name: room, dtype: object
```

```
[21]: courses['building']=courses['room'].str[:3]
      courses[courses['building'].isin(['ACC','HOH','BRI','JKP','JFF'])]\
          .query('term==20171')\
          .groupby('building')['course'].count().sort_values()\
          .plot(kind='bar',title='Number of sections by building in 2017 Spring')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f7606f3a7b8>
```



List of Available Series.str.XXX methods: https://pandas.pydata.org/pandas-docs/version/0.21/api.html#string-handling

```
[22]: courses['days'].head()
```

```
0     F
1    MW
2    MW
3    MW
4     F
Name: days, dtype: object
```

```
[23]: courses['days'].str.contains('M').head()
```

```
0    False
1     True
2     True
3     True
4    False
Name: days, dtype: object
```

```
[24]: courses.query('term==20171')['days'].str.contains('M').mean()
```

```
0.38487394957983195
```

```
[25]: import re
      courses['days'].str.contains('m',flags=re.IGNORECASE).head()
```

```
0    False
1     True
2     True
3     True
4    False
Name: days, dtype: object
```

```
[26]: courses['course'].head()
```

```
0    ACCT-370
1    ACCT-370
```

```
2    ACCT-370
3    ACCT-370
4    ACCT-371
Name: course, dtype: object
```

```
[27]: courses['course'].str.split('-').head()
```

```
0    [ACCT, 370]
1    [ACCT, 370]
2    [ACCT, 370]
3    [ACCT, 370]
4    [ACCT, 371]
Name: course, dtype: object
```

```
[28]: courses['course'].str.split('-').str[0].head()
```

```
0    ACCT
1    ACCT
2    ACCT
3    ACCT
4    ACCT
Name: course, dtype: object
```

```
[29]: courses['course'].str.split('-').str[1].head()
```

```
0    370
1    370
2    370
3    370
4    371
Name: course, dtype: object
```

Q3: Redo Q1 and Q2 using vectorized string methods already in Pandas, rather than writing your own function and calling Series.apply.

```
[30]: # Q1
      courses['first_name']=courses['instructor'].str.split(',').str[1].str.strip()
      courses['last_name']=courses['instructor'].str.split(',').str[0]
```

```
[31]: # Checking outputs for Q1
      courses[['first_name','last_name']].head()
```

```
  first_name last_name
0      Merle   Hopkins
1      Merle   Hopkins
2      Merle   Hopkins
3      Merle   Hopkins
4        NaN       NaN
```

```
[32]: courses['first_name'][0]
```

```
'Merle'
```

```
[33]: # Q2
      courses['evening']=pd.to_numeric(courses['end_time'].str.split(':').str[0]\
                                        ,errors='coerce')>=18
```

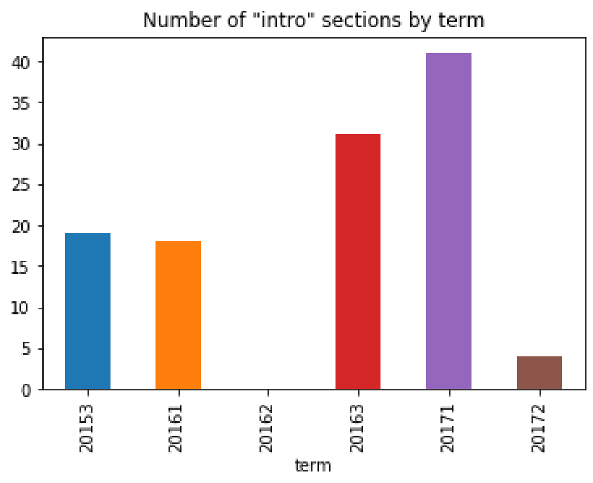
```
[34]: # Checking outputs for Q2
      courses.groupby('term')['evening'].mean()
```

```
term
20153    0.229814
20161    0.241379
20162    0.297297
20163    0.219911
20171    0.216590
20172    0.250000
Name: evening, dtype: float64
```

Q4: Plot the number of sections by term whose title contains the string "intro" (ignoring cases).

```
[35]: import re
      courses['analytics']=courses.title.str.contains('intro',flags=re.IGNORECASE)
      courses.groupby('term')['analytics'].sum()\
          .plot(kind='bar',title='Number of "intro" sections by term')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f7606c2fb00>
```



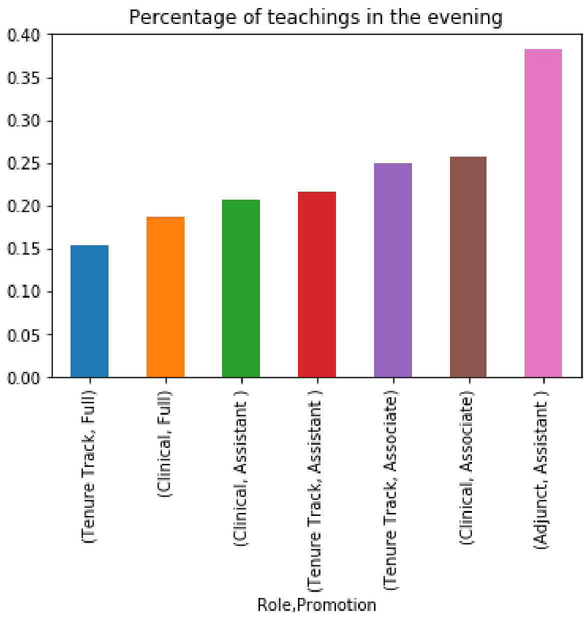
(Optional) Q5: Run the following code to load in professor information, and merge it with the "courses" DataFrame using the "first_name" and "last_name" columns you have created. Then group by the "Role" and "Promotion" of professors and plot the percentage of sections taught by each group scheduled in the evening, as follows.

```
[36]: professors=pd.read_csv('Professor_information.csv',encoding='latin1')\
          [['First_Name','Last_Name','Role','Promotion']]
      professors.head()
```

```
  First_Name Last_Name          Role  Promotion
0       Arif    Ansari      Clinical       Full
1     Yehuda    Bassok  Tenure Track       Full
2      Murat     Bayiz      Clinical  Associate
3      Jacob      Bien  Tenure Track  Assistant
4     Sriram      Dasu  Tenure Track  Associate
```

```
[37]: courses2=courses.merge(professors,\
                left_on=['first_name','last_name'],\
                right_on=['First_Name','Last_Name'],how='left')
      courses2.groupby(['Role','Promotion'])['evening'].mean()\
          .sort_values().plot(kind='bar',title='Percentage of teachings in the evening')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f7606d1a710>
```


Percentage of teachings in the evening
(Tenure Track, Full)
(Clinical, Full)
(Clinical, Assistant)
(Tenure Track, Assistant)
(Tenure Track, Associate)
(Clinical, Associate)
(Adjunct, Assistant)
Role,Promotion