Week 5 and 6

July 16, 2023

```
[2]: import pandas as pd
```

```
[3]: # Read in Data
     data = pd.read_excel('BOING-BOING-CANDY-HIERARCHY-2016-SURVEY-Responses.xlsx.
       ↪xls')
```

```
[4]: data.head()
```

```
[4]:                  Timestamp  \
     0 2016-10-24 05:09:23.033
     1 2016-10-24 05:09:54.798
     2 2016-10-24 05:13:06.734
     3 2016-10-24 05:14:17.192
     4 2016-10-24 05:14:24.625


       Are you going actually going trick or treating yourself? Your gender:  \
     0                                                 No              Male
     1                                                 No              Male
     2                                                 No            Female
     3                                                 No              Male
     4                                                Yes              Male


       How old are you? Which country do you live in?  \
     0              22                          Canada
     1              45                             usa
     2              48                              US
     3              57                             usa
     4              42                             USA


       Which state, province, county do you live in?  [100 Grand Bar]  \
     0                                      Ontario               JOY
     1                                           il               MEH
     2                                     Colorado               JOY
     3                                           il               JOY
     4                                 South Dakota               MEH


       [Anonymous brown globs that come in black and orange wrappers]  \
```

```
0                                      DESPAIR
1                                          MEH
2                                      DESPAIR
3                                          MEH
4                                      DESPAIR

   [Any full-sized candy bar]  [Black Jacks]  …  \
0                         JOY           MEH  …
1                         JOY           JOY  …
2                         JOY           MEH  …
3                         JOY           MEH  …
4                         JOY       DESPAIR  …

  Please estimate the degree(s) of separation you have from the following
celebrities [JK Rowling]  \
0                                  3 or higher
1                                  3 or higher
2                                  3 or higher
3                                  3 or higher
4                                  3 or higher

  Please estimate the degree(s) of separation you have from the following
celebrities [JJ Abrams]  \
0                                            2
1                                  3 or higher
2                                  3 or higher
3                                  3 or higher
4                                  3 or higher

  Please estimate the degree(s) of separation you have from the following
celebrities [Beyoncé]  \
0                                  3 or higher
1                                  3 or higher
2                                  3 or higher
3                                  3 or higher
4                                  3 or higher

  Please estimate the degree(s) of separation you have from the following
celebrities [Bieber]  \
0                                  3 or higher
1                                  3 or higher
2                                  3 or higher
3                                  3 or higher
4                                  3 or higher

  Please estimate the degree(s) of separation you have from the following
celebrities [Kevin Bacon]  \
```

```
0                                          3 or higher
1                                          3 or higher
2                                          3 or higher
3                                          3 or higher
4                                          3 or higher

   Please estimate the degree(s) of separation you have from the following
celebrities [Francis Bacon (1561 - 1626)]  \
0                                          3 or higher
1                                          3 or higher
2                                          3 or higher
3                                          3 or higher
4                                          3 or higher

   Which day do you prefer, Friday or Sunday?  \
0                                  Friday
1                                  Friday
2                                  Sunday
3                                  Sunday
4                                  Friday

   Do you eat apples the correct way, East to West (side to side) or do you eat
them like a freak of nature, South to North (bottom to top)?  \
0                                  South to North
1                                    East to West
2                                    East to West
3                                  South to North
4                                    East to West

   When you see the above image of the 4 different websites, which one would you
most likely check out (please be honest).  \
0                Science: Latest News and Headlines
1                Science: Latest News and Headlines
2                Science: Latest News and Headlines
3                Science: Latest News and Headlines
4                                              ESPN

    [York Peppermint Patties] Ignore
0                              NaN
1                              NaN
2                              NaN
3                              NaN
4                              NaN

[5 rows x 123 columns]
```

Chapter 7

Fill in Missing Data

```
[44]:  # Fills Nan with blank
       data_null_filled = data.fillna("BLANK")
```

```
[46]:  data_null_filled.head()
```

```
[46]:                  Timestamp  \
       0 2016-10-24 05:09:23.033
       1 2016-10-24 05:09:54.798
       2 2016-10-24 05:13:06.734
       3 2016-10-24 05:14:17.192
       4 2016-10-24 05:14:24.625

         Are you going actually going trick or treating yourself? Your gender:  \
       0                                                No           Male
       1                                                No           Male
       2                                                No         Female
       3                                                No           Male
       4                                               Yes           Male

         How old are you? Which country do you live in?  \
       0               22                       Canada
       1               45                          usa
       2               48                           US
       3               57                          usa
       4               42                          USA

         Which state, province, county do you live in?  [100 Grand Bar]  \
       0                                      Ontario              JOY
       1                                           il              MEH
       2                                     Colorado              JOY
       3                                           il              JOY
       4                                 South Dakota              MEH

         [Anonymous brown globs that come in black and orange wrappers]  \
       0                                            DESPAIR
       1                                                MEH
       2                                            DESPAIR
       3                                                MEH
       4                                            DESPAIR

         [Any full-sized candy bar]  [Black Jacks]  …  \
       0                        JOY            MEH  …
       1                        JOY            JOY  …
       2                        JOY            MEH  …
       3                        JOY            MEH  …
```

4   JOY   DESPAIR …

  Please estimate the degree(s) of separation you have from the following
celebrities [JK Rowling] \
0   3 or higher
1   3 or higher
2   3 or higher
3   3 or higher
4   3 or higher

  Please estimate the degree(s) of separation you have from the following
celebrities [JJ Abrams] \
0   2
1   3 or higher
2   3 or higher
3   3 or higher
4   3 or higher

  Please estimate the degree(s) of separation you have from the following
celebrities [Beyoncé] \
0   3 or higher
1   3 or higher
2   3 or higher
3   3 or higher
4   3 or higher

  Please estimate the degree(s) of separation you have from the following
celebrities [Bieber] \
0   3 or higher
1   3 or higher
2   3 or higher
3   3 or higher
4   3 or higher

  Please estimate the degree(s) of separation you have from the following
celebrities [Kevin Bacon] \
0   3 or higher
1   3 or higher
2   3 or higher
3   3 or higher
4   3 or higher

  Please estimate the degree(s) of separation you have from the following
celebrities [Francis Bacon (1561 - 1626)] \
0   3 or higher
1   3 or higher
2   3 or higher

```
3                                              3 or higher
4                                              3 or higher

   Which day do you prefer, Friday or Sunday?  \
0                                 Friday
1                                 Friday
2                                 Sunday
3                                 Sunday
4                                 Friday

   Do you eat apples the correct way, East to West (side to side) or do you eat
   them like a freak of nature, South to North (bottom to top)?  \
0                                 South to North
1                                   East to West
2                                   East to West
3                                 South to North
4                                   East to West

   When you see the above image of the 4 different websites, which one would you
   most likely check out (please be honest).  \
0                  Science: Latest News and Headlines
1                  Science: Latest News and Headlines
2                  Science: Latest News and Headlines
3                  Science: Latest News and Headlines
4                                                ESPN

   [York Peppermint Patties] Ignore
0                          BLANK
1                          BLANK
2                          BLANK
3                          BLANK
4                          BLANK

[5 rows x 123 columns]
```

Remove Duplicates

```
[9]: data_no_dup = data.drop_duplicates()
```

Chapter 8

Create hierarchical index

```
[10]: # Creates hierarchical index using Your gender: and How old are you?
      data_index = data.set_index(["Your gender:", "How old are you?"])
```

```
[11]: data_index.head()
```

```
[11]:                                                     Timestamp  \
      Your gender: How old are you?
      Male        22                      2016-10-24 05:09:23.033
                  45                      2016-10-24 05:09:54.798
      Female      48                      2016-10-24 05:13:06.734
      Male        57                      2016-10-24 05:14:17.192
                  42                      2016-10-24 05:14:24.625

                                     Are you going actually going trick or treating
      yourself?  \
      Your gender: How old are you?
      Male        22                                                             No
                  45                                                             No
      Female      48                                                             No
      Male        57                                                             No
                  42                                                            Yes

                                     Which country do you live in?  \
      Your gender: How old are you?
      Male        22                                            Canada
                  45                                               usa
      Female      48                                                US
      Male        57                                               usa
                  42                                               USA

                                     Which state, province, county do you live in?  \
      Your gender: How old are you?
      Male        22                                                      Ontario
                  45                                                           il
      Female      48                                                     Colorado
      Male        57                                                           il
                  42                                                 South Dakota

                                     [100 Grand Bar]  \
      Your gender: How old are you?
      Male        22                          JOY
                  45                          MEH
      Female      48                          JOY
      Male        57                          JOY
                  42                          MEH

                                     [Anonymous brown globs that come in black and
      orange wrappers]  \
      Your gender: How old are you?
      Male        22                                                      DESPAIR
                  45                                                          MEH
      Female      48                                                      DESPAIR
```

7

```
Male           57                                                              MEH
               42                                                          DESPAIR


                              [Any full-sized candy bar]   [Black Jacks]   \
Your gender: How old are you?
Male           22                                              JOY             MEH
               45                                              JOY             JOY
Female         48                                              JOY             MEH
Male           57                                              JOY             MEH
               42                                              JOY         DESPAIR


                              [Bonkers (the candy)]   \
Your gender: How old are you?
Male           22                                      MEH
               45                                  DESPAIR
Female         48                                      MEH
Male           57                                      MEH
               42                                      MEH


                              [Bonkers (the board game)]   …   \
Your gender: How old are you?                              …
Male           22                                      MEH  …
               45                                      MEH  …
Female         48                                      JOY  …
Male           57                                  DESPAIR  …
               42                                      JOY  …


                              Please estimate the degree(s) of separation you
have from the following celebrities [JK Rowling]   \
Your gender: How old are you?
Male           22                                              3 or higher
               45                                              3 or higher
Female         48                                              3 or higher
Male           57                                              3 or higher
               42                                              3 or higher


                              Please estimate the degree(s) of separation you
have from the following celebrities [JJ Abrams]   \
Your gender: How old are you?
Male           22                                                        2
               45                                              3 or higher
Female         48                                              3 or higher
Male           57                                              3 or higher
               42                                              3 or higher


                              Please estimate the degree(s) of separation you
have from the following celebrities [Beyoncé]   \
```

```
Your gender: How old are you?
Male          22                                                  3 or higher
              45                                                  3 or higher
Female        48                                                  3 or higher
Male          57                                                  3 or higher
              42                                                  3 or higher


                          Please estimate the degree(s) of separation you
have from the following celebrities [Bieber]  \
Your gender: How old are you?
Male          22                                                  3 or higher
              45                                                  3 or higher
Female        48                                                  3 or higher
Male          57                                                  3 or higher
              42                                                  3 or higher


                          Please estimate the degree(s) of separation you
have from the following celebrities [Kevin Bacon]  \
Your gender: How old are you?
Male          22                                                  3 or higher
              45                                                  3 or higher
Female        48                                                  3 or higher
Male          57                                                  3 or higher
              42                                                  3 or higher


                          Please estimate the degree(s) of separation you
have from the following celebrities [Francis Bacon (1561 - 1626)]  \
Your gender: How old are you?
Male          22                                                  3 or higher
              45                                                  3 or higher
Female        48                                                  3 or higher
Male          57                                                  3 or higher
              42                                                  3 or higher


                          Which day do you prefer, Friday or Sunday?  \
Your gender: How old are you?
Male          22                                                     Friday
              45                                                     Friday
Female        48                                                     Sunday
Male          57                                                     Sunday
              42                                                     Friday


                          Do you eat apples the correct way, East to West
(side to side) or do you eat them like a freak of nature, South to North (bottom
to top)?  \
Your gender: How old are you?
Male          22                                                South to North
```

```
                         45                                         East to West
       Female            48                                         East to West
       Male              57                                     South to North
                         42                                         East to West

                                  When you see the above image of the 4 different
       websites, which one would you most likely check out (please be honest).  \
       Your gender: How old are you?
       Male              22                        Science: Latest News and Headlines
                         45                        Science: Latest News and Headlines
       Female            48                        Science: Latest News and Headlines
       Male              57                        Science: Latest News and Headlines
                         42                                                   ESPN

                                  [York Peppermint Patties] Ignore
       Your gender: How old are you?
       Male              22                                                    NaN
                         45                                                    NaN
       Female            48                                                    NaN
       Male              57                                                    NaN
                         42                                                    NaN

       [5 rows x 121 columns]
```

Reshape

```
[15]:  # Stacks and reshapes data
       data_stack = data_index.stack()
```

```
[21]:  data_stack.head(50)
```

```
[21]:  Your gender:  How old are you?
       Male             22           Timestamp
       2016-10-24 05:09:23.033000
                                     Are you going actually going trick or treating
       yourself?                                      No
                                     Which country do you live in?
       Canada
                                     Which state, province, county do you live in?
       Ontario
                                      [100 Grand Bar]
       JOY
                                      [Anonymous brown globs that come in black and
       orange wrappers]                               DESPAIR
                                     [Any full-sized candy bar]
       JOY

                                      [Black Jacks]
```

MEH	[Bonkers (the candy)]
MEH	[Bonkers (the board game)]
MEH	[Bottle Caps]
MEH	[Box'o'Raisins]
DESPAIR	[Broken glow stick]
DESPAIR	[Butterfinger]
JOY	[Cadbury Creme Eggs]
JOY	[Candy Corn]
DESPAIR	[Candy that is clearly just the stuff given out for free at restaurants]
DESPAIR	[Caramellos]
JOY	[Cash, or other forms of legal tender]
JOY	[Chardonnay]
MEH	[Chick-o-Sticks (we don't know what that is)]
MEH	[Chiclets]
MEH	[Coffee Crisp]
JOY	[Creepy Religious comics/Chick Tracts]
JOY	[Dental paraphenalia]
DESPAIR	[Dots]
DESPAIR	[Dove Bars]
DESPAIR	[Fuzzy Peaches]
JOY	[Generic Brand Acetaminophen]
DESPAIR	[Glow sticks]
DESPAIR	[Goo Goo Clusters]
DESPAIR	

JOY	[Good N' Plenty]
DESPAIR	[Gum from baseball cards]
JOY	[Gummy Bears straight up]
JOY	[Hard Candy]
DESPAIR	[Healthy Fruit]
DESPAIR	[Heath Bar]
JOY	[Hershey's Dark Chocolate]
JOY	[Hershey's Milk Chocolate]
JOY	[Hershey's Kisses]
MEH	[Hugs (actual physical hugs)]
MEH	[Jolly Rancher (bad flavor)]
JOY	[Jolly Ranchers (good flavor)]
DESPAIR	[JoyJoy (Mit Iodine!)]
JOY	[Junior Mints]
JOY	[Senior Mints]
DESPAIR	[Kale smoothie]
JOY	[Kinder Happy Hippo]
JOY	[Kit Kat]
JOY	[LaffyTaffy]

dtype: object

Chapter 10

Grouping with Functions

```
[51]:   # Groups by gender and counts items
        data.groupby("Your gender:").count()
```

```
[51]:                      Timestamp  \
     Your gender:
     Female                     410
     I'd rather not say          28
     Male                       795
     Other                       17


                      Are you going actually going trick or treating yourself?  \
     Your gender:
     Female                                                             410
     I'd rather not say                                                  28
     Male                                                               795
     Other                                                               17


                      How old are you?  Which country do you live in?  \
     Your gender:
     Female                        401                             403
     I'd rather not say             24                              26
     Male                          779                             787
     Other                          17                              17


                      Which state, province, county do you live in?  \
     Your gender:
     Female                                                     381
     I'd rather not say                                          23
     Male                                                       756
     Other                                                       15


                      [100 Grand Bar]  \
     Your gender:
     Female                        381
     I'd rather not say             26
     Male                          751
     Other                          16


                      [Anonymous brown globs that come in black and orange
     wrappers]  \
     Your gender:
     Female                                                            405
     I'd rather not say                                                 26
     Male                                                              777
     Other                                                             17


                      [Any full-sized candy bar]   [Black Jacks]  \
     Your gender:
     Female                                 406             334
     I'd rather not say                      27              23
```

```
Male                                                  785             678
Other                                                  16              14


                      [Bonkers (the candy)]   …   \
Your gender:                                   …
Female                                   323   …
I'd rather not say                        22   …
Male                                     672   …
Other                                     13   …


                 Please estimate the degree(s) of separation you have from
the following celebrities [JK Rowling]   \
Your gender:
Female                                                               376
I'd rather not say                                                    24
Male                                                                 755
Other                                                                 17


                 Please estimate the degree(s) of separation you have from
the following celebrities [JJ Abrams]   \
Your gender:
Female                                                               375
I'd rather not say                                                    24
Male                                                                 755
Other                                                                 17


                 Please estimate the degree(s) of separation you have from
the following celebrities [Beyoncé]   \
Your gender:
Female                                                               377
I'd rather not say                                                    24
Male                                                                 752
Other                                                                 17


                 Please estimate the degree(s) of separation you have from
the following celebrities [Bieber]   \
Your gender:
Female                                                               377
I'd rather not say                                                    24
Male                                                                 752
Other                                                                 17


                 Please estimate the degree(s) of separation you have from
the following celebrities [Kevin Bacon]   \
Your gender:
Female                                                               377
I'd rather not say                                                    25
```

```
Male                                                         755
Other                                                         17


                Please estimate the degree(s) of separation you have from
the following celebrities [Francis Bacon (1561 - 1626)]  \
Your gender:
Female                                                       375
I'd rather not say                                           23
Male                                                        754
Other                                                        17


                Which day do you prefer, Friday or Sunday?  \
Your gender:
Female                                                       404
I'd rather not say                                           25
Male                                                        782
Other                                                        17


                Do you eat apples the correct way, East to West (side to
side) or do you eat them like a freak of nature, South to North (bottom to top)?
\
Your gender:
Female                                                        397
I'd rather not say                                            26
Male                                                         768
Other                                                         16


                When you see the above image of the 4 different websites,
which one would you most likely check out (please be honest).  \
Your gender:
Female                                                        398
I'd rather not say                                            26
Male                                                         775
Other                                                         16


                [York Peppermint Patties] Ignore
Your gender:
Female                                                   0
I'd rather not say                                       0
Male                                                     0
Other                                                    0

[4 rows x 122 columns]
```

Grouping with Index Levels

```
[58]: # Groups by age and counts items
      data_index_group = data_index.groupby(level="How old are you?").count()
      data_index_group.head()
```

[58]:   Timestamp \
      How old are you?
      7   1
      10   2
      11   1
      12   1
      13   2

                        Are you going actually going trick or treating yourself? \
      How old are you?
      7   1
      10   2
      11   1
      12   1
      13   2

                        Which country do you live in? \
      How old are you?
      7   1
      10   2
      11   1
      12   1
      13   2

                        Which state, province, county do you live in? \
      How old are you?
      7   1
      10   2
      11   0
      12   0
      13   2

                         [100 Grand Bar] \
      How old are you?
      7   0
      10   1
      11   1
      12   1
      13   2

                         [Anonymous brown globs that come in black and orange
      wrappers] \
      How old are you?

```

```
7   0
10   2
11   1
12   1
13   2

                [Any full-sized candy bar]   [Black Jacks] \
How old are you?
7   1   0
10   2   1
11   1   1
12   1   1
13   2   2

                [Bonkers (the candy)]   [Bonkers (the board game)] … \
How old are you?   …
7   0   0 …
10   1   1 …
11   1   1 …
12   1   1 …
13   2   2 …

                Please estimate the degree(s) of separation you have from the
following celebrities [JK Rowling] \
How old are you?
7   1
10   1
11   1
12   1
13   2

                Please estimate the degree(s) of separation you have from the
following celebrities [JJ Abrams] \
How old are you?
7   1
10   1
11   1
12   1
13   2

                Please estimate the degree(s) of separation you have from the
following celebrities [Beyoncé] \
How old are you?
7   1
10   1
11   1
12   1
```

| | |
|---|---|
| 13 | 2 |

Please estimate the degree(s) of separation you have from the following celebrities [Bieber]  \
How old are you?

| | |
|---|---|
| 7 | 1 |
| 10 | 1 |
| 11 | 1 |
| 12 | 1 |
| 13 | 2 |

Please estimate the degree(s) of separation you have from the following celebrities [Kevin Bacon]  \
How old are you?

| | |
|---|---|
| 7 | 1 |
| 10 | 1 |
| 11 | 1 |
| 12 | 1 |
| 13 | 2 |

Please estimate the degree(s) of separation you have from the following celebrities [Francis Bacon (1561 - 1626)]  \
How old are you?

| | |
|---|---|
| 7 | 1 |
| 10 | 1 |
| 11 | 1 |
| 12 | 1 |
| 13 | 2 |

Which day do you prefer, Friday or Sunday?  \
How old are you?

| | |
|---|---|
| 7 | 1 |
| 10 | 2 |
| 11 | 1 |
| 12 | 1 |
| 13 | 2 |

Do you eat apples the correct way, East to West (side to side) or do you eat them like a freak of nature, South to North (bottom to top)?  \
How old are you?

| | |
|---|---|
| 7 | 1 |
| 10 | 2 |
| 11 | 1 |
| 12 | 1 |
| 13 | 2 |

When you see the above image of the 4 different websites,

```
which one would you most likely check out (please be honest).  \
How old are you?
7                                                              1
10                                                             2
11                                                             1
12                                                             1
13                                                             2

                    [York Peppermint Patties] Ignore
How old are you?
7                                                    0
10                                                   0
11                                                   0
12                                                   0
13                                                   0

[5 rows x 121 columns]
```

Chapter 11

Convert between string and date time

```python
[66]:  # Converts date to string
       data['Timestamp'] = data['Timestamp'].astype(str)
       data.dtypes
```

```
[66]: Timestamp
      object
      Are you going actually going trick or treating yourself?
      object
      Your gender:
      object
      How old are you?
      object
      Which country do you live in?
      object
                                                                    …
      Please estimate the degree(s) of separation you have from the following
      celebrities [Francis Bacon (1561 - 1626)]                        object
      Which day do you prefer, Friday or Sunday?
      object
      Do you eat apples the correct way, East to West (side to side) or do you eat
      them like a freak of nature, South to North (bottom to top)?     object
      When you see the above image of the 4 different websites, which one would you
      most likely check out (please be honest).                        object
       [York Peppermint Patties] Ignore
      float64
      Length: 123, dtype: object
```

```
[69]: # Converts string to date
      data['Timestamp'] = pd.to_datetime(data['Timestamp'])
      data.dtypes
```

[69]: Timestamp
      datetime64[ns]
      Are you going actually going trick or treating yourself?
      object
      Your gender:
      object
      How old are you?
      object
      Which country do you live in?
      object
                                                                          …
      Please estimate the degree(s) of separation you have from the following
      celebrities [Francis Bacon (1561 - 1626)]
      object
      Which day do you prefer, Friday or Sunday?
      object
      Do you eat apples the correct way, East to West (side to side) or do you eat
      them like a freak of nature, South to North (bottom to top)?   object
      When you see the above image of the 4 different websites, which one would you
      most likely check out (please be honest).   object
        [York Peppermint Patties] Ignore
      float64
      Length: 123, dtype: object

Generate date range

```
[71]: # Creates date range
      index = pd.date_range(start="2020-01-01", periods=32)
      index
```

[71]: DatetimeIndex(['2020-01-01', '2020-01-02', '2020-01-03', '2020-01-04',
                     '2020-01-05', '2020-01-06', '2020-01-07', '2020-01-08',
                     '2020-01-09', '2020-01-10', '2020-01-11', '2020-01-12',
                     '2020-01-13', '2020-01-14', '2020-01-15', '2020-01-16',
                     '2020-01-17', '2020-01-18', '2020-01-19', '2020-01-20',
                     '2020-01-21', '2020-01-22', '2020-01-23', '2020-01-24',
                     '2020-01-25', '2020-01-26', '2020-01-27', '2020-01-28',
                     '2020-01-29', '2020-01-30', '2020-01-31', '2020-02-01'],
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