Confidence Intervals - Part I

December 1, 2017

0.0.1 Confidence Intervals - Part I

First let's read in the necessary libraries and the dataset. You also have the full and reduced versions of the data available. The reduced version is an example of you would actually get in practice, as it is the sample. While the full data is an example of everyone in your population.

```
In [1]: import pandas as pd
        import numpy as np

        np.random.seed(42)

        coffee_full = pd.read_csv('coffee_dataset.csv')
        coffee_red = coffee_full.sample(200) #this is the only data you might actually get in th
```

1. What is the proportion of coffee drinkers in the sample? What is the proportion of individuals that don't drink coffee?

```
In [2]: coffee_red.head()
```

```
Out[2]:       user_id   age  drinks_coffee     height
        2402     2874   <21           True  64.357154
        2864     3670  >=21           True  66.859636
        2167     7441   <21          False  66.659561
        507      2781  >=21           True  70.166241
        1817     2875  >=21           True  71.369120
```

```
In [5]: df_c = coffee_red[coffee_red["drinks_coffee"] == True]
        df_c.head()
```

```
Out[5]:       user_id   age  drinks_coffee     height
        2402     2874   <21           True  64.357154
        2864     3670  >=21           True  66.859636
        507      2781  >=21           True  70.166241
        1817     2875  >=21           True  71.369120
        685      4611  >=21           True  71.646296
```

```
In [6]: df_nc = coffee_red[coffee_red["drinks_coffee"] == False]
        df_nc.head()
```

```
Out[6]:       user_id   age  drinks_coffee     height
        2167     7441   <21          False  66.659561
        1234     8190   <21          False  68.226071
        2786     3781   <21          False  69.333116
        1253     8059  >=21          False  71.010834
        1264     4106  >=21          False  76.194046
```

```
In [9]: sample_size = coffee_red.shape[0]
        print("proportion coffee drinkers: {}".format(df_c.shape[0]/sample_size))
        print("proportion non-coffee drinkers: {}".format(df_nc.shape[0]/sample_size))
```

```
proportion coffee drinkers: 0.595
proportion non-coffee drinkers: 0.405
```

2. Of the individuals who drink coffee, what is the average height? Of the individuals who do not drink coffee, what is the average height?

```
In [10]: df_c.mean()
```

```
Out[10]: user_id          5047.378151
         drinks_coffee       1.000000
         height             68.119630
         dtype: float64
```

```
In [11]: df_nc['height'].mean()
```

```
Out[11]: 66.784922799278775
```

3. Simulate 200 "new" individuals from your original sample of 200. What are the proportion of coffee drinkers in your bootstrap sample? How about individuals that don't drink coffee?

```
In [16]: s2 = coffee_red.sample(200, replace = True)
         s2.head()
```

```
Out[16]:       user_id   age  drinks_coffee     height
         2232     3244  >=21           True  69.824271
         1292     6724  >=21           True  66.373129
         1543     3708   <21          False  66.322896
         1239     4172  >=21           True  71.011189
         203      3368   <21          False  69.586635
```

```
In [17]: s2_c_mean = s2['drinks_coffee'].mean()
         print("proportion coffee drinkers: {}".format(s2_c_mean))
         print("proportion non-coffee drinkers: {}".format(1- s2_c_mean))
```

```
proportion coffee drinkers: 0.585
proportion non-coffee drinkers: 0.41500000000000004
```

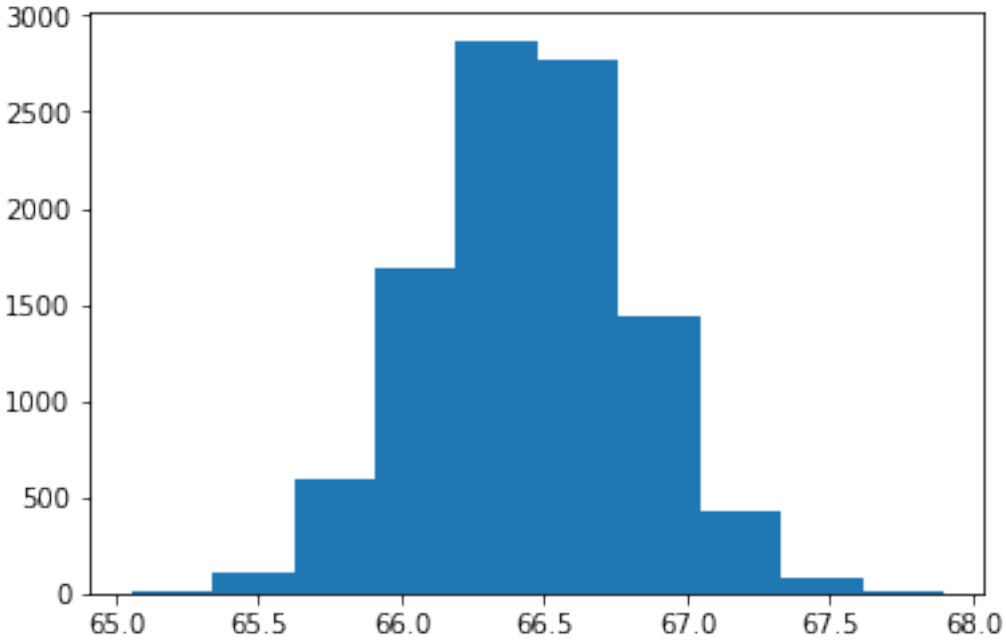
4. Now simulate your bootstrap sample 10,000 times and take the mean height of the non-coffee drinkers in each sample. Each bootstrap sample should be from the very first sample of 200 data points. Plot the distribution, and pull the values necessary for a 95% confidence interval. What do you notice about the sampling distribution of the mean in this example?

```
In [19]: import matplotlib.pyplot as plt

         % matplotlib inline
```

```
In [22]: s_height_means = []
         for _ in range(10000):
             c = coffee_full.sample(200)
             cm = c[c["drinks_coffee"] == False]["height"].mean()
             s_height_means.append(cm)

         plt.hist(s_height_means);
```




```
In [23]: np.mean(s_height_means)

Out[23]: 66.448297242709558

In [24]: np.percentile(s_height_means, 2.5), np.percentile(s_height_means, 97.5)

Out[24]: (65.730218388288435, 67.174615774007734)
```

5. Did your interval capture the actual average height of non-coffee drinkers in the population? Look at the average in the population and the two bounds provided by your 95% confidence interval, and then answer the final quiz question below.

```
In [25]: coffee_full['height'].mean()
```

```
Out[25]: 67.597486973079342
```

```
In [26]: coffee_full[coffee_full["drinks_coffee"] == False]["height"].mean()
```

```
Out[26]: 66.443407762147004
```