Week_04_Quiz-qm2162

October 10, 2021

1 Week 4 Quiz

1.1 Qi Meng - qm2162

1.1.1 Due Sunday Oct 10th 11:59pm ET

[1]:
```
import pandas as pd
import numpy as np
import seaborn as sns

sns.set_style('darkgrid')

%matplotlib inline
```

We're going to calculate the 95% confidence interval for the mean value of 'magnesium' from our wine dataset.

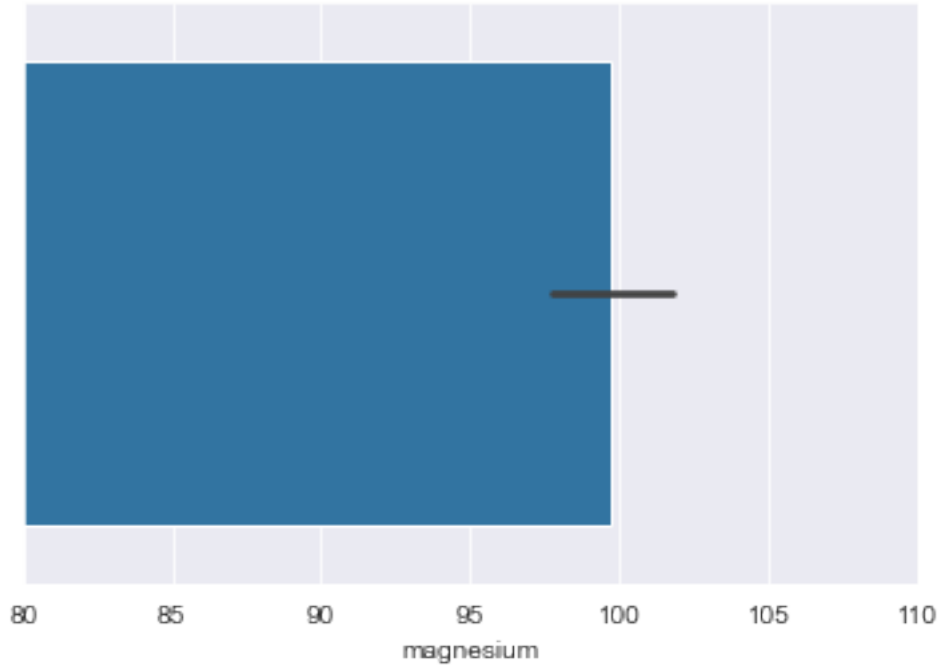
[2]:
```
# Read in ../data/wine_dataset.csv as df
df = pd.read_csv(r"../data/wine_dataset.csv")

# print .info() on df for a summary of the dataset
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 178 entries, 0 to 177
Data columns (total 14 columns):
 #   Column                        Non-Null Count  Dtype
---  ------                        --------------  -----
 0   alcohol                       178 non-null    float64
 1   malic_acid                    178 non-null    float64
 2   ash                           178 non-null    float64
 3   alcalinity_of_ash             178 non-null    float64
 4   magnesium                     178 non-null    float64
 5   total_phenols                 178 non-null    float64
 6   flavanoids                    178 non-null    float64
 7   nonflavanoid_phenols          178 non-null    float64
 8   proanthocyanins               178 non-null    float64
 9   color_intensity               178 non-null    float64
 10  hue                           178 non-null    float64
```

```
 11  od280/od315_of_diluted_wines  178 non-null    float64
 12  proline                       178 non-null    float64
 13  class                         178 non-null    int64
dtypes: float64(13), int64(1)
memory usage: 19.6 KB
None
```

[7]:
```
# Generate a barplot of the 'magnesium' column with 95% confidence intervals␣
 ↪using sns.barplot()
# These are the CI values we're going to calculate below.
# Capture the axis of the plot in ax
ax = sns.barplot(x="magnesium", data=df, ci=95)

# To zoom in, set the xlimits using ax.set_xlim(80,110)
ax.set_xlim(80,110)
```

[7]:
```
(80.0, 110.0)
```



[8]:
```
# Assign the mean value of magnesium to variable observed_mean
observed_mean = df.magnesium.mean()

# Print the observed mean with a precision of 2
print("{:.2f}".format(observed_mean))
```

```
99.74
```

[14]:
```
# generate a bootstrap sample of df.magnesium (with the same number of values␣
 ↪as the original dataset)
#   using .sample() (with replacement)
#   using random_state=123 so our answers will match
#   assign the result to sample
sample = df.magnesium.sample(n=len(df.magnesium), replace=True,␣
 ↪random_state=123)

# Print the mean of the sample with a precision of 2
# Note: if the sample mean is the same as the observed mean,
#       check, are you sampling with replacement?
print("{:.2f}".format(sample.mean()))
```

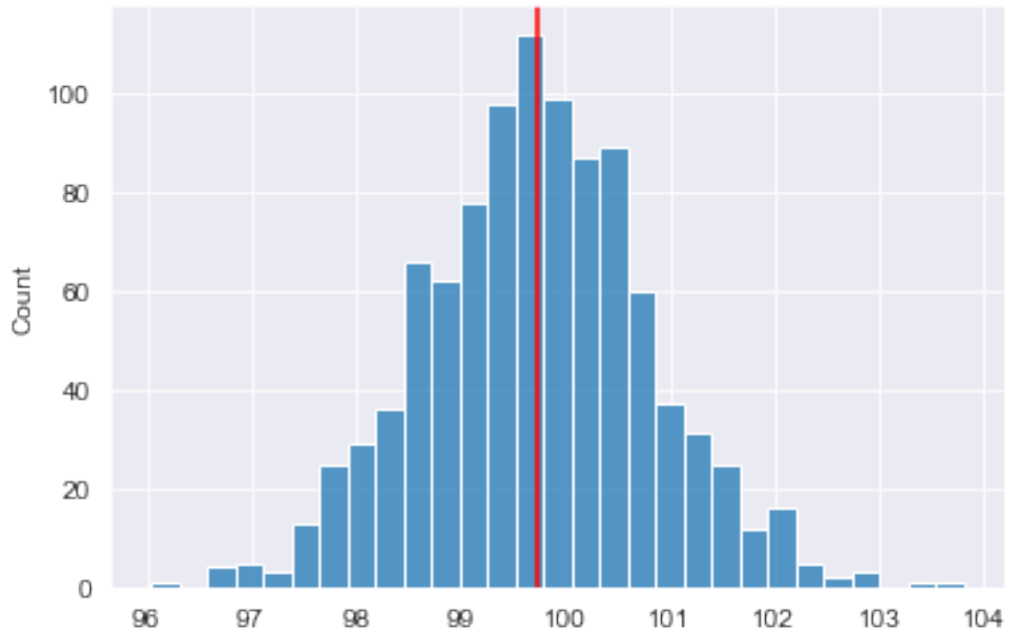
```
98.69
```

[19]:
```
# Generate 1000 additional sample means using bootstrap sampling from the␣
 ↪'magnesium' column
#   each sample should have the same number of values as the original dataframe
#   sample with replacement
#   do not use random_state for this step (your results may differ from the␣
 ↪course solution slightly)
#   store in the list sample_means
sample_means = [df.magnesium.sample(n=len(df.magnesium), replace=True).mean()␣
 ↪for i in range(1000)]


# Print the first 5 values in sample_means
print(sample_means[:5])
```

```
[99.78651685393258, 97.9438202247191, 99.51123595505618, 99.15730337078652,
99.74157303370787]
```

[21]:
```
# Plot the distribution of sample means using sns.histplot
# Store the returned axis in ax
ax = sns.histplot(x=sample_means)

# Add a vertical line located at the observed mean on the x-axis using ax.
 ↪axvline()
#   Set the color of the line to 'red'
# The observed_mean should fall near the center of the distribution.
ax.axvline(x=observed_mean, color="red")
```

[21]:
```
<matplotlib.lines.Line2D at 0x7fb45af5cfd0>
```



[22]:
```
# To get the 95% confidence interval, we want to retain the central 95% of our␣
 ↪sample_means.
# To do this we need to first determine how many values must be trimmed from␣
 ↪the ends of the sorted array.
# For 95% CI, we want to trim 1/2 of 5% from each end.
# Calculate 2.5% of the length of sample_means and store as trim_amount.
trim_amount = 0.025 * len(sample_means)

# print the trim_amount, the number of elements we'll trim from each end of the␣
 ↪sorted list
trim_amount
```

[22]: 25.0

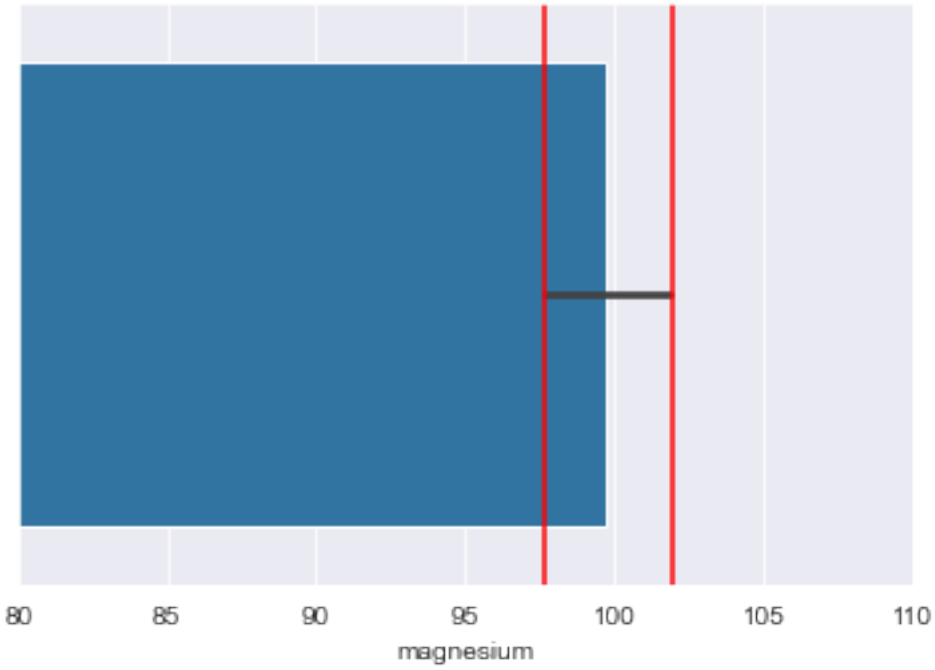
[23]:
```
# We want to index into our sample_means, but trim_amount is a float.
# We must be first round this value and converted to an integer.
# Use np.round() to round and int() to convert to int and store the result in␣
 ↪trim_idx.
trim_idx = int(np.round(trim_amount))

# Print trim_idx
trim_idx
```

[23]: 25

[27]:
```
# We can now print the 95% CI for our measure by indexing into the sorted array␣
 ↪of sample_means.
# Use np.sort() to return a sorted numpy array
#   then use a list of the indices we want, [trim_idx,-trim_idx-1], to use␣
 ↪"fancy indexing" on this sorted array.
# Store the 95% CI values as ci
ci = np.sort(sample_means)[[trim_idx,-trim_idx]]

# Print the ci values and visually compare the endpoints of the CI in the␣
 ↪barplot above.
print(ci)

ax = sns.barplot(x="magnesium", data=df, ci=95)
ax.axvline(ci.min(), color="red")
ax.axvline(ci.max(), color="red")
ax.set_xlim(80, 110)
```

```
[ 97.63483146 101.98876404]
```

[27]:
```
(80.0, 110.0)
```



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