Congratulations! You passed!

TO PASS 80% or higher

Keep Learning

GRADE
100%

Week 4 Python Assessment

LATEST SUBMISSION GRADE

100%

1. 1 / 1 point

```
import numpy as np
import matplotlib.pyplot as plt
import matplotlib.mlab as mlab
import math

# Set a random seed for repeated computation
np.random.seed(123)

# Global constants - these are what we need to change
# This is my inital belief about the mean of the average IQ score on campus
prior_sigma = 10 # my uncertainty about the mean
prior_mean = 100 # my initial belief about the mean
sigma_observations = 3 # uncertainty in my observations

# New observations - We are going to be updating this list to see how observing
# different data changes our beliefs about the average IQ score
new_data = [110,110,110,125,125]

# Compute some statistics on the new data
n = len(new_data)

# Some hairy math to avoid doing integrals (Wikipedia has the math!)
if n != 0:
  posterior_mean = (( 1 / prior_sigma ** 2) + n / sigma_observations ** 2)**(-1)
    * ((prior_mean / prior_sigma ** 2) + sum(new_data) / sigma_observations ** 2
    )
  posterior_sd = (1 / prior_sigma ** 2 + n / sigma_observations ** 2)**(-1)
else:
  posterior_mean = prior_mean
  posterior_sd = prior_sigma

# Plot the distribution of the prior and the posterior
x = np.linspace(50, 150, 100)
plt.plot(x,mlab.normpdf(x, prior_mean, prior_sigma), color = "blue")
plt.plot(x,mlab.normpdf(x, posterior_mean, posterior_sd), color = "red",
  linestyle = '--')
plt.title("Red = Posterior, Blue = Prior")

# To view the graph, comment-out print(posterior_mean)
# To view the numerical output, comment-out plt.show()

#plt.show()
print(posterior_mean, posterior_sd)
```

Run

Reset

For this problem, we are going to be using the above code to recreate some of the mathematics behind the Introduction to Bayesian Statistics lecture. The math has already been worked out for you, so you will only have to manipulate code, but if you are curious of the math behind the update for the mean of a distribution, you can look here: https://en.wikipedia.org/wiki/Conjugate_prior. The math for this problem is located under the continuous distributions section where our model parameter is mu and we have a known variance sigma^2

Before we get started, we need to get some values.

First, what is the mean of the prior that we are using?

100

Correct

We can see that 100 is the value assigned to prior_mean

2. What is the standard deviation of the prior? 1 / 1 point

10

Correct

This is the value that is assigned to prior_sigma

3. Let's say that we observe a person with an IQ of 125, as we did in the lecture. Which way should the posterior distribution, after our Bayesian update, shift? 1 / 1 point

- ○ Left
- ◉ Right
- ○ Stay the Same

Correct

That's right, the posterior should shift right to account for seeing data that was larger than the mean that my prior had

4. Now, lets say that I observe two more people and I see that they also have IQs of 110. So we have three people with IQs of 110. How does the variance of my estimate change from my prior? We can do this in the code by setting: **1 / 1 point**

new_data = [110, 110, 110]

- (●) The variance decreases
- ( ) The variance increases
- ( ) The variance stays the same

✓ **Correct**
The variance should decrease. If we run the code, we can see that the width of the distribution decreases indicating the variance of the estimate also decreased

5. What is the posterior mean after observing three people with an IQ of 110 in a row? **1 / 1 point**

109.70873786407766

✓ **Correct**
The correct answer is: 109.7087378640. We can get this answer by running the code and looking at the posterior_mean variable

6. If I observe now five people: the first three have an IQ of 110, and the last two have an IQ of 125, which of the following are true? **1 / 1 point**

- [ ] The posterior mean is the average of 110, 110, 110, 125, and 125
- [ ] The posterior mean is equal to 110
- [ ] The posterior mean is equal to 100
- [ ] The posterior mean is equal to 125
- [x] The posterior mean is equal to 115.717

✓ **Correct**
This is correct and what you would get if you ran the code

- [ ] The posterior standard deviation is the same as the prior standard deviation
- [ ] The posterior standard deviation is greater than the prior standard deviation
- [x] The posterior standard deviation is less than the prior standard deviation

✓ **Correct**
Correct!

- [ ] The posterior standard deviation is equal to 10
- [x] The posterior standard deviation is equal to 1.768

✓ **Correct**
This is correct

- [ ] The posterior standard deviation is equal to 3