import numpy as np

import scipy.stats as sts

import matplotlib.pyplot as plt

# Grid of possible true baby body temperatures (in Celsius)

mu = np.linspace(36, 38.5, 300)

# Prior belief: Baby's normal temp ~ 37°C, std dev 0.2°C

prior = sts.norm.pdf(mu, loc=37, scale=0.2)

prior = prior / prior.sum()

# Plot the prior as a histogram

plt.bar(mu, prior, width=0.01, label='Prior', alpha=0.7)

plt.xlabel("Baby's Body Temperature (°C)")

plt.ylabel("Probability Density")

plt.title("Prior Belief About Baby's Body Temperature")

plt.legend()

plt.show()

# Likelihood: Observed temp = 37.5°C, measurement error std dev = 0.3

def likelihood\_func(observation, mu\_values):

likelihood = sts.norm.pdf(observation, loc=mu\_values, scale=0.3)

return likelihood / likelihood.sum()

# Compute the likelihood for the baby’s observed temperature

likelihood = likelihood\_func(37.5, mu)

# Plot the likelihood as a histogram

plt.bar(mu, likelihood, width=0.01, label='Likelihood', color='orange', alpha=0.7)

plt.xlabel("Baby's Body Temperature (°C)")

plt.ylabel("Likelihood")

plt.title("Likelihood Given Baby's Observed Temp = 37.5°C")

plt.legend()

plt.show()

# Compute the unnormalized posterior

unnormalized\_posterior = prior \* likelihood

# Plot the unnormalized posterior as a histogram

plt.bar(mu, unnormalized\_posterior, width=0.01, label='Unnormalized Posterior', color='green', alpha=0.7)

plt.xlabel("Baby's Body Temperature (°C)")

plt.ylabel("Unnormalized Probability")

plt.title("Posterior Distribution of Baby's Body Temperature")

plt.legend()

plt.show()