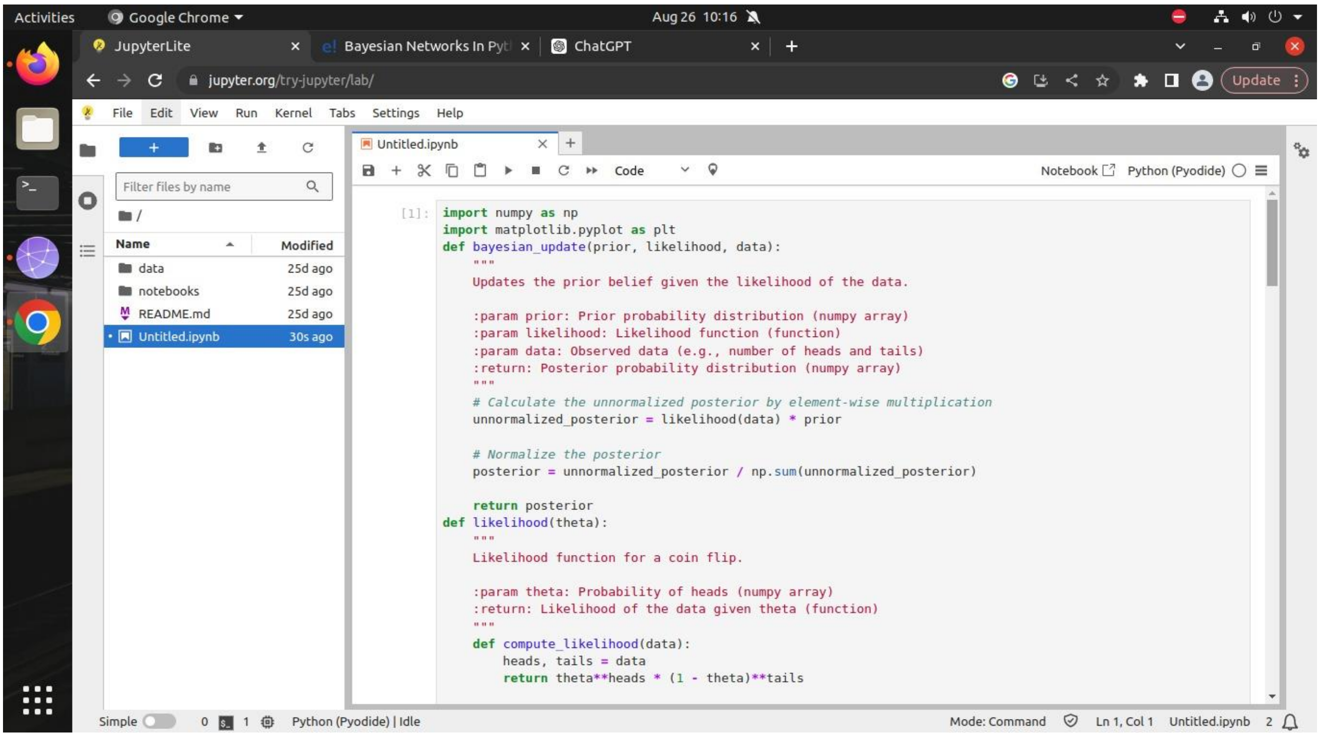
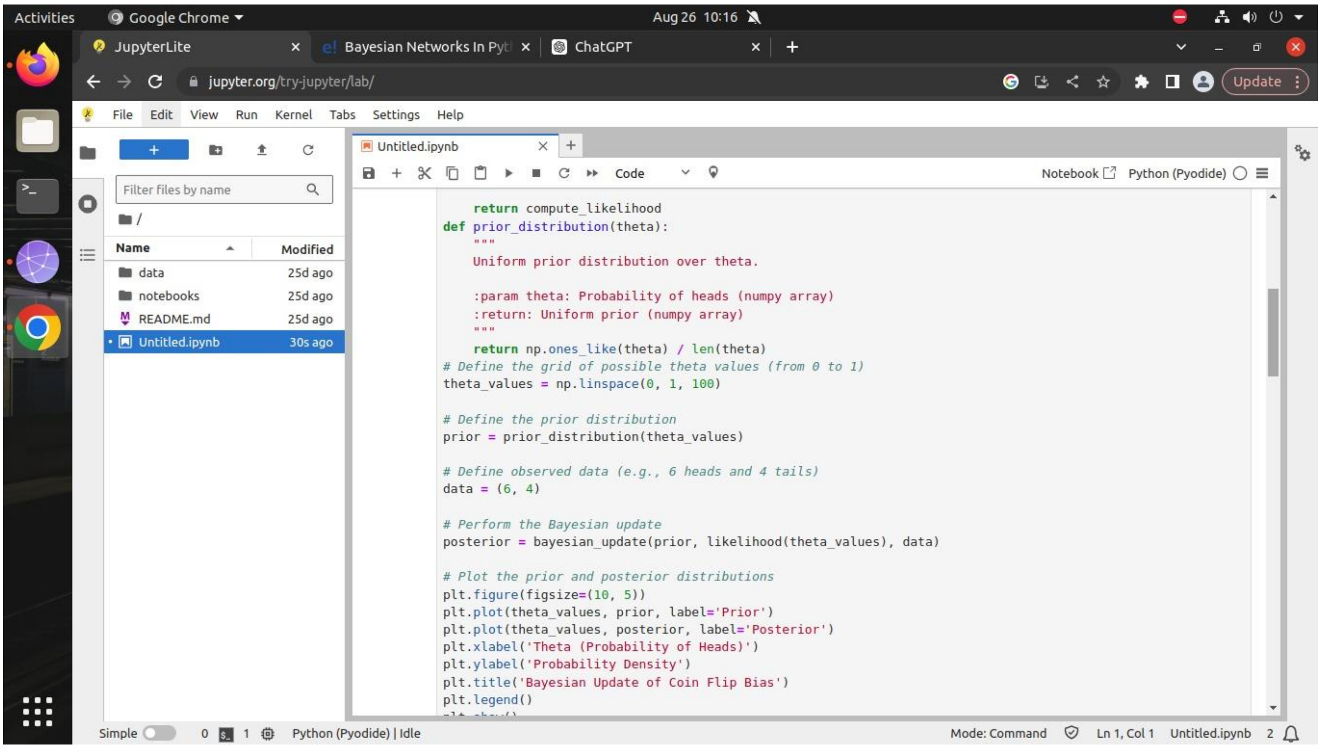
EXPERIMENT NO: 4

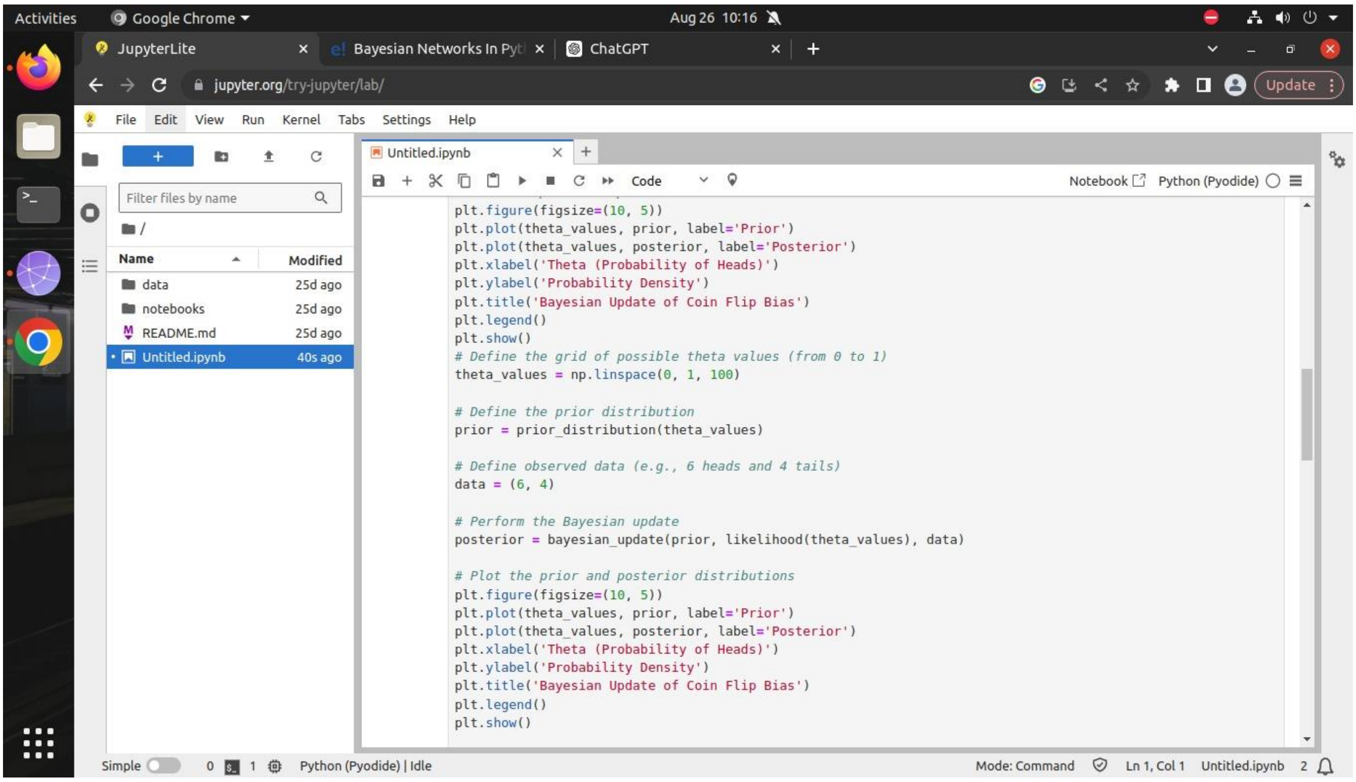
IMPLEMENTATION OF BAYESIAN ALGORITHM



```
[1]: import numpy as np
     import matplotlib.pyplot as plt
     def bayesian_update(prior, likelihood, data):
         """
         Updates the prior belief given the likelihood of the data.

         :param prior: Prior probability distribution (numpy array)
         :param likelihood: Likelihood function (function)
         :param data: Observed data (e.g., number of heads and tails)
         :return: Posterior probability distribution (numpy array)
         """
         # Calculate the unnormalized posterior by element-wise multiplication
         unnormalized_posterior = likelihood(data) * prior

         # Normalize the posterior
         posterior = unnormalized_posterior / np.sum(unnormalized_posterior)

         return posterior
     def likelihood(theta):
         """
         Likelihood function for a coin flip.

         :param theta: Probability of heads (numpy array)
         :return: Likelihood of the data given theta (function)
         """
         def compute_likelihood(data):
             heads, tails = data
             return theta**heads * (1 - theta)**tails
```



```
         return compute_likelihood
     def prior_distribution(theta):
         """
         Uniform prior distribution over theta.

         :param theta: Probability of heads (numpy array)
         :return: Uniform prior (numpy array)
         """
         return np.ones_like(theta) / len(theta)
     # Define the grid of possible theta values (from 0 to 1)
     theta_values = np.linspace(0, 1, 100)

     # Define the prior distribution
     prior = prior_distribution(theta_values)

     # Define observed data (e.g., 6 heads and 4 tails)
     data = (6, 4)

     # Perform the Bayesian update
     posterior = bayesian_update(prior, likelihood(theta_values), data)

     # Plot the prior and posterior distributions
     plt.figure(figsize=(10, 5))
     plt.plot(theta_values, prior, label='Prior')
     plt.plot(theta_values, posterior, label='Posterior')
     plt.xlabel('Theta (Probability of Heads)')
     plt.ylabel('Probability Density')
     plt.title('Bayesian Update of Coin Flip Bias')
     plt.legend()
     plt.show()
```



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data	25d ago
notebooks	25d ago
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```
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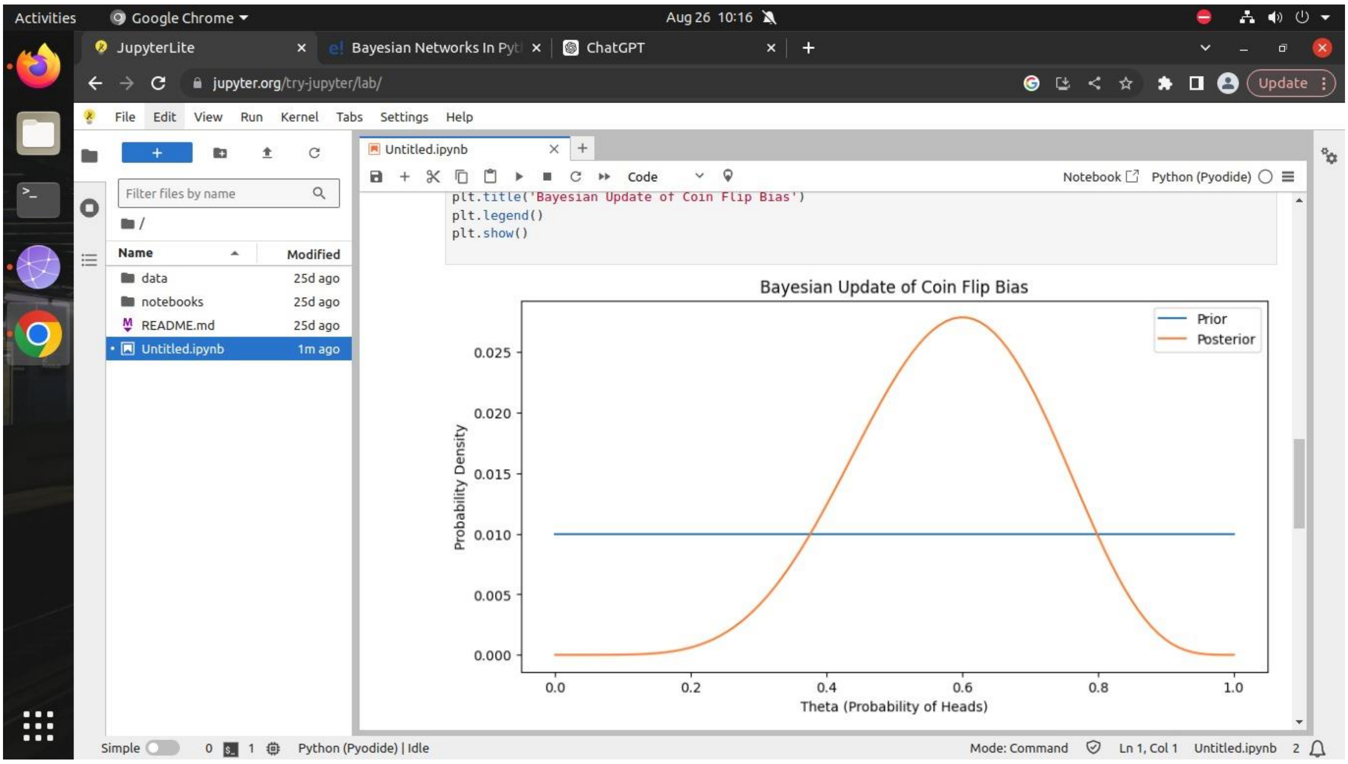

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data	25d ago
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```
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