Ph21 Assignment 4

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Part 1

First we tackle the coin tossing problem. Here are some plots on uniform prior with different values of H:
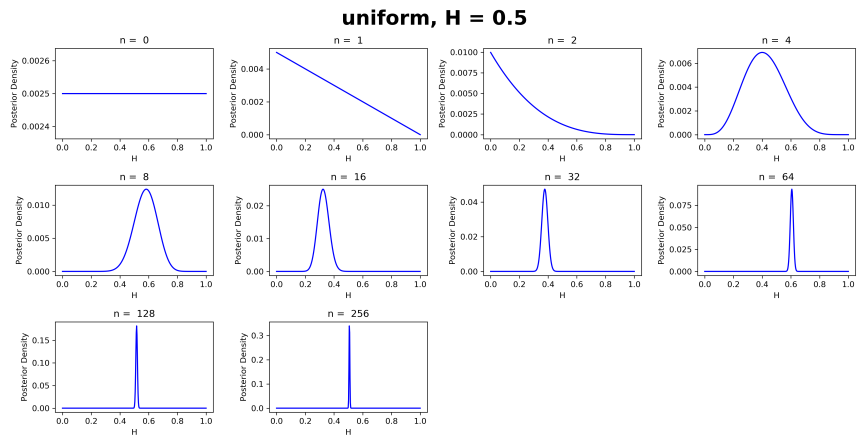

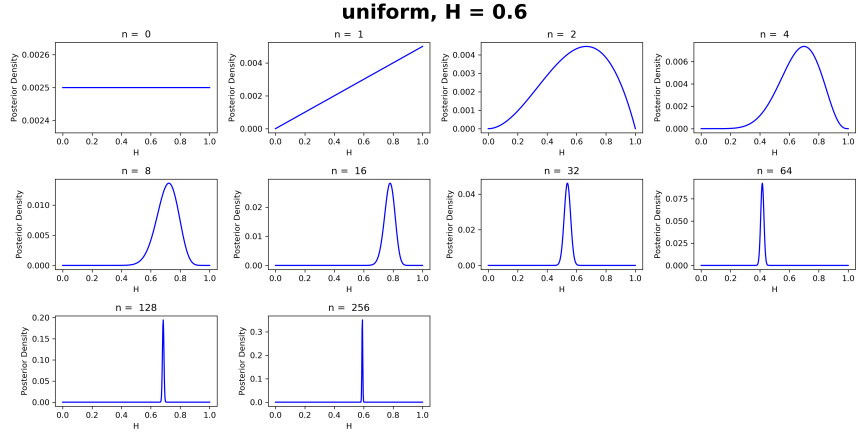Figure 1: Uniform Posterior distributions for multiple N.

uniform, H = 0.6

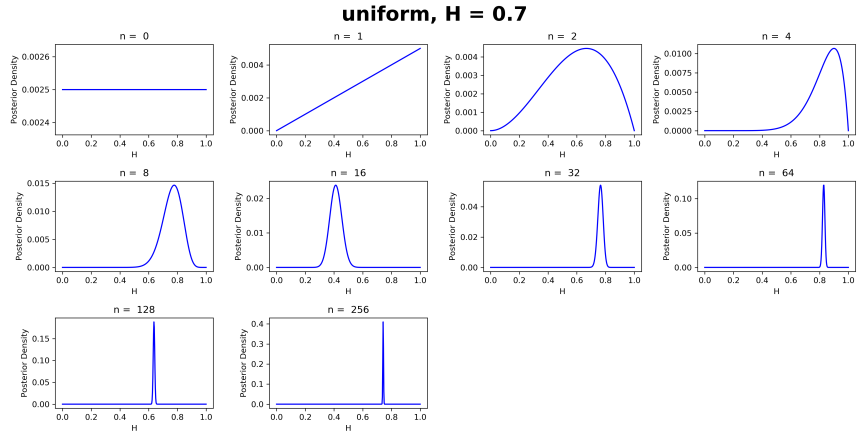Figure 2: Uniform Posterior distributions for multiple N.

uniform, H = 0.7

Figure 3: Uniform Posterior distributions for multiple N.

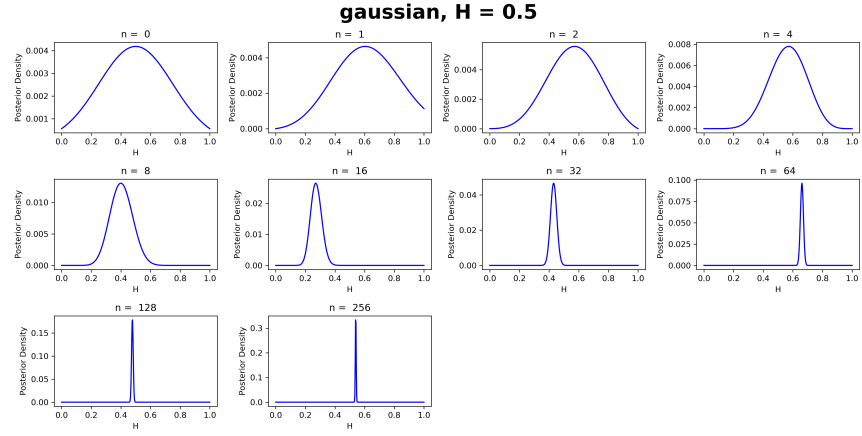Now we use a gaussian prior to investigate the difference between them.

gaussian, H = 0.5

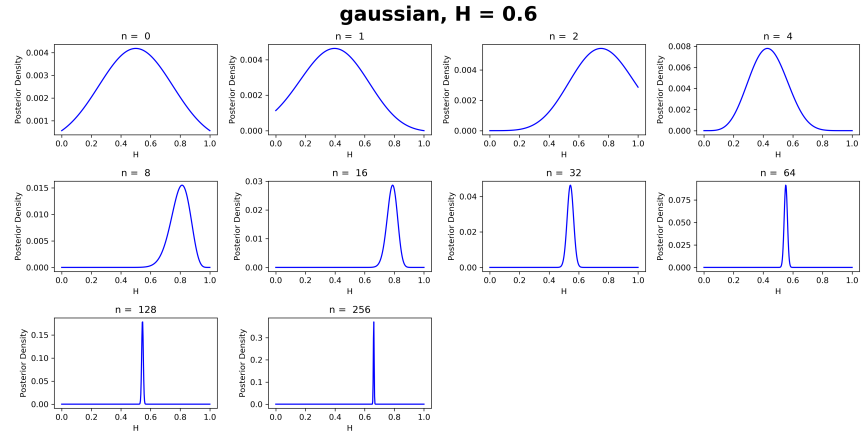Figure 4: Gaussian Posterior distributions for multiple N.

gaussian, H = 0.6

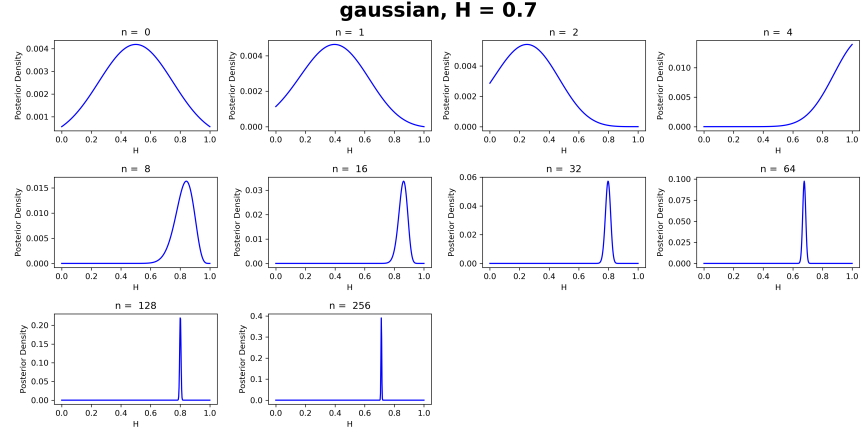Figure 5: Gaussian Posterior distributions for multiple N.

Figure 6: Gaussian Posterior distributions for multiple N.

As we can see for both priors the width of the distribution decreases as N increases. For N=0, prior is same with posterior as expected. Gaussian is better for small values of N at predicting the true value of H, but at large N both priori do a good job and peak at the correct H.

Part 2

In this section we investigate the lighthouse problem. First we assume we know β and we try to infer the posterior probability distribution of α from the data x_k. We plot the PDF.
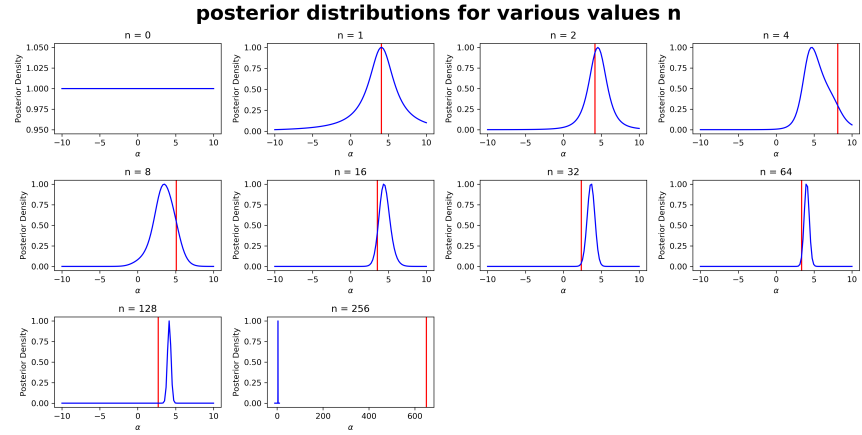

Figure 7: Unknown α Posterior distributions for multiple N.

It seems like the mean x_k sometimes lies outside the range of values of the posterior distributions. This suggests that it is not a good estimate.

Now we explore the distributions of unknown α and unknown β. Since this will be a 2d plot, I will use a colorscale to display results.

posterior distributions for various values n

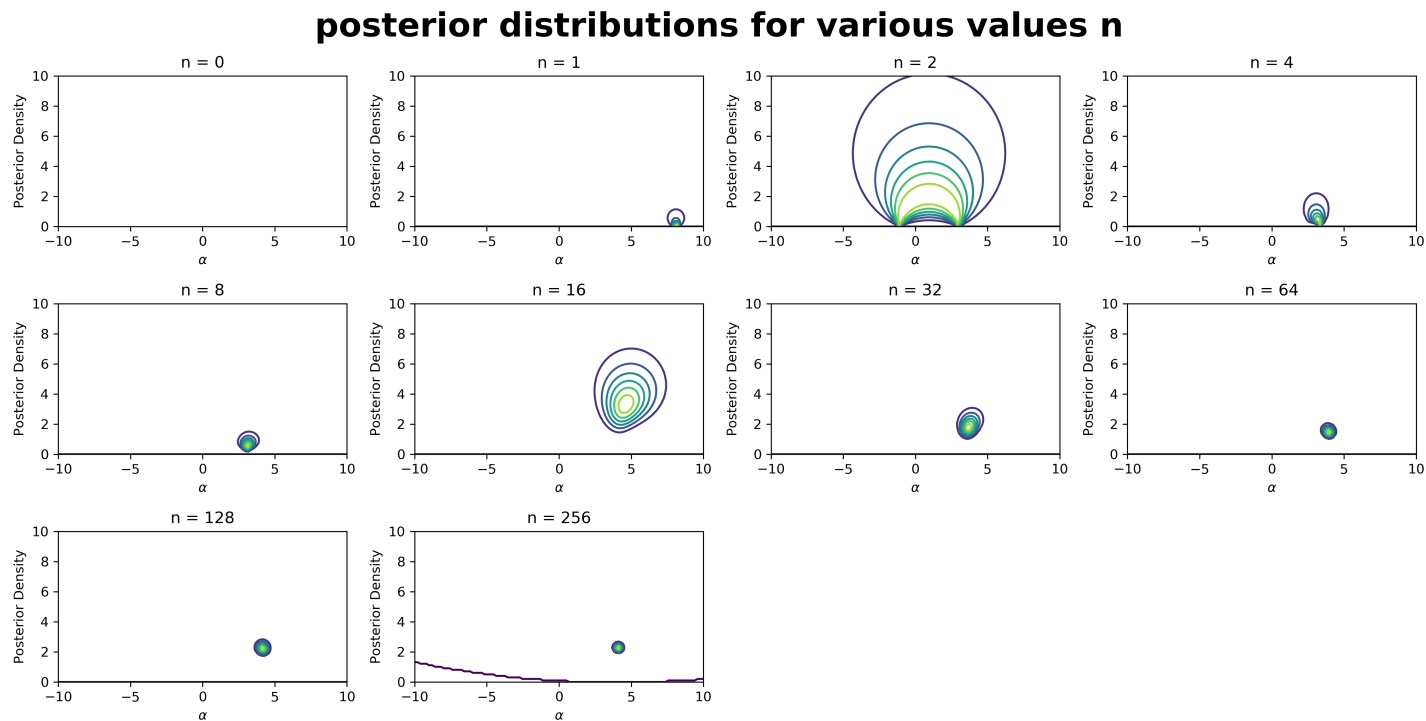Figure 8: Unknown α, β Posterior distributions for multiple N.

As it can be seen, the same pattern is observed in the 2D case. As N increases, the distribution of probabilities is concentrated towards the true values of α and β.