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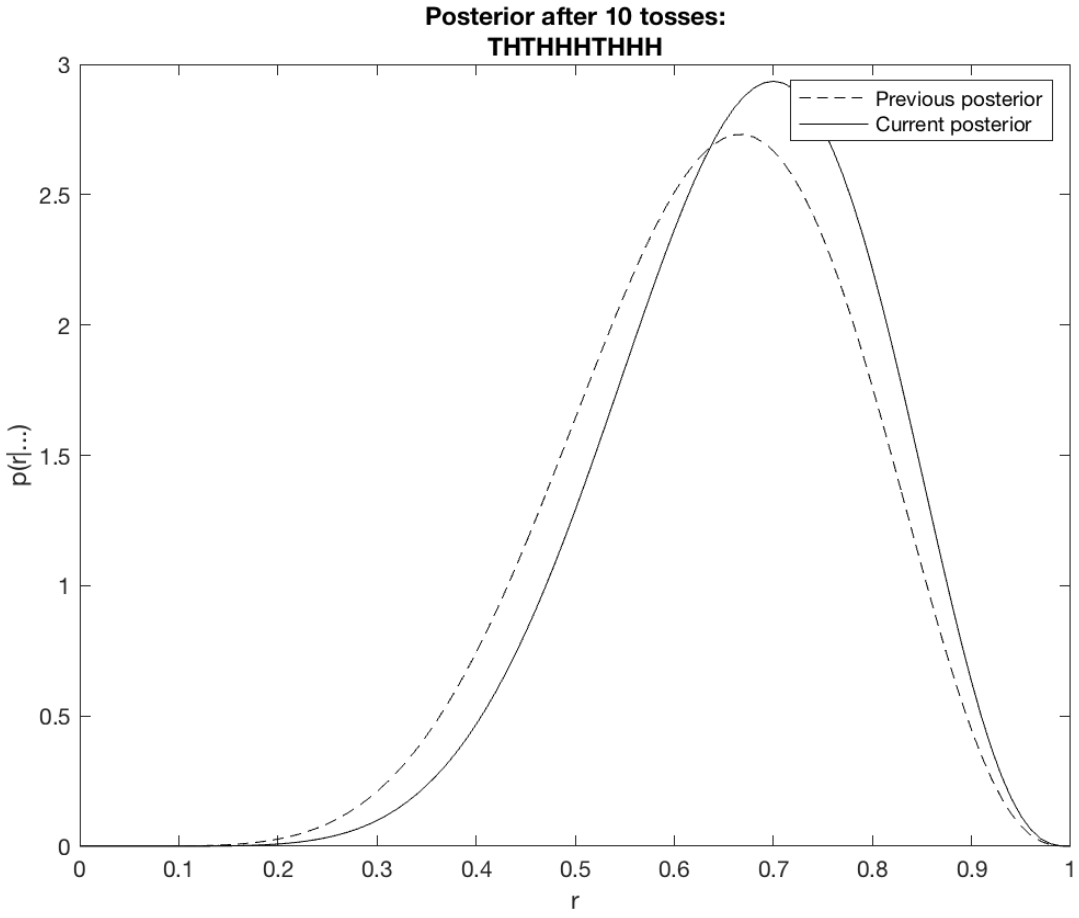
COMP 542 (Machine Learning) - Section 20834-02

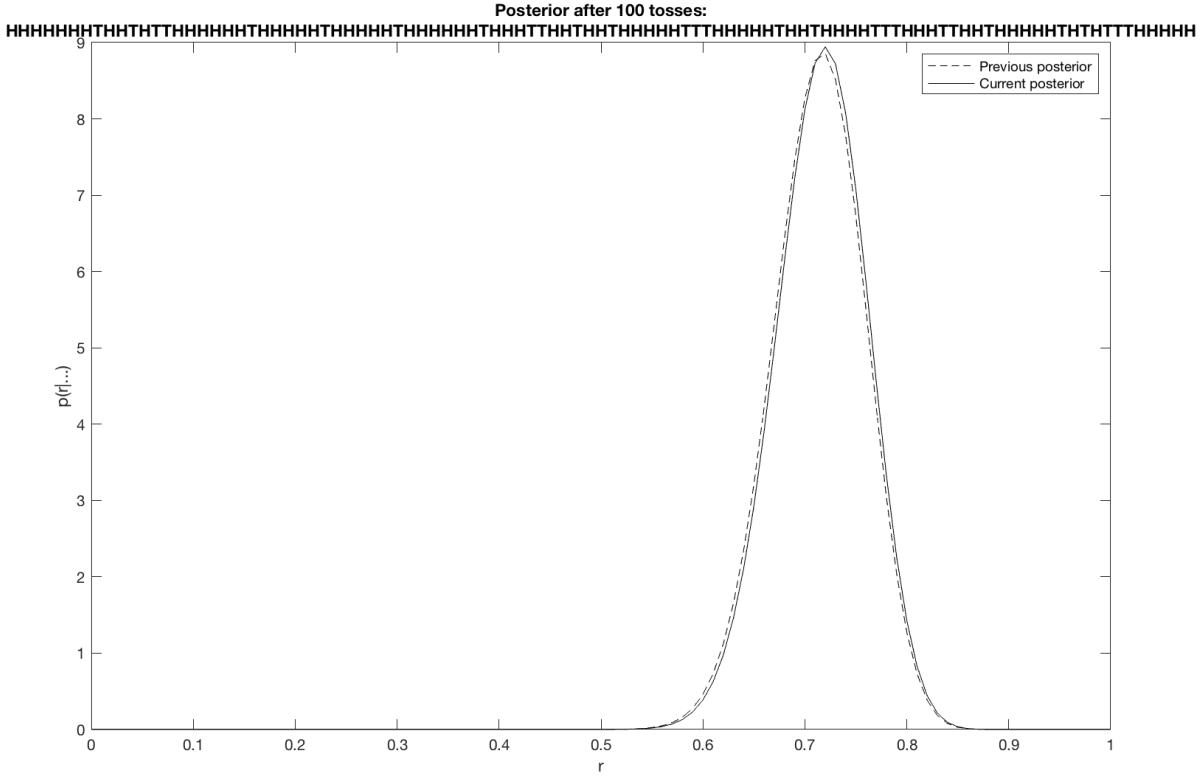
Chapter 3 Project - Bayesian Way

1. Scenarior 1 - No Prior Knowledge

1.1. Posterior plot

```
%% coin_scenario.m
clear all; close all; warning('off');
%% Inputs
alpha = 1;
beta  = 1;
p = 0.7;
num_toss = 100;

fprintf('\nInputs:\n');
fprintf('---------------------------------------\n');
fprintf('number of tosses = %i\n', num_toss);
fprintf('probability of head = %i\n', p);
fprintf('alpha  = %i\n', alpha);
fprintf('beta = %d\n', beta);
fprintf('***************************************\n');

%% Compute final gamma and theta
[post_alpha, post_beta] = bayesian_way(p, num_toss, alpha, beta);

%% Compute and print out the probability of winning p_hat
[y_n, r_hat, p_hat] = prob_win(post_alpha, post_beta, alpha, num_toss);
fprintf('\nCompute the probability of winning\n');
fprintf('---------------------------------------\n');
fprintf('theta = %i\n', post_alpha);
fprintf('gamma  = %i\n', post_beta);
fprintf('r_hat = %d\n', r_hat);
fprintf('YN = %i\n', y_n);
fprintf('Probability of winning = %d\n', p_hat);            % print the probability of winning
fprintf('***************************************\n');

%% Compute and print out the marginal likelihoods
fprintf('\nCompute the marginal likelihoods\n');
fprintf('---------------------------------------\n');
fprintf('alpha = %i\n', alpha);
fprintf('beta  = %i\n', beta);
fprintf('YN = %i\n', y_n);
fprintf('N  = %i\n', num_toss);
m_likelihoods =  ml(alpha, beta, y_n, num_toss);            % print the marginal likelihoods
fprintf('Marginal likelihoods  = %d\n', m_likelihoods);
fprintf('***************************************\n\n');
```


Posterior after 10 tosses:
THTHHHTHHH
Previous posterior
Current posterior
p(r|...)
r
0
0.5
1
1.5
2
2.5
3
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9


Posterior after 100 tosses:
HHHHHHHTHHTHTTHHHHHHTHHHHHTHHHHHTHHHHHTTHHTHHTHHHHHTTTHHHHHTHHTHHHHTTTHHHTTHHTHHHHHTHTHTTTHHHHH
Previous posterior
Current posterior
p(r|...)
r
0
1
2
3
4
5
6
7
8
9
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

1.2. Probabilities of winning

>> coin_scenario

```
    Compute the probability of winning

    ---------------------------------------

    theta = 80

    gamma  = 22

    r_hat = 7.843137e-01

    YN = 79

    Probability of winning = 5.939986e-01

    ***********************************
```

1.3. Marginal likelihoods

```
    Compute the marginal likelihoods

    ---------------------------------------

    alpha = 1

    beta  = 1

    YN = 79

    N  = 100

    Marginal likelihoods  = 9.900990e-03

    ***********************************
```