Statistical Machine Learning
Assignment 1
Submitted By
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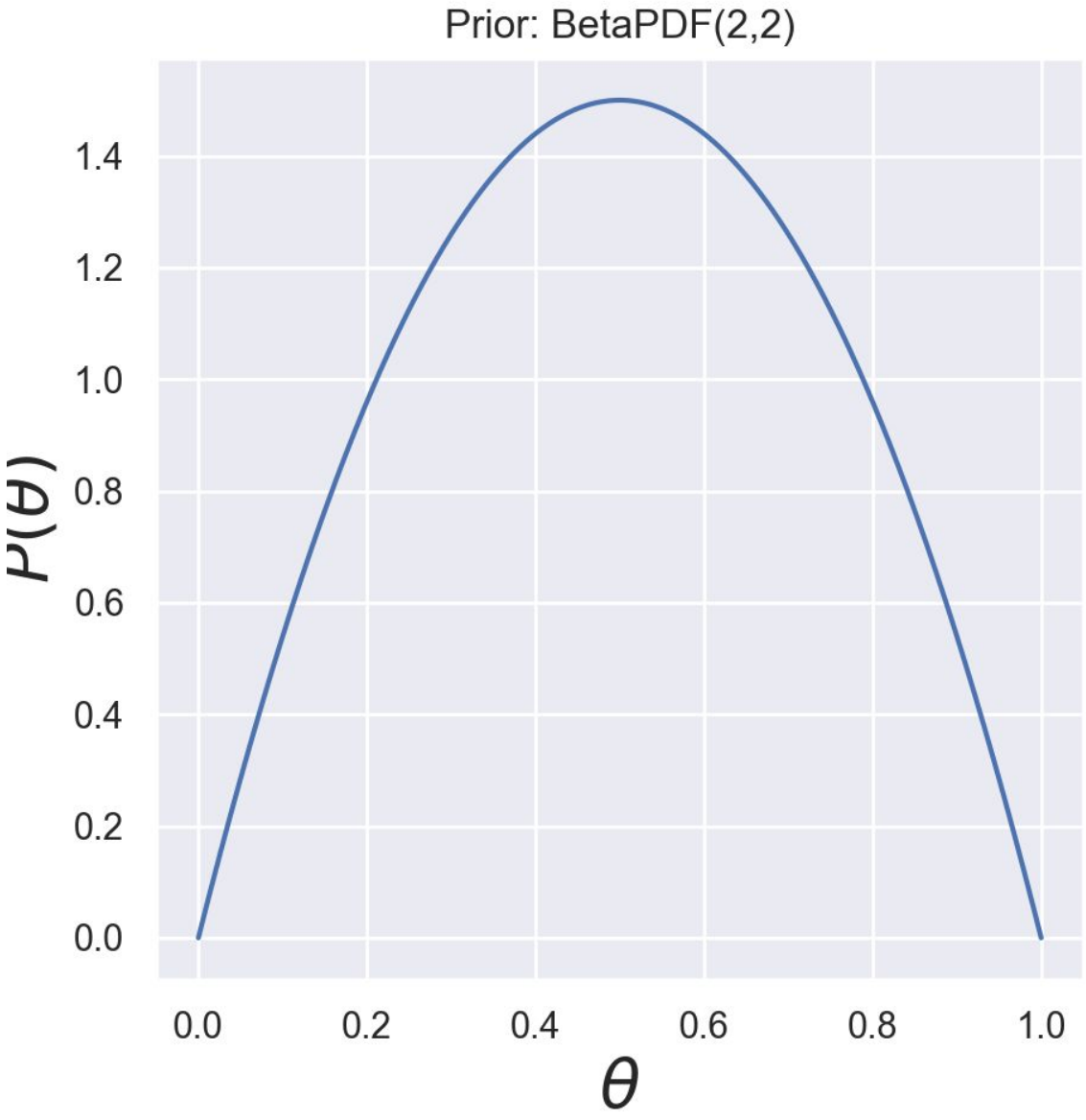
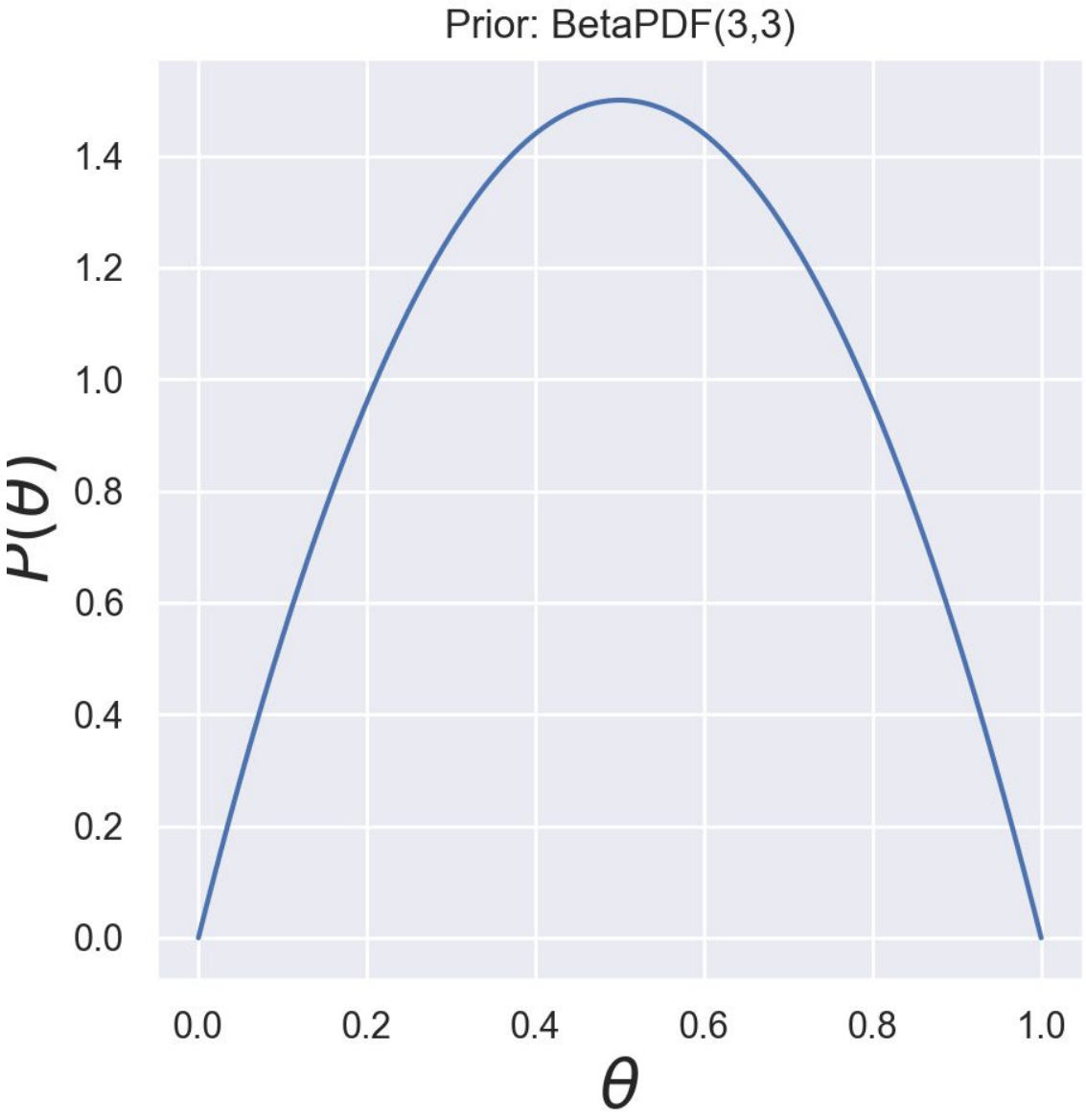
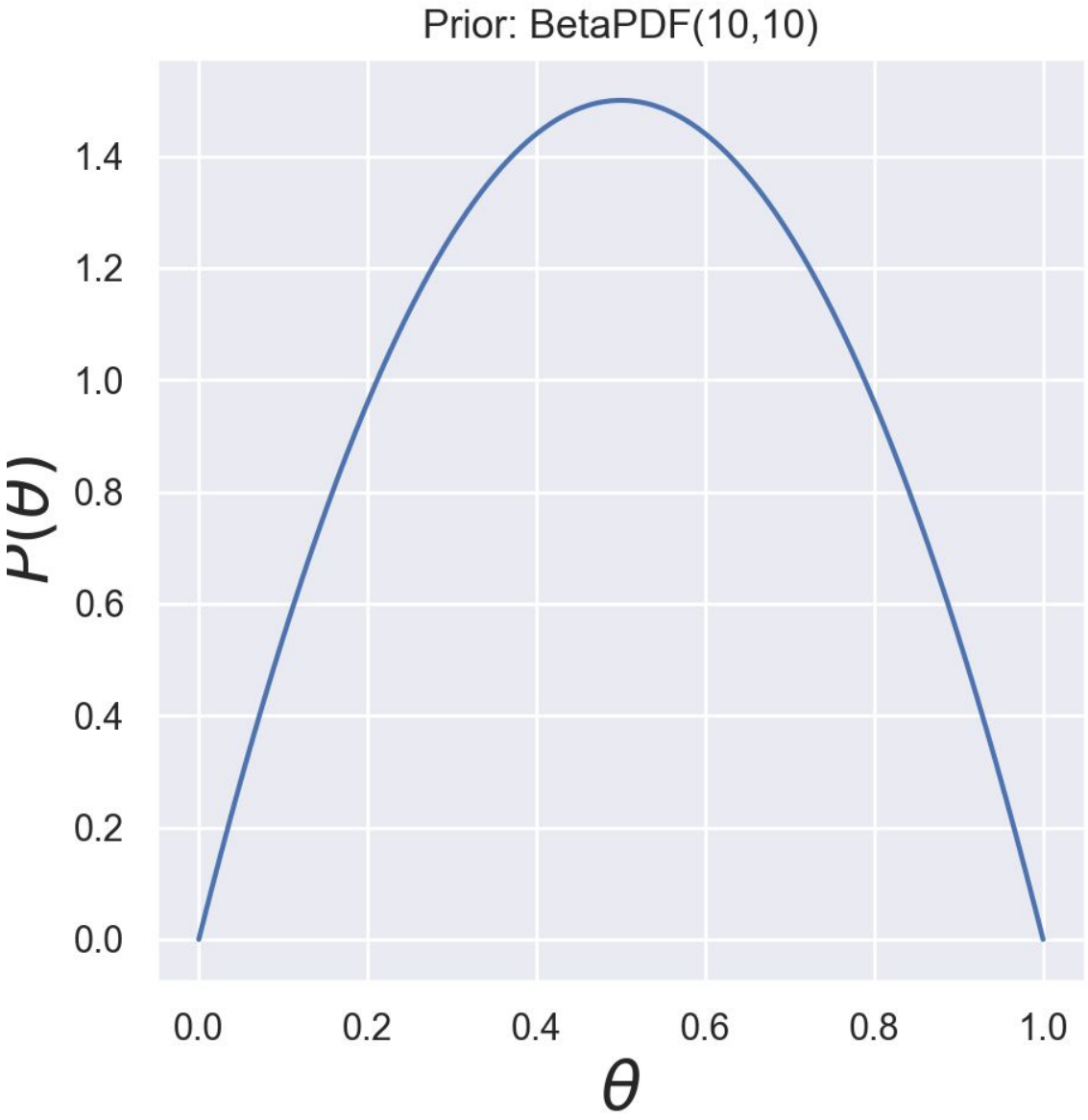
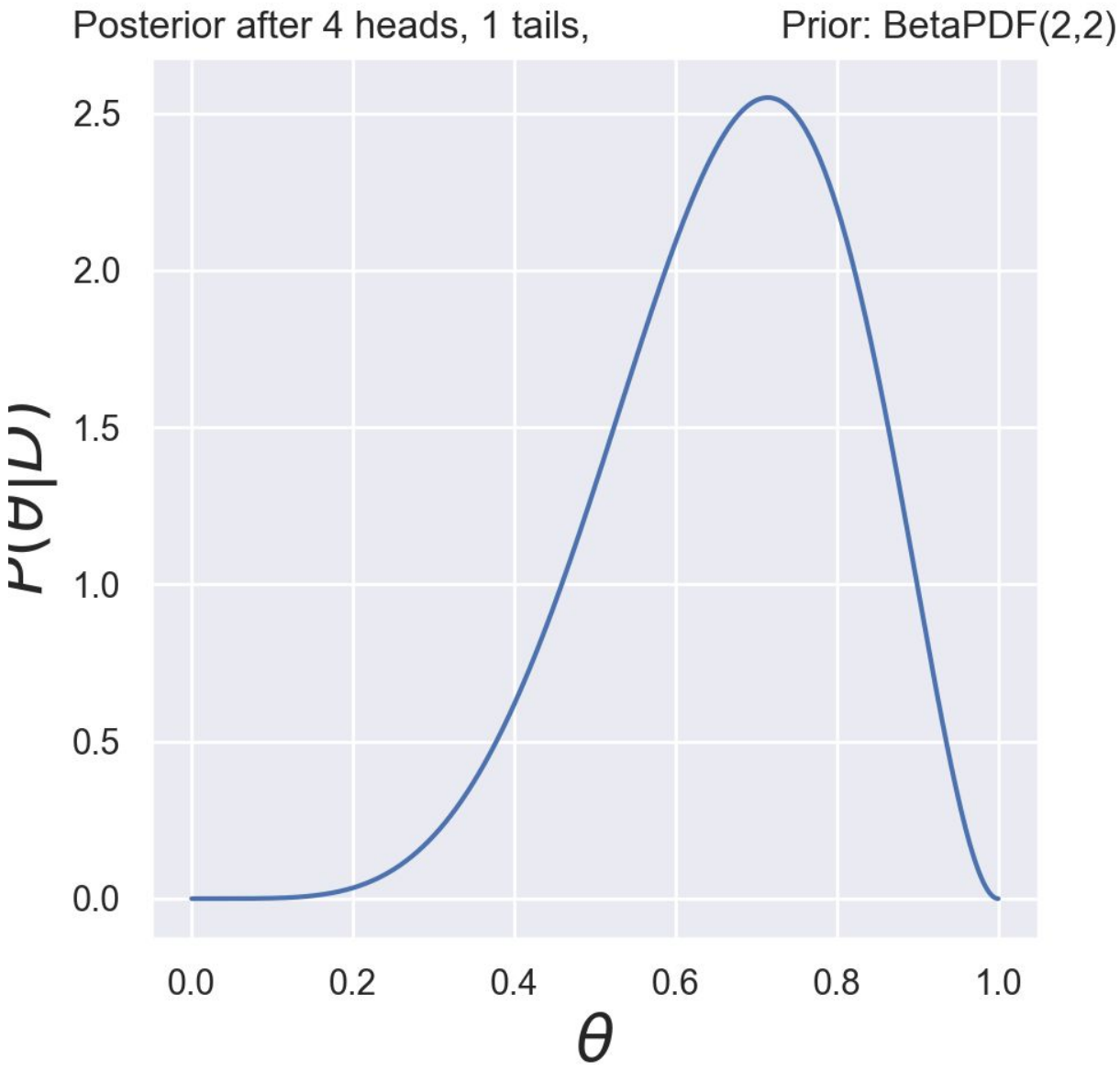
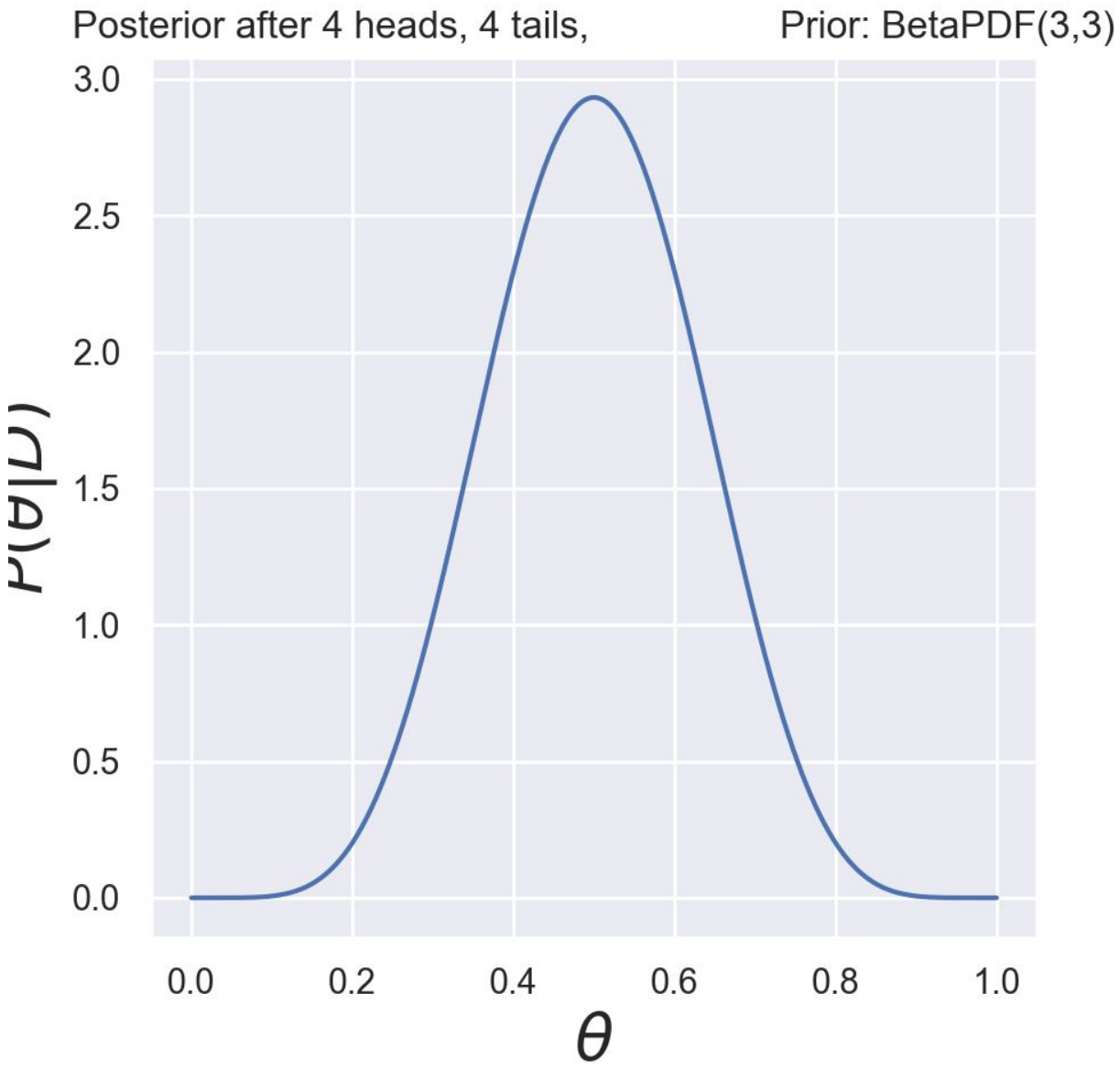
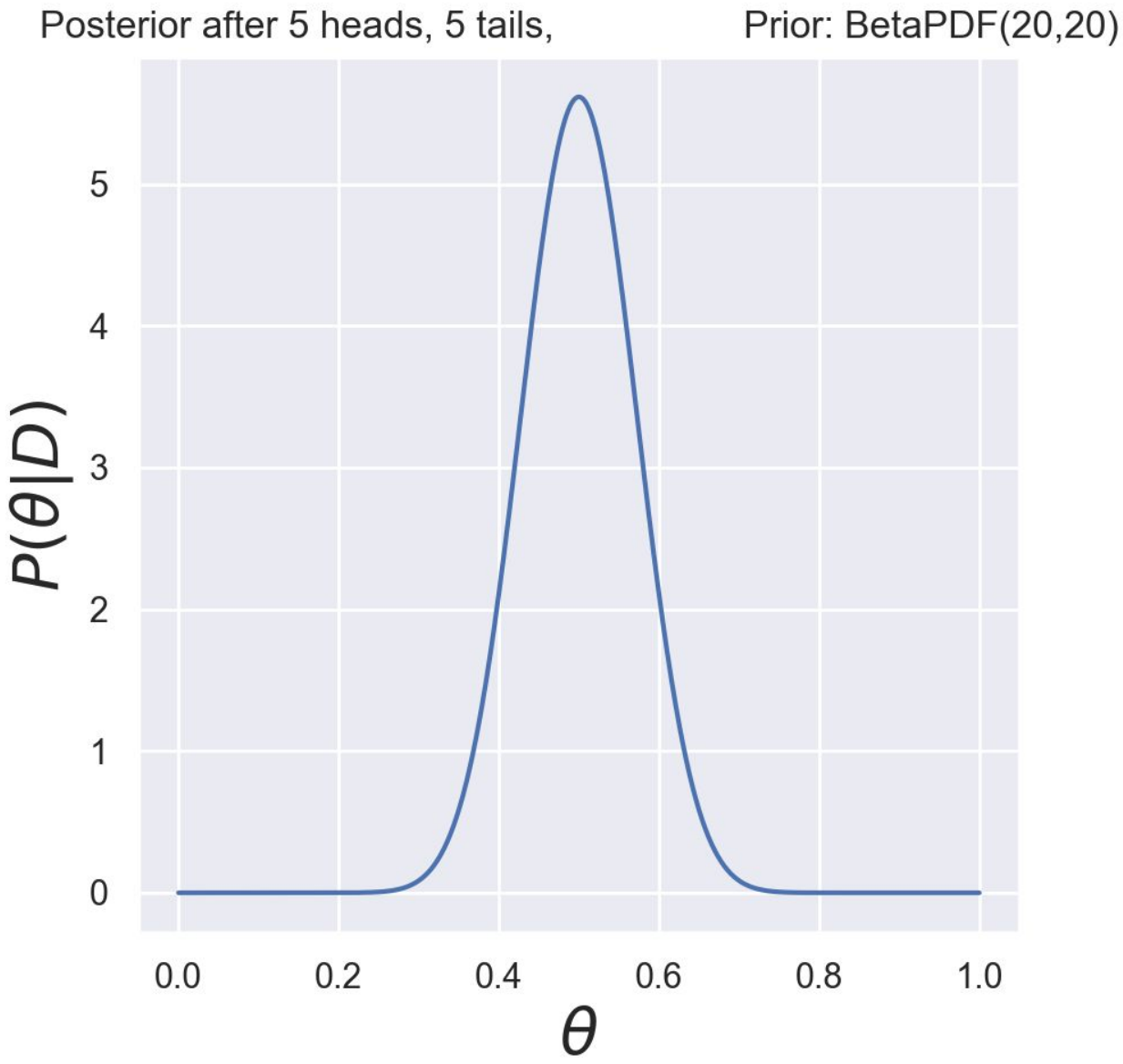

Prior: BetaPDF(2,2)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
P(θ)
0.0
0.2
0.4
0.6
0.8
1.0
θ


Prior: BetaPDF(3,3)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
P(θ)
0.0
0.2
0.4
0.6
0.8
1.0
θ

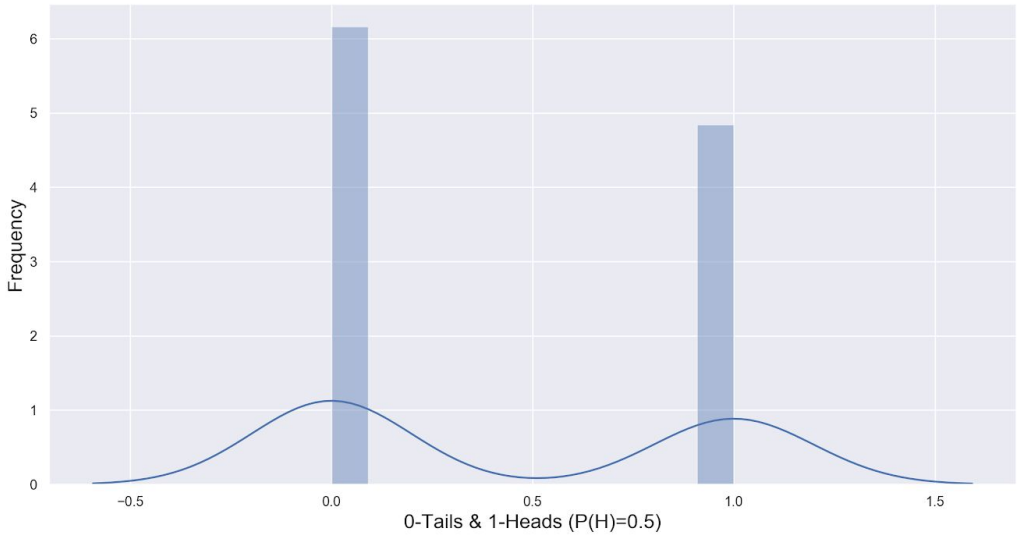

Prior: BetaPDF(10,10)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
P(θ)
0.0
0.2
0.4
0.6
0.8
1.0
θ

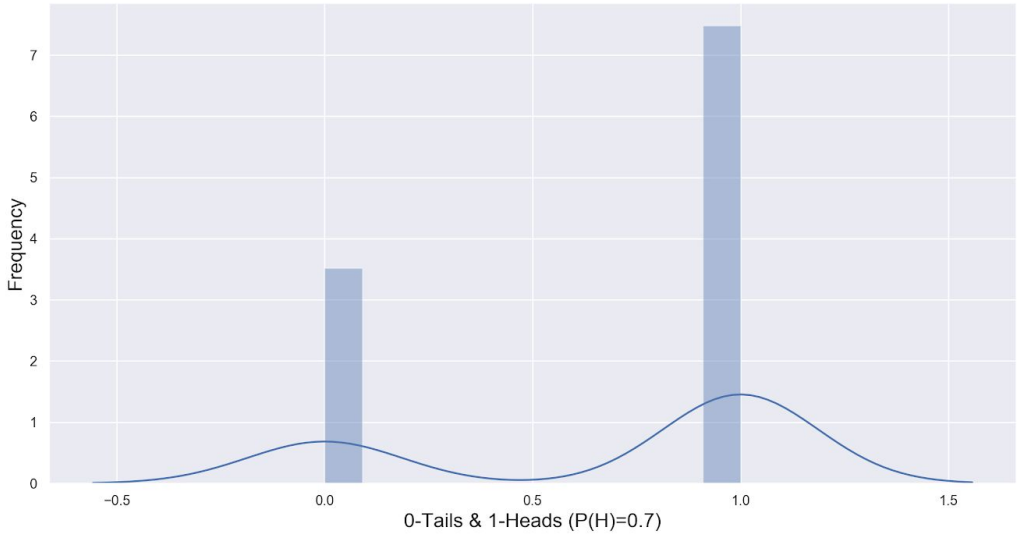

Posterior after 4 heads, 1 tails,
Prior: BetaPDF(2,2)
2.5
2.0
1.5
1.0
0.5
0.0
P(θ|D)
0.0
0.2
0.4
0.6
0.8
1.0
θ

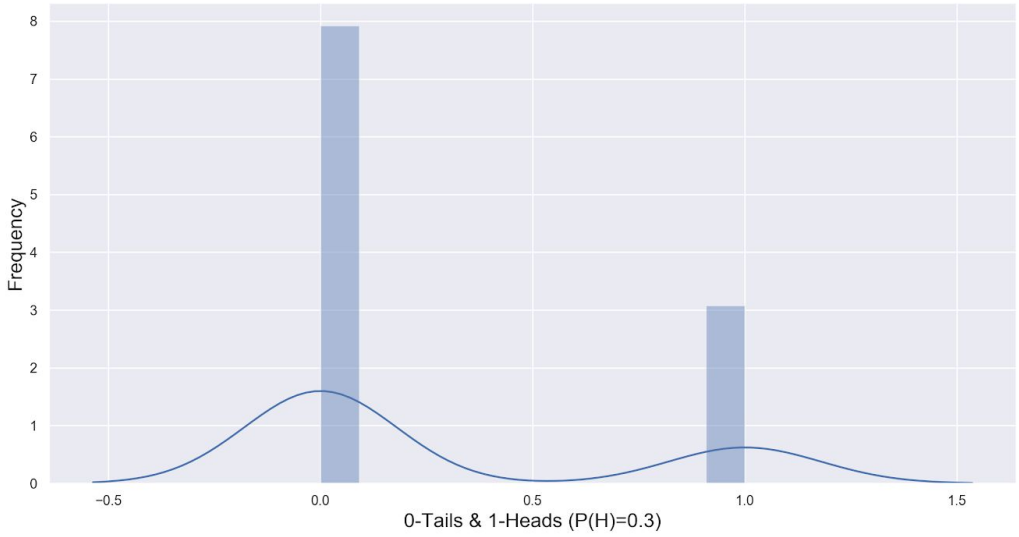

Posterior after 4 heads, 4 tails,
Prior: BetaPDF(3,3)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
P(θ|D)
0.0
0.2
0.4
0.6
0.8
1.0
θ


Posterior after 5 heads, 5 tails,
Prior: BetaPDF(20,20)
$P(\theta|D)$
0
1
2
3
4
5
0.0
0.2
0.4
0.6
0.8
1.0
θ

Likelihood With Different Parameters







Predictive Posterior:

Predictive Posterior for the given Sequence is:

predictive_posterior = (nh+alpha)/(nh+alpha+bta+nt)=⅔

Model Comparison:

We denote simple model where P(H)=0.5

Marginal Likelihood will be:

P(D|0.5) = ((0.5)^3)*(0.5^1)=1/16

For complex model where prior is Beta(2,2), Marginal Likelihood will be:

$$(\Gamma 4/(\Gamma 2 * \Gamma 2)) \int_0^1 \theta^4 (1-\theta)^2 d\theta$$

$$= (\Gamma 4/(\Gamma 2 * \Gamma 2)) * ((\Gamma(5+3)/(\Gamma 5 * \Gamma 3)))$$

= 0.0571

From these results I observed that simple model would be better than complex one.
I enclosed my code of model comparison also.