

Math642_HW11_FyonaSun

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Problem 1.

```
source("DBDA2E-utilities.R") # Load definitions of graphics functions etc.
```

```
##
## *****
## Kruschke, J. K. (2015). Doing Bayesian Data Analysis, Second Edition:
## A Tutorial with R, JAGS, and Stan. Academic Press / Elsevier.
## *****

## Loading required package: coda

## Error : package or namespace load failed for 'rjags':
## .onLoad failed in loadNamespace() for 'rjags', details:
## call: dyn.load(file, DLLpath = DLLpath, ...)
## error: unable to load shared object '/Library/Frameworks/R.framework/Versions/3.6/Resources/library/
## dlopen(/Library/Frameworks/R.framework/Versions/3.6/Resources/library/rjags/libs/rjags.so, 10): Li
## Referenced from: /Library/Frameworks/R.framework/Versions/3.6/Resources/library/rjags/libs/rjags.s
## Reason: image not found
```

```
source("BernBeta.R")

# Specify the prior:
t = 0.75 # Specify the prior MODE.
n = 25 # Specify the effective prior sample size.
a = t*(n-2) + 1 # Convert to beta shape parameter a.
b = (1-t)*(n-2) + 1 # Convert to beta shape parameter b.

Prior = c(a,b) # Specify Prior as vector with the two shape parameters.

# Specify the data:
N = 25 # The total number of flips.
z = 1 # The number of heads.
Data = c(rep(0,N-z),rep(1,z)) # Convert N and z into vector of 0's and 1's.
#
# openGraph(width=5,height=7)
# posterior = BernBeta( priorBetaAB=Prior, Data=Data , plotType="Bars" ,
# showCentTend="Mode" , showHDI=TRUE , showpD=FALSE )
# saveGraph(file="BernBetaExample",type="png")
```

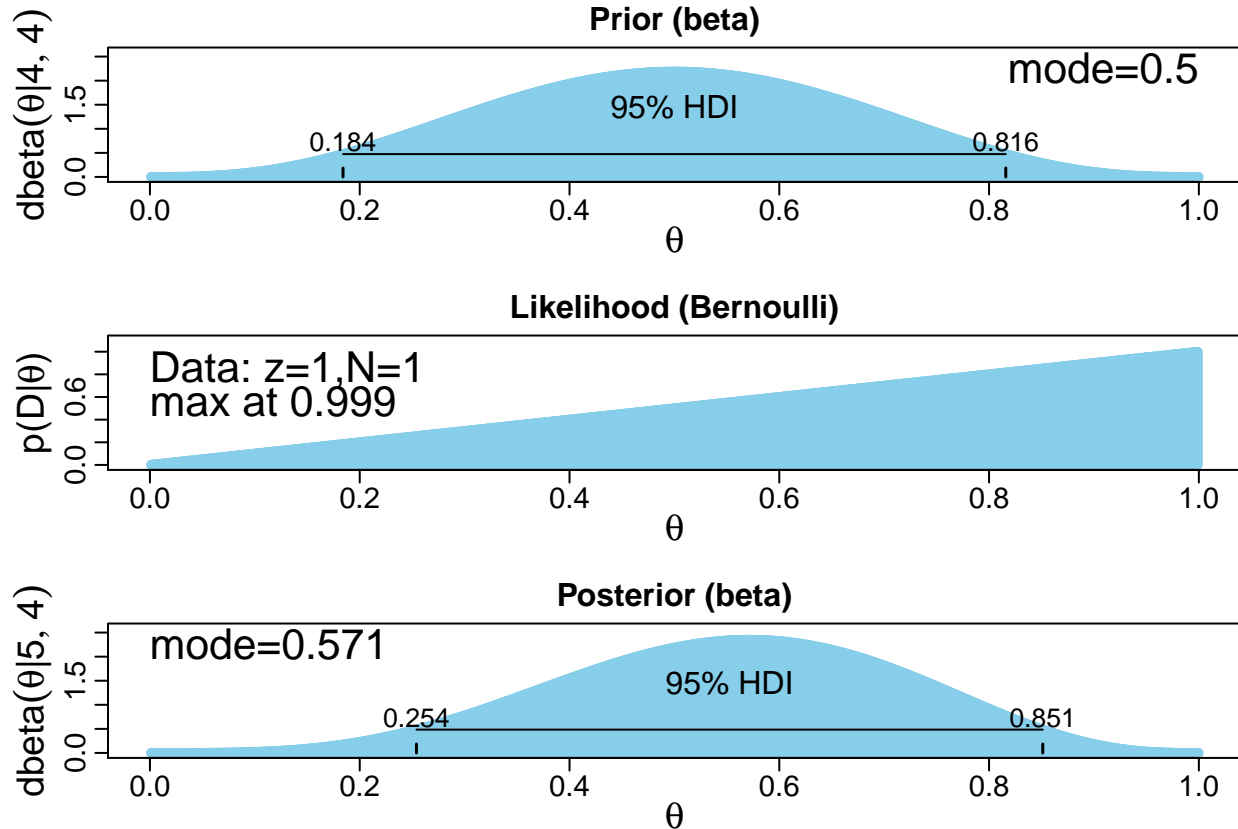
- a) What are the inputs and outputs for BernBeta? Explain what they mean . Input of BernBeta is prior of a beta distribution and new observations. priorBetaAB is two-element vector of beta distribution $B(a,b)$. Data is vector of 0's and 1's. z is the number of observed heads from the data and N is the

total number of trials from the data.

The output is a two-element vector that gives posterior beta parameters

- b) Start with a prior of $\text{beta}(4,4)$. Use the `BernBeta` function to flip the coin once and get a head. What is the posterior? Show all plots and explain results.

```
BernBeta(priorBetaAB = c(4, 4), Data = c(1), plotType="Bars", showCentTend="Mode" , showHDI=TRUE , show
```

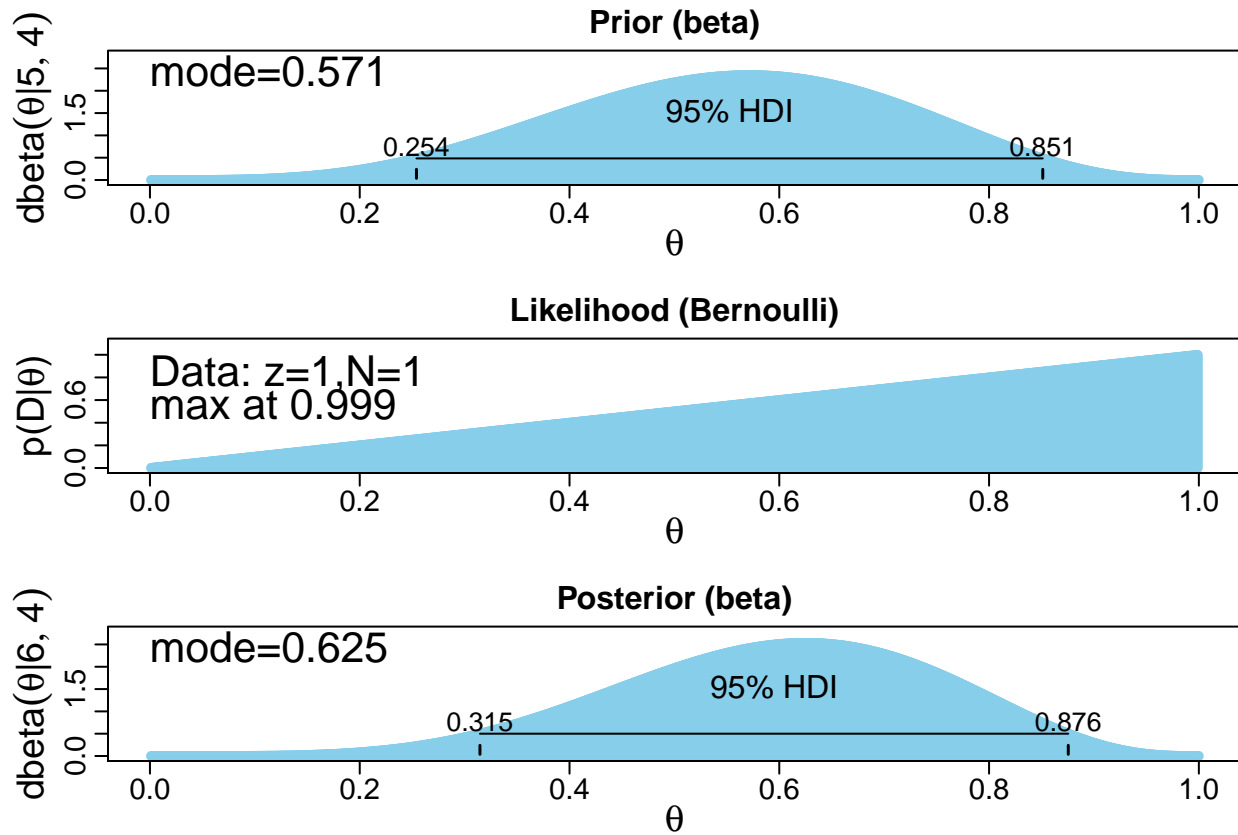


```
## [1] 5 4
```

The posterior is $B(5,4)$. The observed head shifts the prior distribution slightly to the right. The Posterior is a compromise between our prior beliefs and a single data point observed.

- c) Use the posterior from the previous flip as the prior for the next flip. (You can use the result from the last run - "post" - instead of $c(5,4)$ as the input the `BernBeta`.) Flip the coin again and get a head again. What is the new posterior?

```
BernBeta(priorBetaAB = c(5, 4), Data = c(1), plotType="Bars", showCentTend="Mode" , showHDI=TRUE , show
```

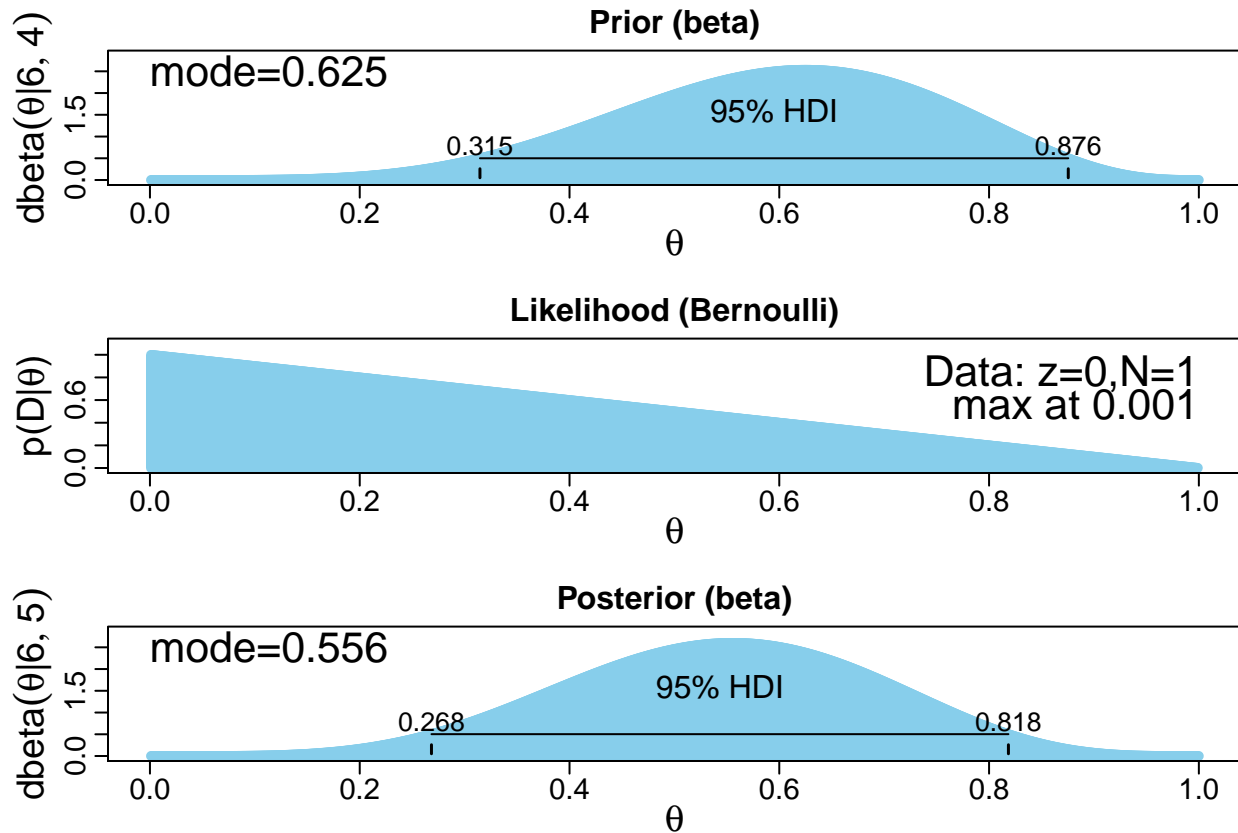


```
## [1] 6 4
```

The new posterior is $B(6,4)$.

d) Using the posterior from the last flip, flip again and get tails. What is the new posterior?

```
BernBeta(priorBetaAB = c(6, 4), Data = c(0), plotType="Bars", showCentTend="Mode", showHDI=TRUE, show
```



```
## [1] 6 5
```

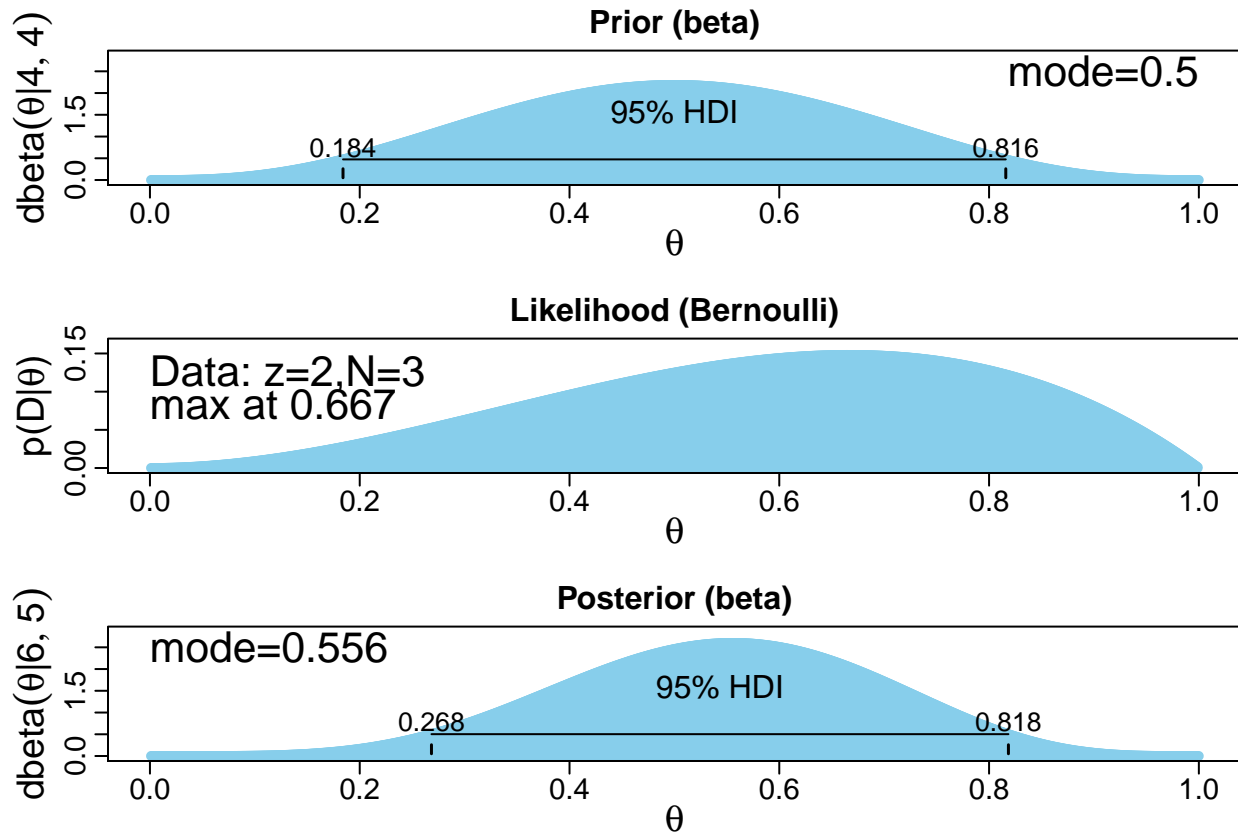
The new posterior is B(6,5).

- e) Start over at b) and do three flips, but in the order T, H, H. Show the posterior after these 3 flips. How does the posterior change? Does order of the results matter?

```
BernBeta(priorBetaAB = c(4, 4), Data = c(0,1,1), plotType="Bars", showCentTend="Mode", showHDI=TRUE, s
```

```
## [1] 6 5
```

```
BernBeta(priorBetaAB = c(4, 4), Data = c(1,0,1), plotType="Bars", showCentTend="Mode", showHDI=TRUE, s
```



```
## [1] 6 5
```

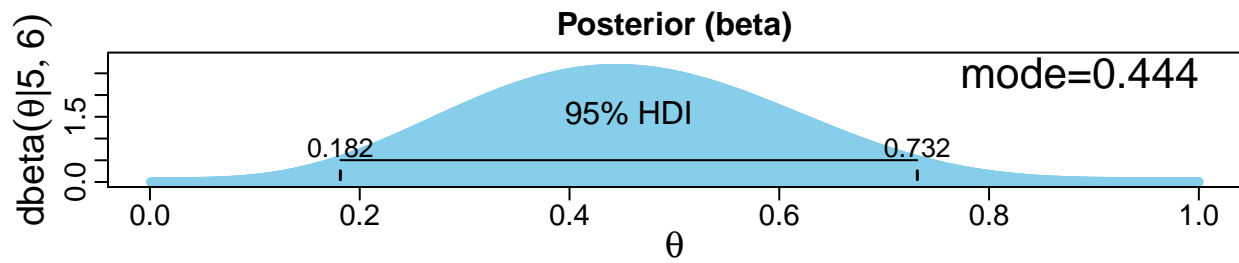
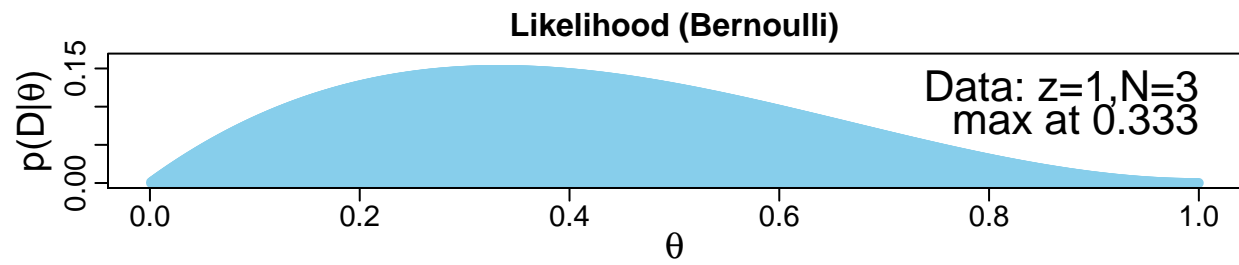
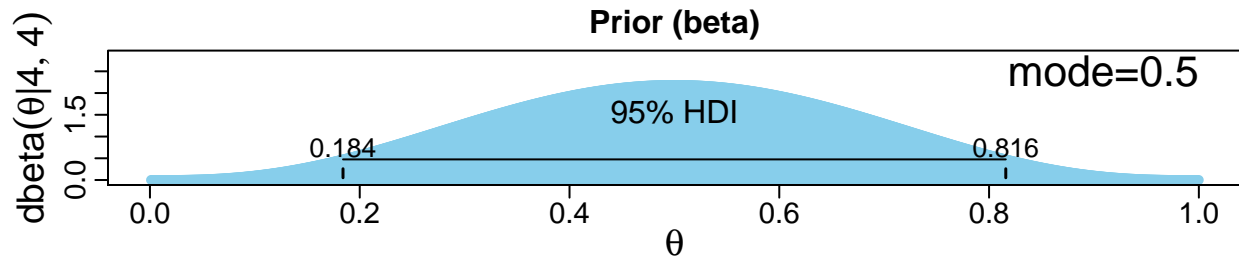
```
BernBeta(priorBetaAB = c(4, 4), Data = c(1,1,0), plotType="Bars", showCentTend="Mode", showHDI=TRUE, s
```

```
## [1] 6 5
```

We get the same final posterior form as before regardless of ordering of the 3 coin tosses. The posterior distribution is $B(6,5)$

- f) Start over at b) and do three flips, but in the order T, T, H. Show the posterior after these 3 flips. How does the posterior change?

```
BernBeta(priorBetaAB = c(4, 4), Data = c(0,0,1), plotType="Bars", showCentTend="Mode", showHDI=TRUE, s
```



```
## [1] 5 6
```

The posterior distribution is $B(5,6)$