[ESC] Bayes Week2 HW

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2021 1 13

Bayesian Data Analysis

```
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 3.6.3
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.0 --
```

```
## v ggplot2 3.3.3     v purrr   0.3.4
## v tibble  3.0.4     v dplyr   1.0.2
## v tidyr   1.1.2     v stringr 1.4.0
## v readr   1.4.0     v forcats 0.5.0
```

```
## Warning: package 'ggplot2' was built under R version 3.6.3
```

```
## Warning: package 'tibble' was built under R version 3.6.3
```

```
## Warning: package 'tidyr' was built under R version 3.6.3
```

```
## Warning: package 'readr' was built under R version 3.6.3
```

```
## Warning: package 'purrr' was built under R version 3.6.3
```

```
## Warning: package 'dplyr' was built under R version 3.6.3
```

```
## Warning: package 'forcats' was built under R version 3.6.3
```

```
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     combine
```

2.11

```
p1 <- data.frame(x=rep(seq(0, 100, 0.1),5)) %>%
  mutate(y=rep(c(43,44,45,46.5,47.5),each=1001),
         pdf=dcauchy(y, location=x, scale=1)) %>%
  group_by(x) %>%
  summarise(dense=prod(pdf)) %>%
  ggplot(aes(x=x, y=dense)) + geom_line() +
  ggtitle("Unnormalized Density")
```

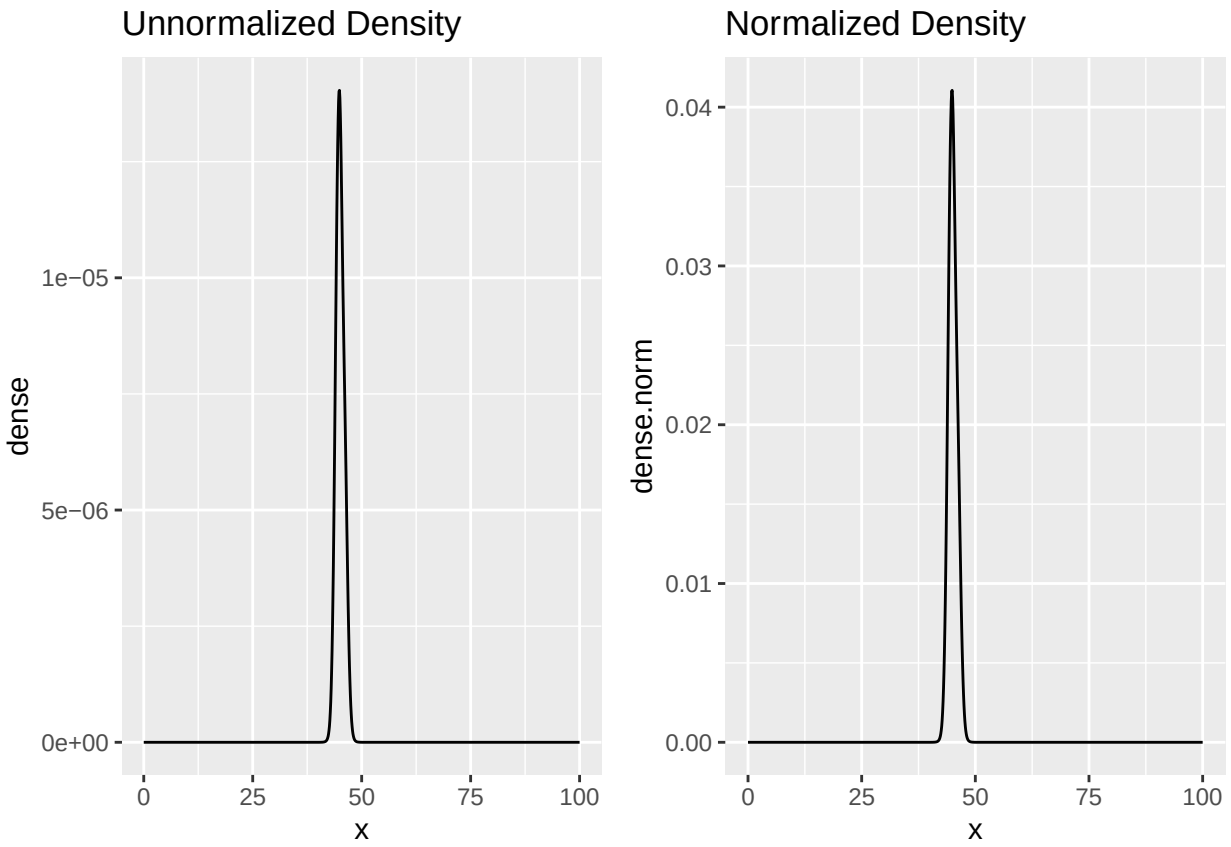
(a)

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
p2 <- data.frame(x=rep(seq(0, 100, 0.1),5)) %>%
  mutate(y=rep(c(43,44,45,46.5,47.5),each=1001),
         pdf=dcauchy(y, location=x, scale=1)) %>%
  group_by(x) %>%
  summarise(dense.unnorm=prod(pdf)) %>%
  mutate(dense.norm = dense.unnorm/sum(dense.unnorm)) %>%
  ggplot(aes(x=x, y=dense.norm)) + geom_line() +
  ggtitle("Normalized Density")
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
grid.arrange(p1, p2, ncol=2)
```

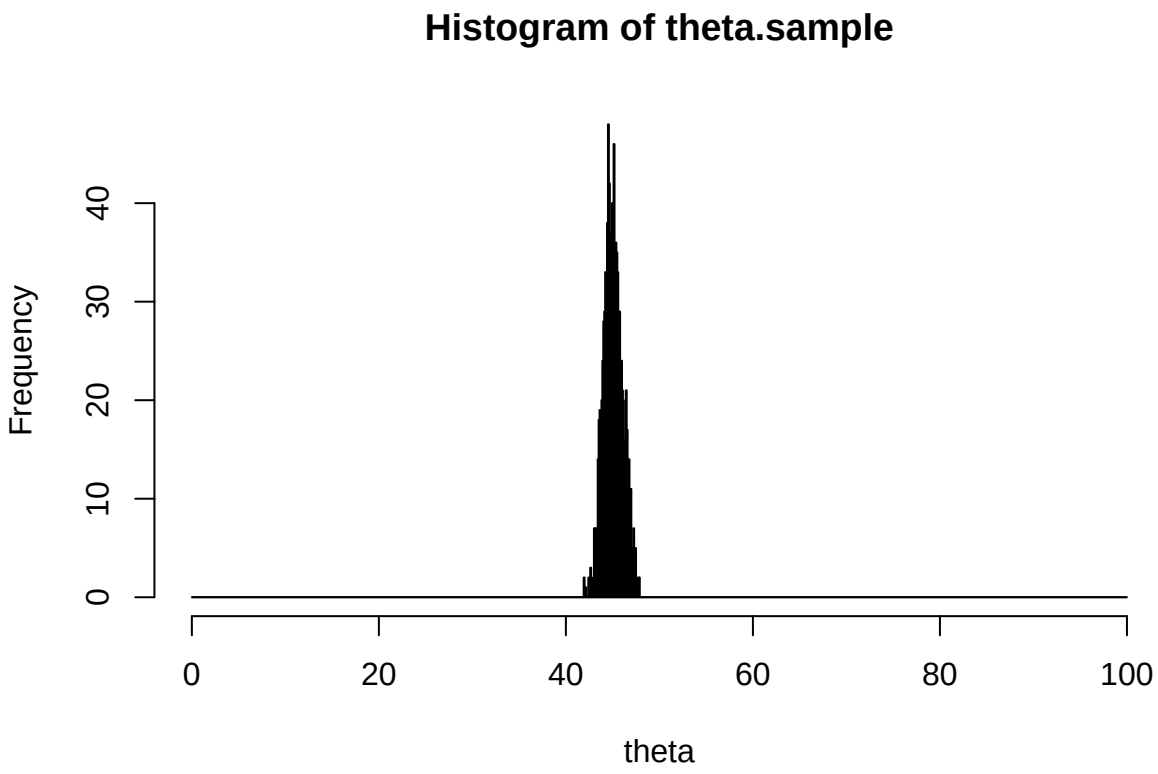



```
df <- data.frame(x=rep(seq(0, 100, 0.1),5)) %>%
  mutate(y=rep(c(43,44,45,46.5,47.5),each=1001),
         pdf=dcauchy(y, location=x, scale=1)) %>%
  group_by(x) %>%
  summarise(dense.unnorm=prod(pdf)) %>%
  mutate(dense.norm = dense.unnorm/sum(dense.unnorm))
```

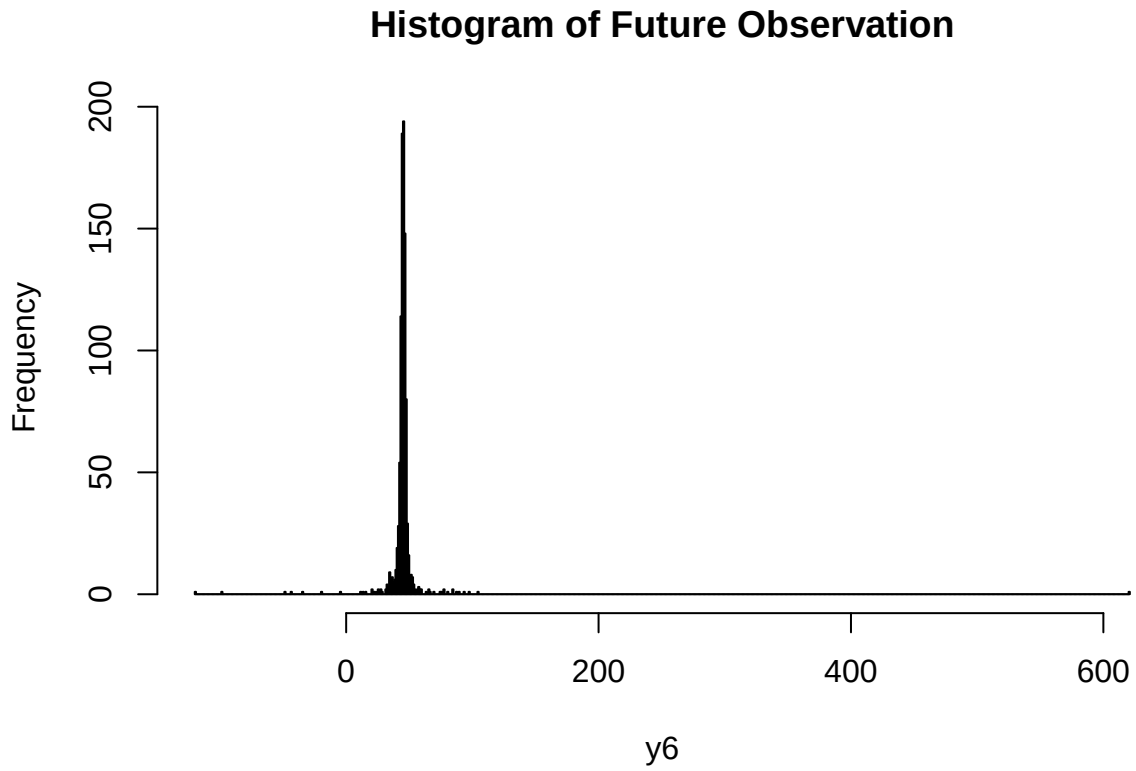
(b)

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
theta.sample <- sample(df$x, size=1000, prob=df$dense.norm, replace=TRUE)
hist(theta.sample, xlab='theta', breaks=seq(0,100,0.1))
```




```
y6 <- rcauchy(1000, theta.sample, 1)
hist(y6, nclass=1000, main='Histogram of Future Observation')
```



(c)

Code Home Work