Statistical Inference Simulation Project

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1.Simulation exercises.

```
lambda = 0.2
n = 40
nsims = 1:1000
set.seed(820)
means <- data.frame(x = sapply(nsims, function(x) {mean(rexp(n, lambda))}))
head(means)
```

```
##       x
## 1 5.750
## 2 3.808
## 3 4.058
## 4 3.999
## 5 4.313
## 6 4.418
```

2. Basic inferential data analysis

```
mean(means$x)
```

```
## [1] 4.999
```

```
#Expected mean
1/0.2
```

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

```
# SD of our simulation
sd(means$x)
```

```
## [1] 0.7909
```

```
#(1/lambda)/sqrt(40) SD expected
(1/lambda)/sqrt(40)
```

```
## [1] 0.7906
```

```
# Variance of our simulations
var(means$x)
```

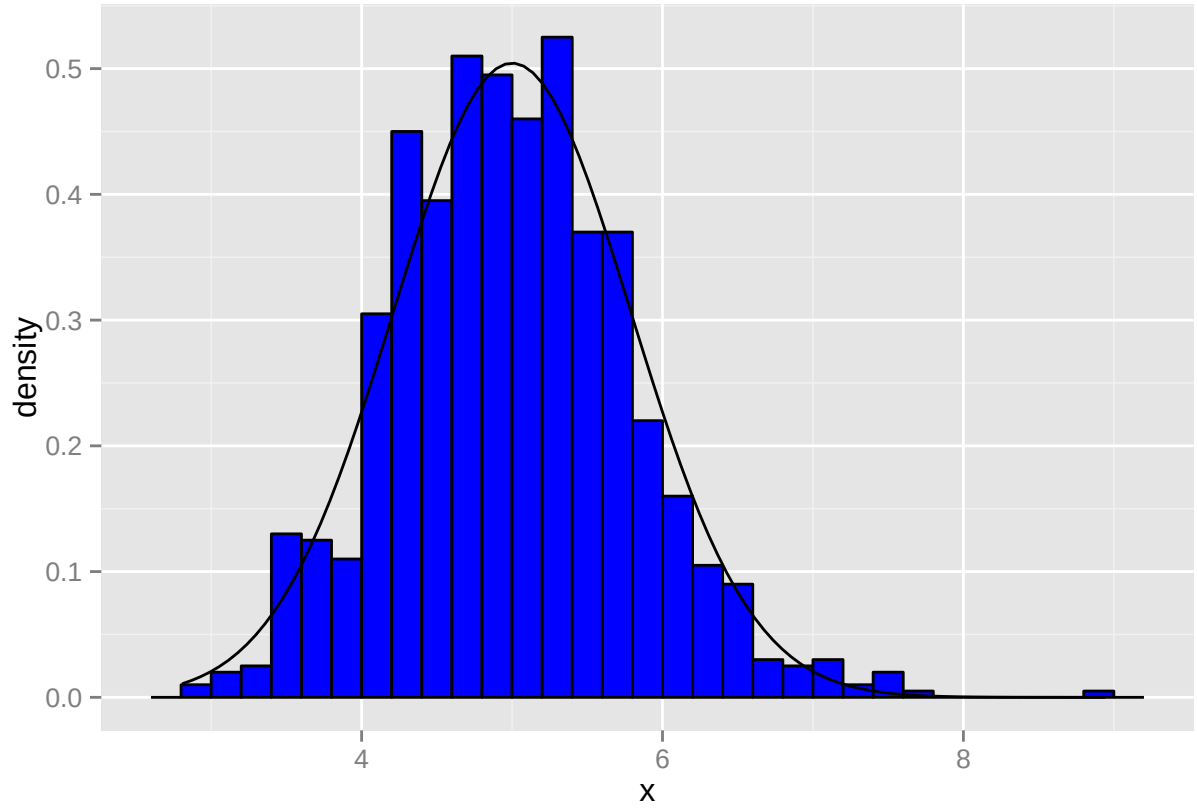
```
## [1] 0.6256
```

```r
# Variance expected
((1/lambda)/sqrt(40))^2
```

```
## [1] 0.625
```

3. Plot to Show that the distribution is approximately normal

```r
library(ggplot2)
ggplot(data = means, aes(x = x)) +
    geom_histogram(aes(y=..density..), fill = I('blue'),
                   binwidth = 0.20, color = I('black')) +
    stat_function(fun = dnorm, arg = list(mean = 5, sd = sd(means$x)))
```



Evaluate the coverage of the confidence interval for 1/lambda: $\bar{X} \pm 1.96 Sn???$.

```r
mean(means$x) + c(-1,1)*1.96*sd(means$x)/sqrt(nrow(means))
```

```
## [1] 4.950 5.048
```