Sampling Importance Resampling Algo

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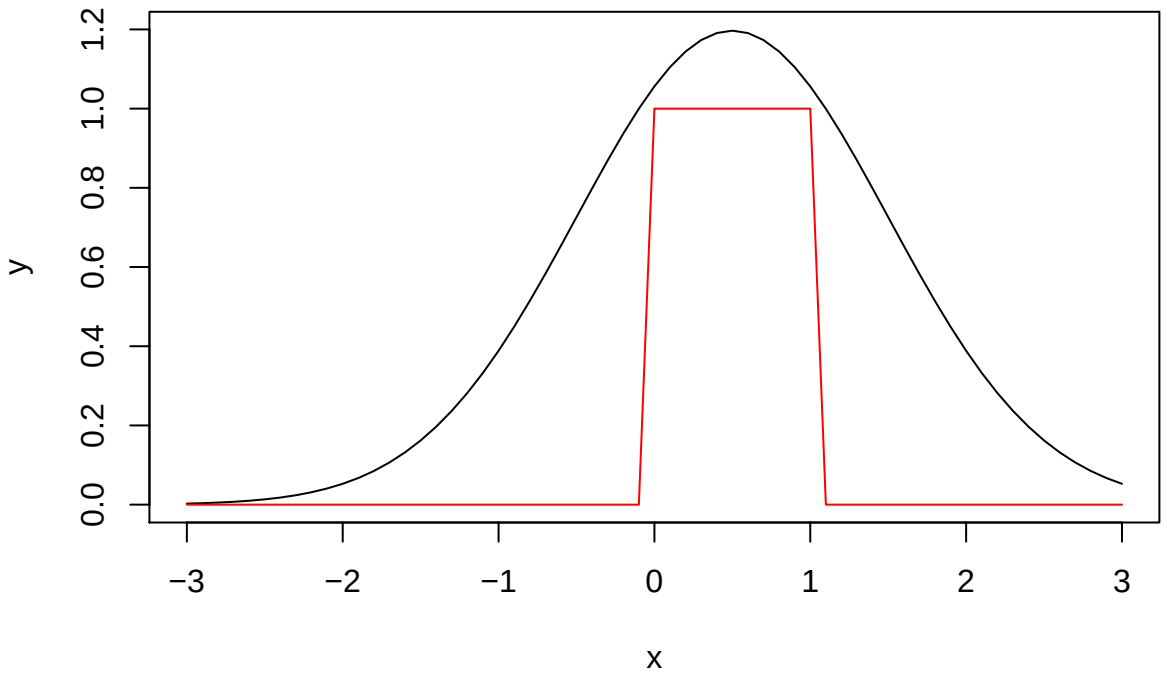
SIR Algo See 6.3.1 Computational Statistics Givens Hoeting 0. Goal: Want samples from f 1. Sample from envelope g 2. Compute weights = density(f)/density(g) for all samples 3. normalize weights 4. Resample from g with replacement, with prob = weights.

```
#Step 0, 1. Just show f & the envelope g. Make sure g encloses f
# Want samples from f = U[0,1]
# Will use g ~ 3*N(0.5,1)
x=seq(-3,3,0.1)
y=3*dnorm(x,0.5,1)
y2 = dunif(x,0,1)
plot(x,y,'l')
lines(x,y2,'l',col='red')
```



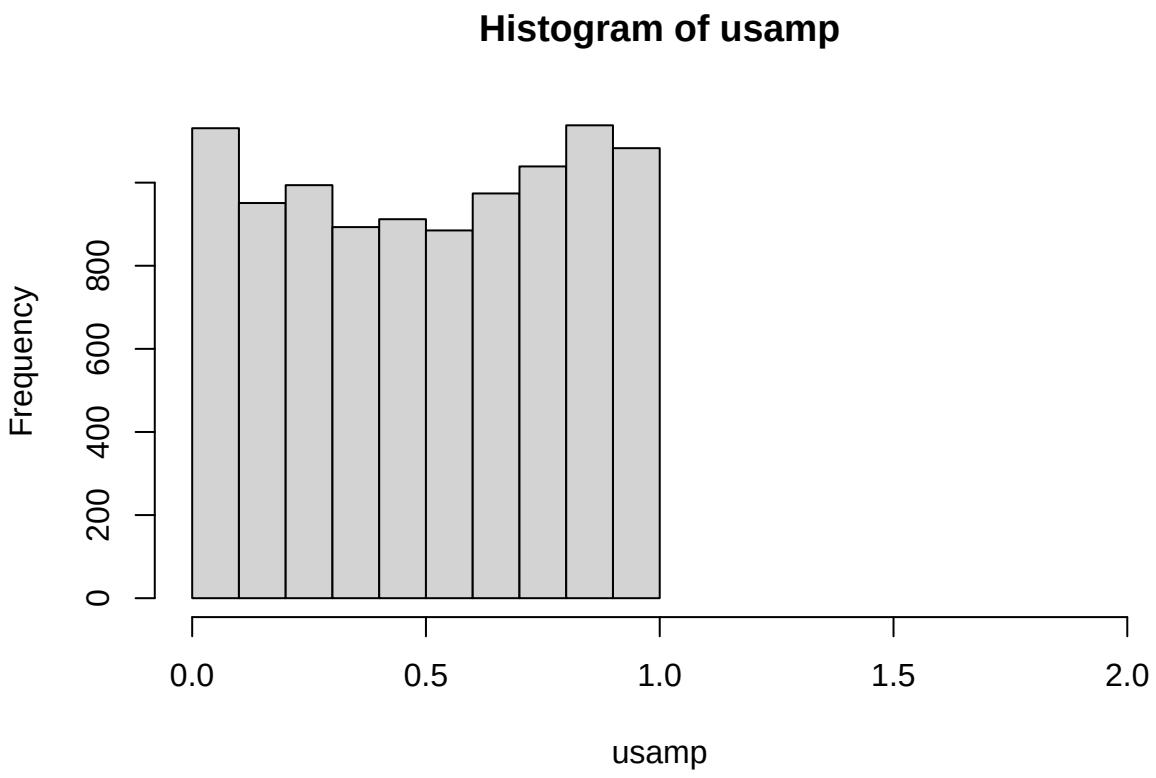

```
# Step 1-4
# sample from g
n = 10000
mu = 0.5
sd = 1
gsamp = 3*rnorm(n,mu,sd)
```

```r
# make f/g as weight
w=sapply(gsamp, function(i) { dunif(i,0,1)/dnorm(i,mu,sd) })

# normalize weights
W = sum(w)
w = w/W

# resample from g with replacement using w as probabilities
usamp<- sample(gsamp, n, replace=TRUE, prob=w)

# check histogram, moments
hist(usamp, xlim=c(0,2), breaks=10)
```




```r
summary(usamp)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.0006268 0.2502247 0.5153679 0.5071477 0.7799872 0.9976481
```

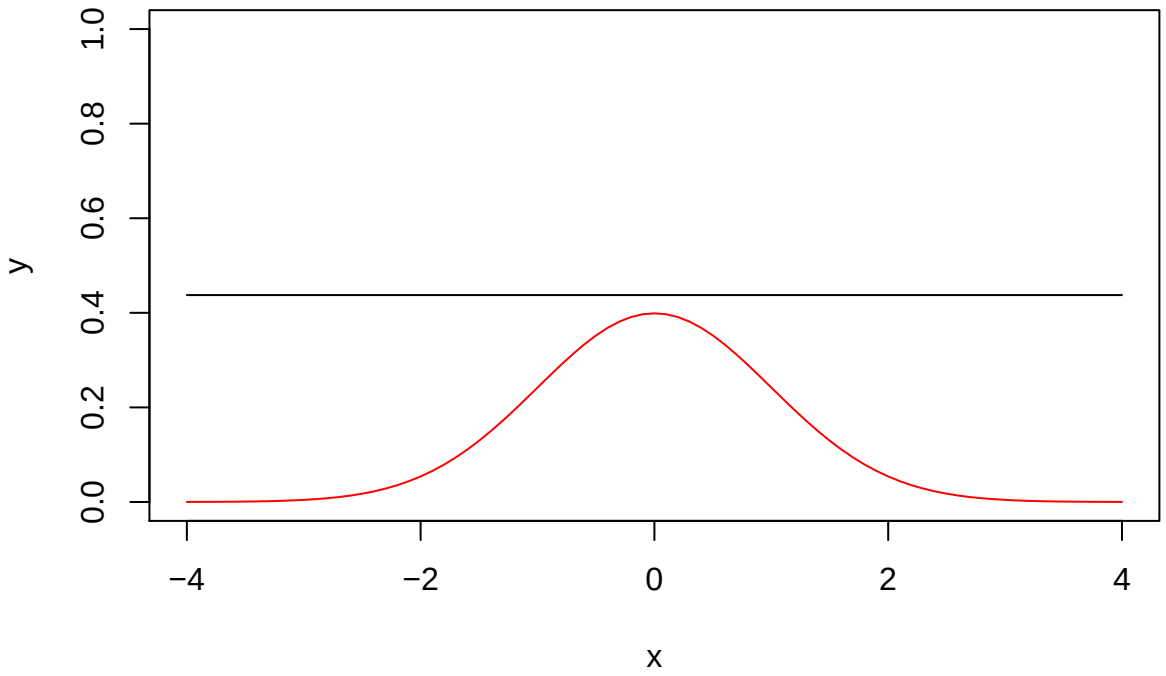
```r
print(paste("Sample variance: ", var(usamp)))
```

```
## [1] "Sample variance:  0.0892395157945148"
```

```r
print(paste("True variance of U[0,1] is 1/12", 1/12))
```

```
## [1] "True variance of U[0,1] is 1/12 0.0833333333333333"
```

```r
#Step 0, 1. Just show f & the envelope g. Make sure g encloses f
# Want samples from f = N(0,1)
# Will use g ~ U(-4,4)
x=seq(-4,4,0.1)
y=3.5*dunif(x,-4,4)
y2 = dnorm(x,0,1)
plot(x,y,'l', ylim=c(0,1), xlim=c(-4,4))
lines(x,y2,'l',col='red')
```



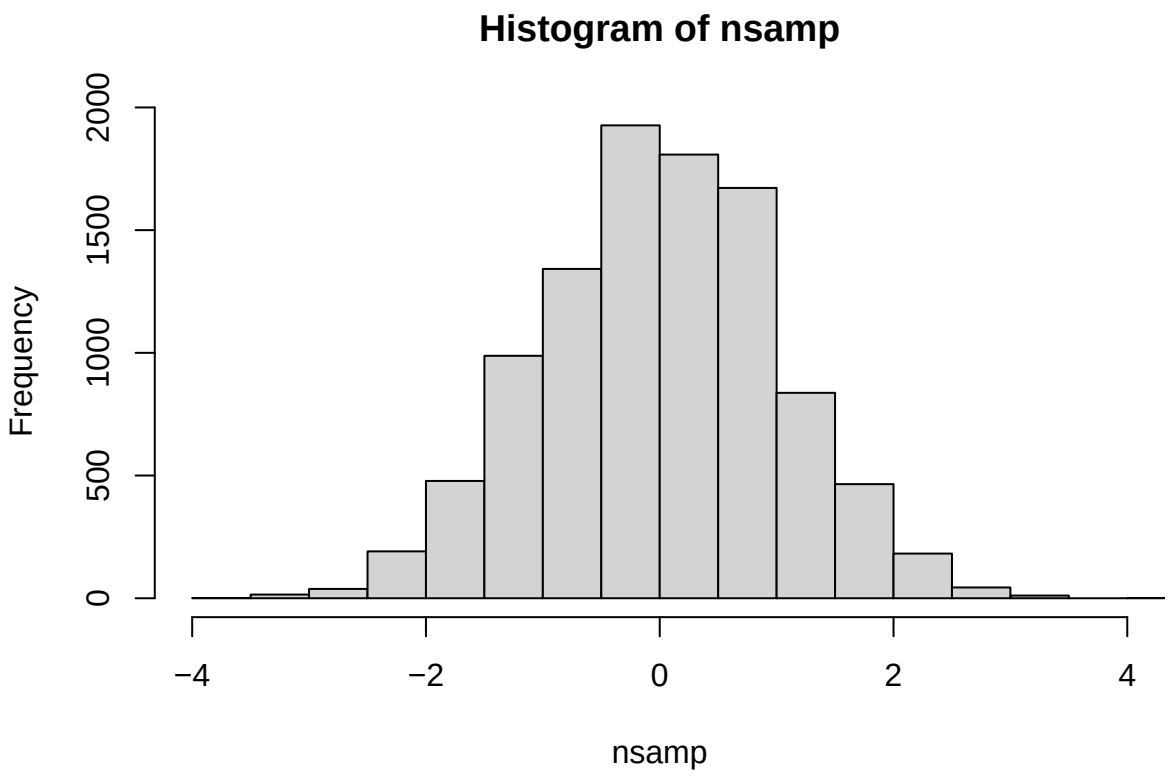

```r
# Step 1-4
# sample from g
n = 10000
mu = 0.5
sd = 1
gsamp = 3.5*runif(n,-4,4)

# make f/g as weight
w=sapply(gsamp, function(i) { dnorm(i,0,1)/dunif(i,-4*3.5,4*3.5) })

# normalize weights
W = sum(w)
w = w/W

# resample from g with replacement using w as probabilities
nsamp<- sample(gsamp, n, replace=TRUE, prob=w)

# check histogram, moments
hist(nsamp, xlim=c(-4,4))
```




```
summary(nsamp)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## -3.575558 -0.684005  0.002840 -0.003158  0.684106  4.025468
```

```
print(paste("Sample variance: ", var(nsamp)))
```

```
## [1] "Sample variance:  1.01925408595038"
```