9-1Rainy Day

Hao Li

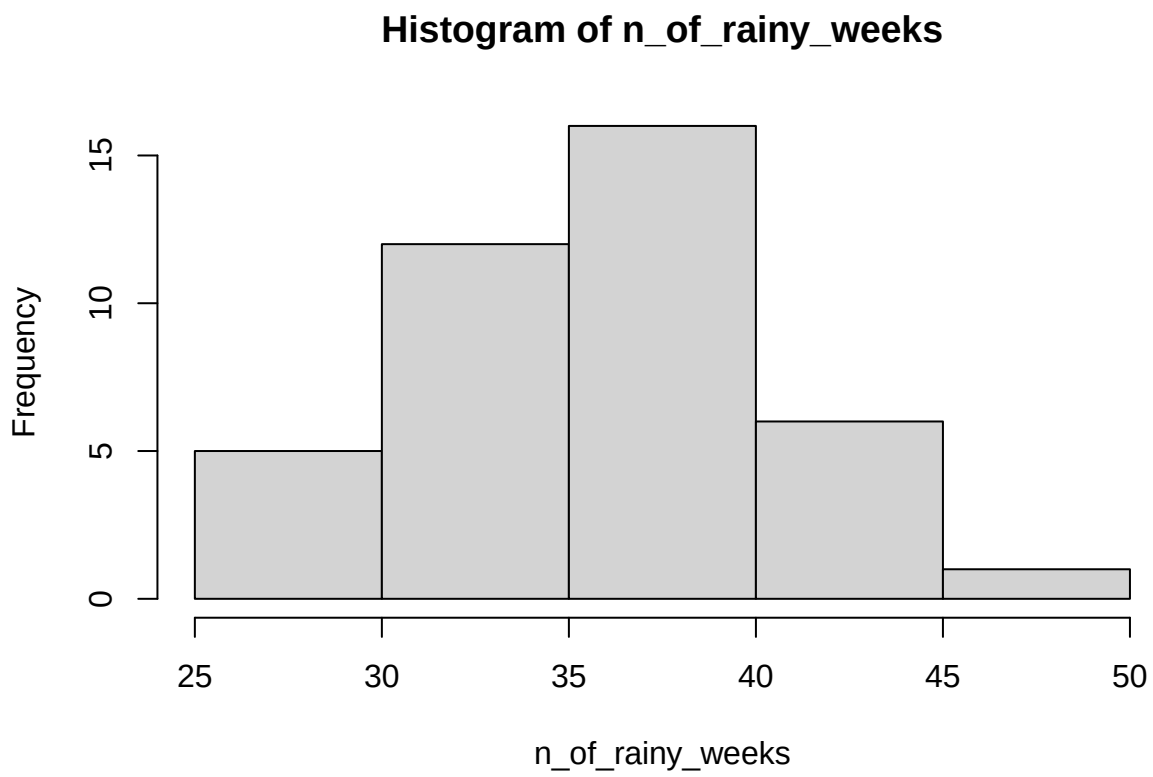
3/23/2021

```
#Added Mar 2021
#Rainy day problem
#different from the previous version
rainy_day = function(p){
  Y=0;C=0
  X = numeric(7)
  for(t in 1:7){
    if(runif(1)<p){
      X[t] = 1
    }else{
      X[t] = 0
    }
    if(X[t]==1){
      C=C+1
    }else{
      C = 0
    }
    if(C>=3) Y=1
  }
  return(Y)
}

rainy_day_rep = function(p,n){
  S = 0
  for(k in 1:n){
    Y = rainy_day(p)
    S = S+Y

  }
  return(S)
}

rainy_day_rep(p=.5,n=100)
```

```
## [1] 43
```

```
nrep = 40#repeat simulation
n_of_rainy_weeks = numeric(nrep)
for(i in 1:nrep) n_of_rainy_weeks[i] = rainy_day_rep(p=.5,n=100)
hist(n_of_rainy_weeks)#Compare this with Fig 9.4
```

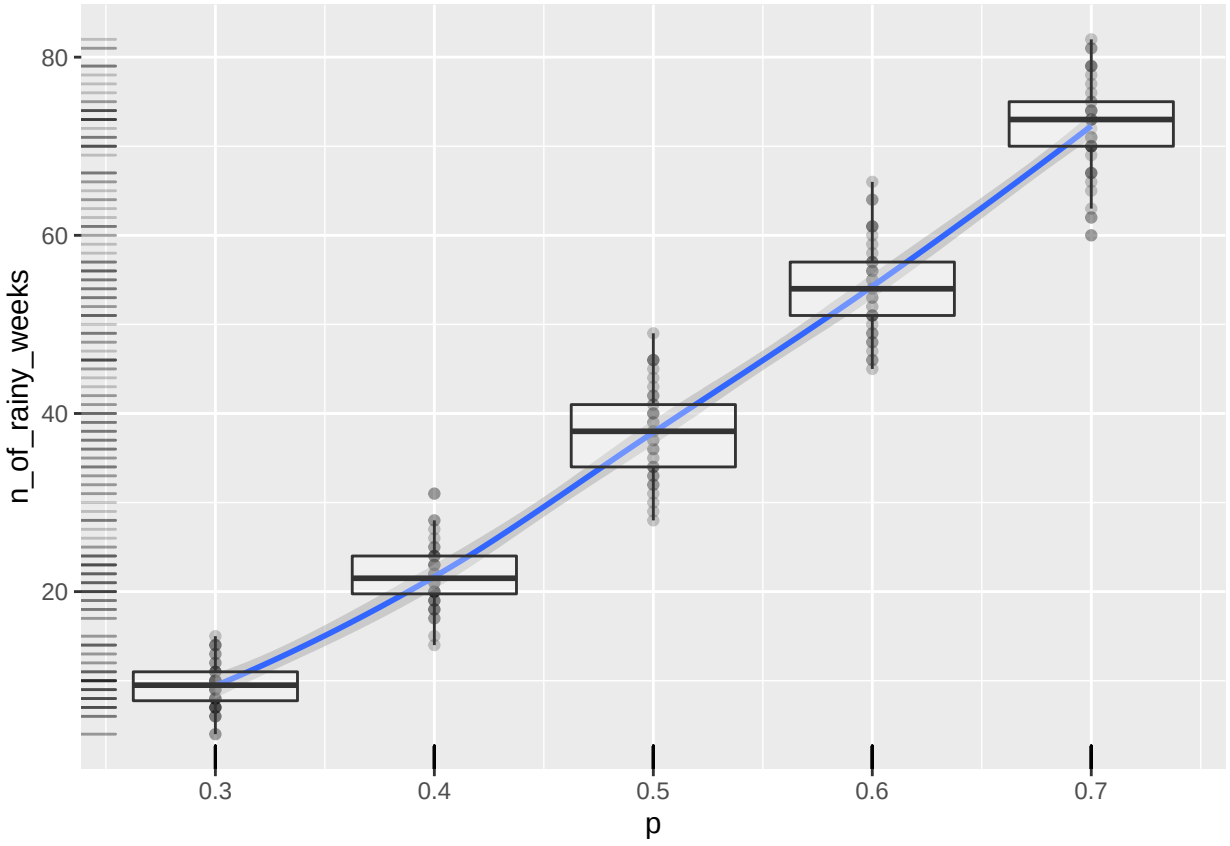
```r
#Sensitivity: yet, repeat 9.4 for different ps to get Fig 9.5

p = seq(from=.3,to=.7,by=.1)
p_s =NULL
n_of_rainy_weeks = NULL
for(i in seq_along(p)){
  for(j in 1:nrep){
  n_of_rainy_weeks = c(n_of_rainy_weeks,rainy_day_rep(p[i],100))
  p_s = c(p_s,p[i])
  }
}

df_sensitivity = data.frame(p = p_s,n_of_rainy_weeks = n_of_rainy_weeks)

library(ggplot2)
```



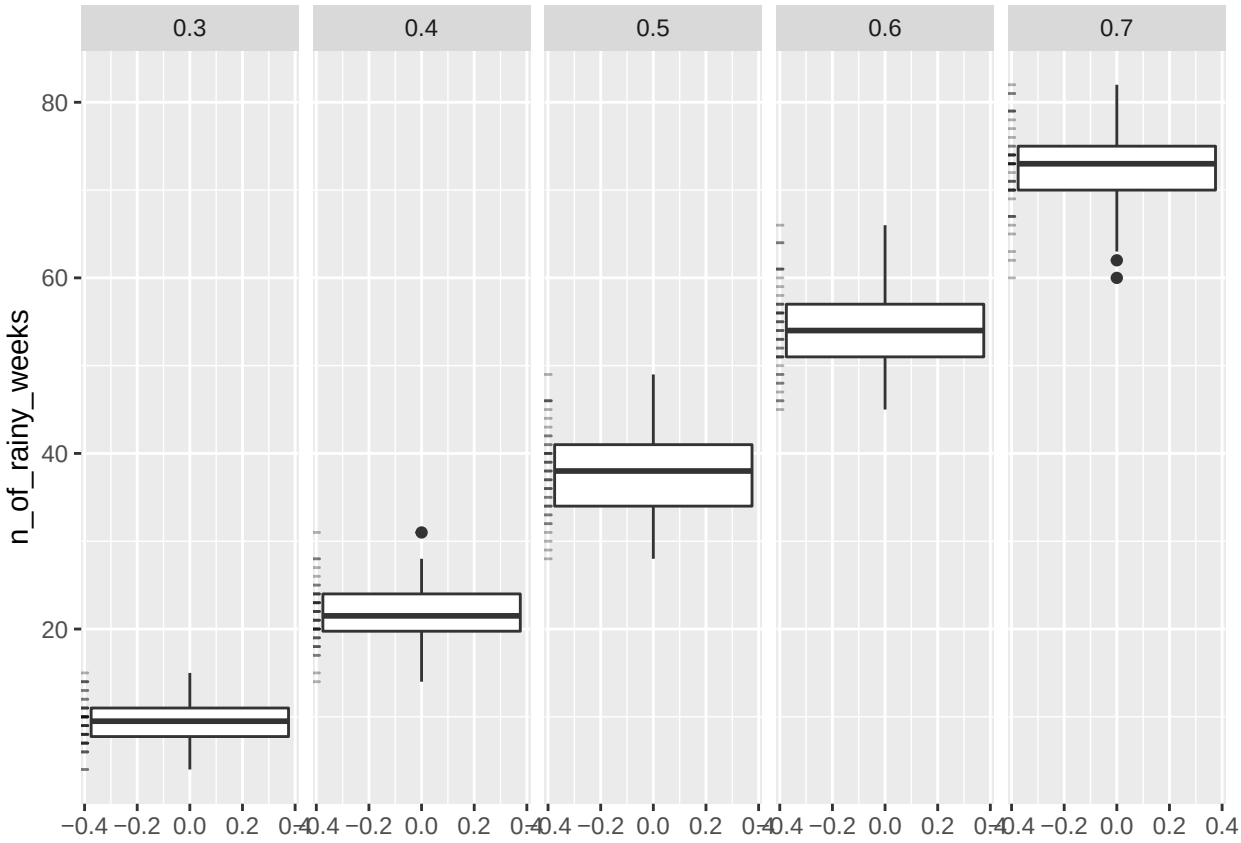

```r
g = ggplot(df_sensitivity,aes(x = p, y = n_of_rainy_weeks))

g+geom_point(alpha = .2)+geom_smooth()+geom_boxplot(aes(facet = factor(p)),alpha = .3)+geom_rug(alpha =
```

```
## Warning: Ignoring unknown aesthetics: facet
```

```
## `geom_smooth()` using method = 'loess' and formula 'y ~ x'
```




```
ggplot(df_sensitivity,aes(y = n_of_rainy_weeks)) + geom_boxplot() + facet_grid(.~factor(p)) +geom_rug(a
```


0.3
0.4
0.5
0.6
0.7
n_of_rainy_weeks
80
60
40
20
−0.4 −0.2 0.0 0.2 0.4