StatsLab

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Data Management

Loading data from current directory

```
data <- read.table("videodata.txt", header=TRUE)
data.population <- 314      # True population
data.samples <- 91          # Number of samples
head(data)
```

```
##   time like where freq busy educ sex age home math work own cdrom email
## 1  2.0    3     3    2    0    1   0  19    1    0   10   1     0     1
## 2  0.0    3     3    3    0    0   0  18    1    1    0   1     1     1
## 3  0.0    3     1    3    0    0   1  19    1    0    0   1     0     1
## 4  0.5    3     3    3    0    1   0  19    1    0    0   1     0     1
## 5  0.0    3     3    4    0    1   0  19    1    1    0   0     0     1
## 6  0.0    3     2    4    0    0   1  19    0    0   12   0     0     0
##   grade
## 1     4
## 2     2
## 3     3
## 4     3
## 5     3
## 6     3
```

```
summary(data)
```

```
##       time             like            where            freq
##  Min.   : 0.000   Min.   : 1.000   Min.   : 1.00   Min.   : 1.00
##  1st Qu.: 0.000   1st Qu.: 2.000   1st Qu.: 3.00   1st Qu.: 2.00
##  Median : 0.000   Median : 3.000   Median : 3.00   Median : 3.00
##  Mean   : 1.243   Mean   : 4.077   Mean   :21.97   Mean   :16.46
##  3rd Qu.: 1.250   3rd Qu.: 3.000   3rd Qu.: 5.00   3rd Qu.: 4.00
##  Max.   :30.000   Max.   :99.000   Max.   :99.00   Max.   :99.00
##       busy            educ             sex              age
##  Min.   : 0.00   Min.   : 0.00   Min.   :0.0000   Min.   :18.00
##  1st Qu.: 0.00   1st Qu.: 0.00   1st Qu.:0.0000   1st Qu.:19.00
##  Median : 0.00   Median : 1.00   Median :1.0000   Median :19.00
##  Mean   :12.15   Mean   :14.55   Mean   :0.5824   Mean   :19.52
##  3rd Qu.: 1.00   3rd Qu.: 1.00   3rd Qu.:1.0000   3rd Qu.:20.00
##  Max.   :99.00   Max.   :99.00   Max.   :1.0000   Max.   :33.00
##       home             math             work            own
##  Min.   :0.0000   Min.   : 0.000   Min.   : 0.00   Min.   :0.0000
##  1st Qu.:1.0000   1st Qu.: 0.000   1st Qu.: 0.00   1st Qu.:0.0000
##  Median :1.0000   Median : 0.000   Median : 5.00   Median :1.0000
##  Mean   :0.7582   Mean   : 1.407   Mean   :10.37   Mean   :0.7363  
##  3rd Qu.:1.0000   3rd Qu.: 1.000   3rd Qu.:14.50   3rd Qu.:1.0000  
##  Max.   :1.0000   Max.   :99.000   Max.   :99.00   Max.   :1.0000  
##      cdrom            email            grade      
##  Min.   : 0.000   Min.   :0.0000   Min.   :2.000  
##  1st Qu.: 0.000   1st Qu.:1.0000   1st Qu.:3.000  
##  Median : 0.000   Median :1.0000   Median :3.000  
##  Mean   : 5.604   Mean   :0.7912   Mean   :3.253  
##  3rd Qu.: 0.000   3rd Qu.:1.0000   3rd Qu.:4.000  
##  Max.   :99.000   Max.   :1.0000   Max.   :4.000  
```

Cleaning Data

Replacing 99 values (the unanswered/improper results) with NAs

```
data[data == 99] <- NA
numSamples <- NROW(data)
head(data)
```

```
##   time like where freq busy educ sex age home math work own cdrom email
## 1  2.0    3     3    2    0    1   0  19    1    0   10   1     0     1
## 2  0.0    3     3    3    0    0   0  18    1    1    0   1     1     1
## 3  0.0    3     1    3    0    0   1  19    1    0    0   1     0     1
## 4  0.5    3     3    3    0    1   0  19    1    0    0   1     0     1
## 5  0.0    3     3    4    0    1   0  19    1    1    0   0     0     1
## 6  0.0    3     2    4    0    0   1  19    0    0   12   0     0     0
##   grade
## 1     4
## 2     2
## 3     3
## 4     3
## 5     3
## 6     3
```

```
summary(data)
```

```
##       time             like           where            freq      
##  Min.   : 0.000   Min.   :1.000   Min.   :1.000   Min.   :1.000  
##  1st Qu.: 0.000   1st Qu.:2.000   1st Qu.:2.000   1st Qu.:2.000  
##  Median : 0.000   Median :3.000   Median :3.000   Median :3.000  
##  Mean   : 1.243   Mean   :3.022   Mean   :2.973   Mean   :2.705  
##  3rd Qu.: 1.250   3rd Qu.:3.000   3rd Qu.:4.000   3rd Qu.:4.000  
##  Max.   :30.000   Max.   :5.000   Max.   :6.000   Max.   :4.000  
##                   NA's   :1       NA's   :18      NA's   :13     
##       busy             educ             sex              age       
##  Min.   :0.0000   Min.   :0.0000   Min.   :0.0000   Min.   :18.00  
##  1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:19.00  
##  Median :0.0000   Median :0.0000   Median :1.0000   Median :19.00  
##  Mean   :0.2125   Mean   :0.4744   Mean   :0.5824   Mean   :19.52  
##  3rd Qu.:0.0000   3rd Qu.:1.0000   3rd Qu.:1.0000   3rd Qu.:20.00  
##  Max.   :1.0000   Max.   :1.0000   Max.   :1.0000   Max.   :33.00  
##  NA's   :11       NA's   :13                                       
##       home             math             work             own        
##  Min.   :0.0000   Min.   :0.0000   Min.   : 0.000   Min.   :0.0000  
##  1st Qu.:1.0000   1st Qu.:0.0000   1st Qu.: 0.000   1st Qu.:0.0000  
##  Median :1.0000   Median :0.0000   Median : 1.000   Median :1.0000  
##  Mean   :0.7582   Mean   :0.3222   Mean   : 7.352   Mean   :0.7363  
##  3rd Qu.:1.0000   3rd Qu.:1.0000   3rd Qu.:13.250   3rd Qu.:1.0000  
##  Max.   :1.0000   Max.   :1.0000   Max.   :55.000   Max.   :1.0000  
##                   NA's   :1        NA's   :3                        
##      cdrom            email            grade      
##  Min.   :0.0000   Min.   :0.0000   Min.   :2.000  
##  1st Qu.:0.0000   1st Qu.:1.0000   1st Qu.:3.000  
##  Median :0.0000   Median :1.0000   Median :3.000  
##  Mean   :0.1744   Mean   :0.7912   Mean   :3.253  
##  3rd Qu.:0.0000   3rd Qu.:1.0000   3rd Qu.:4.000  
##  Max.   :1.0000   Max.   :1.0000   Max.   :4.000  
##  NA's   :5
```

Scenario 1

Sample Proportion of Students Who Played a Video Game in the Last Week

The individual variables measured here are Bernoulli since time is being converted to a binary ‘did’ or ‘did not’ play.

```
# Create 'numPlayers' variable to count number of players in the last week.
# This is done by counting the number of people with time spent over 0, which represents the
# people who played something in the last week since they spent time on it. 0 indicates no time
# spent.
numPlayers <- NROW(which(data$time > 0))
paste("Number of players:", numPlayers, sep=" ")
```

```
## [1] "Number of players: 34"
```

```
# Sample proportion is the ratio of numPlayers to total students (rows in data)
data.playersSampleProportion <- (numPlayers/numSamples)
paste("Sample proportion:", data.playersSampleProportion, sep=" ")
```

```
## [1] "Sample proportion: 0.373626373626374"
```

Players Sample Proportion Confidence Interval

Since the sample Bernoulli variables are NOT identically independentally distributed, the confidence interval itself will be computed utilizing the finite population correction factor.

```
# Sample proportion is nearly Binomial, except not iid.
playersCorrectionFactor <- sqrt((data.population - numSamples)/data.population)
# Binomial standard error formula without correction
playersIndepStandardError <-  (sqrt(data.playersSampleProportion*(1-data.playersSampleProportion))/sqrt
# Standard error with finite population correction
data.playersStandardErrorEstimate <- playersIndepStandardError*playersCorrectionFactor
paste("Corrected Standard Error:", data.playersStandardErrorEstimate, sep=" ")
```

```
## [1] "Corrected Standard Error: 0.0429736108569751"
```

```
# Since the sample proportion follows a normal distribution by the Central Limit Theorem,
# we need to multiply the corrected standard error by 1.96 to generate the interval.
```

```
data.playersMarginOfError <- 1.96*data.playersStandardErrorEstimate
paste("Margin of Error: ", data.playersMarginOfError, sep="")
```

```
## [1] "Margin of Error: 0.0842282772796712"
```

```
# Therefore, the confidence interval:
playersLowerBound <- data.playersSampleProportion - data.playersMarginOfError
playersUpperBound <- data.playersSampleProportion + data.playersMarginOfError
data.playersSampleProportionConf95 <- c(playersLowerBound, playersUpperBound)
paste("Player Proportion 95% CI: ", "(",playersLowerBound, ", ", playersUpperBound,")", sep="")
```

```
## [1] "Player Proportion 95% CI: (0.289398096346702, 0.457854650906045)"
```

Scenario 2

```
smalltime.ind <- which(data$time < 6)
data.smalltime <- data[smalltime.ind,]

zerohours.ind <- which(data.smalltime$time ==0)
data.zerohours <- data[zerohours.ind, ]
mean(data.zerohours$freq, na.rm=TRUE)
```

```
## [1] 3
```

```
fewhours.ind <- which(data.smalltime$time > 0 & data.smalltime$time <=5 )
data.fewhours <- data[fewhours.ind, ]
mean(data.fewhours$freq, na.rm=TRUE)
```

```
## [1] 2.206897
```

```
manyhours.ind <- which(data$time > 6)
data.manyhours <- data[manyhours.ind, ]
summary(data.manyhours$freq, na.rm=TRUE)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   1.000   1.000   1.000   1.333   1.500   2.000
```

```
daily.ind <- which(data$freq == 1)
weekly.ind <- which(data$freq == 2)
monthly.ind <- which(data$freq == 3)
semester.ind <- which(data$freq == 4)

data.daily <- data[daily.ind, ]
data.weekly <- data[weekly.ind, ]
data.monthly <- data[monthly.ind, ]
data.semester <- data[semester.ind, ]

mean(data.daily$time)
```

```
## [1] 4.444444
```

```
mean(data.weekly$time)
```

```
## [1] 2.539286
```

```
mean(data.monthly$time)
```

```
## [1] 0.05555556
```

```
mean(data.semester$time)
```

```
## [1] 0.04347826
```

```
busy.ind <- which(data$busy == 1)
data.busy <- data[busy.ind, ]

notbusy.ind <- which(data$busy == 0)
data.notbusy <- data[notbusy.ind, ]

mean(data.busy$time)
```

```
## [1] 4.705882
```

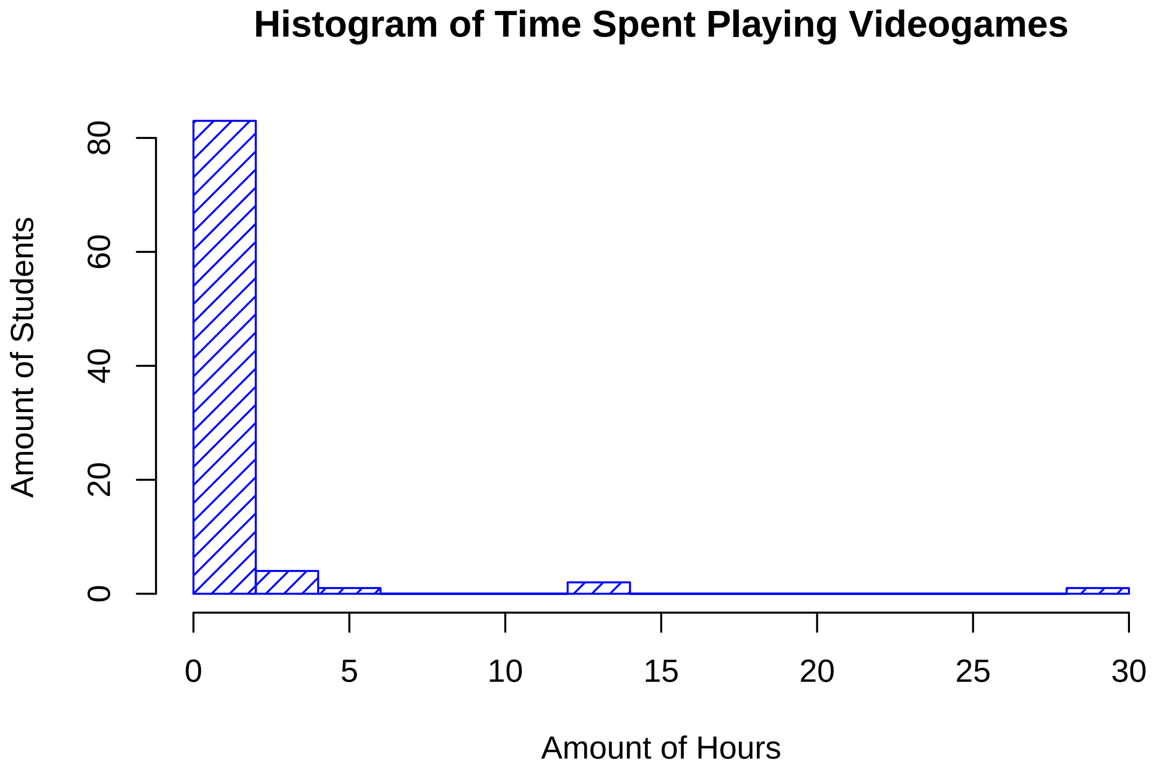
```
mean(data.notbusy$time)
```

```
## [1] 0.5095238
```

Scenario 3

```
#First we calculate the estimate for the # of students that played a video game:
nogame.ind <- which(data['time'] == 0.0) #Identify those who did not play video games the week prior
data.nogame <- data[nogame.ind,] #Create a data frame with no gamers
n1 <- length(data.nogame$time) #Calculates the # of students that played video games
prop.nogame <- (n1)/91 #Calculates the proportion (# that don't play/sample size)
sd.prop.nogame <- sqrt( (.6263736)*(1-.6263736)/90 )*sqrt((314-91)/314 ) #Calculates the sd of those th
prop.nogame.ci <- prop.nogame + c(-1, 1)*2*sd.prop.nogame #Creates the CI

#Histogram of sample time spent playing
hist(data$time, main = "Histogram of Time Spent Playing Videogames", xlab = "Amount of Hours", ylab = "
     col = 4, density = 15, breaks = 15)
```



```
#Here we do Bootstrap
boot.population <- rep(data$time, length.out = 314) #Creates the population
sample1 <- sample(boot.population, size = 91, replace = FALSE) #creates the sample populations
B = 500 # the number of bootstrap samples we want
boot.sample <- array(dim = c(B, 91))
for (i in 1:B)
  {
  boot.sample[i, ] <- sample(boot.population, size = 91, replace = FALSE)
}
boot.mean <- apply(X = boot.sample, MARGIN = 1, FUN = mean) #Here we take the sample mean of each sampl
ci.boot <- c(quantile(boot.mean,0.025), quantile(boot.mean, 0.975))
```

Scenario 4

Getting proportion who likes games.

```
# Initializing variables corresponding to responses from students on the survey
likeVeryMuch <- 2
likeSomewhat <- 3
# Fetching all students who responded with positive game likeness
data.likeColumns <- which(data$like == likeVeryMuch)
data.likeColumns <- c(data.likeColumns, which(data$like == likeSomewhat))
# Calculating percentage
numOfLikes <- NROW(data.likeColumns)
proportionLike <- numOfLikes/data.samples
paste("Proportion of Like: ", proportionLike, sep="")
```

```
## [1] "Proportion of Like: 0.758241758241758"
```

Scenario 5

```r
#didn't use graphing or cross tabulation
#18+30=48 people who own a computer like playing games
play2_comp <- NROW(which(data$like==2 & data$own == 1))
play3_comp <- NROW(which(data$like==3 & data$own == 1))

#1+12+5=18 people who own a computer don't like playing games
noplay1_comp <- NROW(which(data$like==1 & data$own==1))
noplay4_comp <- NROW(which(data$like==4 & data$own==1))
noplay5_comp <- NROW(which(data$like==5 & data$own==1))

#5+16=21 people who don't own a computer like playing games
play2_nocomp <- NROW(which(data$like==2 & data$own == 0))
play3_nocomp <- NROW(which(data$like==3 & data$own == 0))

#0+1+2=3 people who don't own a computer don't like playing games
noplay1_nocomp <- NROW(which(data$like==1 & data$own==0))
noplay4_nocomp <- NROW(which(data$like==4 & data$own==0))
noplay5_nocomp <- NROW(which(data$like==5 & data$own==0))

#14+25=39 people who like games worked
play2_work <- NROW(which(data$like==2 & data$work>0))
play3_work <- NROW(which(data$like==3 & data$work>0))

#1+3+3=7 people who don't like games worked
play1_work <- NROW(which(data$like==1 & data$work>0))
play4_work <- NROW(which(data$like==4 & data$work>0))
play5_work <- NROW(which(data$like==5 & data$work>0))

#9+21=30 people who like games don't work
play2_nowork <- NROW(which(data$like==2 & data$work==0))
play3_nowork <- NROW(which(data$like==3 & data$work==0))

#0+10+4=14 people who don't like games don't worked
noplay1_nowork <- NROW(which(data$like==1 & data$work==0))
noplay4_nowork <- NROW(which(data$like==4 & data$work==0))
noplay5_nowork <- NROW(which(data$like==5 & data$work==0))

#18+25=43 males who like games
play2_male <- NROW(which(data$like==2 & data$sex==1))
play3_male <- NROW(which(data$like==3 & data$sex==1))

#1+5+3=9 males who don't like games
play1_male <- NROW(which(data$like==1 & data$sex==1))
play4_male <- NROW(which(data$like==4 & data$sex==1))
play5_male <- NROW(which(data$like==5 & data$sex==1))

#5+21=26 females who like games
play2_female <- NROW(which(data$like==2 & data$sex==0))
play3_female <- NROW(which(data$like==3 & data$sex==0))

#0+8+4=12 females who don't like games
```

```
play1_female <- NROW(which(data$like==1 & data$sex==0))
play4_female <- NROW(which(data$like==4 & data$sex==0))
play5_female <- NROW(which(data$like==5 & data$sex==0))
```

Scenario 6

```
#Chi-square test
observed <- c(31, 52, 8, 0)
expected <- c(.2, .33, .4, .1)
chisq.test(observed, p = expected, rescale.p = TRUE)
```

```
##
##  Chi-squared test for given probabilities
##
## data:  observed
## X-squared = 57.942, df = 3, p-value = 1.617e-12
```