Learning Bayesian Data Analysis 1

What is This Stuff Called Probability?

Excercises

Point of excercises is also to get used to R

Built in library HairEyeColor Show the data in `HairEyeColor`

```
show(HairEyeColor)
```

```
## , , Sex = Male
##
##        Eye
## Hair    Brown Blue Hazel Green
##   Black    32   11    10     3
##   Brown    53   50    25    15
##   Red      10   10     7     7
##   Blond     3   30     5     8
##
## , , Sex = Female
##
##        Eye
## Hair    Brown Blue Hazel Green
##   Black    36    9     5     2
##   Brown    66   34    29    14
##   Red      16    7     7     7
##   Blond     4   64     5     8
```

The data given is for both male and female. We sum the frequencies across sex.

```
EyeHairFreq=apply(HairEyeColor, c("Eye","Hair"),sum)
show(EyeHairFreq)
```

```
##        Hair
## Eye     Black Brown Red Blond
##   Brown    68   119  26     7
##   Blue     20    84  17    94
##   Hazel    15    54  14    10
##   Green     5    29  14    16
```

Calculate Joint Proportions

```
EyeHairProp=EyeHairFreq/sum(EyeHairFreq)
show(round(EyeHairProp,2))
```

```
##        Hair
## Eye     Black Brown  Red Blond
```

```
##   Brown  0.11  0.20 0.04  0.01
##   Blue   0.03  0.14 0.03  0.16
##   Hazel  0.03  0.09 0.02  0.02
##   Green  0.01  0.05 0.02  0.03
```

Marginal proportions across Hair and Sex

```
HairFreq=apply(HairEyeColor, c("Hair"),sum)
HairProp=HairFreq/sum(HairFreq)
show(round(HairProp,2))
```

```
## Black Brown   Red Blond
##  0.18  0.48  0.12  0.21
```

Marginal proportions across Eye and Sex

```
EyeFreq=apply(HairEyeColor, c("Eye"),sum)
EyeProp=EyeFreq/sum(EyeFreq)
show(round(EyeProp,2))
```

```
## Brown  Blue Hazel Green
##  0.37  0.36  0.16  0.11
```

Conditional probablity of Hair colours given Blue eyes. We normalise by the marginal probability of Blue eyes by `EyeProp["Blue"]`

```
EyeHairProp["Blue",]/EyeProp["Blue"]
```

```
##      Black      Brown        Red      Blond
## 0.09302326 0.39069767 0.07906977 0.43720930
```

Probability of Hair colour given brown eyes

```
##      Black      Brown        Red      Blond
## 0.30909091 0.54090909 0.11818182 0.03181818
```

Probability of Eye colour given brown hair **NOTE:** *the 'EyeHairProp[,"Brown"]' gives marginal probabilities along the column

```
EyeHairProp[,"Brown"]/HairProp["Brown"]
```

```
##     Brown      Blue     Hazel     Green
## 0.4160839 0.2937063 0.1888112 0.1013986
```

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.