# Example 1

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```
library(knitr)
setwd("/Users/KevQuant/Desktop/Depaul/csc495/wk1/ex1")
read_chunk("example01_2.R")
knitr::opts_chunk$set(echo = TRUE)
```

### Load packages

```
# Load packages
library("ggplot2")
# Must load other packages first
library("sand")
```

### Load the data

```
# Load the data.
setwd("/Users/KevQuant/Desktop/Depaul/csc495/wk1/ex1")
dolphin <- read.graph("dolphin2.graphml", format="graphml")
```

### Graph information

```
# Display basic information about the graph
# Summary
summary(dolphin)
```

```
## IGRAPH U--- 62 159 --
## + attr: label (v/c), Sex (v/n), id (v/c)
```

```
# Is it directed? (use functions with _ rather than .)
is_directed(dolphin)
```

```
## [1] FALSE
```

```
# Is it simple?
is_simple(dolphin)
```

```
## [1] TRUE
```

```
# Count nodes
vcount(dolphin)
```

```
## [1] 62
```

```
# Count edges
ecount(dolphin)
```

```
## [1] 159
```

### Graph elements

```
# List graph elements
# Nodes
V(dolphin)
```

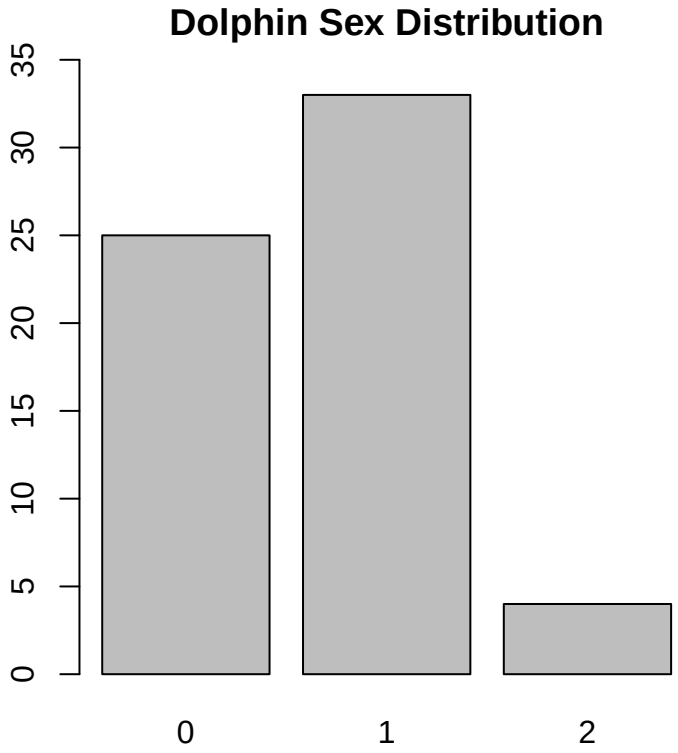
```
## + 62/62 vertices:
##  [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
## [24] 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
## [47] 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62
```

```
# Edges
E(dolphin)
```

```
## + 159/159 edges:
##   [1]  4-- 9  6--10  7--10  1--11  3--11  6--14  7--14 10--14  1--15  4--15
##  [11]  1--16 15--17  2--18  7--18 10--18 14--18 16--19  2--20  8--20  9--21
##  [21] 17--21 19--21 19--22 18--23 15--25 16--25 19--25 18--26  2--27 26--27
##  [31]  2--28  8--28 18--28 26--28 27--28  2--29  9--29 21--29 11--30 19--30
##  [41] 22--30 25--30  8--31 20--31 29--31 18--32 10--33 14--33 13--34 15--34
##  [51] 17--34 22--34 15--35 34--35 30--36  2--37 21--37 24--37 15--38 17--38
##  [61] 21--38 34--38 37--39  1--40  8--40 15--40 16--40 34--40 37--40 40--62
##  [71]  2--41 10--41 14--41  1--42  3--42 11--42 31--42 15--43 30--43 34--43
##  [81] 38--43 43--62  3--44 21--44 35--44 38--44  9--45 16--45 19--45 22--45
##  [91] 24--45 25--45 30--45 45--62 43--46  1--47 11--47 21--47 29--47 31--47
## + ... omitted several edges
```

### Histogram

```
# Histogram of sex distribution
par(mar=c(2,2,2,2))
barplot(table(V(dolphin)$Sex), ylim = c(0,35),main = "Dolphin Sex Distribution")
```

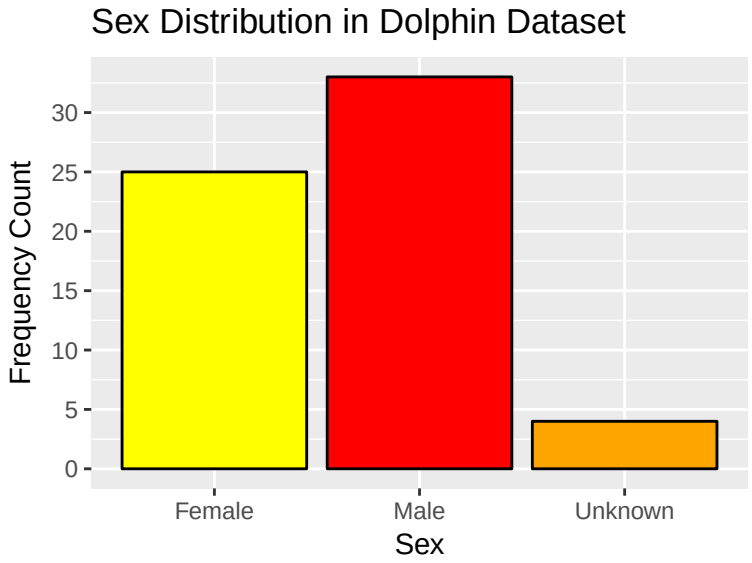



GGPlot version

```
# GGPlot version
# Note that node attributes cannot be factors
sex<-factor(V(dolphin)$Sex,c(0,1,2),labels = c("Female","Male","Unknown"))
g <- ggplot(data.frame(sex),aes(x=sex))
g<-g+geom_histogram(binwidth=1,stat="count",colour="black",fill=c("yellow","red","orange"))
```

```
## Warning: Ignoring unknown parameters: binwidth, bins, pad
```

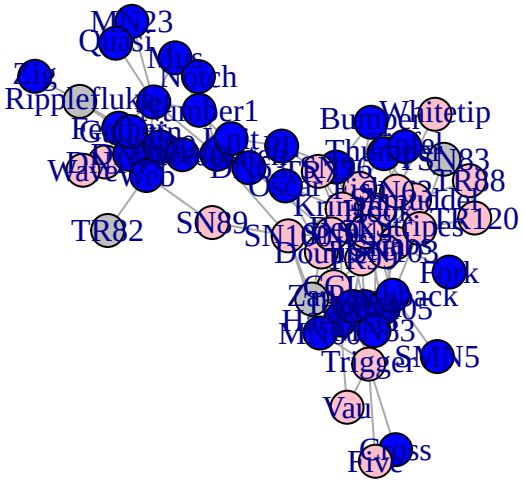
```
g<-g+xlab("Sex")
g<-g+ylab("Frequency Count")
g<-g+ggtitle("Sex Distribution in Dolphin Dataset")
g<-g+scale_y_continuous(breaks = seq(0,40,5))
print(g)
```




```
##Altervative plot option
#g <- g + geom_bar()
#print(g)
```

### Network visualization

```
# Create a network visualization. Note that the layout has a random element, so your visualization will
# Make the male nodes blue, female nodes pink, and unknown grey
dolphin.col<-factor(V(dolphin)$Sex,c(0,1,2),labels = c("pink","blue","grey"))
plot(dolphin,vertex.color=as.character(dolphin.col))
```




```
#altnative
#dolphin.col<-rep("pink",each=vcount(dolphin))
#dolphin.col<-seq(1:vcount(dolphin))
#dolphin.col[V(dolphin)$Sex==1]<-"lightblue"
#dolphin.col[V(dolphin)$Sex==2]<-"grey"
#dolphin.col[V(dolphin)$Sex==0]<-"red"
#plot(dolphin,vertex.color=as.character(f))
```

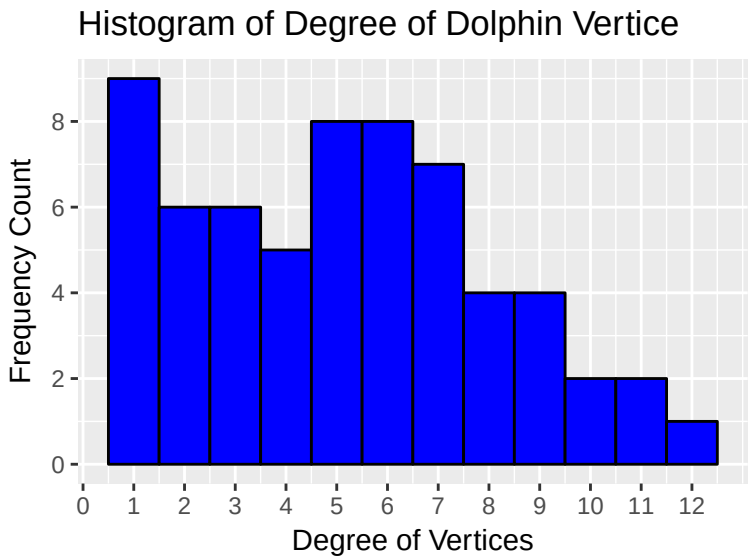
### Degree distribution

```
# Degree distribution
# Compute degrees of each node (degree sequence)
deg<-degree(dolphin)
deg
```

```
##  [1]  6  8  4  3  1  4  6  5  6  7  5  1  1  8 12  7  6  9  7  4  9  6  1
## [24]  3  6  3  3  5  5  9  5  1  3 10  5  1  7  8  2  8  5  6  7  4 11  2
## [47]  6  1  2  7 10  4  2  7  2  2  9  1  5  1  3 11
```

### Histogram

```
# Histogram with ggplot (boundary, binwidth)
g<-ggplot(data.frame(Degree=deg),aes(x=Degree))
g<-g+geom_histogram(binwidth=1,stat="bin",col="black",fill="blue")
g<-g+ylab("Frequency Count")
g<-g+xlab("Degree of Vertices")
g<-g+ggtitle("Histogram of Degree of Dolphin Vertice")
g<-g+scale_x_continuous(breaks = 0:12)
g<-g+scale_y_continuous(breaks = seq(0,10,2))
print(g)
```




```
#Altnative option
#g<-g+geom_bar()
#print(g)
```

### Degree distribution by sex

Setting up the data

```
# Degree distribution of male and female dolphins.

# Set up the data
```

```
# First make a data frame with the degree and sex. Then remove the "Unknown" dolphins.
dol.df<-data.frame(Degree=deg, Sex=V(dolphin)$Sex)
dol.df<-dol.df[dol.df$Sex!=2,]

# Then remake the sex factor so that the "Unknown" option is omitted.
dol.df$Sex<-factor(dol.df$Sex,c(0,1),labels=c("Female","Male"))
```

Plotting

```
# GGPlot boxplot
g<-ggplot(dol.df,aes(x=Sex,y=Degree,color=Sex))
g<-g+geom_boxplot(outlier.colour="red", outlier.shape=16,outlier.size=3)
g<-g+ggtitle("Degree distribution of male and female dolphins")
g<-g+scale_y_continuous(breaks = seq(0,13,2))
print(g)
```