Histograms and Density Plots

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Spring 2006 R Notes
Histograms
   Overview of Histograms

Density Plots
   Overview of Density Plots

Stem-and-Leaf Plots
   Overview of Stem-and-Leaf Plots

Problem
   Application

The R Script
The **histogram** is a graphical means of illustrating numerical data. Although the barplot and the histogram look similar, the barplot is used for categorical data, while the histogram is used for numerical data. Yet, the bins that either the user specifies or those that R uses by default are in essence categories. Clearly, we can always make quantitative data categorical; however, the reverse is not true.
Using the R function `hist()`

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- To create relative frequency histograms, use the optional argument `prob=TRUE`.
- For information on `hist()`, type `?hist` at the R prompt.
The R function `density()`

The R function `density(x)`, where `x` is a numeric vector, can be used to create a density estimate. The user can optionally specify kernels other than the default Gaussian. The result of the density estimate can be viewed with either the `plot()` or `lines()` function.
Using `plot()` and `lines()`

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- The `lines()` is a low-level function.

That is, `plot()` will create a graph, while `lines()` will add to an existing graph.
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The R function `stem()`

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- `x` must be a numeric vector
- `scale` controls plot length
- `stem(x, scale=2)` produces plot roughly twice as long as default
Stem-and-Leaf Example

> library(BSDA)
> attach(Entrance)
> stem(score)

The decimal point is 1 digit(s) to the right of the |

| 4 | 38 |
| 5 | 589 |
| 6 | 2346689 |
| 7 | 345579 |
| 8 | 12346 |
| 9 | 1 |
Stem-and-Leaf Example Continued

> stem(score, scale=2)

The decimal point is 1 digit(s) to the right of the  |

```
4  | 3
4  | 8
5  |
5  | 589
6  | 234
6  | 6689
7  | 34
7  | 5579
8  | 1234
8  | 6
9  | 1
```
Problem

Construct a relative frequency histogram of the waiting time until the next eruption using the data frame `geyser` available in the MASS library. Superimpose a density estimate over the relative frequency histogram. In the same graph, show the estimated density without showing the histogram.
Solution

Note that to superimpose a density over a histogram, the histogram must be a relative frequency histogram. Recall that relative frequency histograms are produced with the optional argument `prob=TRUE`.

```r
> library(MASS)
> par(mfrow=c(1,2))  # Make device region 1 by 2
> attach(geyser)
> hist(waiting,prob=TRUE)
> lines(density(waiting))  # Add density to Histogram
> plot(density(waiting))  # Create density by itself
```
The Graphs

Histogram of waiting

density(x = waiting)

N = 299   Bandwidth = 3.998
Can you get colors in your graphs?

1. Use the argument `col="somecolor"` to change the color of the histogram.
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2. Use the argument `col="somecolor"` to change the density line color.
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3. To change the default titles use the argument `main="YOU TYPE SOMETHING HERE"`.
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1. Use the argument `col="somecolor"` to change the color of the histogram.
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3. To change the default titles use the argument `main="YOU TYPE SOMETHING HERE"`. 
The actual R code used for the graphs

```r
> par(mfrow=c(1,2))  # Make device region 1 by 2
> hist(waiting,prob=TRUE,col="cyan",
+ main="You Type Something Here")
> lines(density(waiting),lwd=3,col="red")
> plot(density(waiting),lwd=3,col="red",main="")
> title(main="Density Plot")
> par(mfrow=c(1,1))
```
Link to the R Script

- Go to my web page *Script for Histograms and Density Plots*
- Homework: problems 1.45-1.50, 1.54-1.56
- See me if you need help!