Example 1.3

Consider the experimental observations of strength reported in Table **??** (p. **??**). Sort the data into n=7 bins of equal width ΔS to cover the entire range of the data. Build a histogram reporting the number of observations per bin. Compute the mean μ_F, standard deviation ϖ_F, and coefficient of variance C_F. Plot the normal probability density function $p(F)$ together with the normalized histogram. The histogram has to be normalized for plotting together with the probability density, which has area $A = 1$.

Solution

The data **F** is sorted, then grouped into $n = 7$ bins of equal width in Table **??** (Histogram). Since the minimum strength is $F_{min} = 30\ MPa$ and the maximum is $F_{max} = 100\ MPa$, using 7 bins yield bins of with 10.

The data is represented by a normal distribution with $\mu_F = 65.4, \varpi_F = 14.47, C_F = 0.22$. The resulting histogram and PDF are shown in Figure **??**.

```
% Example 1.3
clc; clear
[F txt] = xlsread('Table1_1.xlsx') % read data
ndata = length(F) % number of data points
% Histogram
n = 7; % number of bins
[Hist,centers] = hist(F,n)
binwidth = (max(F)-min(F))/n;
NHist = Hist/(ndata*binwidth); % normalizes the histogram
bar(centers,NHist,'FaceColor','none','LineWidth',2); hold on
% probability density
F = sort(F); % sort for plotting a line
m = mean(F)
v = std(F)
p = pdf('norm',F,m,v)
plot(F,p,'k','LineWidth',2);
% labels
xlabel('Strength F','FontSize',14,'FontName','Arial');
ylabel('Probability p(F)','FontSize',14,'FontName','Arial');
axis([30 100 0.0 0.04]);
set(gca,'FontSize',14,'FontName','Arial');
legend('Histogram','PDF');
```

```
saveas(gca,'./Histogram.example.1.3','png');
hold off
```