STT 351-001 and 351-002
Assignment due in class Wednesday 10-31-07

This assignment covers bootstrap confidence intervals. You will need to work with Little Software2 in a university lab.

1. For the data of problem 66, Chapter 1,

a. Enter

flow = {4.6, 12.3, ..... , 8.2, 6.3}.

Remember to use shift + enter. There are 129 data values.

b. Enter

ci[flow, 1.96],

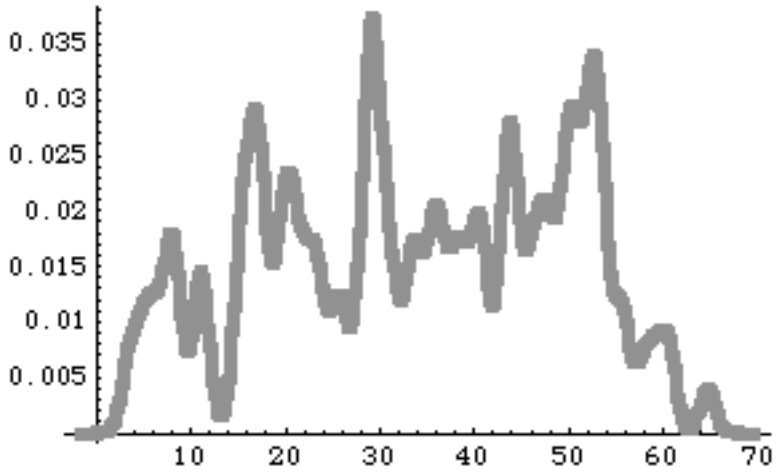
which will give you the usual 95% z-based ci for the population mean of flow rate for houses in Perth.

c. Compare (b) with the bootstrap confidence interval

bootci[mean, flow, 10000, 0.95].

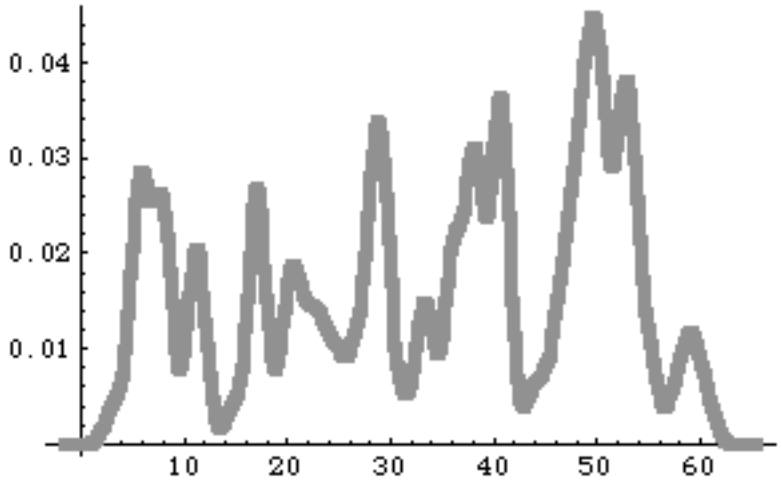
d. Plot a kernel density estimate for the population density of flow rates in Perth (e..g. smooth[flow, 0.8]). What you do is try to find the smallest bandwidth (finest resolution) that seems to hold up when applied to a with replacement sample of 129 from flow. For example, try a bandwidth such as 0.8. Then check whether this bandwidth gives about the same picture when applied to a random with-replacement sample of 129 from flow. Adjust your bandwidth smaller if there is good agreement. If not, try a larger bandwidth. The examples below do not use your data but illustrate this "bootstrap like" method of deciding on a reasonable bandwidth.

In[543]:= **smooth[perth, 0.8]**

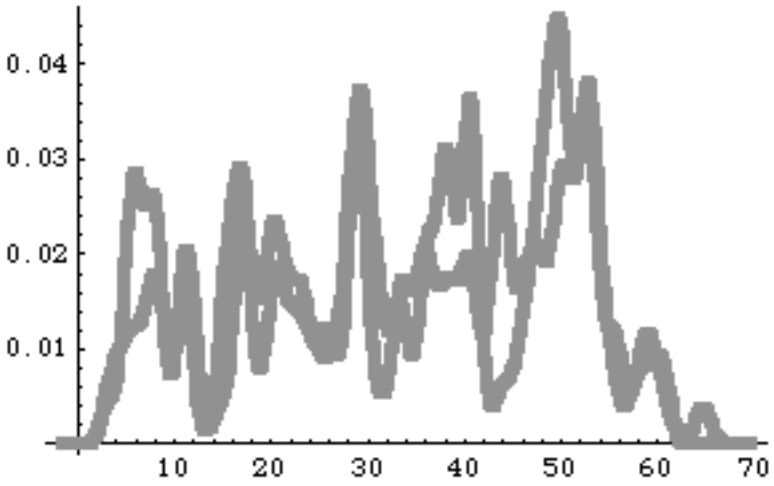



Out[543]= -Graphics-

In[544]:= **smooth[sample[perth, 129], 0.8]**

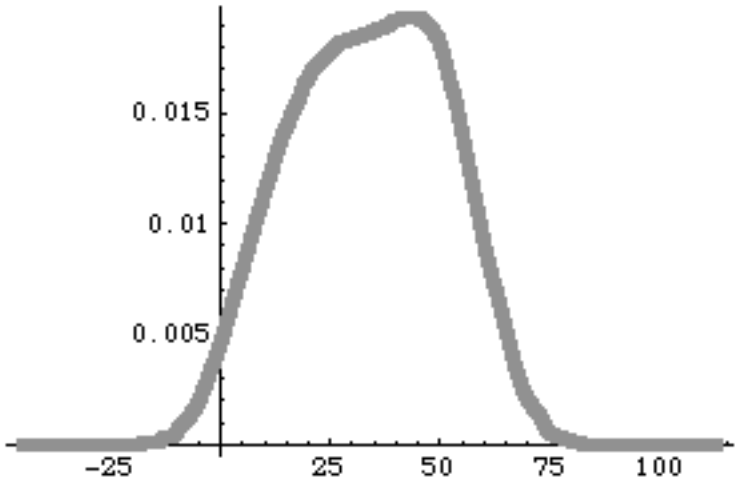


In[545]:= **Show[X, XX]**



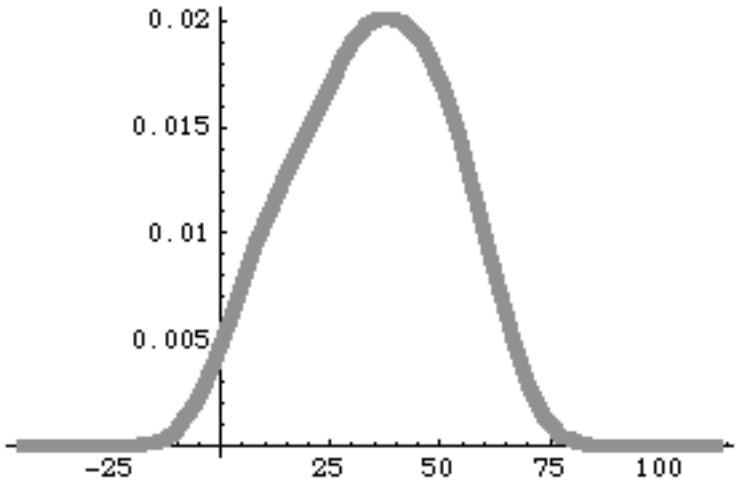

From the above, bandwidth 0.8 is too small since the density calculated on the sample perth is not at all like the one calculated on a bootstrap sample from perth. Here is what happens with bandwidth 8.0 (ten times coarser, i.e. lower resolution).

In[561]:= **smooth[perth, 8]**

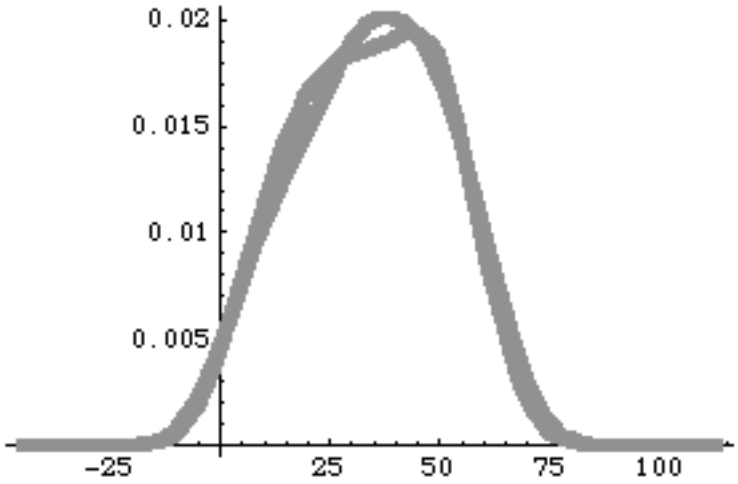



Out[561]= - Graphics -

In[562]:= **smooth[sample[perth, 129], 8]**



In[563]:= **Show[%, %%]**




At bandwidth 8.0 the density of our sample perth agrees rather well with the density of a bootstrap sample of 129 from perth.

We can play around to find the smallest bandwidth bw* that holds up for (several) bootstrap samples from perth. The kernel density

smooth[perth, bw*]

would seem to be the finest we can get away with when estimating the density of the population from which the random sample perth was selected.