Computer Lab Project No. 5
The Normal Distribution

In this project, you are going to explore how to use software in order to calculate probabilities for normal distributions. You won't need to consult the probability table for the standard normal distribution, and you won't need to calculate z-scores to find probabilities for nonstandard normal distributions.

Info

Here is the procedure for finding probabilities or values (percentiles) for normal distributions using StatCrunch:

1. Start StatCrunch.

2. Click on "Stat" in the menu bar.

3. Click or hover over the menu item "Calculators".

4. Click "Normal".

5. In the "Normal Calculator" window that opens, enter the parameters μ and σ of the desired normal distribution in the text fields "Mean" and "Std. Dev."

6. If you want to **find the probability** that X (a normally distributed random variable with the specified parameters) is less than (or equal) to a value, enter that value in the text box on the left of the second line.

7. If you know the probability that X is less than (or equal) to an unknown value and you want to **find the value**, then enter the probability in the text box on the right of the second line.

8. When you're done entering the information, click the "Compute" button on the bottom right. The field you left open will be filled with the answer you were looking for.

If you are interested in probabilities of the form $P(X \geq x)$, then you can change the relation symbol on the bottom left by clicking it and choosing the one you want.

You can even find the probability that X falls in an interval $[a, b]$ by clicking "Between" and putting the values of a and b in the appropriate text boxes.

Do now

1. Load the data set "Body Temperatures". It is a sample of body temperatures of healthy adults, in degrees Fahrenheit.

2. Use the "Graphics" menu of StatCrunch to make a histogram of one of the temperature columns in the sample. Leave the window containing the histogram open.

3. Use the "Stat" menu of StatCrunch to calculate a summary of the column statistics of the column you chose.

4. Open the normal calculator, as described above. Enter the sample mean as μ and the sample standard deviation as σ. These values can be read off the summary statistics. Three decimal places suffice.

5. Use the normal calculator to calculate the (theoretical) probability $P(X \leq 97.85)$, if X is normally distributed with the parameters you entered.

6. In addition to the wanted probability, the normal calculator also displays a graph of the normal distribution with the parameters you entered. Compare it to the histogram. Do you think this normal distribution is a good approximation to the distribution of body temperatures of healthy adults?

7. What percentage of the sample data is less than 97.85? Compare that percentage to the probability you calculated. In order to tell what percentage of the data is less than 97.85, you can order the data (Data → Sort).

8. Find the 80th percentile of the normal distribution with the parameters you entered.

Finish

- Follow the instructions in the *Do now* section, and create a pdf document called "Lab5-Firstname-Lastname.pdf" in which you answer the questions asked in that section. Say which column you chose, and include in your document the histogram and the summary statistics.

- When you're done, submit this one document via Blackboard as your Lab 5 assignment.