

## Standard Deviation of a Data Set

Given a set of data  $\{x_1, x_2, x_3, \dots, x_N\}$ , we often wish to describe the types of values we encounter in such a data set. A good way to do this is using the mean, standard deviation, and the standard deviation of the mean.

The mean, which you are undoubtedly already familiar with, is given by

$$\bar{x} = \frac{1}{N} \sum x_i. \quad (23)$$

The standard deviation is a quantity that describes the spread in the data set from the mean. It is given by

$$s = \sqrt{\frac{1}{N-1} \sum (x_i - \bar{x})^2}. \quad (24)$$

We may also wish to express how certain we are about our mean. If we were to repeat our experiment, we would obtain different data, and thus would obtain a different mean value. A measure of about how much we would expect the mean to change is given by the standard deviation of the mean, or standard error:

$$\sigma = \sqrt{\frac{1}{N(N-1)} \sum (x_i - \bar{x})^2}. \quad (25)$$