

Rennen.Tech.Talk

with George Costa

Performance Math: Standard Deviation

To further elaborate on last month's article regarding how to compute averages, we will now take a look at something called the standard deviation.

Standard deviation allows you to see how much your data varies from the average. A low standard deviation says that most of your data is very consistent and is close to your average, usually a good result. A high standard deviation means that your data is all over the place and is not very consistent.

The math required is a little more complex but I'll show you step by step how to calculate this. Let's start with the first data set used last month for computing an average value.

Run 1; 3.10	Run 6; 3.90
Run 2; 3.50	Run 7; 3.75
Run 3; 3.70	Run 8; 3.35
Run 4; 3.60	Run 9; 3.55
Run 5; 3.30	Run 10; 5.5

Ave time = $(3.10+3.50+3.70+3.60+3.30+3.90+3.75+3.35+3.55+5.5)/10$
Ave time = 3.73 seconds

Now in order to compute the standard deviation it's a three step process:

1st we need to subtract each individual run from the average and square the result.

Run 1; $(3.10-3.73)^2=0.3969$	Run 6; $(3.90-3.73)^2=0.0289$
Run 2; $(3.50-3.73)^2=0.0529$	Run 7; $(3.75-3.73)^2=0.0004$
Run 3; $(3.70-3.73)^2=0.0009$	Run 8; $(3.35-3.73)^2=0.1444$
Run 4; $(3.60-3.73)^2=0.0169$	Run 9; $(3.55-3.73)^2=0.0324$
Run 5; $(3.30-3.73)^2=0.1849$	Run 10; $(5.5-3.73)^2=3.1329$

2nd we compute the average value of these results

Average = $(0.3969+0.0529+0.0009+0.0169+0.1849$
 $+0.0289+0.0004+0.1444+0.0324+3.1329)/10$

Average = 0.39915

3rd we compute the square root of this average

Standard deviation = $\text{sqrt}(0.39915) = (0.39915)^{1/2} = 0.6317$

This means that the majority of the data collected will result in a number that is 3.73 (+/- 0.6317). You can think of standard deviation like a tolerance around which the average value can be represented.

Please take a look at our January Tech Talk article to see our second example used in computing the average value. If we calculate its standard deviation then we get this result.

Standard deviation = 0.2017

This second standard deviation is almost 300 percent better and shows that the majority of the data is very consistent. Removing the two outliers improved our results greatly but caution should be taken when evaluating data and making these decisions.

All of this may seem complicated but luckily pretty much anyone with access to a computer can perform these mathematical calculations in a matter of seconds using a spreadsheet program such as Microsoft Excel. There are even free spreadsheet programs out there one of them is provided by Google.

Both Excel and Google use the same commands so the first step is to enter all of your collected data into the cells of either program.

Next use the following functions in a separate cell

=AVERAGE(Data pt 1 : Last Data pt)
=STDEV(Data pt 1 : Last Data pt)

Make sure you use the colon (:) between the first cell that the data is located and the last cell. Cell names are usually in order of column by row such as (A1; column A, row 1). You can type these commands into a separate cell and use your mouse to click on and select the data.

Tracking your performance and using some of these Statistical methods can really shed light on your progress and training.

I hope you enjoyed this month's installment of Rennen Tech Talk, as always stop by and see us at an ABA national near you.