1 Range Normalization

Normalization is nothing more than mapping some range $[a; b]$ to a range $[0; 1]$. We're going to assume that both a and b are real numbers, as well as $b > a$. That way we can nicely simplify and work out rather pleasant math.

For example, we can see that if we subtract a from every number in our range we get something like this:

$$[a; b] \Rightarrow [0; b - a] \tag{1}$$

Furthermore, we know that $b - a$ must be positive because of our previous assumptions, meaning we can divide every term in our range by $b - a$:

$$[0; b - a] \Rightarrow [0; 1] \tag{2}$$

In practice you'd probably find minimum and maximum of some random set of points and perform a simple operation like so:

$$N = \frac{P - min([a; b])}{max([a; b]) - min([a; b])} \tag{3}$$

Where P is our point within a given range and N is the same point normalized. This is a very powerful tool, we can also apply the same concepts to normalize data in whatever range we want. Sometimes using range $[0; 1]$ as something in-between. Let's say we want to oscillate some level of brightness over time, but we want our brightness to be within $[0.5; 1]$ range. In that case we can do the following:

$$b = \frac{(\sin x + 1)}{4} + 0.5 \tag{4}$$

Where b is brightness and x is some value that we can sample over time. Equation above gives us a value between $[0.5; 1]$. Usage of sin function here was neccessary for oscillating the value over time (provided we are changing the angle x over time), we applied the same techniques as stated above knowing that sin ranges between $[-1; 1]$.