How to do statistics on the number of molecules

Numbers.R

Outputs median nr of molecules with standard error (SE)

Test if two molecule numbers are the same

Do 2-sided test to show if two numbers are different, 1-sided to show that one is smaller/larger then the other. Two-sided z-test gives a p-value that is 2x value of a 1-sided z-test.

To calculate z-value use:

$$\frac{X_{mut} - X_{WT}}{\sqrt{\sigma_{mut}{}^2 + \sigma_{WT}{}^2}} = z$$

Where

- Xmut, XWT = median molecule numbers
- σmut, σWT = SE of molecule numbers

2-sided z-test:

$$pvalue = 2 * (1 - pnorm\ (abs(z)))$$

1-sided z-test:

$$pvalue = 1 - pnorm(abs(z))$$

To calculate Arc18 and Act1 molecule numbers and propagate errors

Arc18 is tagged with myEGFP, which according to Picco, 2015 is 68% ± 14% as bright as EGFP.

New nr = output from numbers.R / 0.68

To propagate error, use:

$$SE_{new} = \sqrt{\frac{{SE_n}^2}{c^2} + \frac{n^2}{c^4}{SE_c}^2}$$

With

- n = median nr of Arc18 mol
- SEn = SE of Arc18
- c = 0.68
- SEc = 0.14

For Act1, according to Picco et al, 9% ± 1% of molecules are labeled. So new nr = output from numbers.R / 0.09. To propagate error, use above formula with c = 0.09 and SEc = 0.01