Calculating statistics

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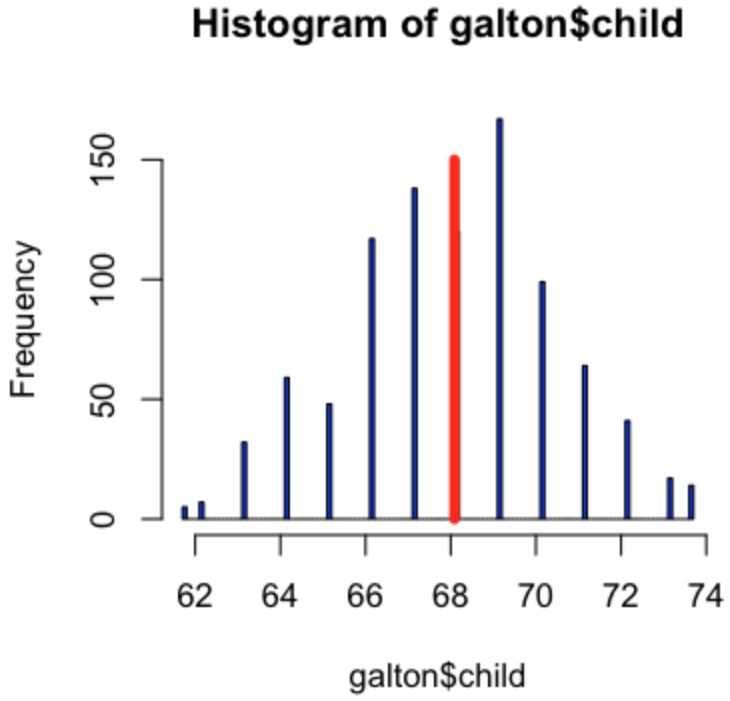
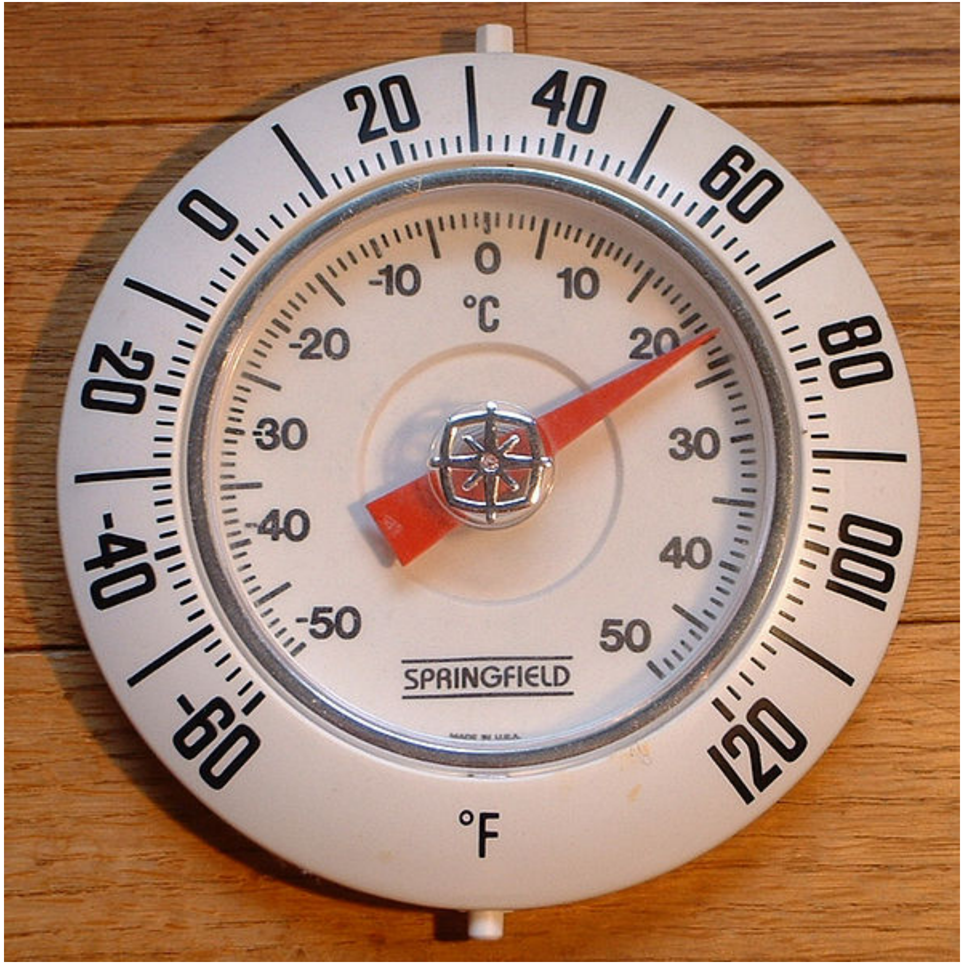
Typical goal: quantify how certain we are about associations

$$\bar{X} = \frac{1}{M}\sum_{i=1}^{M} X_i$$

$$\bar{X} - 70$$



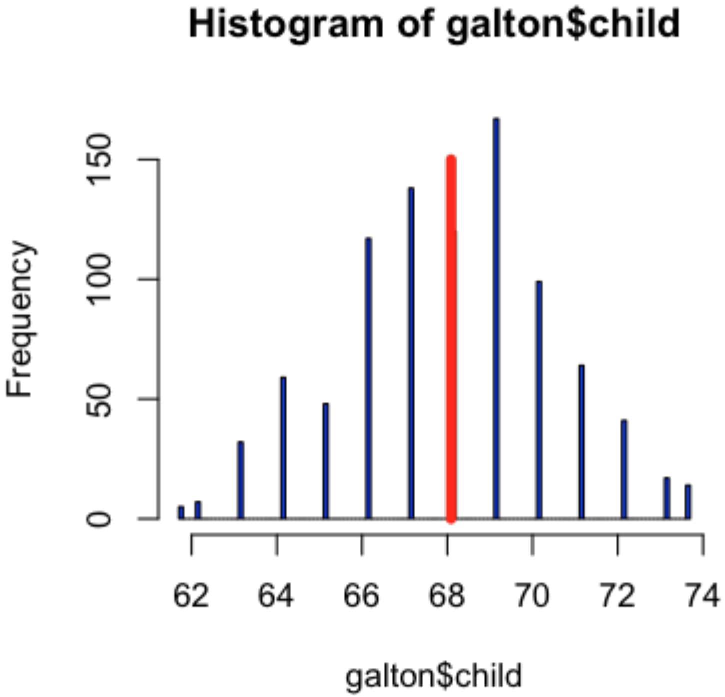
http://en.wikipedia.org/wiki/Kelvin



$$s_X^2 = \frac{1}{M-1}\sum_{i=1}^{M}(X_i - \bar{X})^2$$

$$\bar{X} = \frac{1}{M}\sum_{i=1}^{M} X_i$$

$$\frac{\bar{X} - 70}{s_x / \sqrt{n}}$$



Observations: $X_1, \ldots, X_M \quad Y_1, \ldots, Y_N$

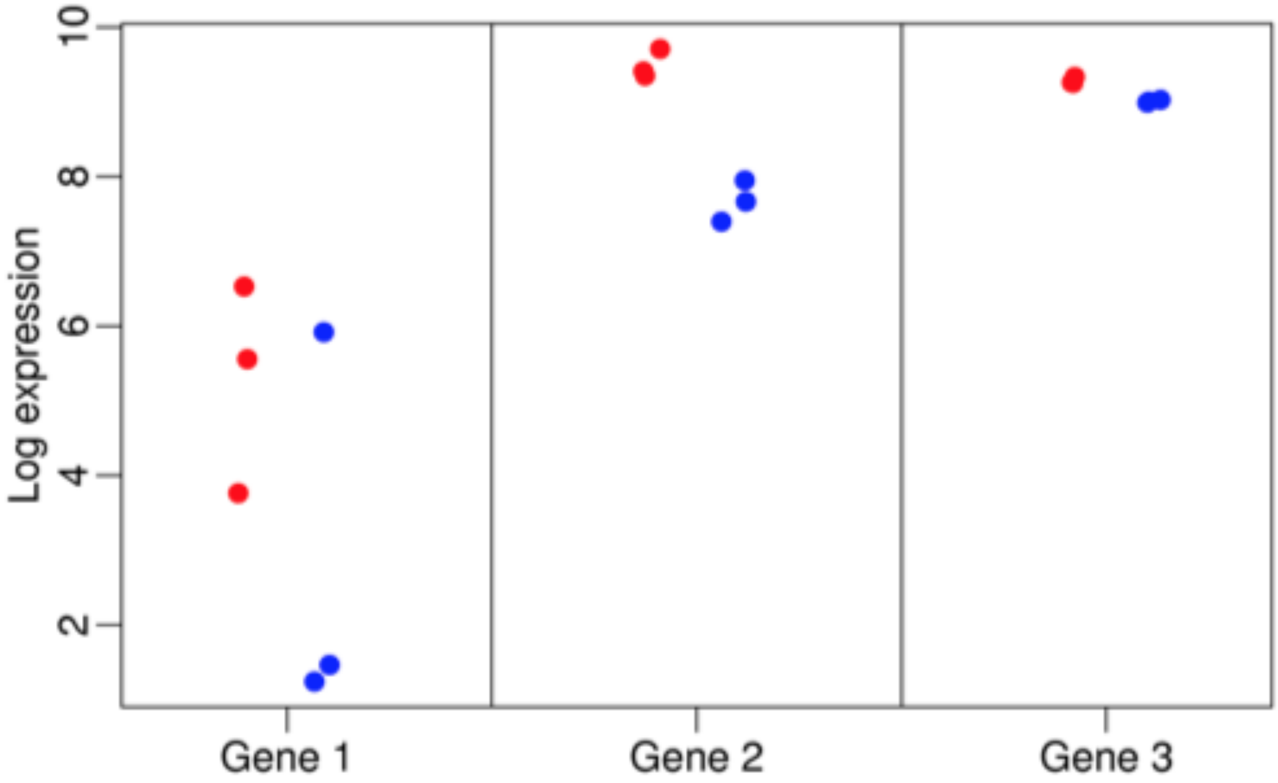
Averages: $\bar{X} = \frac{1}{M}\sum_{i=1}^{M} X_i \qquad \bar{Y} = \frac{1}{N}\sum_{i=1}^{N} Y_i$

SD^2 or variances:

$$\frac{\bar{X} - 70}{s_x / \sqrt{n}}$$

$$s_X^2 = \frac{1}{M-1}\sum_{i=1}^{M}(X_i - \bar{X})^2 \qquad s_Y^2 = \frac{1}{N-1}\sum_{i=1}^{N}(Y_i - \bar{Y})^2$$

Slide courtesy: Ingo Ruczinski



https://en.wikipedia.org/wiki/T-statistic

$$\frac{\bar{Y} - \bar{X}}{\sqrt{\frac{s_Y^2}{N} + \frac{s_X^2}{M}}}$$

Statistics for regression

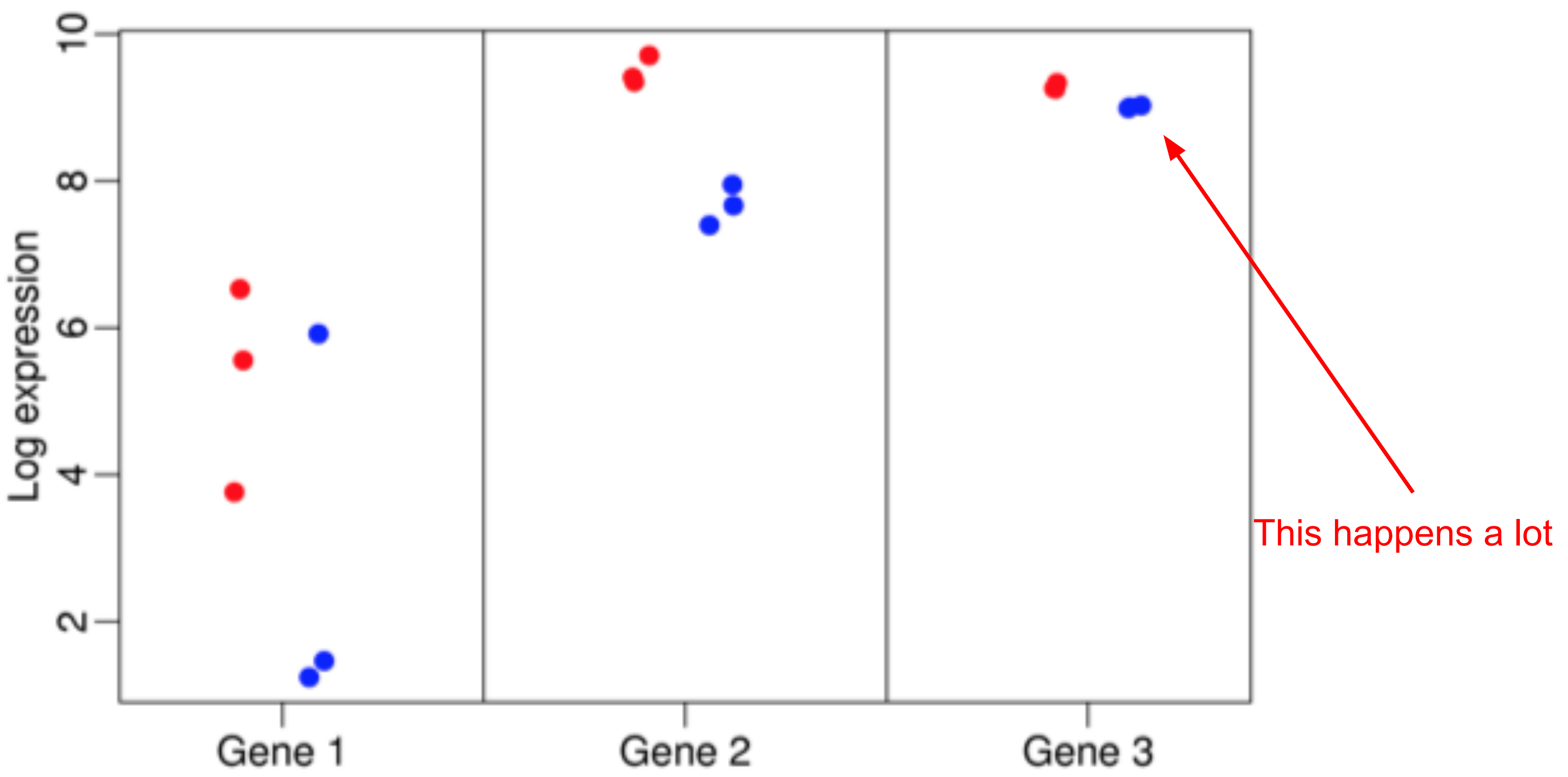
[redacted]

$$\text{Expr} = b_0 + b_1 \text{ Age} + e$$

$$\frac{\hat{b}}{s.e.(\hat{b})}$$

Moderated statistics

Slide courtesy: Ingo Ruczinski



http://statweb.stanford.edu/~tibs/SAM/sam.pdf

$$\text{Expr} = b_0 + b_1\ \text{Age} + e$$

$$\frac{\hat{b}}{s.e.(\hat{b}) + c}$$

Notes and further reading

- Linear models for microarray data
  - http://www.statsci.org/smyth/pubs/limma-biocbook-reprint.pdf
- Statistics and R for the Life Sciences
  - https://www.edx.org/course/statistics-r-life-sciences-harvardx-ph525-1x