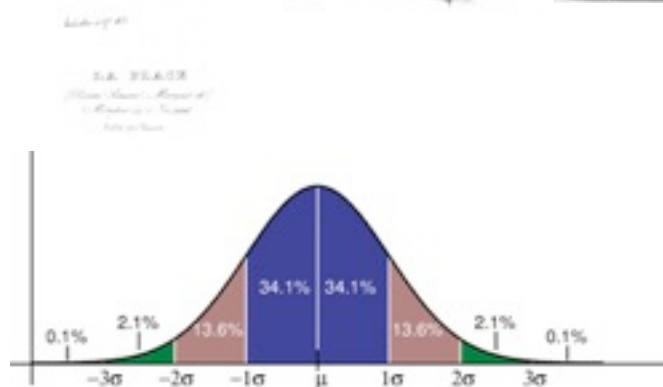# Applied Statistics

Troels C. Petersen (NBI)

"Statistics is merely a quantization of common sense"

Correlation

Recall the definition of the Variance, V:

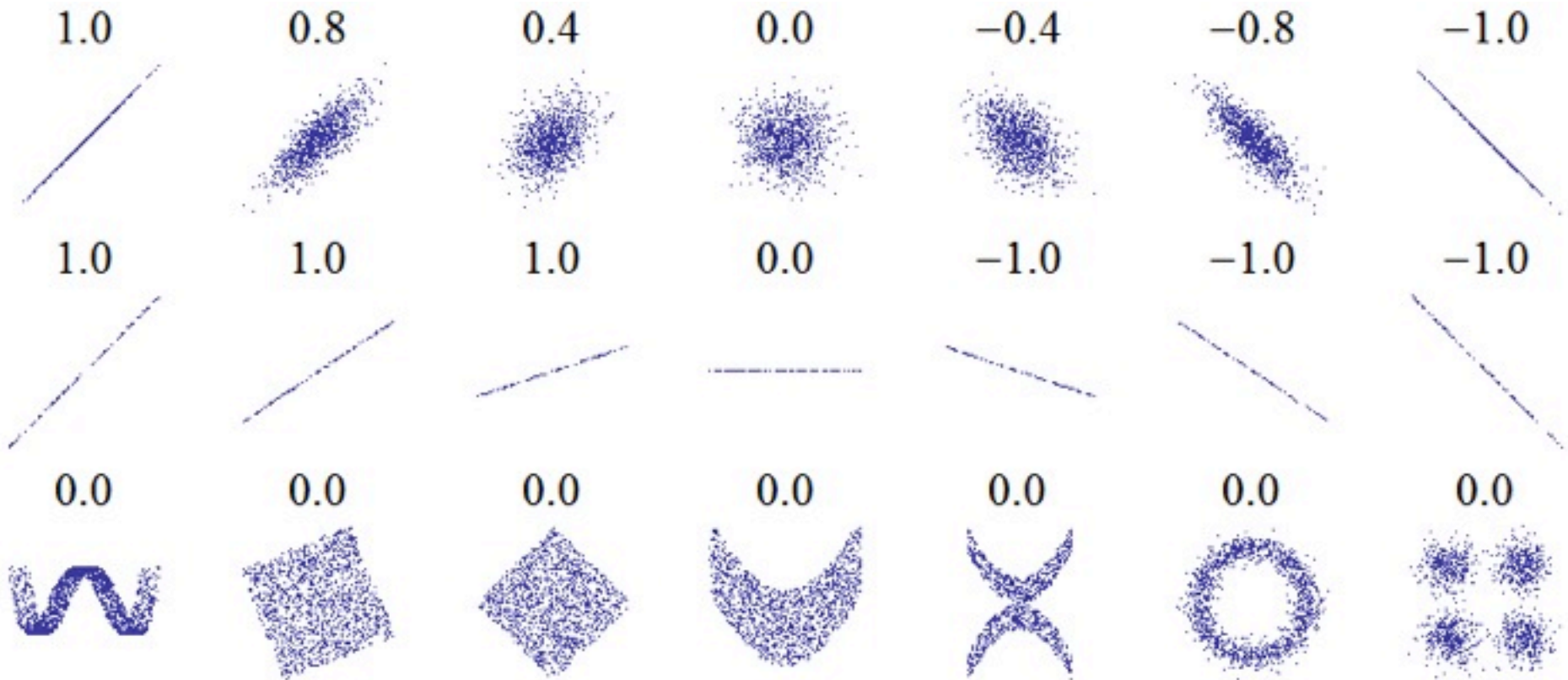$$\sigma^2 \;=\; E[(x - \mu)^2] \;=\; E[x^2] - \mu^2$$

Likewise, one defines the **Covariance:**

$$V_{xy} \;=\; E[(x - \mu_x)(y - \mu_y)]$$

"Normalizing" by the widths, gives the (linear) correlation:

$$\rho_{xy} = \frac{V_{xy}}{\sigma_x \sigma_y}. \qquad -1 \leq \rho_{xy} \leq 1$$

Correlations

Note how ALL of the bottom distributions have $\varrho = 0$, despite obvious correlations!

Correlation Vs. Causation

"Com hoc ergo propter hoc"

(with this, therefore because of this)