THE MAXIMUM LIKELIHOOD WAY

Given some data...

$$y = \{y_1, \cdots, y_n\}$$

Define an observational model:

$$P(y \mid \theta) = L_y(\theta)$$

Maximize the likelihood over the parameter space:

$$\boxed{\hat{\theta} = \underset{\theta \in \Omega}{\operatorname{argmax}} \left[L_y(\theta) \right]}$$

Any further inference uses this ML estimator:

$$\boxed{\rho = f(\hat{\theta})}$$

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LOG LIKELIHOOD SURFACE

Likelihood $P(y \mid \theta)$

$y \sim Normal(\alpha + \beta x, \sigma)$