

# Fisher information

The Fisher information roughly describes how much information a random variable gives about an unknown parameter of its distribution. It is defined as:

$$I(\theta) = \{\mathrm{Var}\}[\ell'(\theta)] = -\mathbb{E}[\ell''(\theta)]$$

From the Fisher information, we can derive the asymptotic variance of the parameter.

$$\sqrt{n}(\hat{\theta}_n^{\mathrm{MLE}} - \theta^*) \xrightarrow[n \rightarrow \infty]{(d)} \mathcal{N}\left(0, \frac{1}{I(\theta^*)}\right)$$

where  $\theta^*$  is the true parameter, and  $\hat{\theta}_n^{\mathrm{MLE}}$  is the MLE of the parameter.

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