Estadística y análisis de datos

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Bibliografía

Esta presentación se basa principalmente en la primer referencia que aparece a continuación.

- *Probability and statistics in particle physics.* A.Frodesen.
- *Statistical methods in experimental physics.* F. James.
- *Data reduction and error analysis for the physical sciences.* P. Bevington, K Robinson.

General

- Variables.
- Media, mediana, valor medio.
- Varianza y parametros de forma de orden superior.

Variables

- Variable y dato.
- Espacio muestral y muestra.
- Variable discreta o continua.
- Variable aleatoria.

Media, Mediana, Valor medio

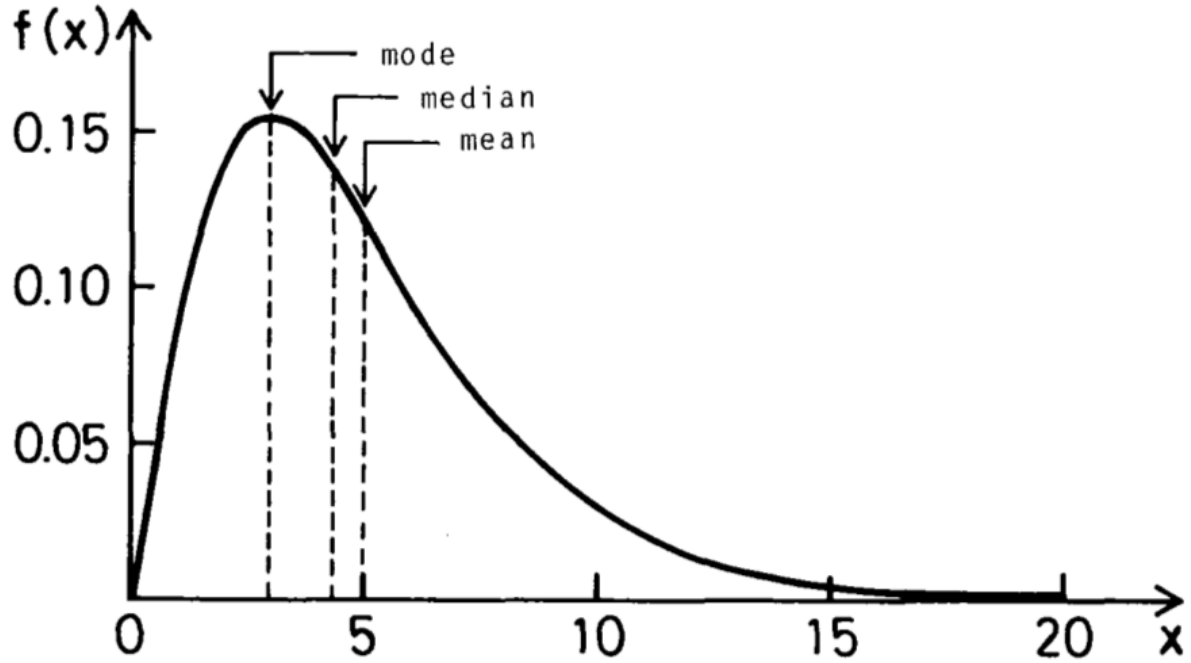


Fig. 3.1. Location parameters for a unimodular probability density function. (The curve corresponds to a chi-square p.d.f. for 5 degrees of freedom.)

Valor de espectación : $E(x) = \int x f(x)\,\mathrm{d}x = < x >$

Varianza y parámetros de forma de orden superior

Valor medio: $E(x) = \int x f(x)\,\mathrm{d}x = \mu$

Varianza: $E(x-\mu)^2 = \int (x-\mu)^2 f(x)\,\mathrm{d}x = \sigma^2$

Skewness: $\gamma_1 = \frac{E(x-\mu)^3}{\sigma^3} = \frac{\mu_3}{\mu_2^{3/2}}$

Kurtosis: $\gamma_2 = \frac{E(x-\mu)^4}{\sigma^4} - 3 = \frac{\mu_4}{\mu_2^2} - 3$

General

- Distribución gaussiana.
- Distribución binomial.
- Distribución de poisson.
- Distribución Bose-Einstein.

Distribución gausiana o normal

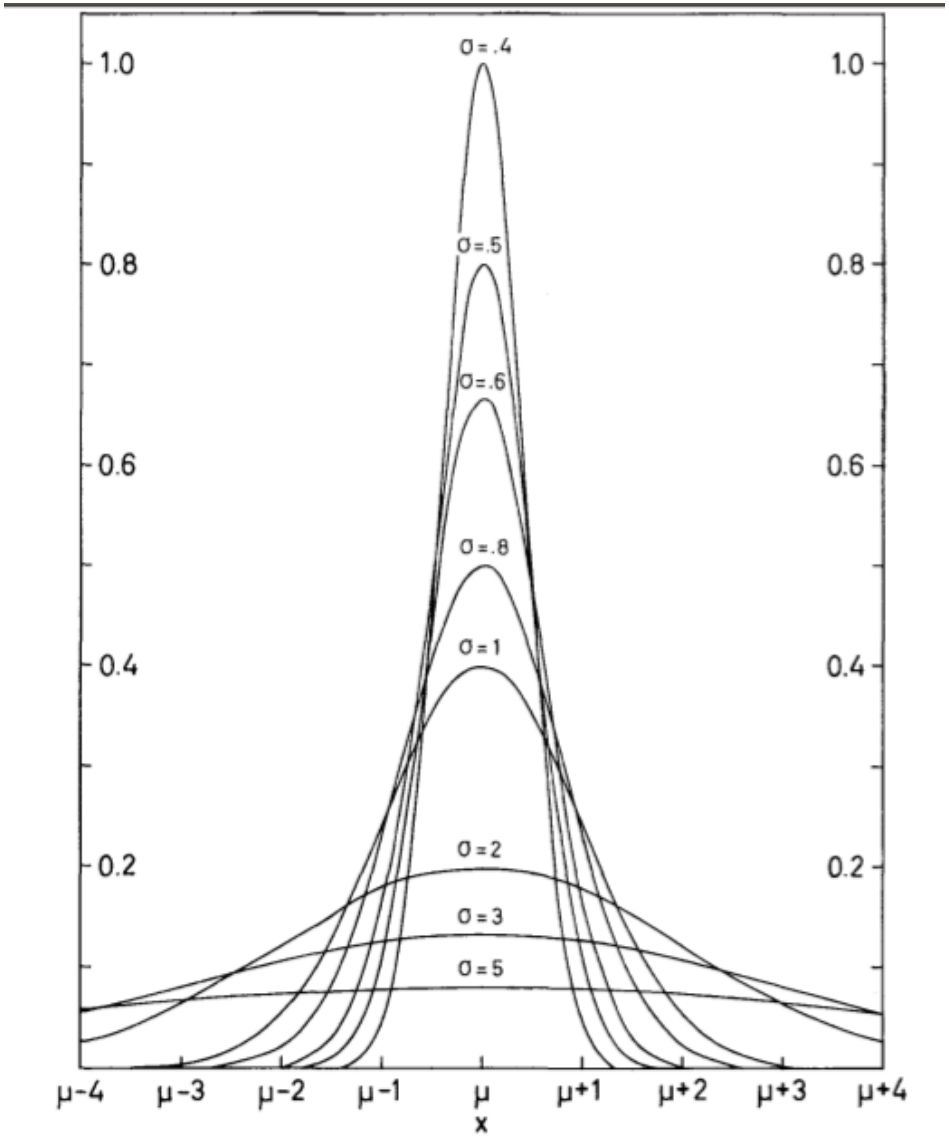


Fig. 4.6. The normal p.d.f. $N(\mu,\sigma^2)$ for different values of the standard deviation σ.

Distribución binomial

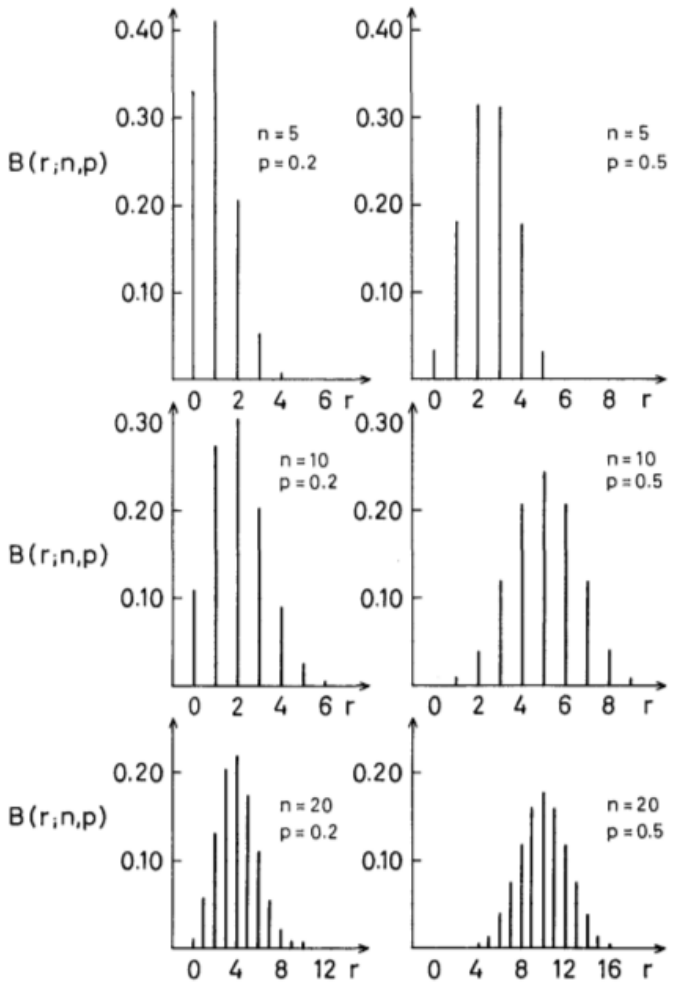
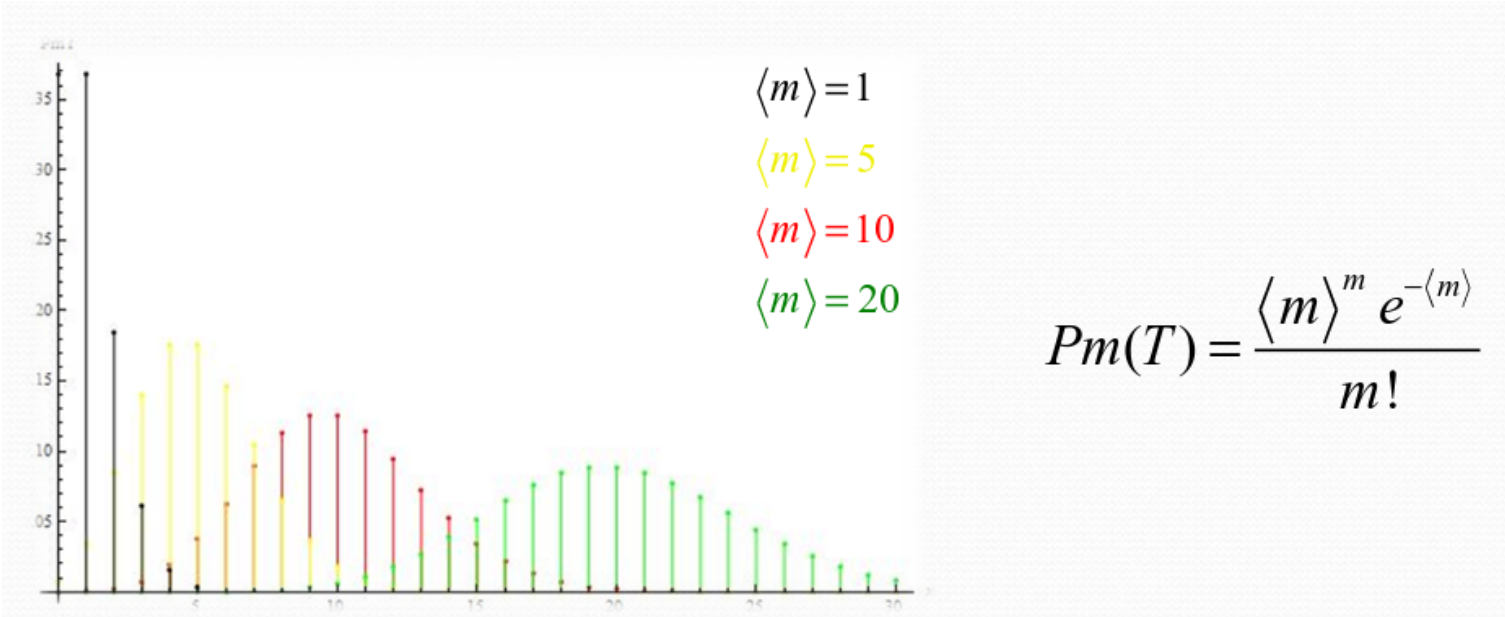


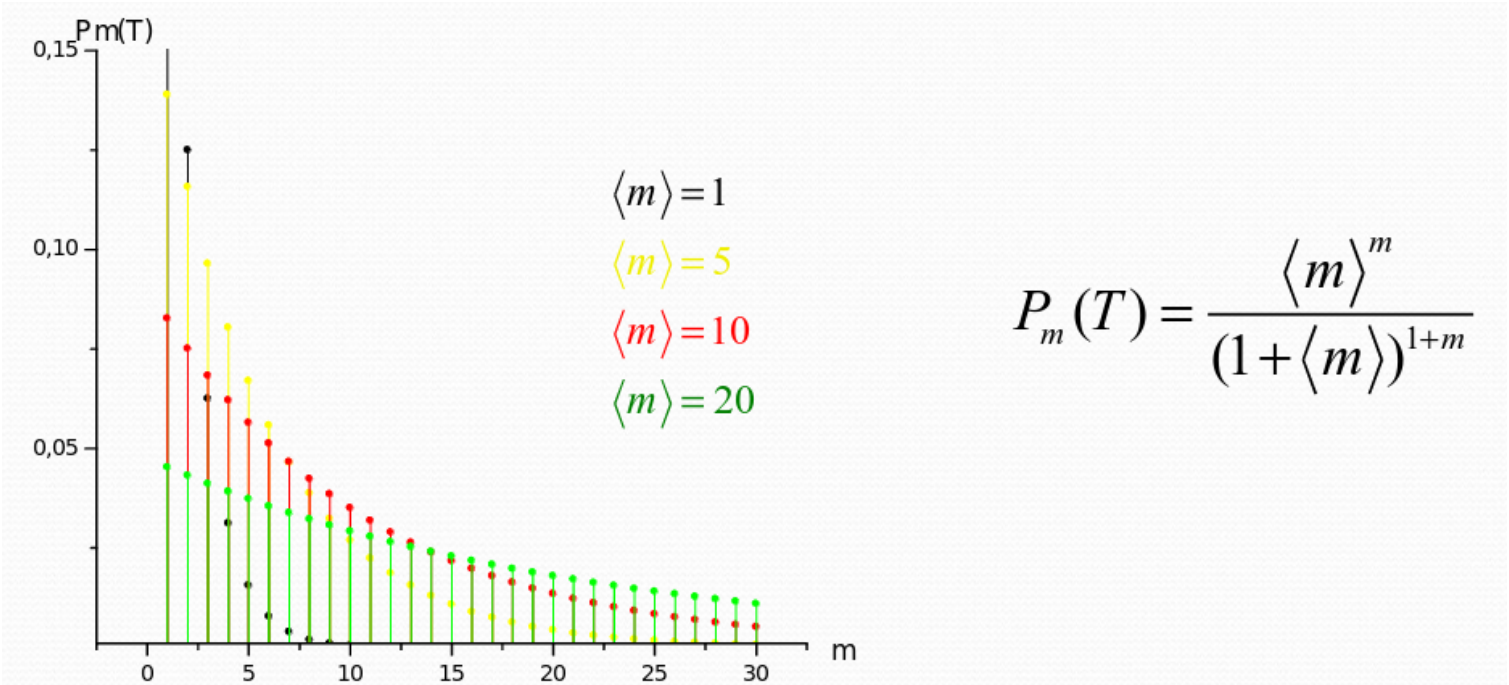
Fig. 4.1. The binomial distribution for indicated values of the parameters n,p.

$$B(r;\, n,p) = \binom{n}{r} p^r (1-p)^{n-r}, \qquad r = 0,1,2,\ldots,n.$$

Distribución de Poisson



Distribución Bose-Einstein



$$P_m(T) = \frac{\langle m \rangle^m}{(1+\langle m \rangle)^{1+m}}$$

Relación entre distribuciones

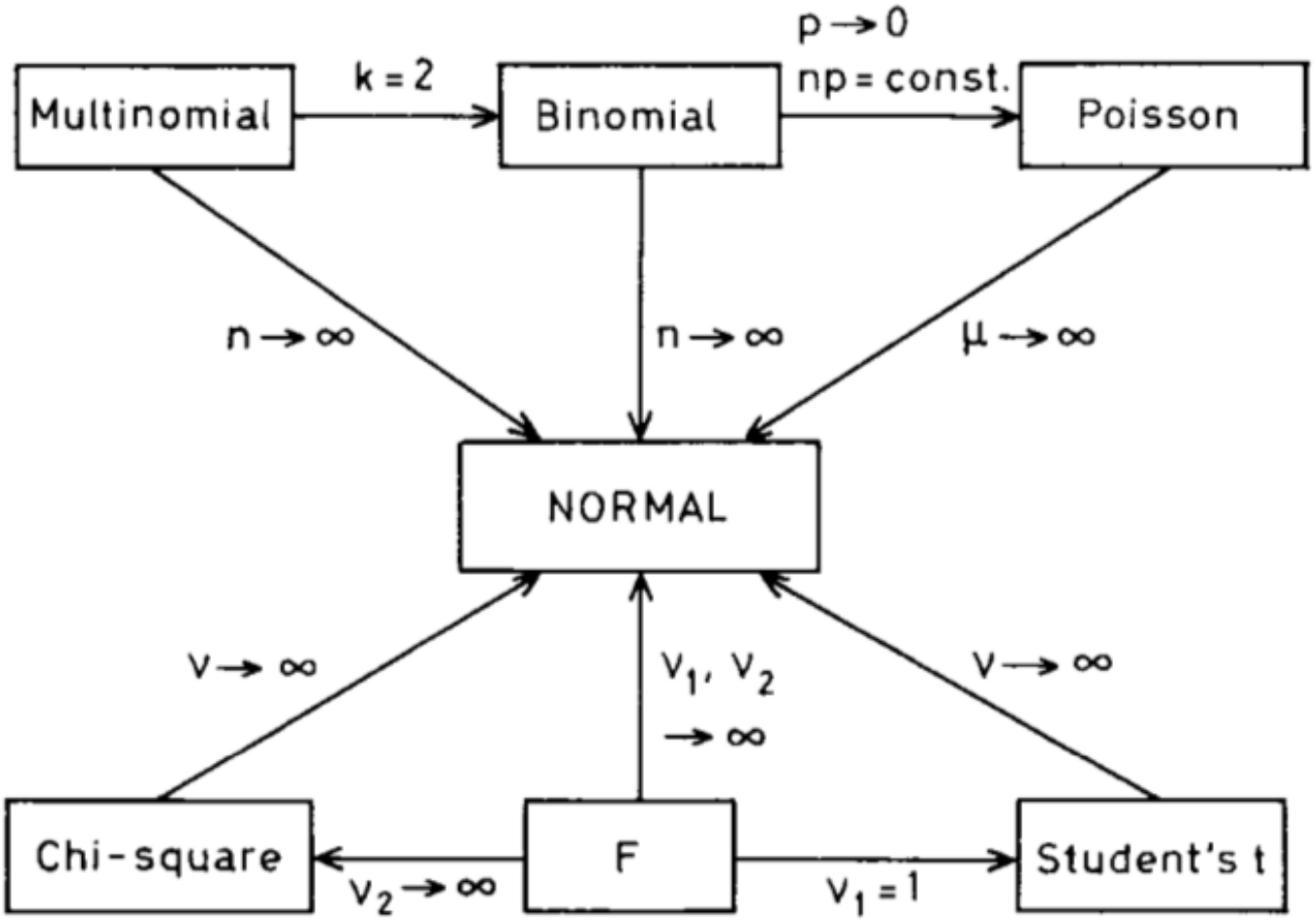


Fig. 5.5. Relations between probability distributions.

General

- Intervalos de confianza.
- Tests y parametros para estudiar la correlación entre variables.
- Ejemplos de papers.

Intervalos de confianza

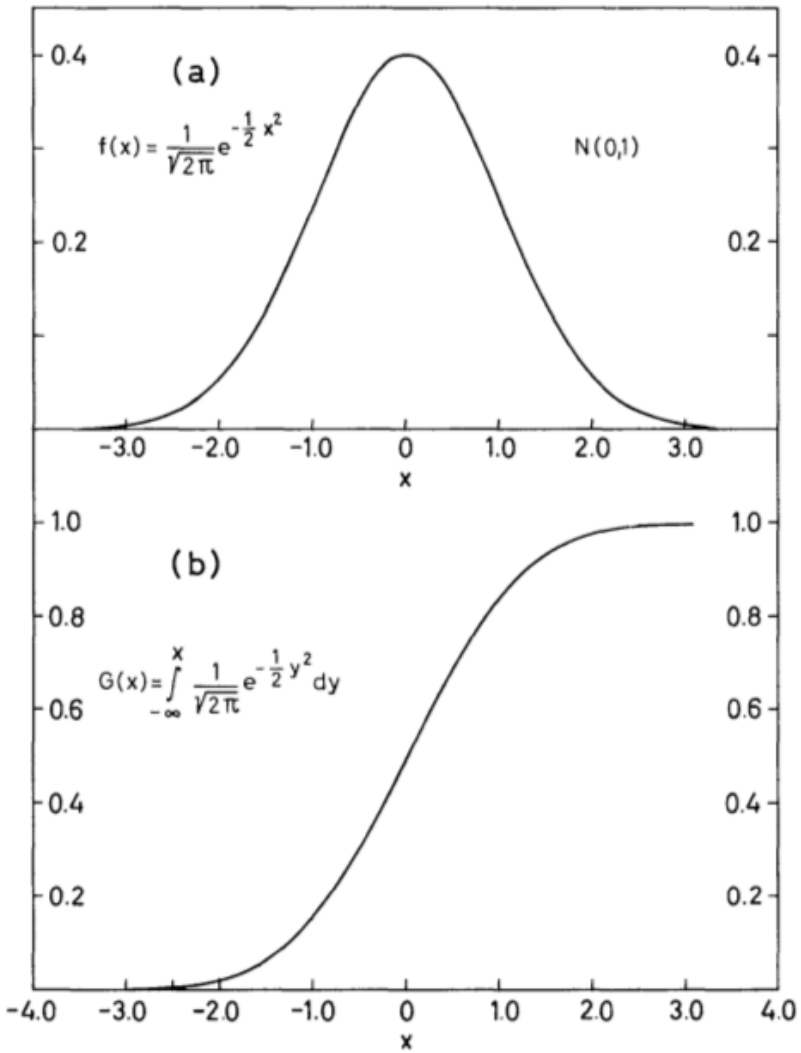
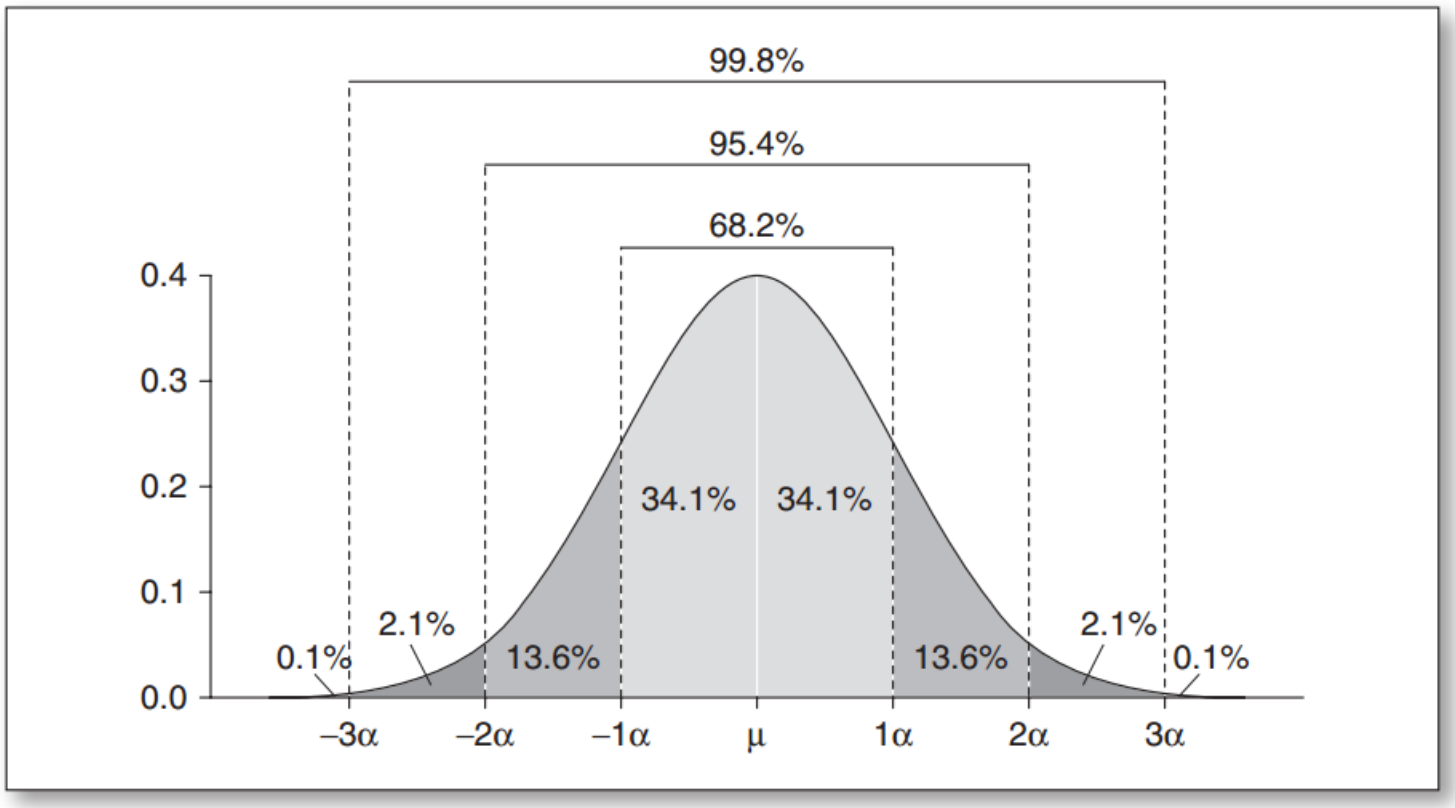


Fig. 4.7. (a) The standard normal p.d.f. N(0,1).
(b) The cumulative standard normal distribution.

Intervalos de confianza



Source: Image courtesy of Wikipedia.

¿Que es un test de hipotesis?

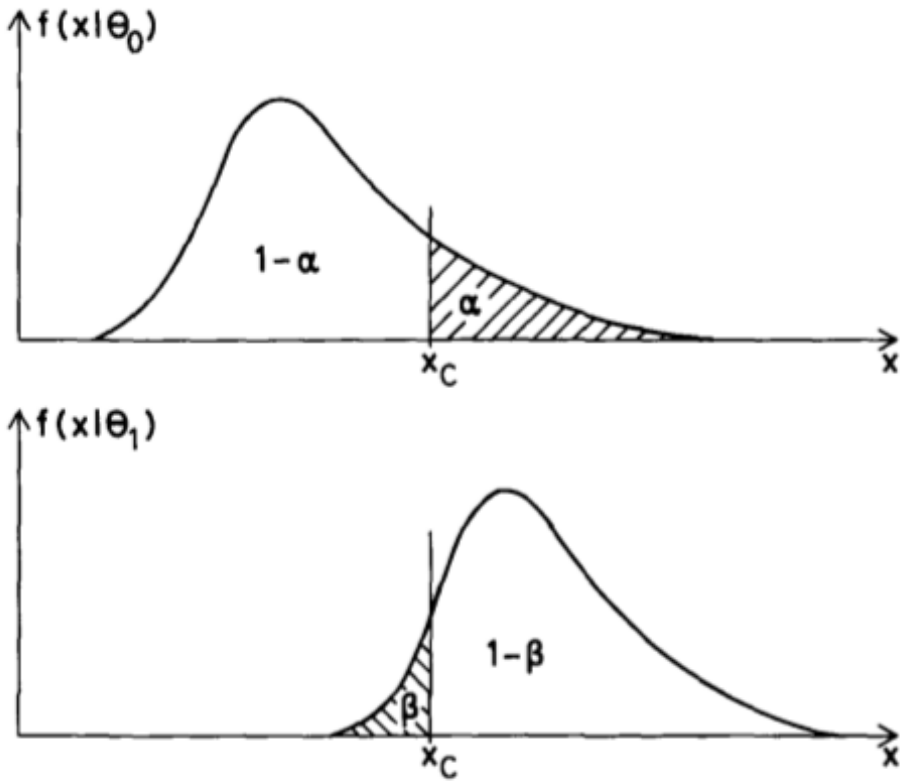


Fig. 14.2. Illustration of Type I error α and Type II error β.

The power of a test is defined as the probability of rejecting a hypothesis when it is false. We have for the power of the test of the null hypothesis H_o against the alternative H_1:

$$\text{Power} = 1-\beta = \int_R f(x|\theta_1)dx = \int_{x_c}^{\infty} f(x|\theta_1)dx\,. \qquad (14.3)$$