The Calculus of Statistics

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1 Probability Distribution Functions

1.1 Probability Density Functions

A probability density function (**PDF**) describes the relative likelihood $f(x)$ of possible outcomes for a continuous random variable.

- The probability of any x occurring is either positive or zero, so a PDF can never be negative.

$$f(x) \geq 0 \text{ for all } x$$

- The area under the curve must equal 1

$$\int_a^b f(x)\,\mathrm{d}x = 1$$

where a and b are the lower and upper bounds, often $-\infty$ and ∞.

1.2 Cumulative Distribution Functions

A cumulative distribution function (**CDF**) gives the probability $F(x)$ that the outcome of a continuous random variable will be less than or equal to x.

- A CDF is monotonically increasing on the interval (a,b).

$$F(a) = 0\ ; \quad F(b) = 1$$