Continuous probability unit

- Introduction to continuous random variables (last weekWednesday)
- Continuous distributions 1: Uniform (last week Friday)
- Continuous distributions 2: Gaussian and Exponential (Monday)
- Continuous distributions 3: Pareto (and Zipf) (**Today**)
- Jointly distributed random variables (Friday)

Today:

- Pareto observed in data
- Pareto formulation
- Zipf's law

Let X be a continuous random variable and let $m, \alpha \in \mathbb{R}^+$ Then X has an **Pareto** distribution if its cumulative distribution function F is

$$F(x) = \begin{cases} 1 - \left(\frac{m}{x}\right)^\alpha & \text{if } x \geq m \\ 0 & \text{otherwise} \end{cases}$$

Moreover, X has probability density function f

$$f(x) = \begin{cases} \frac{\alpha m^\alpha}{x^{\alpha+1}} & \text{if } x \geq m \\ 0 & \text{otherwise} \end{cases}$$

m is the minimum value for x and α is a “shape” parameter.

Let X be a continuous random variable and let $m, \alpha \in \mathbb{R}^+$ Then X has an **Pareto** distribution if probability density function f is

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Let X be a continuous random variable and let $\lambda \in \mathbb{R}^+$ Then X has an **exponential** distribution if its probability density function f is

$$f(x) = \begin{cases} \lambda e^{-\lambda x} & \text{if } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

For next time:

Take the quiz on Canvas