Probability Distributions: Continuous

Introduction to Data Science Algorithms

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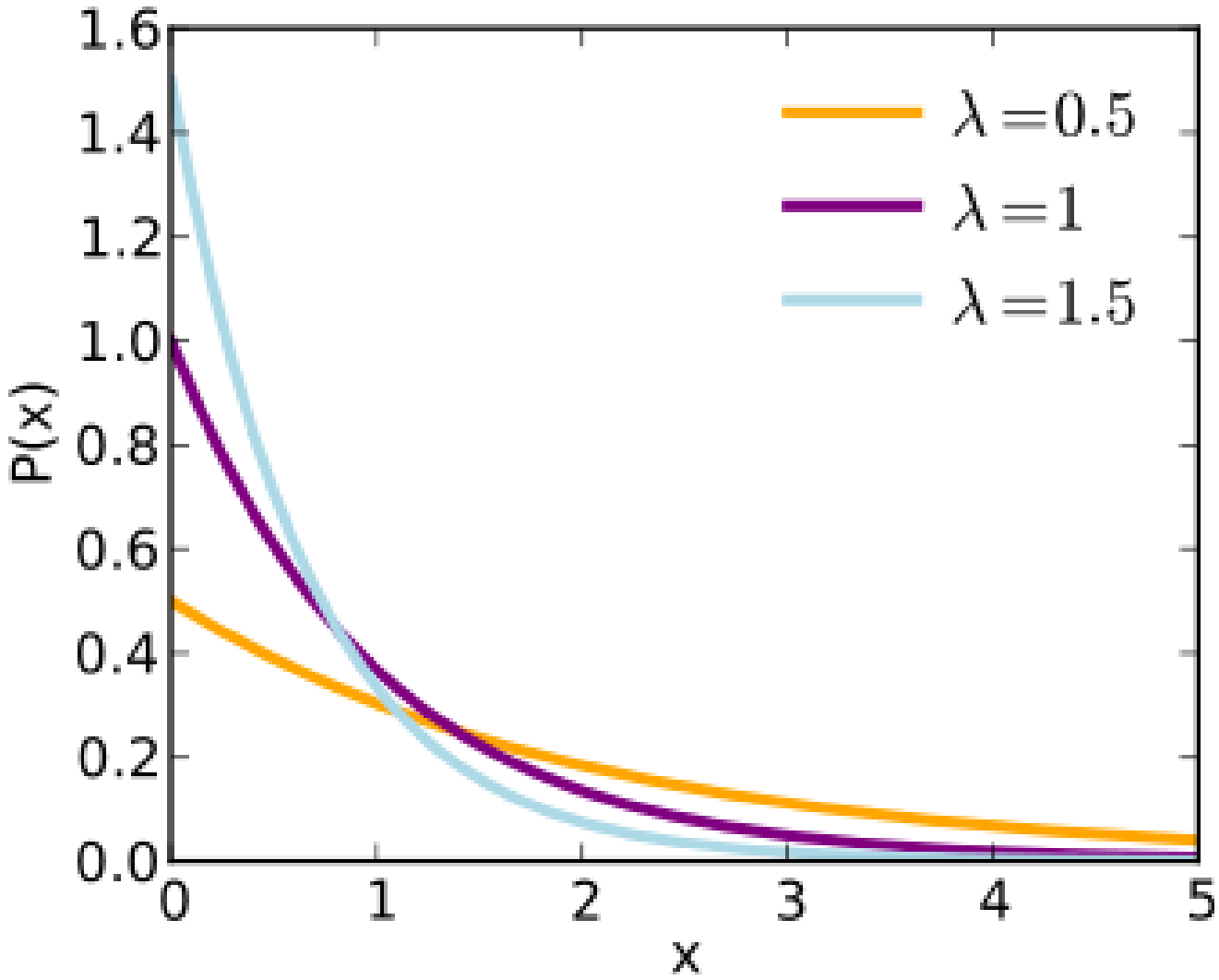
Exponential distribution

- The exponential distribution is over positive real numbers (including zero), with the highest density at zero and decaying as x increases
- Sample space: $[0, \infty)$
- The probability density function is:

$$f(x) = \lambda \exp(-\lambda x)$$

- The parameter $\lambda > 0$ controls how quickly the density decays
- A good model for:
  - The length of a phone call
  - The time between shooting stars during a meteor shower
  - The distance between cracks in a pipeline

Exponential distribution



Gamma distribution

- The gamma distribution is a generalization of the exponential distribution (and others)
- Two parameters: shape $k > 0$, scale $\theta > 0$
- PDF:

$$f(x) = \frac{x^{k-1} \exp(-\frac{x}{\theta})}{\theta^k \Gamma(k)}$$

- Equivalent to exponential distribution when $k = 1$, $\theta = \frac{1}{\lambda}$

Exponential distribution