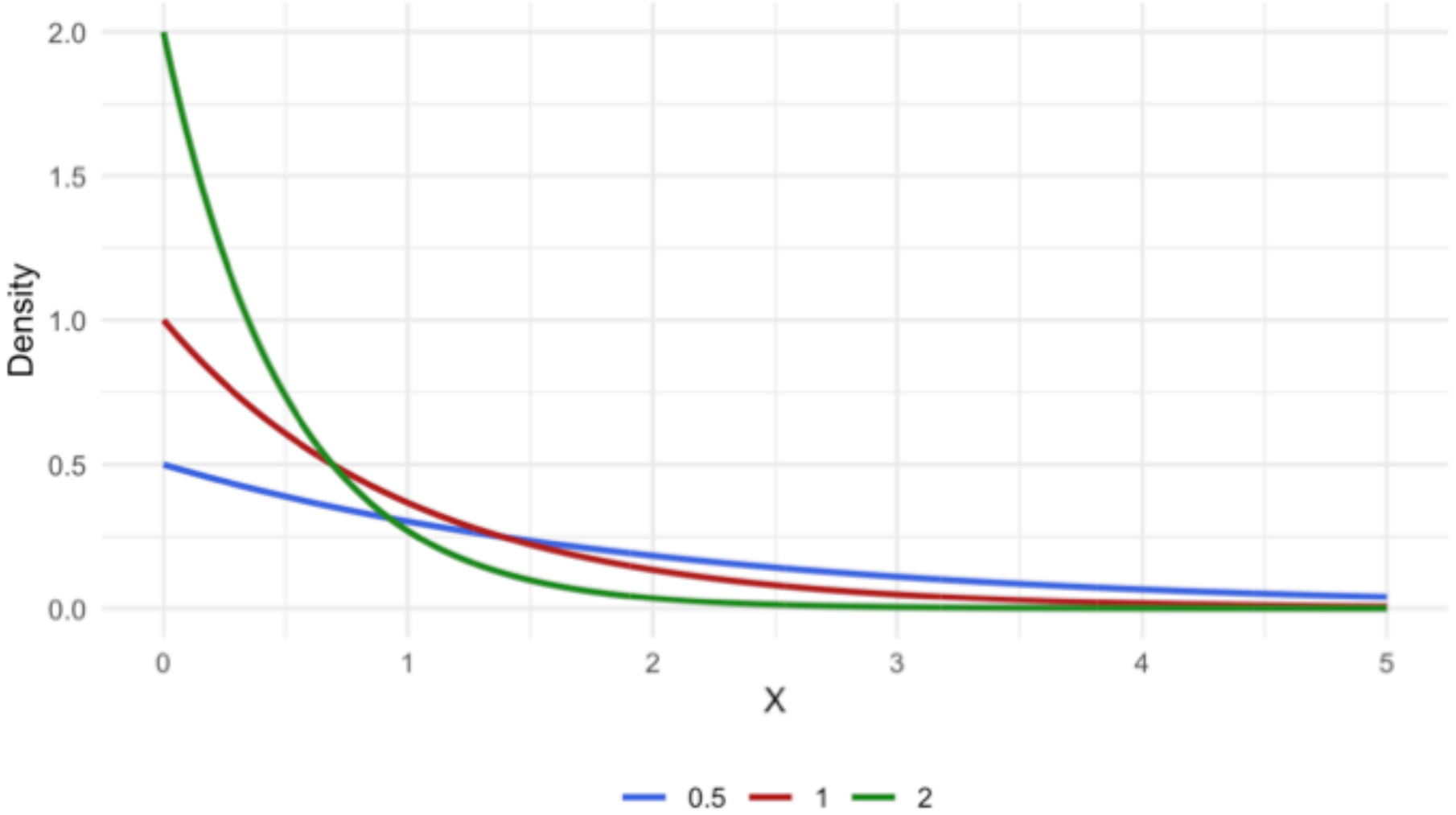
some continuous random variables and their pdfs

exponential distribution $X \sim \text{Exp}(\lambda)$


2.0
1.5
1.0
0.5
0.0
Density
0
1
2
3
4
5
X
0.5
1
2

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exponential distribution $X \sim \text{Exp}(\lambda)$

A continuous random variable X has exponential distribution with parameter λ, for some $\lambda > 0$, if it has the following pdf

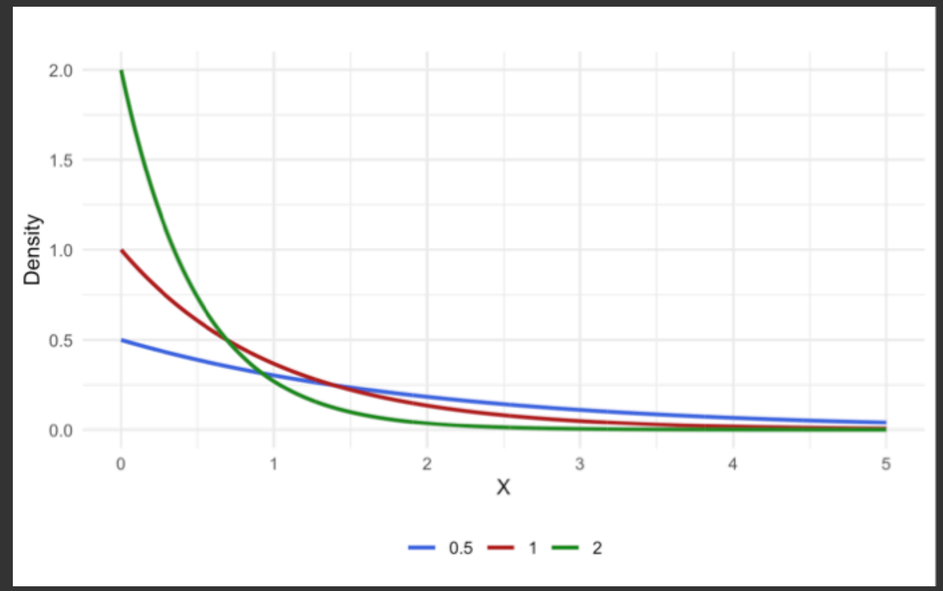
$$f(x) = \begin{cases} \lambda e^{-\lambda x} & \text{if } x > 0 \\ 0 & \text{otherwise} \end{cases}$$

and the following cdf

$$F(x) = \begin{cases} 1 - e^{-\lambda x} & \text{if } x > 0 \\ 0 & \text{otherwise} \end{cases}$$

This distribution is **memoryless** i.e.

$$P(X \geq a \,|\, X \geq b) = P(X \geq a - b)$$



The exponential distribution is a specific version of gamma family distributions…

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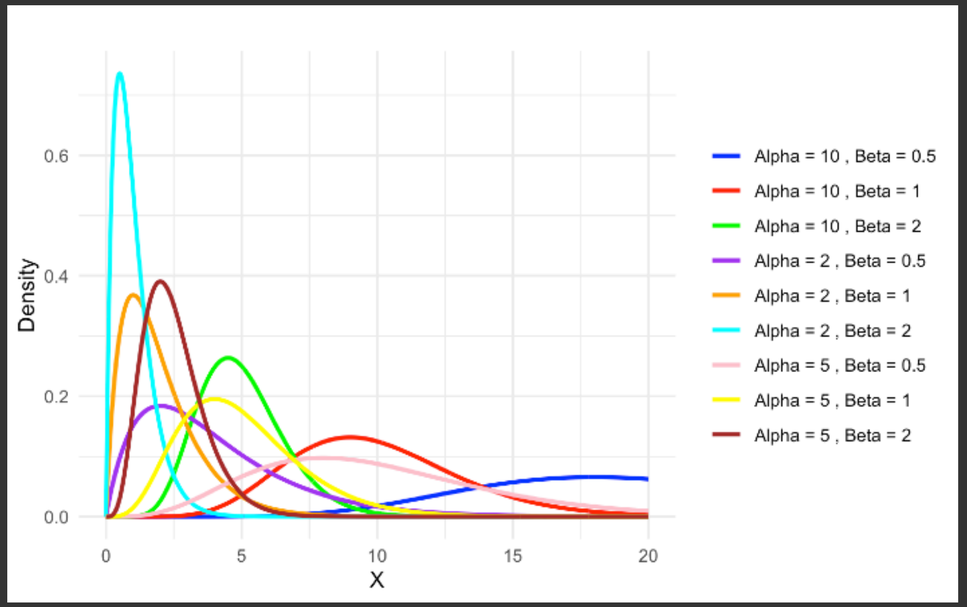
gamma distribution $X \sim \text{Gamma}(\alpha, \beta)$



$$\alpha = 1 \implies \text{Exponential} \left(\beta = \frac{1}{\lambda} \right)$$

$$\alpha = \frac{v}{2}, \beta = 2 \implies \text{chi-square} \quad \chi^2(v)$$