Probability Distribution Families

DASC 512

Overview

- Location Families
- Scale Families
- Location and Scale Families

Why Families?

Because they are useful! And because Python implements them.

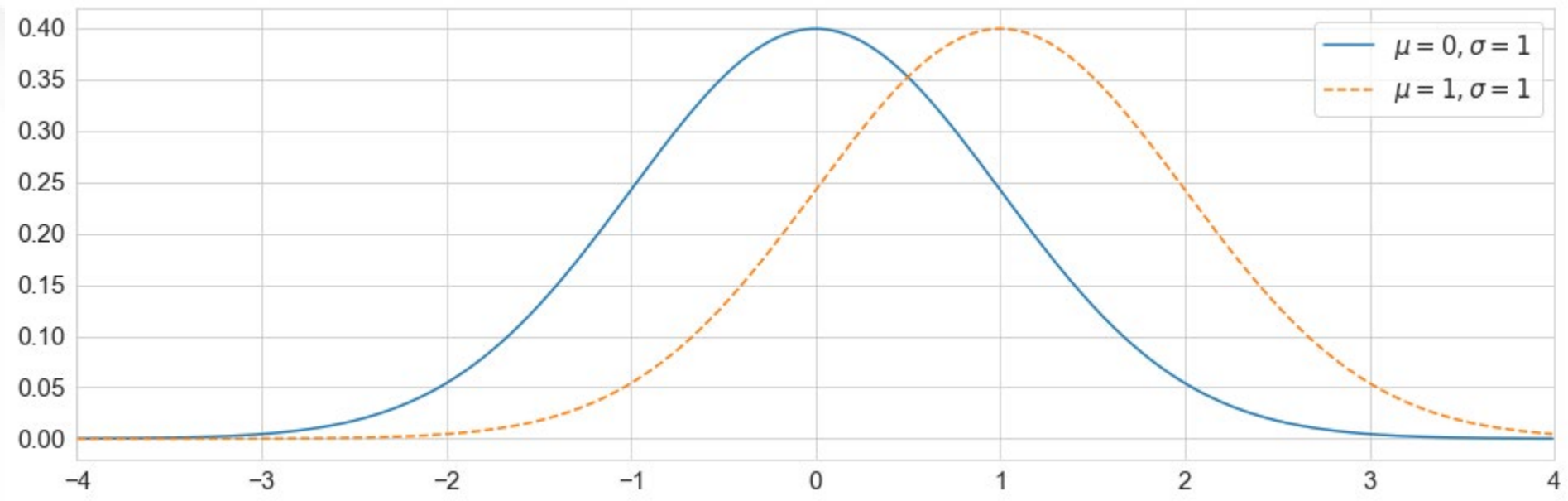
Families are groups of probability distributions with similar characteristics

Location Families

Let $f(x)$ be any pdf. Let μ be any constant. Then the function

$$g(x) = f(x - \mu)$$

is also a pdf. The group of pdfs $f(x - \mu)$ is a location family.

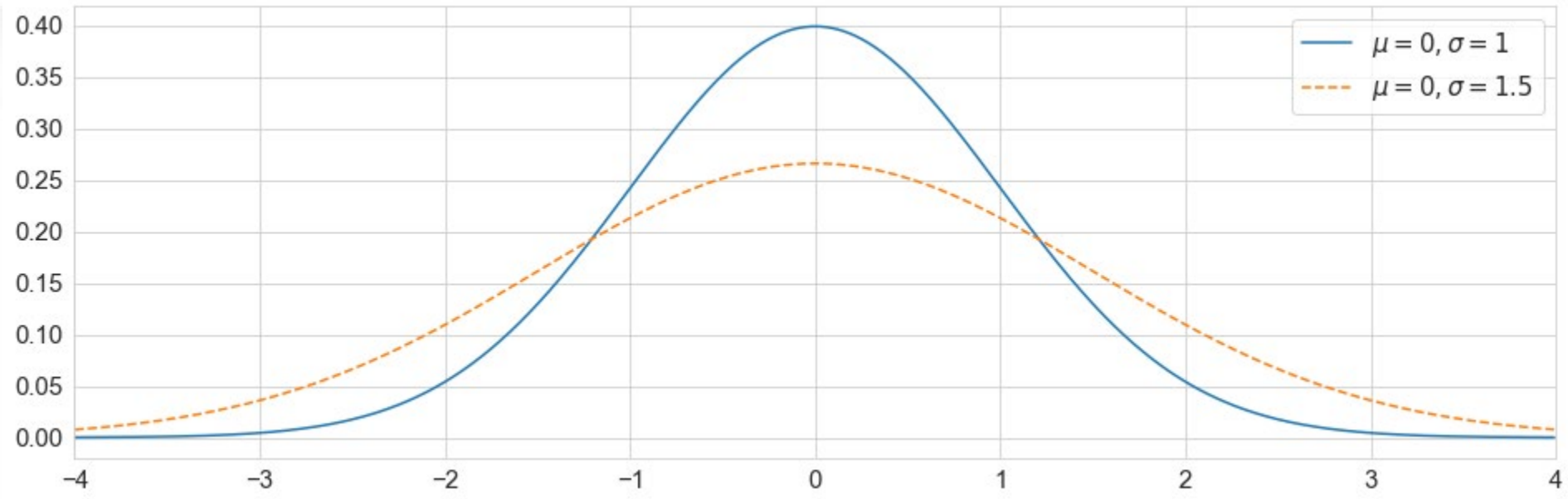


Scale Families

Let $f(x)$ be any pdf. Let $\sigma > 0$ be any constant. Then the function

$$g(x) = \frac{1}{\sigma} f\left(\frac{x}{\sigma}\right)$$

is also a pdf. The group of pdfs $\frac{1}{\sigma} f\left(\frac{x}{\sigma}\right)$ is a scale family.

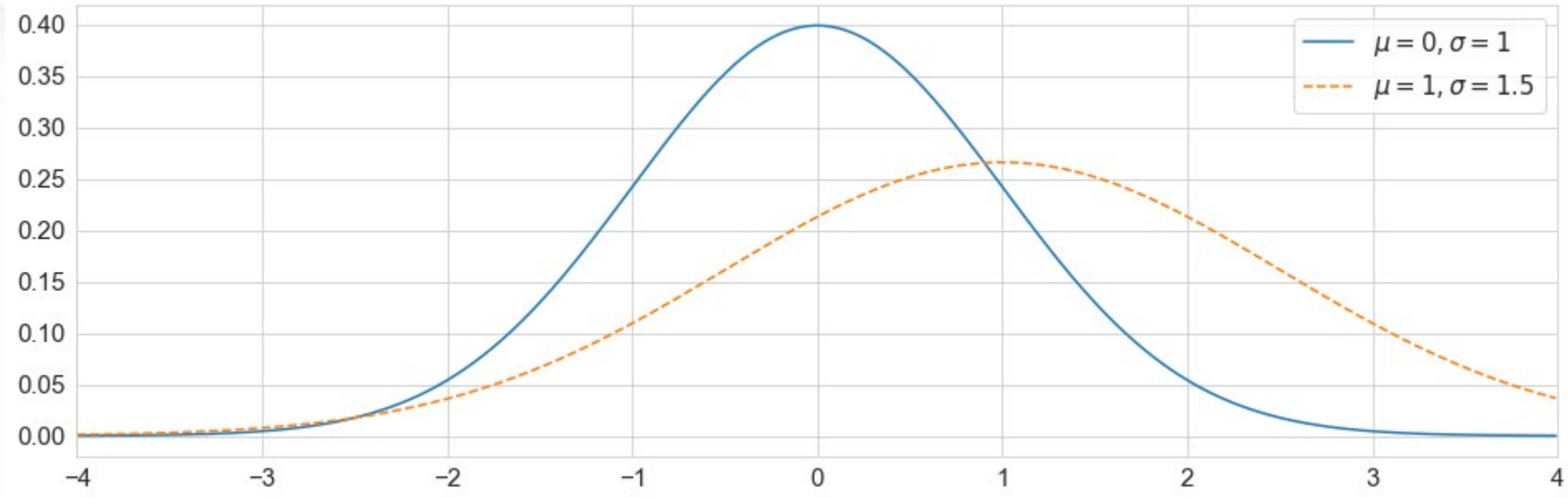


Location and Scale Families

Let $f(x)$ be any pdf. Let μ be any constant. Let $\sigma > 0$ be any constant. Then the function

$$g(x) = \frac{1}{\sigma} f\left(\frac{x-\mu}{\sigma}\right)$$

is also a pdf. The group of pdfs $\frac{1}{\sigma} f\left(\frac{x-\mu}{\sigma}\right)$ is a location and scale family.



Examples

I'll illustrate implementation in Python as we go through the various families of distributions

Recap

- Location Families
- Scale Families
- Location and Scale Families