



Empirical Normal

1 Why

What is a reasonable normal density to associate with some data?

2 Definition

Let x^1, \dots, x^n be a dataset in \mathbf{R}^d . The *empirical mean* of the dataset is

$$\frac{1}{n} \sum_{k=1}^n x^k.$$

The *empirical covariance* of the dataset is

$$\frac{1}{n} \sum_{i=1}^n \left(x^i - \frac{1}{n} \sum_{k=1}^n x^k \right) \left(x^i - \frac{1}{n} \sum_{k=1}^n x^k \right)^\top.$$

The *empirical normal* associated with the dataset is the normal density whose mean is the empirical mean and whose covariance is the empirical covariance.