# Intro. to Machine Learning Project3

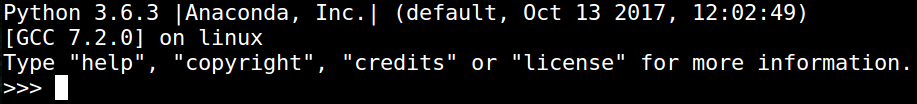
Comparison b/w KDTree , Decision Tree and Naive Bayes Classifier Report

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## Build environment (Note, this report is written in md-like format)

\* Ubuntu 16.04 LTS 64bit

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\* Packages including sklearn, numpy, scipy

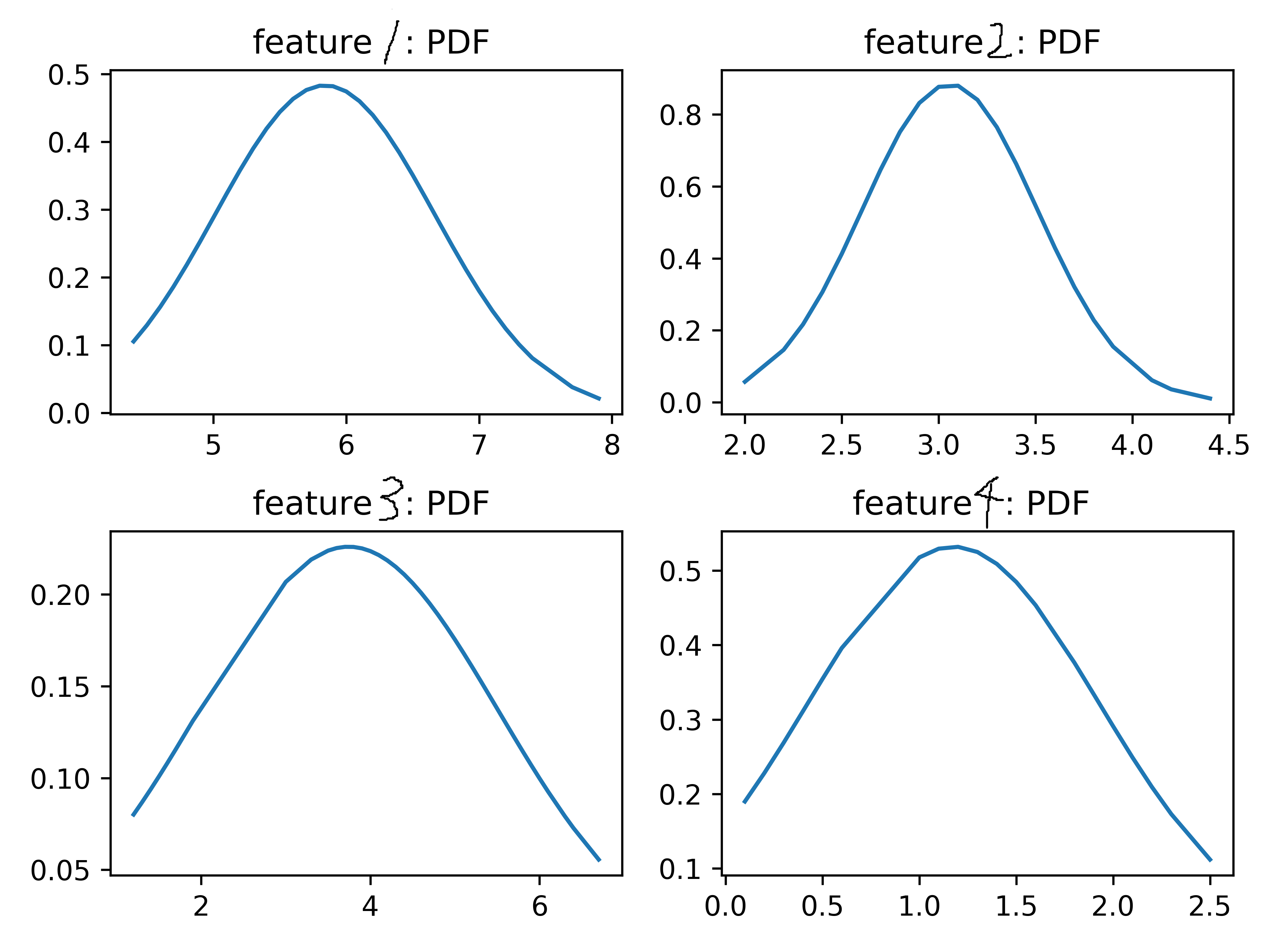
Where sklearn is used for the constructing/training /validating model, numpy and scipy for the numerical and statistical analysis.

\* Intel Core i7-5700HQ 2.9GHz 4C8T

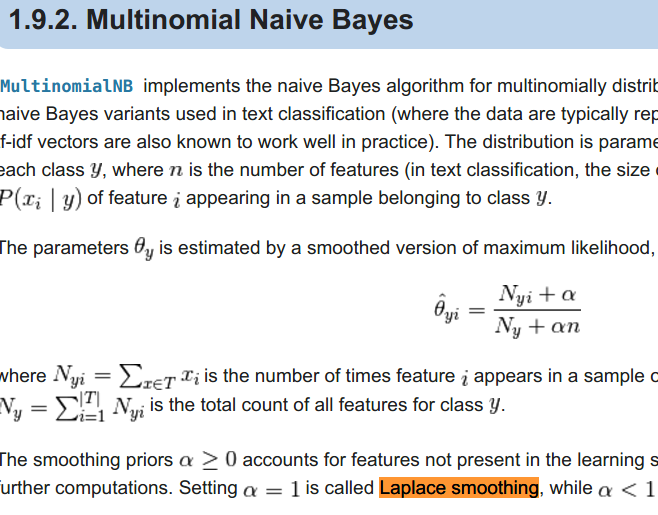
\* DDR3 -1866 16GB dual channel

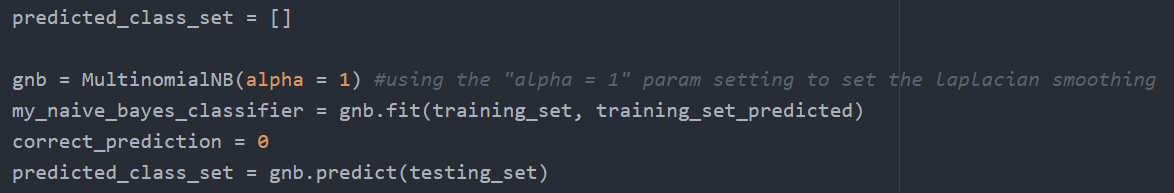
## Iris data set

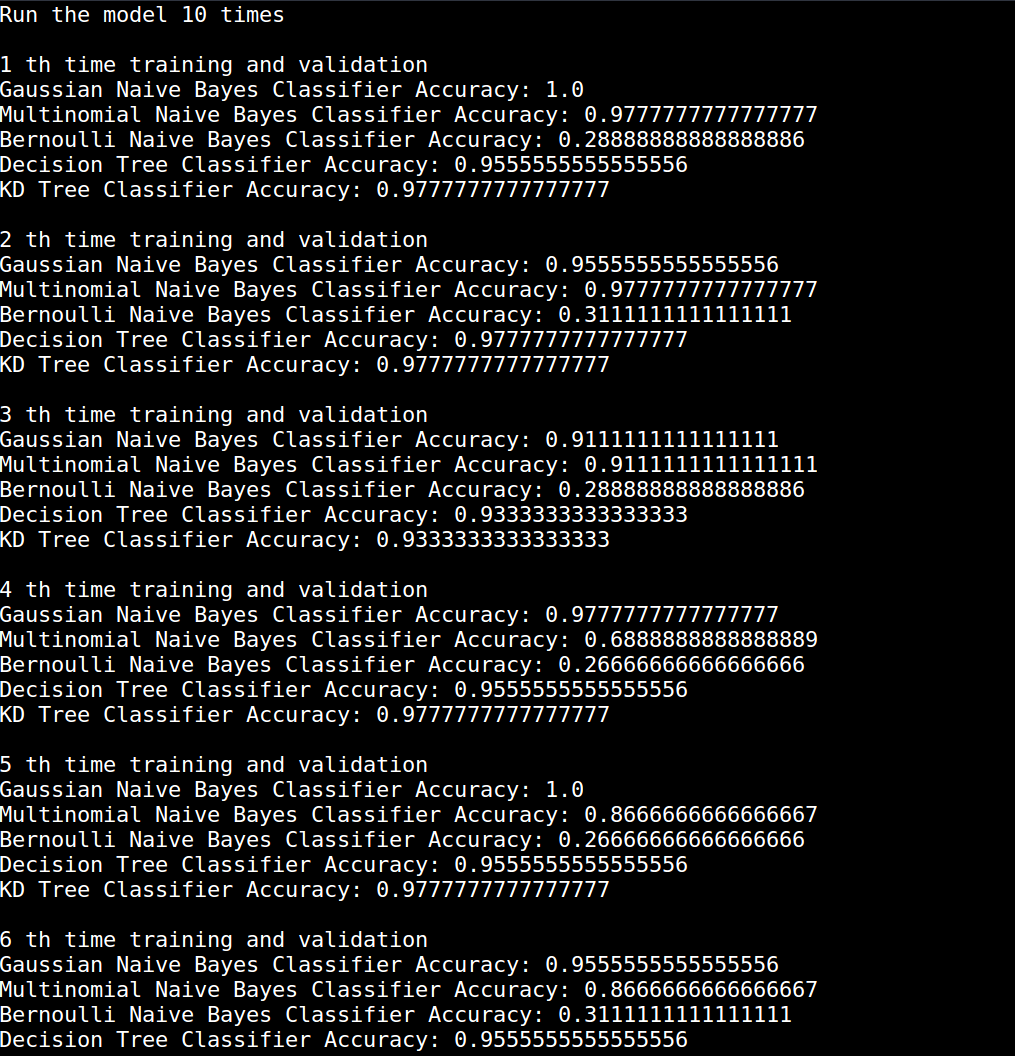
\* Probability Distribution Plot of the iris\_dataset

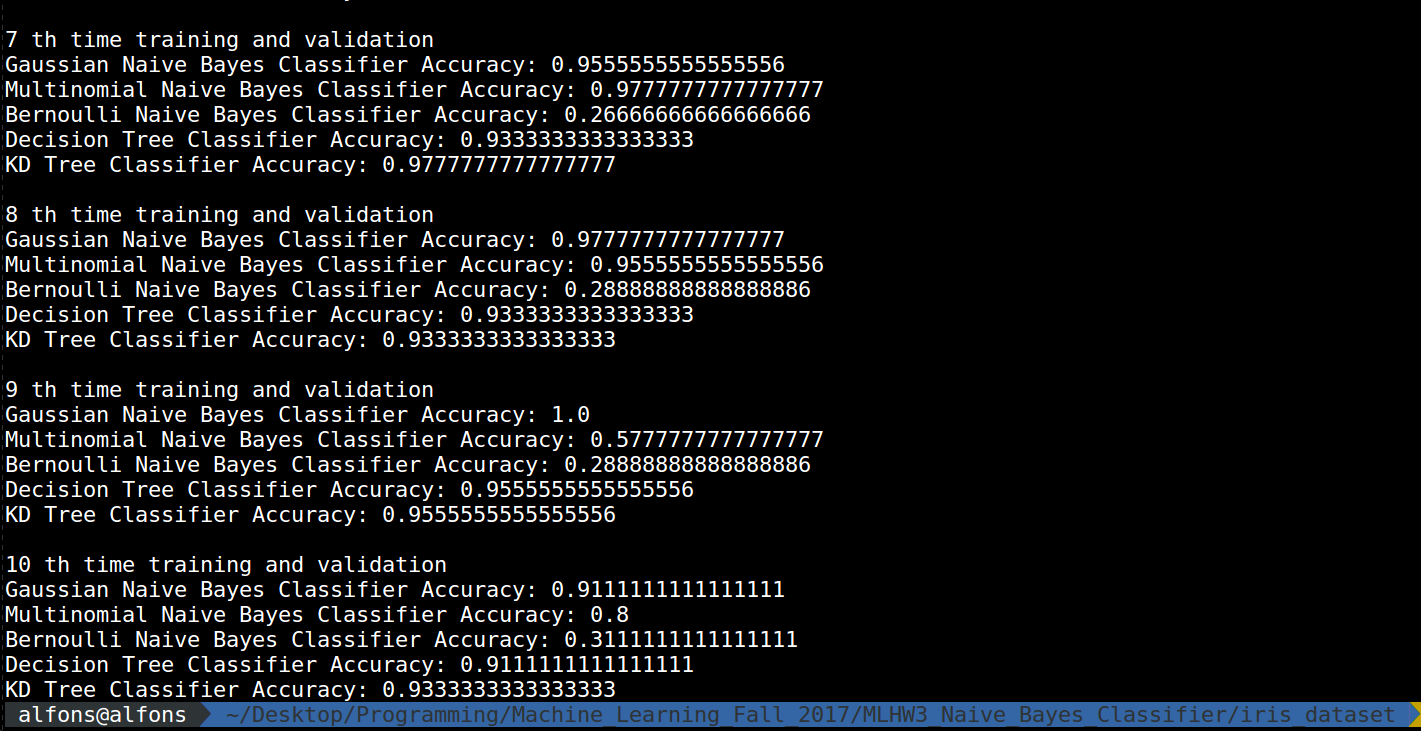


\* The required Laplacian Smoothing can be found in the Multinomial Naive Bayes Classifier:





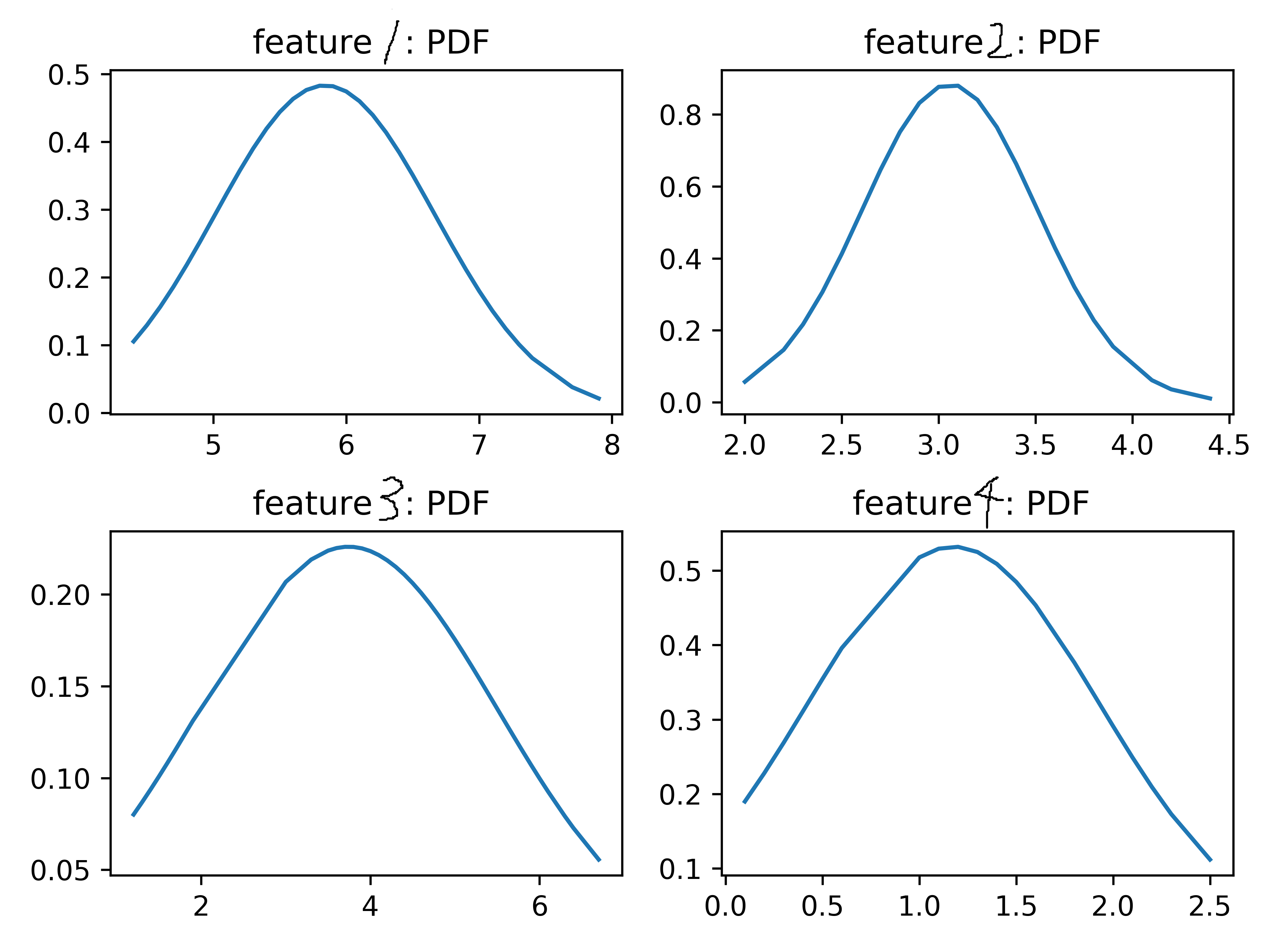




\* Observation and my inference from the prediction result of the iris dataset

As we can see, the GaussianNB , KD Tree and Decision Tree Classifier have an outstanding result compared to the Multinominal and Bernoulli NB which they both have a quite inaccurate one. Hence, what is the reason?

●First, consider the probability distribution function of the iris data set

All of the features are rather bearing the resemblance to that of the Normal Distribution, or say the Gaussian Distribution.

Namely, the GaussianNB will be quite suitable for the prediction.

But how come the Multinominal and Bernoulli NB produce such an dissatisfying result?

The Multinomial Naïve Bayes model counts how often a certain event occurs in the dataset (for example how often a certain word occurs in a document).

The Bernoulli Naïve Bayes model is similar to the Multinomial Naive Bayes model, but instead of counting how often an event occurred, it only describes whether or not an event occurred (for example whether or not a certain word occurs in a document, where it doesn't matter if it occurs once or 100000 times)

In short, the GNB group the similar data together according to the Gaussian Distribution like mean mean+-std mean+-2std and mean +-3std.

In the other two Naïve Based models, they count each distinct value, even though this is the continuous one, 0.1 0.2 0.3 0.4 will be counted to different type respectively, where they originally should produce the same result. Therefore, it undoubtedly produces a result which is quite inaccurate.

●Then we consider the KD Tree model and Decision Tree model for the iris\_dataset

The KD Tree KNN algorithm produces a slightly better accuracy then the Decision Tree while they both produces the results which are quite satisfying.

Def supervised learning (from Wikipedia): Supervised learning is the machine learning task of inferring a function from labeled training data.[1] The training data consist of a set of training examples. In supervised learning, each example is a pair consisting of an input object (typically a vector) and a desired output value (also called the supervisory signal). A supervised learning algorithm analyzes the training data and produces an inferred function, which can be used for mapping new examples.

And they are both supervised learning since in Decision Tree, it has the classification as input while in KNN, it self-search the NN to find the classification.

●Difference b/w regression and classcification?

Regression involves estimating or predicting a response.

Classification is identifying group membership.

Given the following

f:x→y

f:x→y

If y is discrete/categorical variable, then this is classification problem.

If y is real number/continuous, then this is a regression problem.