Week 5
Classification

Overview

1. Steps for KNN algorithms
2. Implementation of Confusion Matrix
3. Implementation of Naïve Bayes Classifier
4. ROC Curve

Classification

Classification problem => inference stage => decision stage

$$p(\mathcal{C}_k|\mathbf{x}) = \frac{p(\mathbf{x}|\mathcal{C}_k)p(\mathcal{C}_k)}{p(\mathbf{x})}.$$

Discriminant functions:
these approaches map each input directly on to a class label and probabilities play no role.

Discriminative models:
These models solve the posterior class probability, p(Ck|x) directly, and then assign each new x to a class using a suitable loss function or other decision function. (e.g. Logistic Regression)

Generative models: Like discriminative models, these also solve for p(Ck|x), but first have to determine p(x|Ck) and p(Ck) for each class individually. Afterwards, a decision function determines class membership. (e.g. Naïve Bayes)

Naïve Bayes Classifier

$$p(\mathcal{C}_k|\mathbf{x}) = \frac{p(\mathbf{x}|\mathcal{C}_k)p(\mathcal{C}_k)}{p(\mathbf{x})}.$$

Assumption: features are conditionally independent given the class (hence naïve)

P(x) is normalisation constant

Pick Ck has the largest probability as outcome => Maximum A Posteriori