Artificial Intelligence Club:

Classificiation Methods

Week 9

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Created by Allgirlithm Outreach: https://www.allgirlithm.org/

Today's Agenda

- Supervised learning revisited
- Three methods
  - K-nearest neighbors
  - Support vector machines
  - Random forests and decision trees

Supervised Learning

Machine is trained using labelled data

Correct/incorrect "answer" is known

1

K-Nearest Neighbors

Birds of a feather flock together

Supervised Learning Example

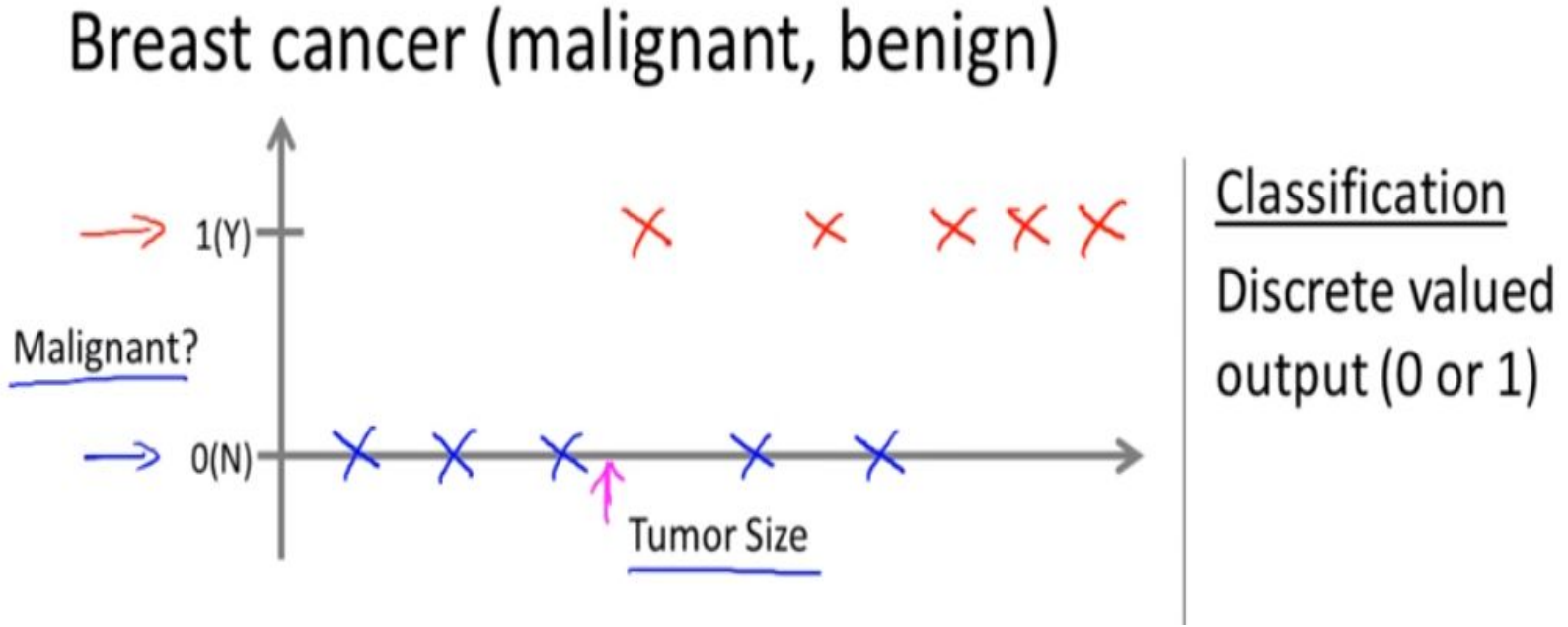


Image credit: Stanford Machine Learning

K-Nearest Neighbors

- Similar things are grouped close to each other
- Finds distance between test data and labelled data
- Selects number of examples (K) closest to the test data
  - Most frequent label: classification
  - Average label: regression

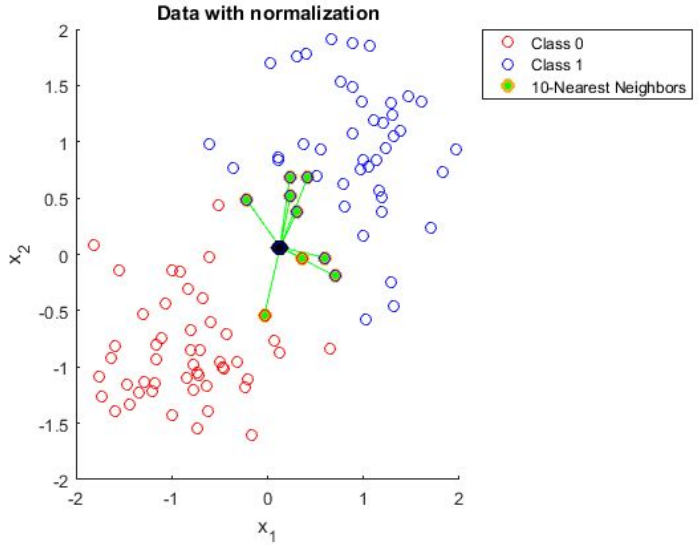


Image credit: Stack Exchange

2

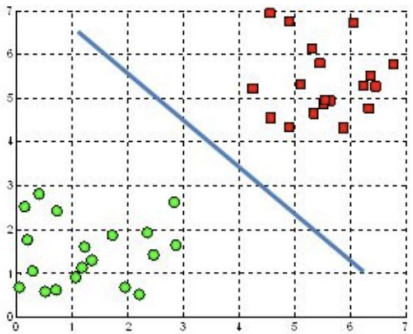
Support Vector Machines

Finds a hyperplane that splits sections of data

Support Vector Machines

- For classification purposes
- Tuning parameter: kernel, regularization, gamma, margin

A hyperplane in $\mathbb{R}^2$ is a line



A hyperplane in $\mathbb{R}^3$ is a plane

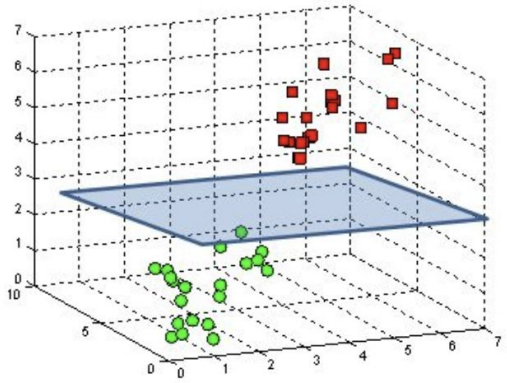
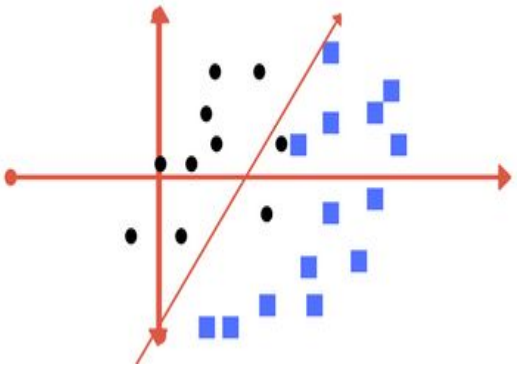
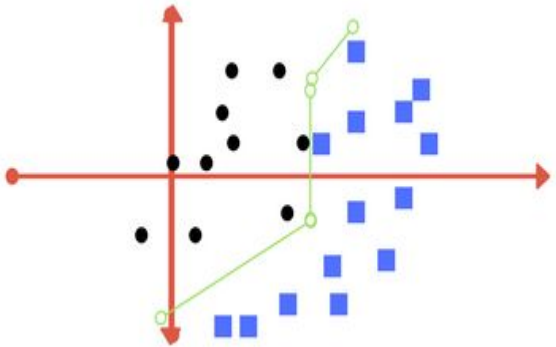


Image credit: DeepAI

SVM Parameters

- Kernel - can change line of separation (linear, polynomial, exponential)
- Regularization - how much you want to avoid misclassifying





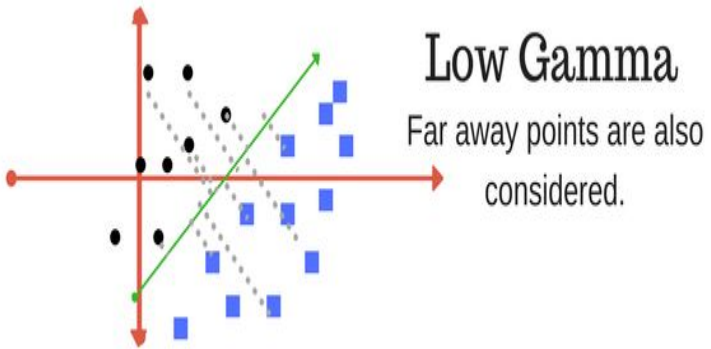
Left: low regularization

Right: high regularization

Image credit: Towards Data Science

SVM Parameters

- Gamma - what types of data points are considered based on distance
- Margin - separation of the line to the closest class points



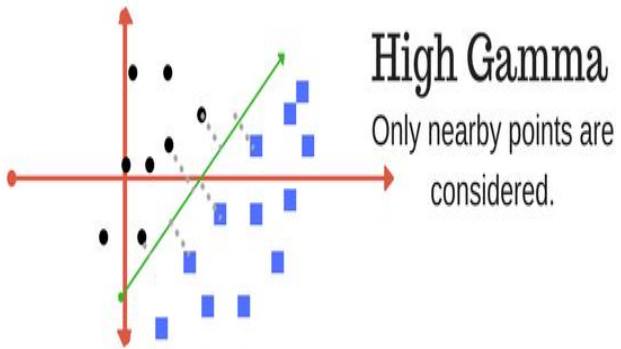
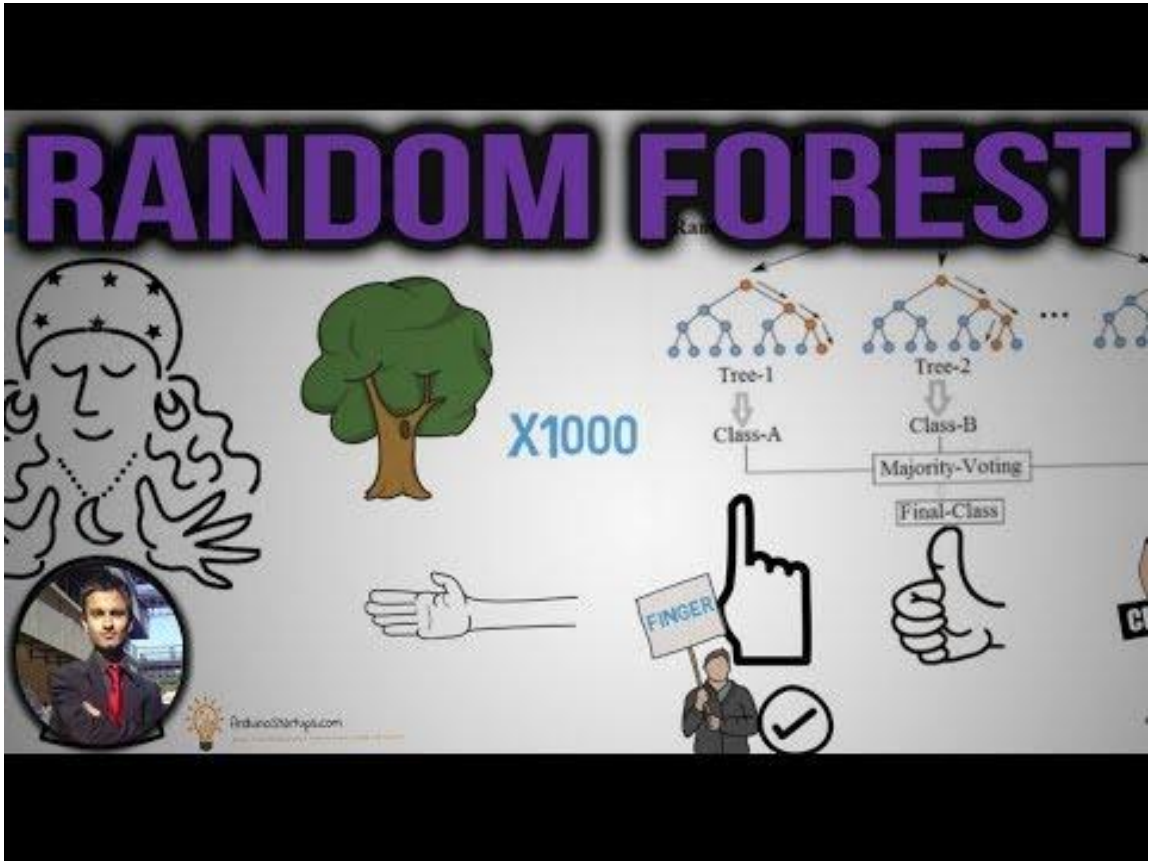


Image credit: Towards Data Science

3

Random Forests and Decision Trees

Classifies data based on multiple features


RANDOM FOREST
X1000
Tree-1
Tree-2
Class-A
Class-B
Majority-Voting
Final-Class
FINGER

Sources

- https://towardsdatascience.com/machine-learning-basics-with-the-k-nearest-neighbors-algorithm-6a6e71d01761
- https://medium.com/machine-learning-101/chapter-2-svm-support-vector-machine-theory-f0812effc72
- https://www.youtube.com/watch?v=D_2LkhMJcfY