

Lecture 20

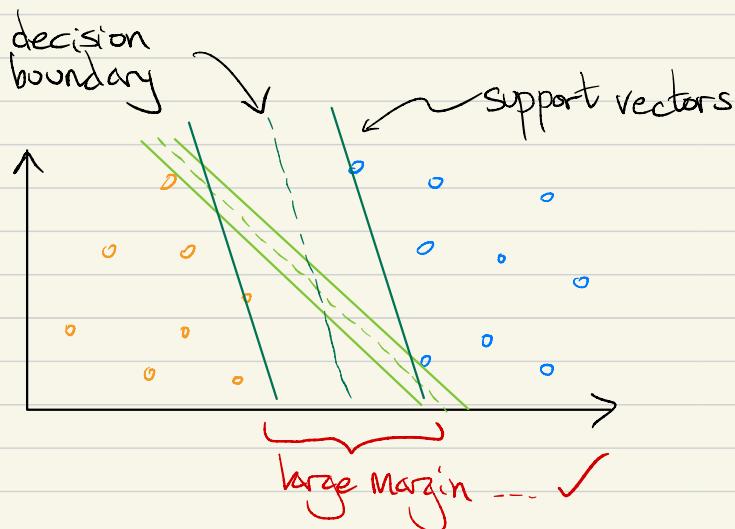
03/31/2022

DISCRIMINATIVE CLASSIFICATION

- no attempt to model the class PDFs
- just determine a DECISION BOUNDARY

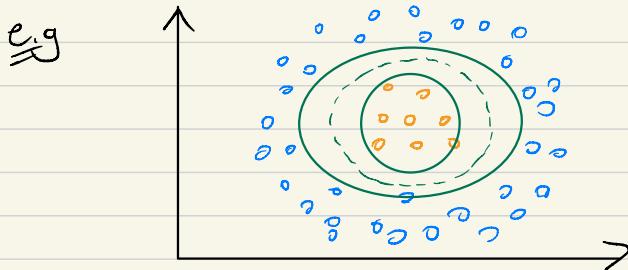
Support Vector Machines (SVMs)

- define a HYPERPLANE that maximizes the distance of the closest point from each class.
 - "Margin" → the points that touch the margin are called SUPPORT VECTORS.



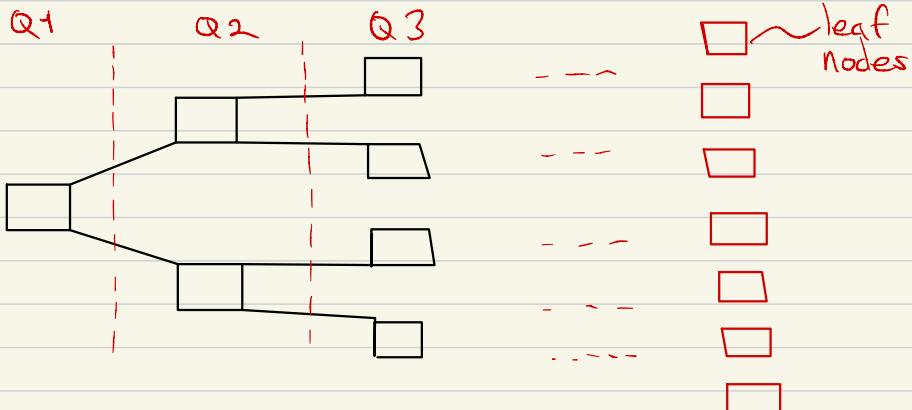
- * [NOTE] data does not need to be fully separated. There can be mixing. We just put constraints on number of "failures".

→ We can also implement a NON-LINEAR
DECISION BOUNDARY ... use kernels



o Decision Trees

- * Define criteria to separate your sample into 2 groups.
- * Take these sub-groups and split again.
- * Keep going until there are too few points to split again.



How to split? ~ perform trials of feature and feature-value used to split.

→ optimal splitting will decrease the disorder in the dataset through partitioning.

- Ensemble Learning

- * **BAGGING (Bootstrap Aggregation)**

- ↳ bootstrap resample a dataset many times; train many decision trees; then average the predictive results.

- * **RANDOM FORESTS**

- ↳ choose the splitting features at random; only choose a # of splitting features \sqrt{D} ; final classification based on averaging results from individual decision trees.

- * **BOOSTING**

- ↳ run the classification multiple times, and re-weight data based on how poorly the data were classified in the previous iteration.

- Great, which one do I use?

naive Bayes
decision trees

LDA

KNN

LSVM

KSVM

QDA

(RFs)/Boosting



Accuracy



powerful and
easily parallelized