Introduction to K Nearest Neighbors

Reading Assignment

Complete Chapter 4

Introduction to Statistical Learning

By Gareth James, et al.

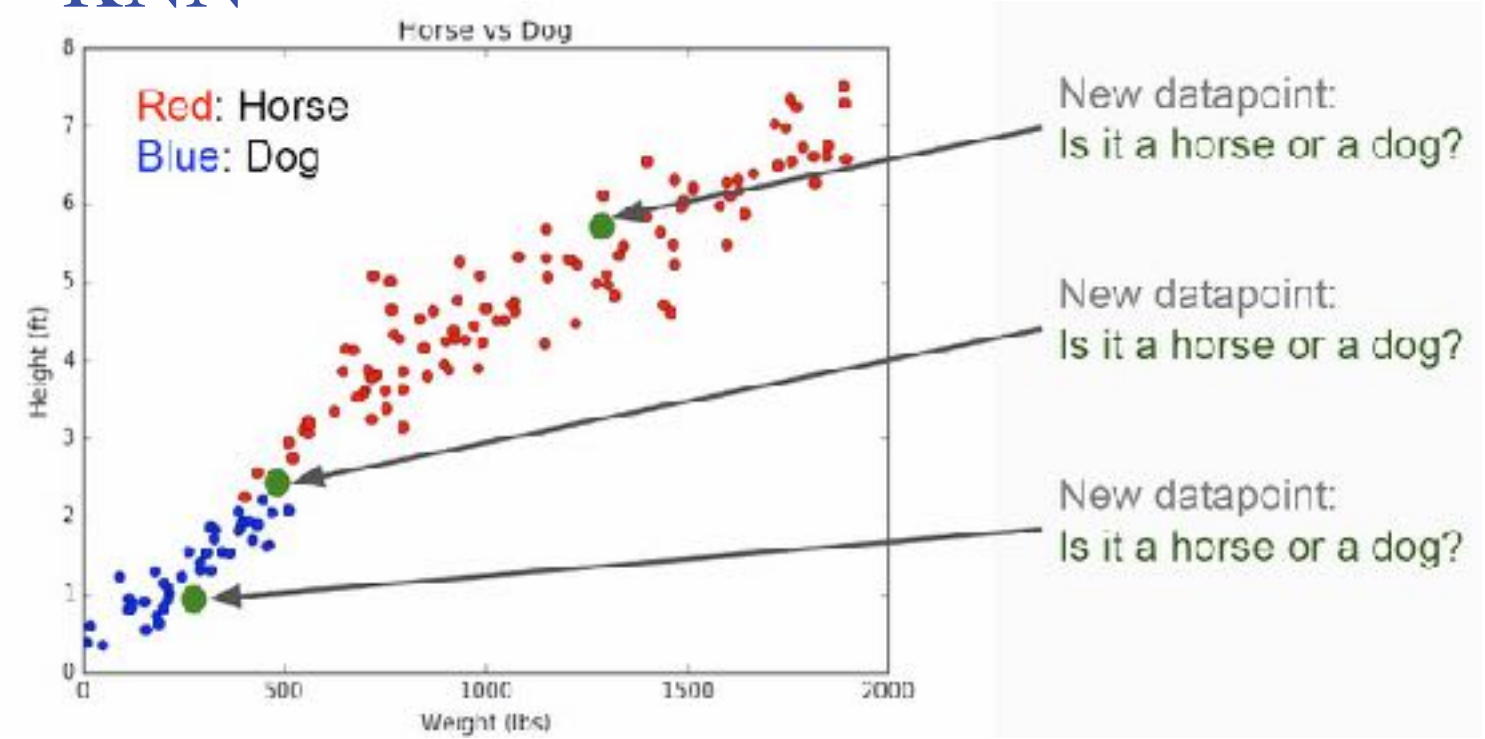
KNN

K Nearest Neighbors is a classification algorithm that operates on a very simple principle.

It is best shown through example!

Imagine we had some imaginary data on Dogs and Horses, with

KNN


Horse vs Dog
Red: Horse
Blue: Dog
Height (ft)
Weight (lbs)
0
1
2
3
4
5
6
7
8
0
500
1000
1500
2000
New datapoint:
Is it a horse or a dog?
New datapoint:
Is it a horse or a dog?
New datapoint:
Is it a horse or a dog?

KNN

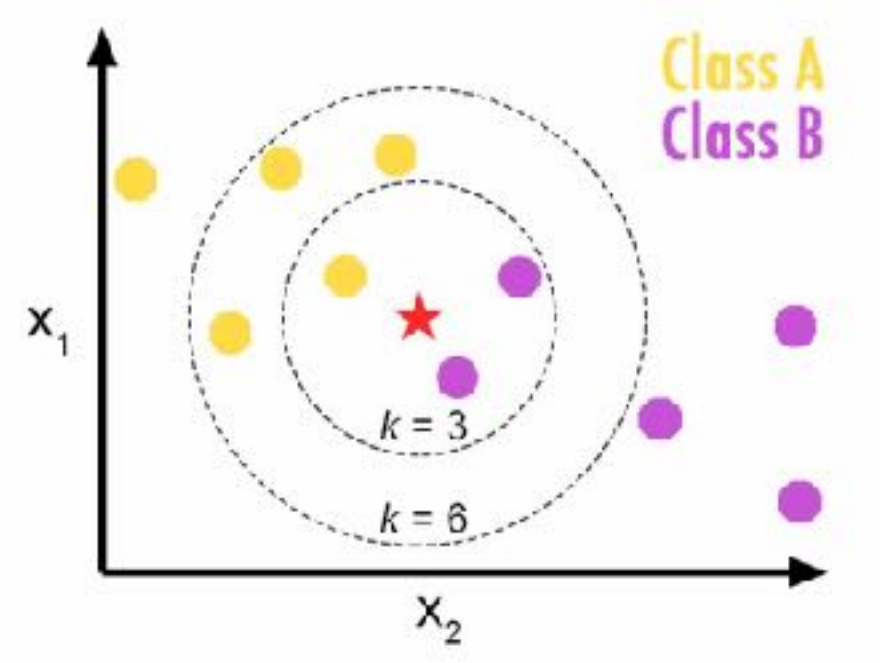
Training Algorithm:

1. Store all the Data

1. Calculate the distance from x to all points in your data
2. Sort the points in your data by increasing distance from x
3. Predict the majority label of the “k” closest points

KNN

Choosing a K will affect what class a new point is assigned to:



KNN

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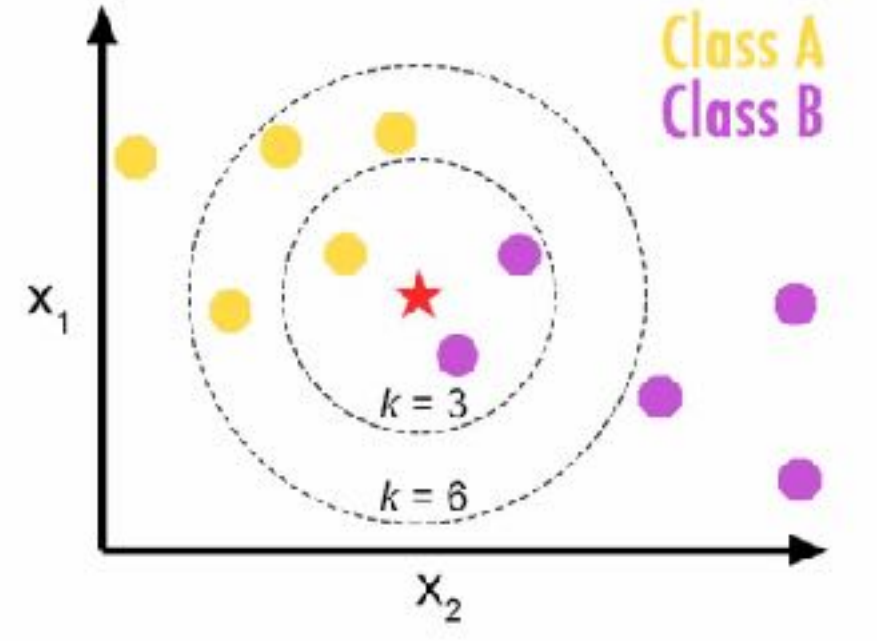

KNN

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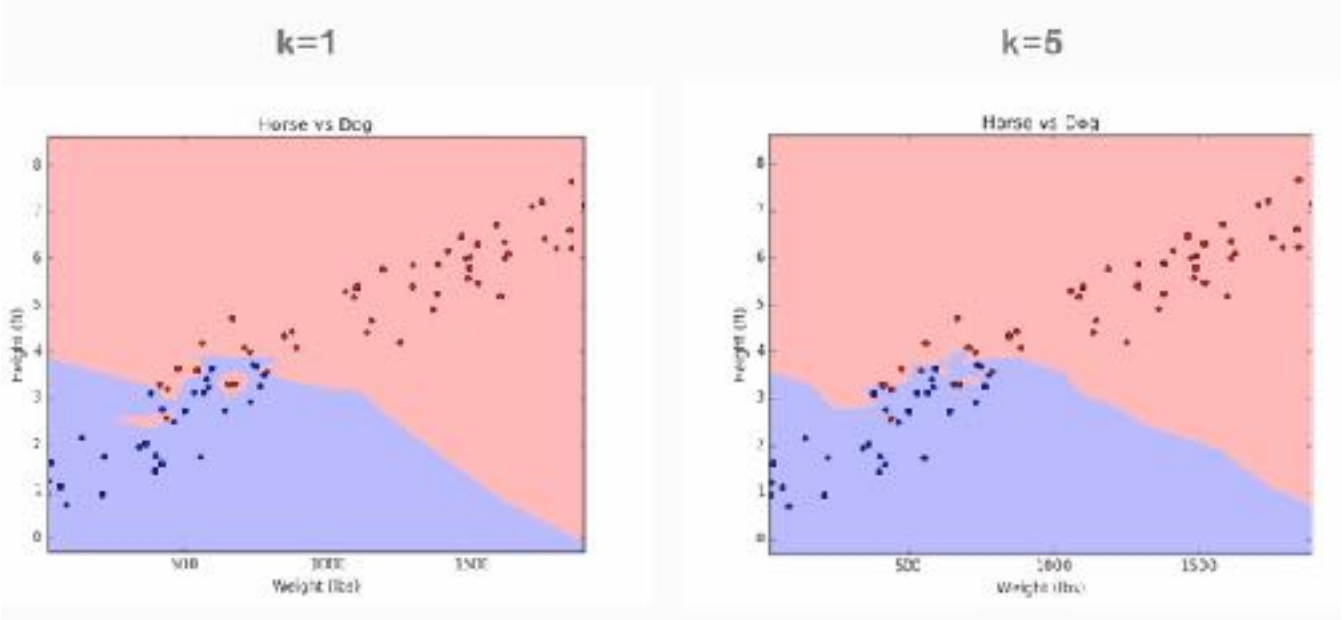

KNN

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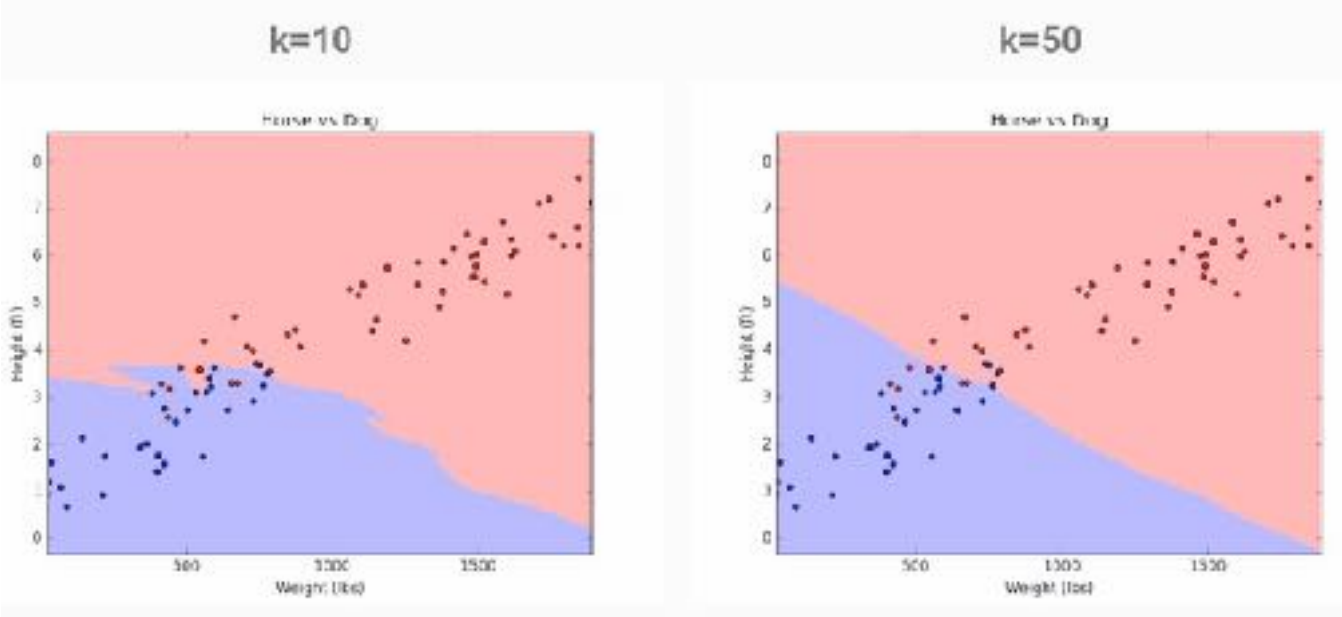

KNN

Pros

- Very simple
- Works with any number of classes
- Training is trivial
- Easy to add more data
- Few parameters
  - Distance Metric
  - K

KNN

Cons

- Not good with high dimensional data
- Categorical Features don’t work well
- High Prediction Cost (worse for large data sets)