Introduction to K Nearest Neighbors

PIERIAN DATA
www.pieriandata.com

Reading Assignment

Complete Chapter 4

Introduction to Statistical Learning

By Gareth James, et al.

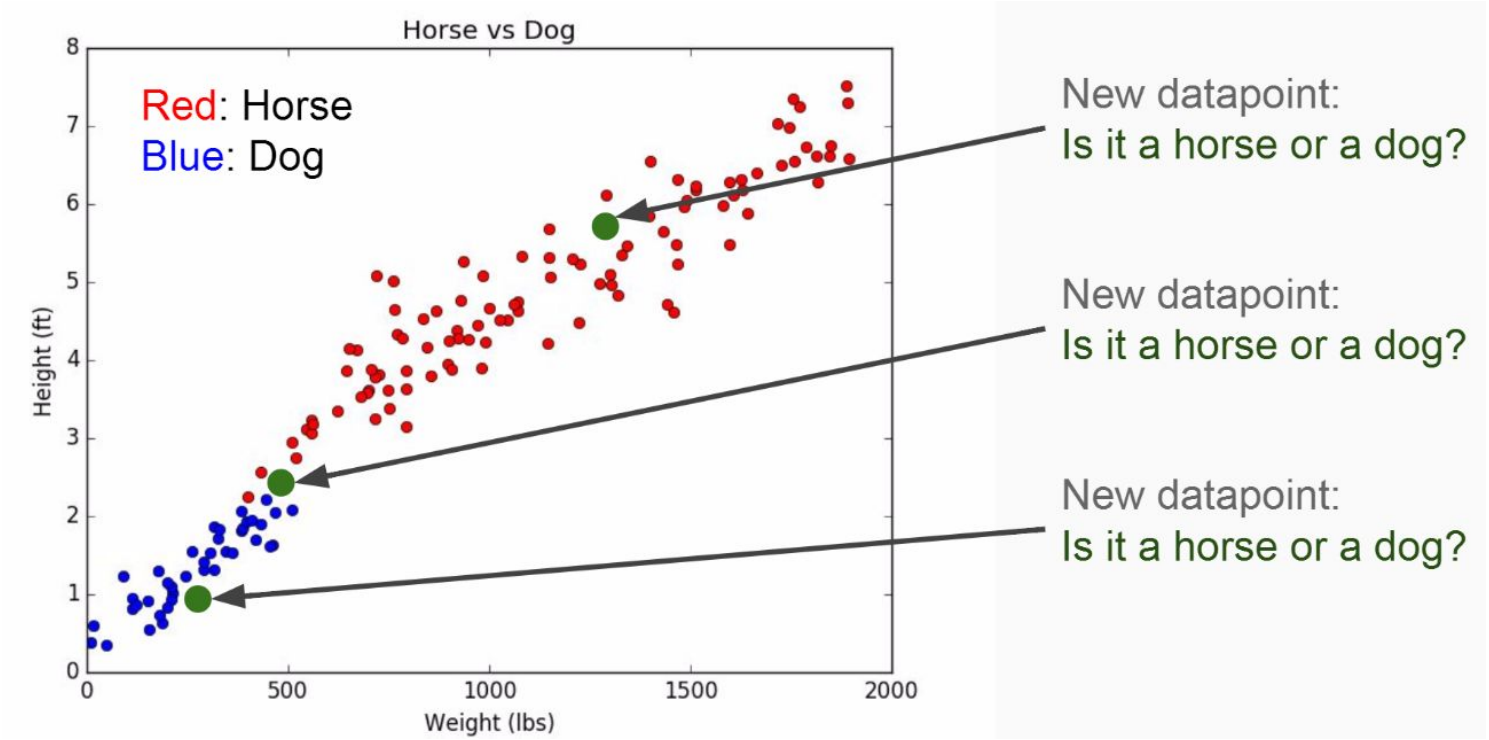
KNN

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 heights and weights.

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:

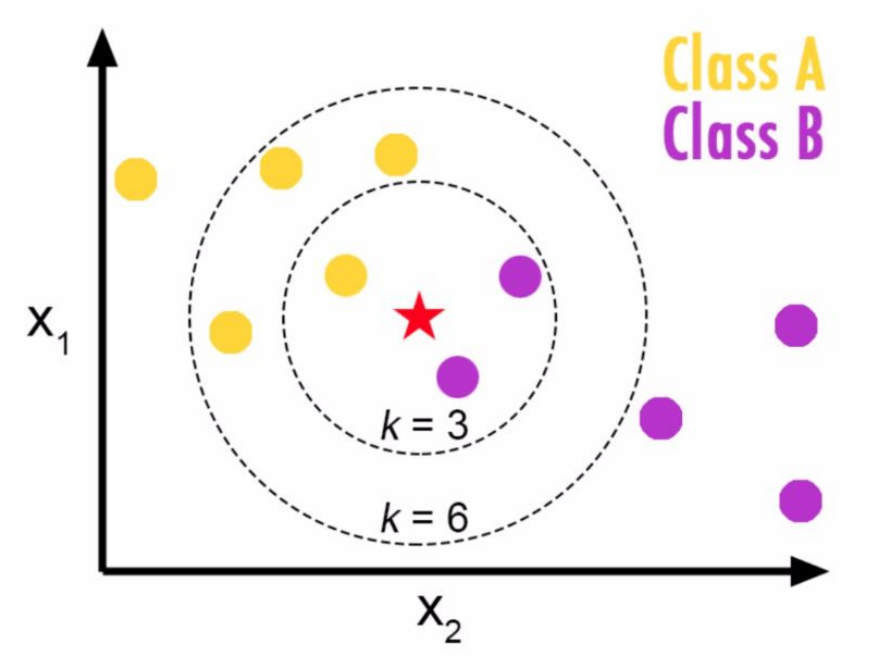
1. Store all the Data

Prediction Algorithm:

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

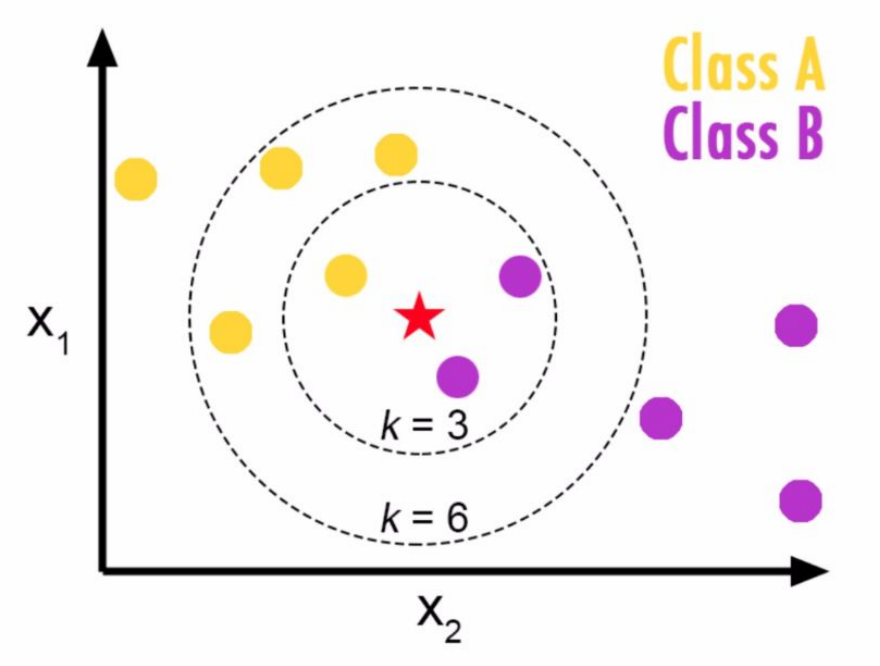
KNN

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



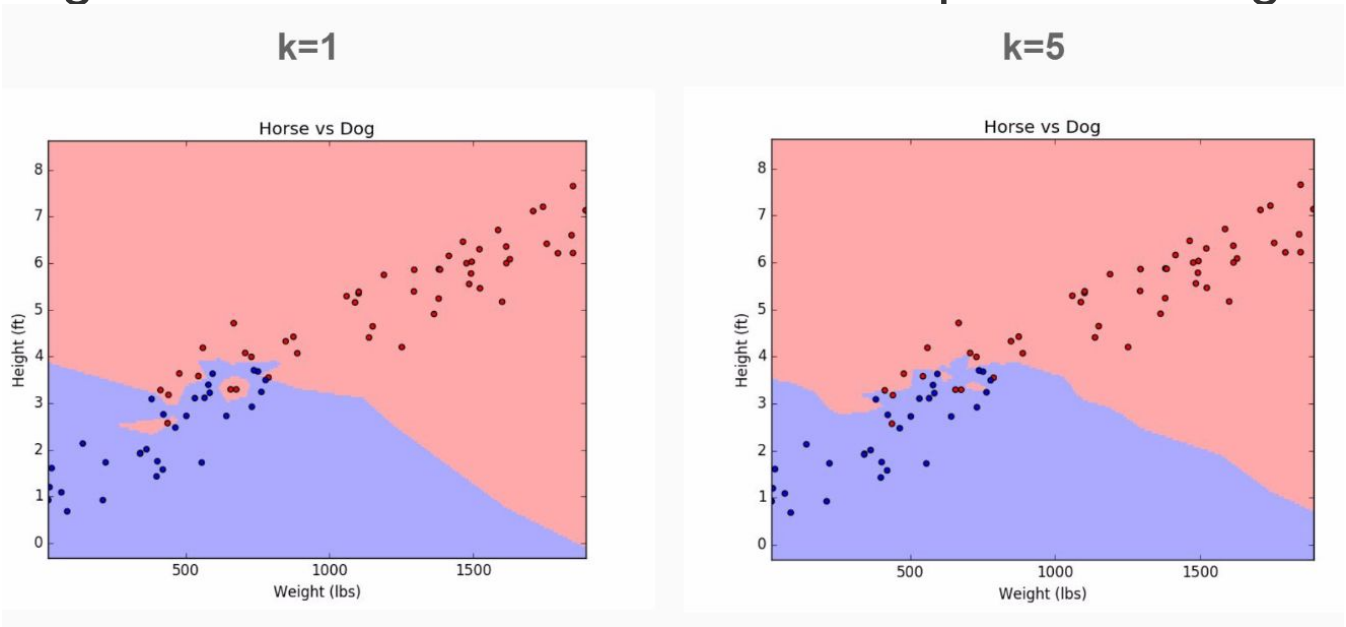
KNN

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



KNN

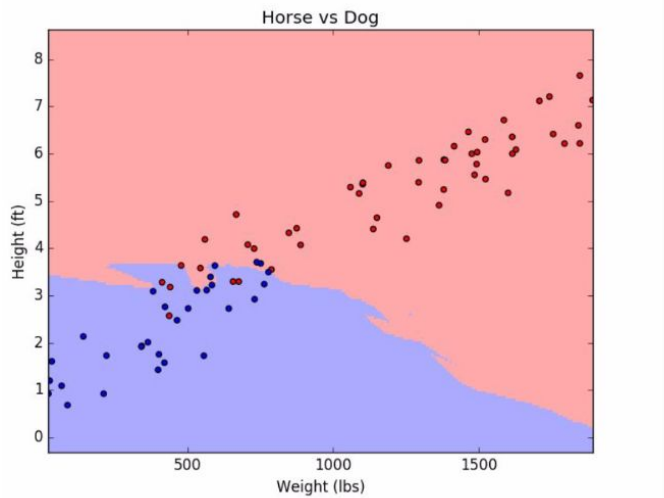
Choosing a K will affect what class a new point is assigned to:



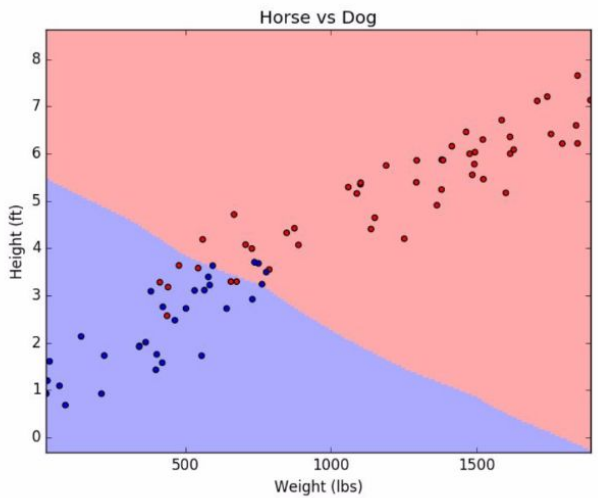
KNN

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

k=10



k=50



KNN

Pros

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

KNN

Cons

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

Example with R

Let's go to RStudio and begin to explore an example, then you'll have a project to test your understanding!