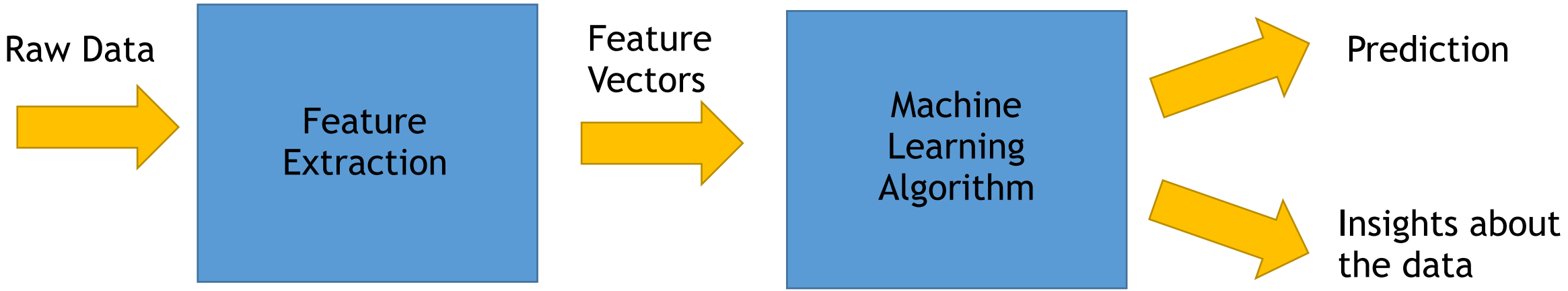
Introduction to Machine Learning

Bananas Anyone?

Machine Learning Pipeline



Intro to Machine Learning

- What is Machine Learning?

The study and construction of algorithms that can learn from and make predictions on data.

- Types of tasks (by feedback):

  ✳ **Supervised learning**: Example inputs and desired outputs

  ✳ **Unsupervised learning**: No labels

  ✳ **Reinforcement learning**: Interact with a dynamic environment in which a certain goal must be performed

Types of tasks (by desired output):

- **Regression**: Continuous output
- **Classification**: Discrete classes
- **Clustering**: Divide inputs into groups
- And a couple of other minor ones…

Linear Regression

Table 1. Example data.

X	Y
1.00	1.00
2.00	2.00
3.00	1.30
4.00	3.75
5.00	2.25

Linear Regression

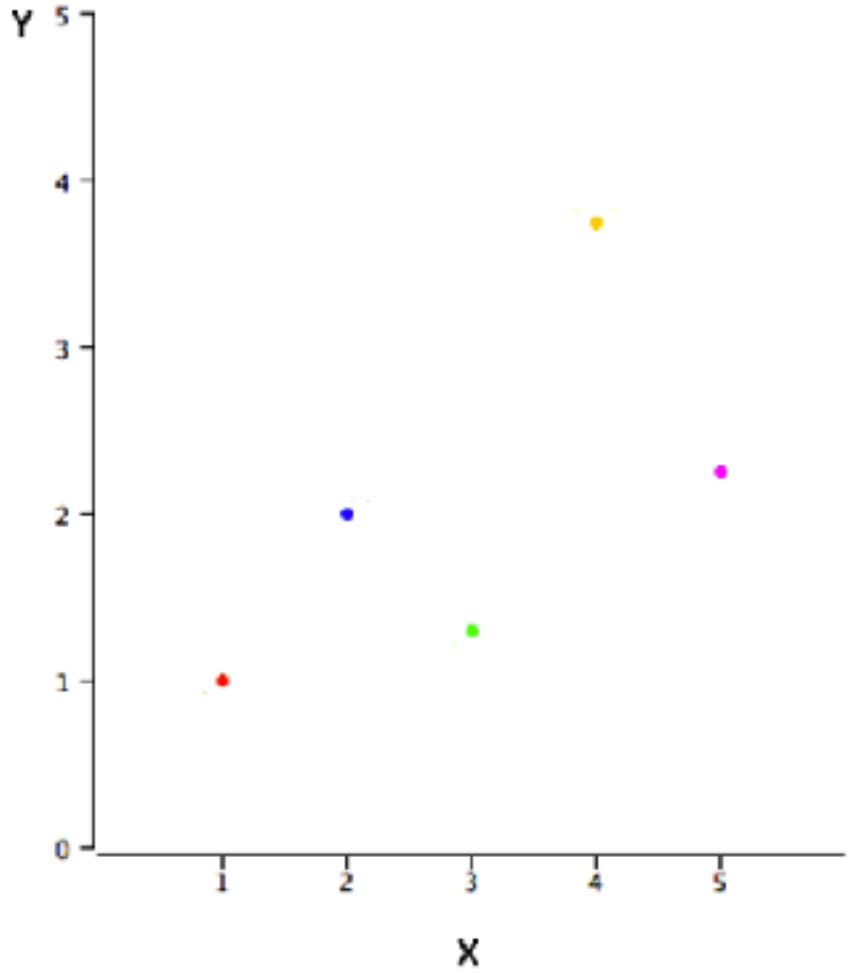
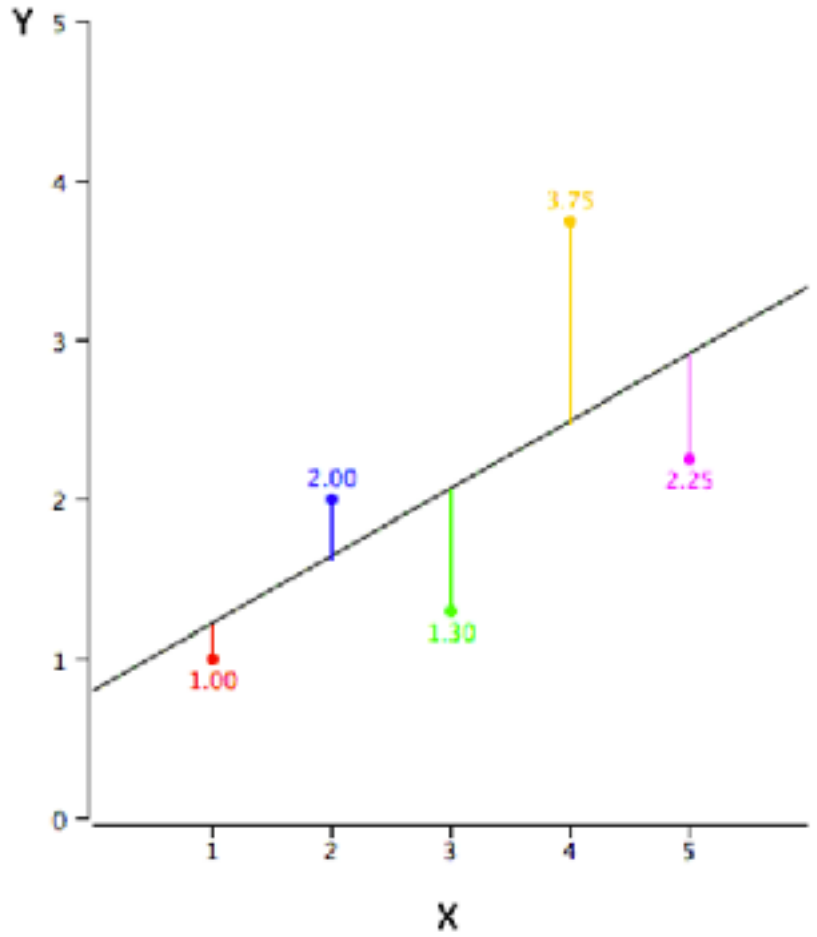


Figure 1. A scatter plot of the example data.

Linear Regression



Minimise the sum of squared residuals of the model

Linear Regression

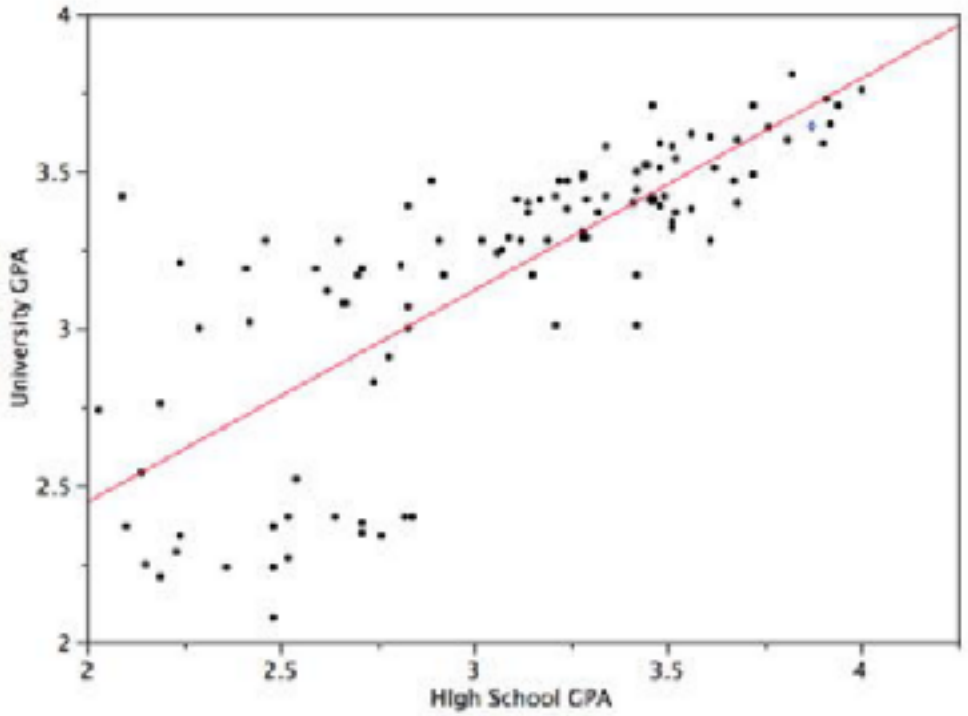
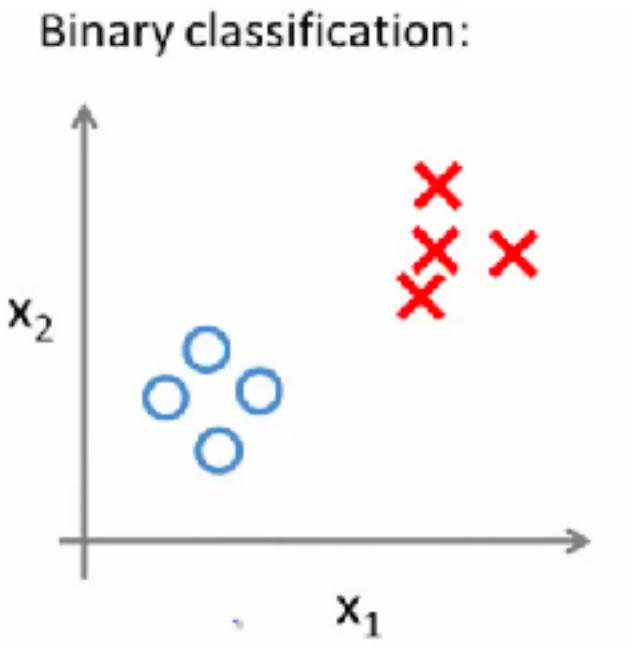


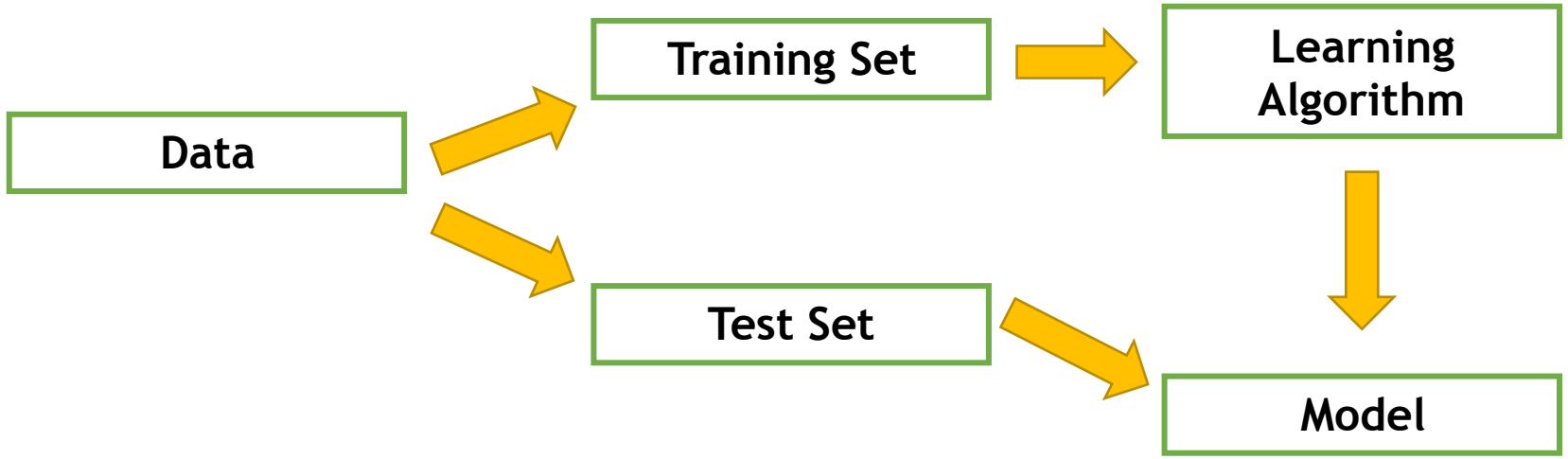
Figure 3. University GPA as a function of High School GPA.

Classification



x_1	x_2	Class
4.7	3.3	X
1.2	1.1	O
1.8	1.6	O
4.9	5.1	X

Classification Pipeline

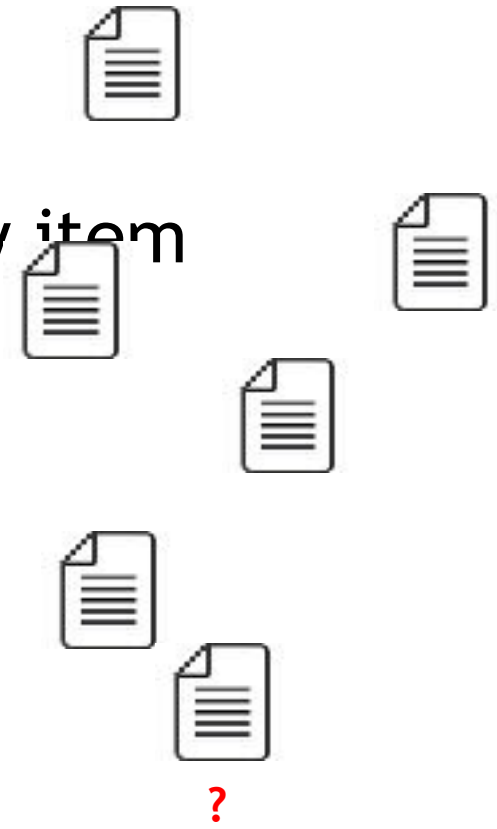


Algorithms:

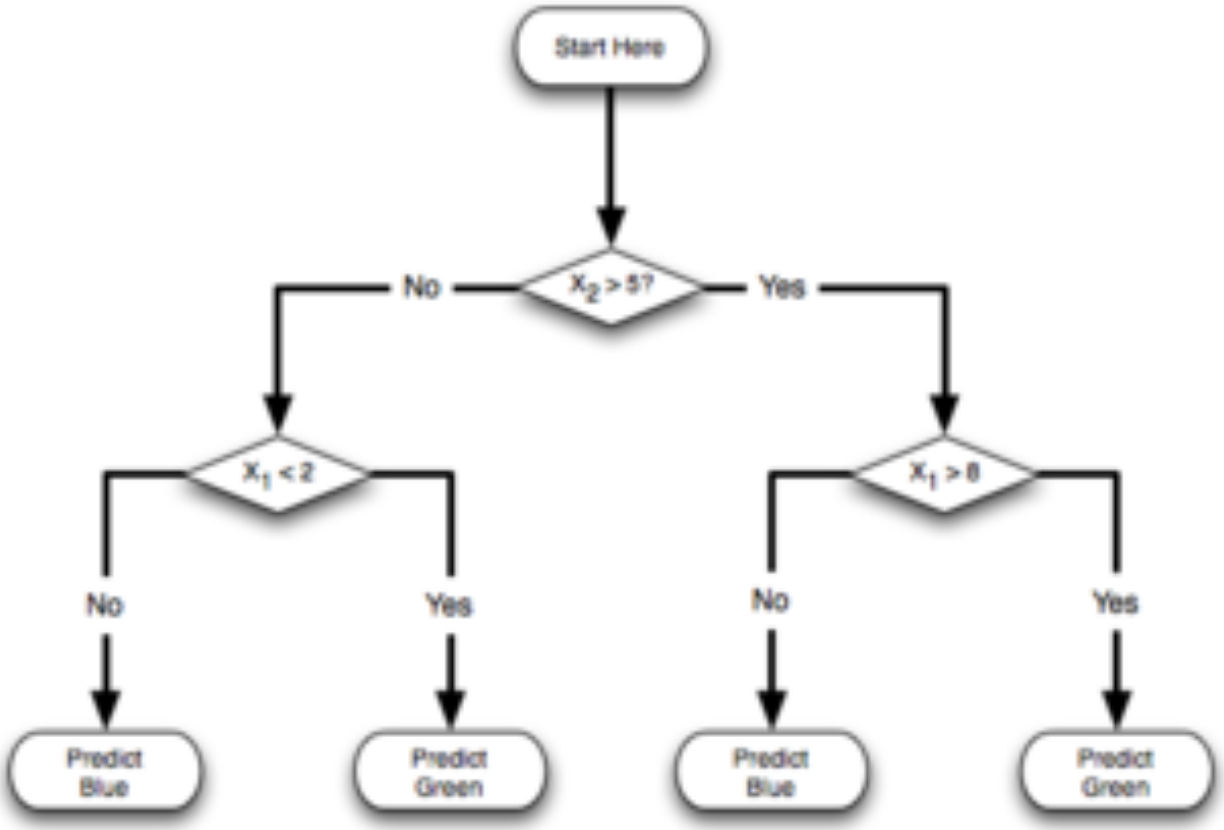
- K-nearest neighbors
- Decision Tree
- SVM

K Nearest Neighbors

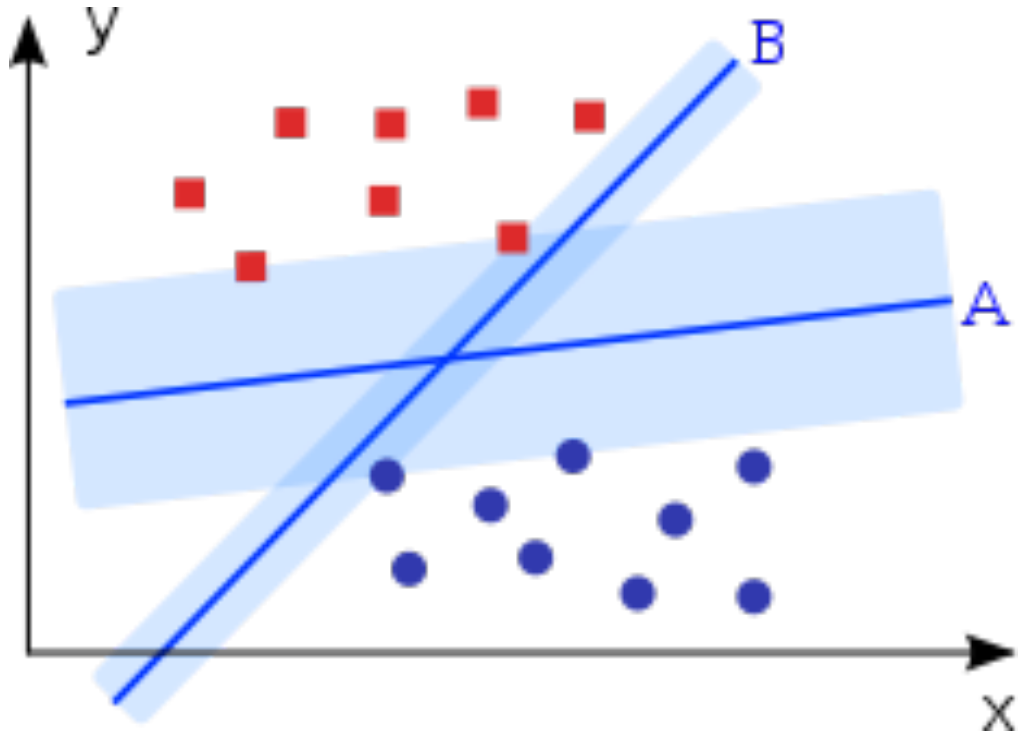
- Given set of items
- Find k nearest neighbors of a new item
- Use these items to predict the class of the new item



Decision Tree

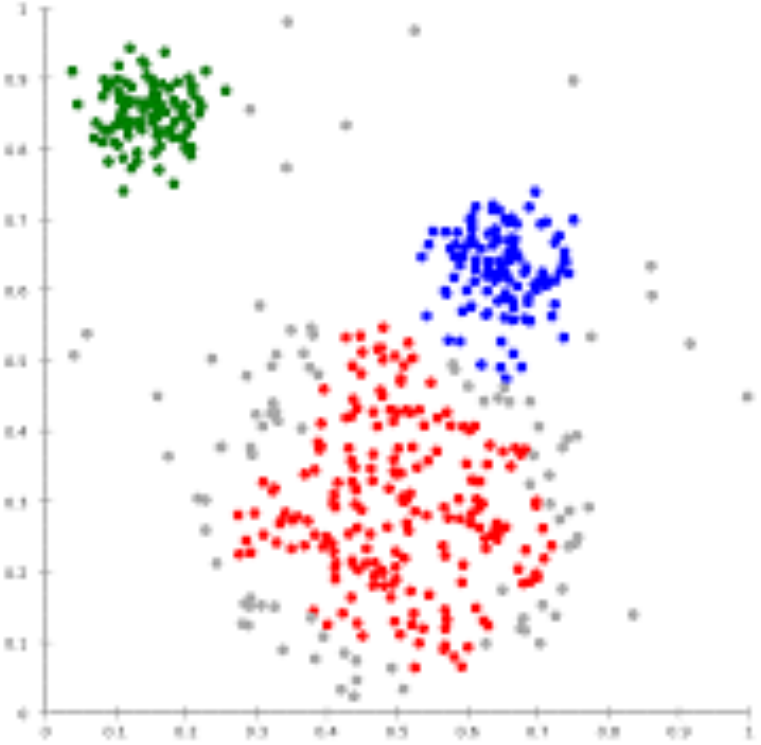


Support Vector Machines



Unsupervised example: clustering

- Objective: given a set of examples, we want to divide them into groups such that similar examples will be in the same group and dissimilar examples will be in different groups



K-means