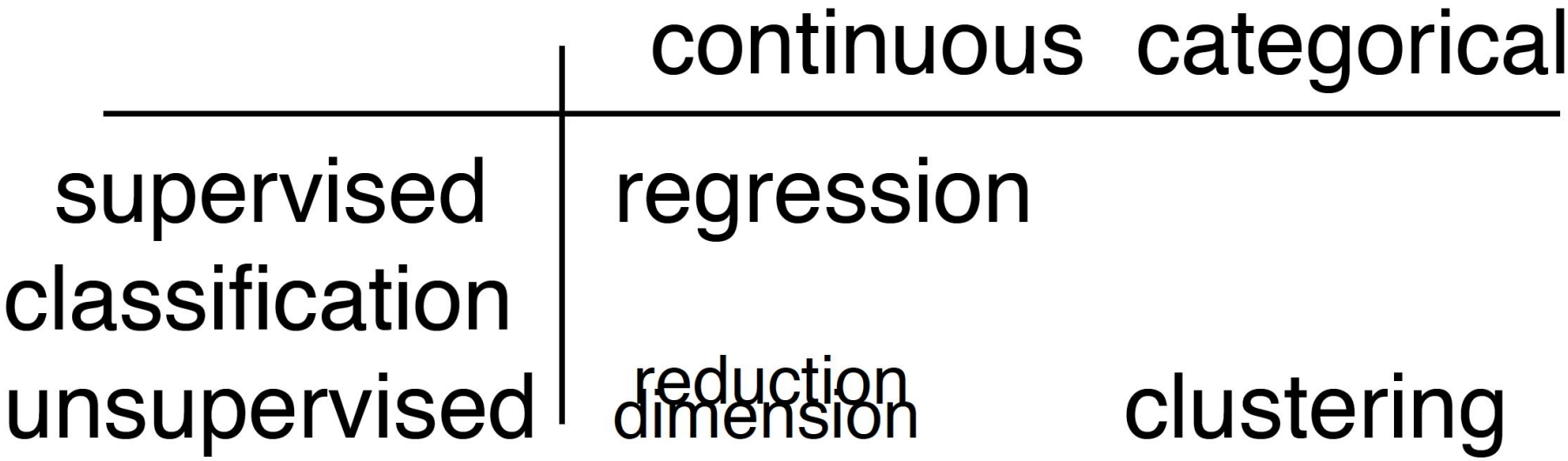
Classification With K-Nearest Neighbors

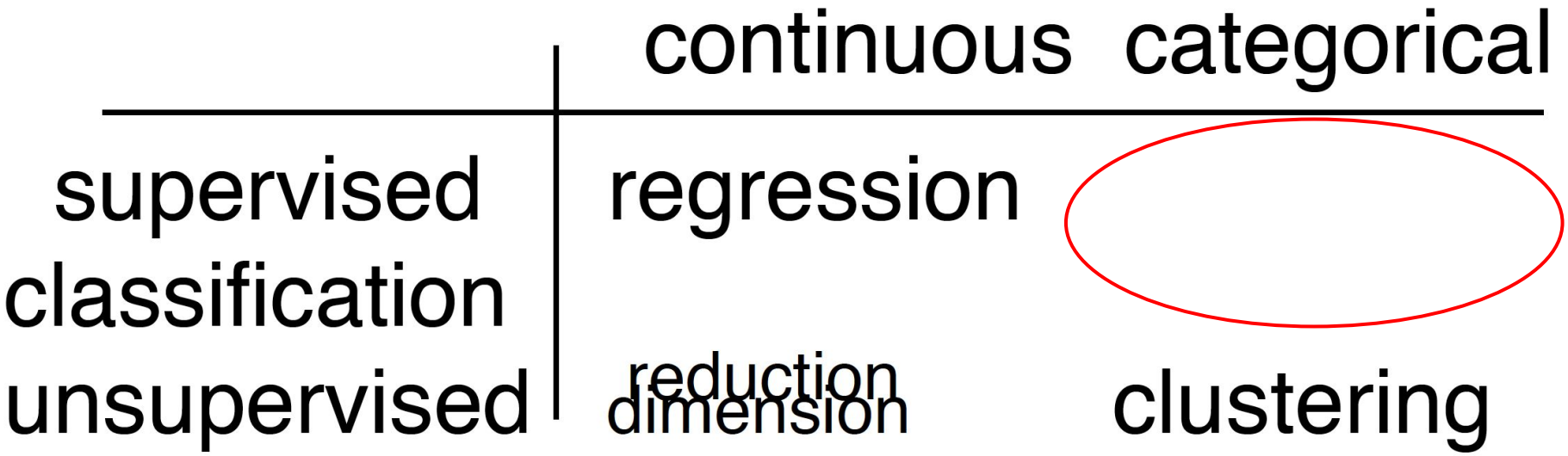
Agenda

1. What is big data, really
2. Accessing the data
3. Analysing the data
4. Discussion

Supervised vs. Unsupervised Learning



Supervised vs. Unsupervised Learning



Supervised Learning

150 observations *(n = 150)*

Fisher's *Iris* Data

Sepal length	Sepal width	Petal length	Petal width	Species
5.1	3.5	1.4	0.2	*I. setosa*
4.9	3.0	1.4	0.2	*I. setosa*
4.7	3.2	1.3	0.2	*I. setosa*
4.6	3.1	1.5	0.2	*I. setosa*
5.0	3.6	1.4	0.2	*I. setosa*
5.4	3.9	1.7	0.4	*I. setosa*
4.6	3.4	1.4	0.3	*I. setosa*
5.0	3.4	1.5	0.2	*I. setosa*

response

4 predictors (p = 4)

Classification Problems

Q: How does a classification problem work?

A: Data in, predicted labels out.

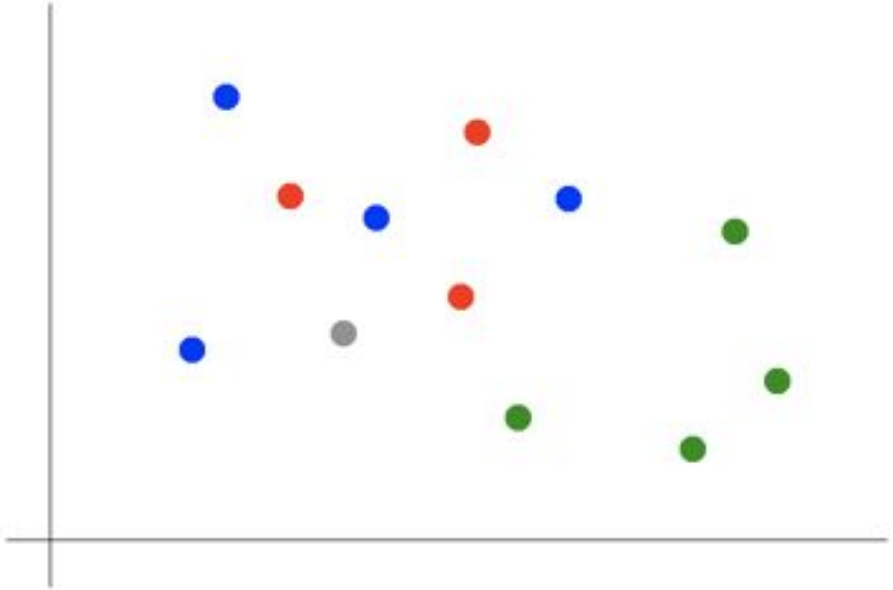
Figure 4.2. Classification as the task of mapping an input attribute set $\mathbf{x}$ into its class label y.

Source: http://www-users.cs.umn.edu/~kumar/dmbook/ch4.pdf

Classification With KNN

Suppose we want to predict the color of the gray dot.

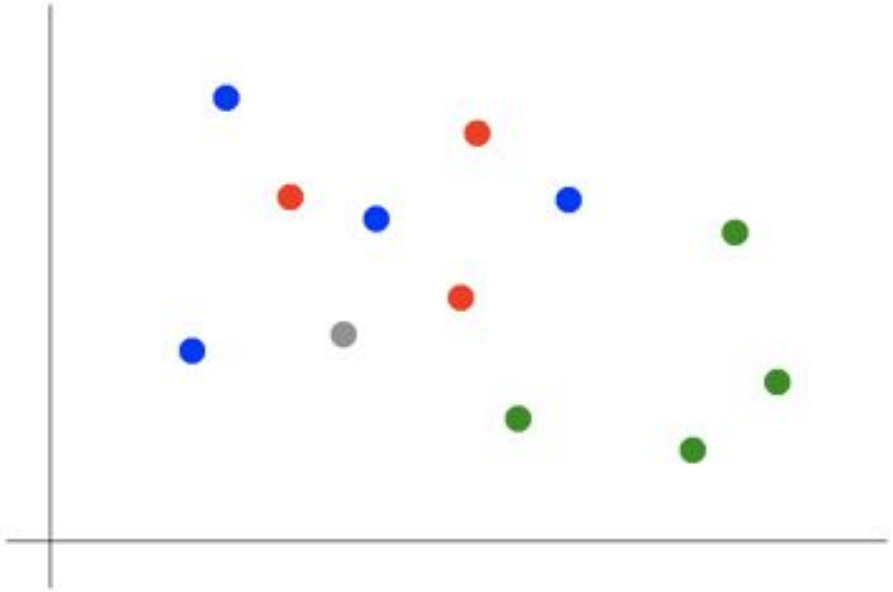
QUESTION:
What are the predictors?
What is the response?



Classification With KNN

Suppose we want to predict the color of the gray dot.

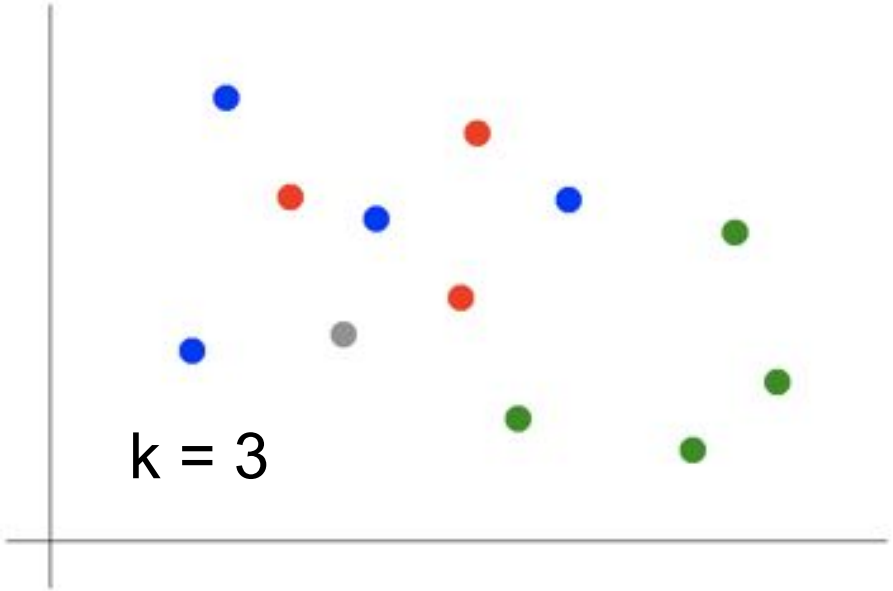
1) Pick a value for k.



Classification With KNN

Suppose we want to predict the color of the gray dot.

1) Pick a value for k.



Classification With KNN

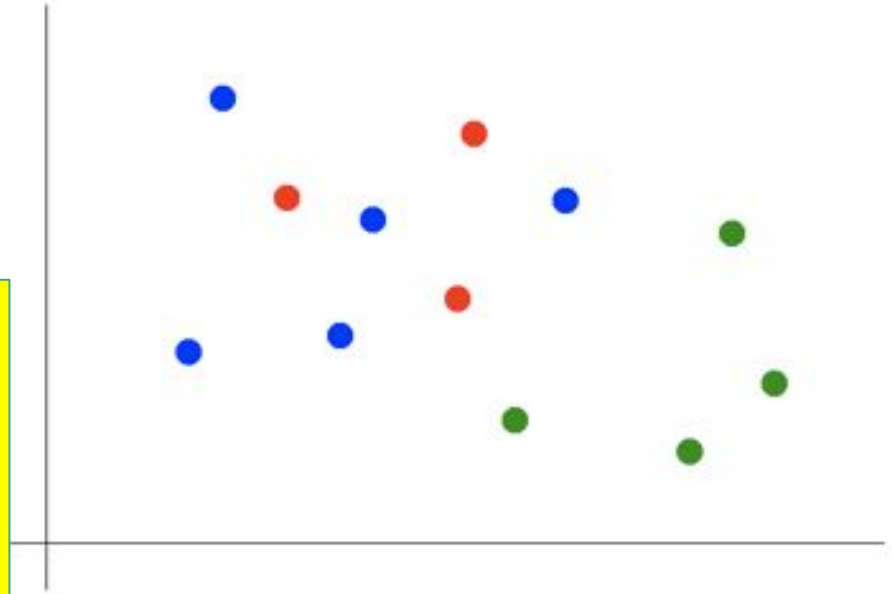
Suppose we want to predict the color of the gray dot.

1) Pick a value for k.

2) Find colors of k nearest neighbors.

3) Assign the most common color to the gray dot.

NOTE:
Our definition of "nearest" implicitly uses the Euclidean distance function.



Classification With KNN

Advantages of KNN:

- Simple to understand and explain
- Model training phase is fast
- Non-parametric (does not presume a “form” of the “decision boundary”)

Disadvantages of KNN:

- Prediction phase can be slow when n is large
- Sensitive to irrelevant features

Q??