Chapter VI: Classification

Knowledge Discovery in Databases

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Chapter VI: Classification

Classification: basic concepts.

Decision-tree induction.

Bayes classification methods.

Rule-based classification.

Model evaluation and selection.

Techniques to improve classification accuracy: ensemble methods.

Summary.

Supervised vs. unsupervised learning

Supervised learning (classification).

Supervision:

The **training data** (observations, measurements, etc.) are accompanied by **labels** indicating the **class** of the observations.
New data is classified based on a **model** created from the training data.

Unsupervised learning (clustering).

The class labels of training data are unknown.

Or rather, there are no training data.

Given a set of measurements, observations, etc.,
the goal is to find classes or clusters in the data.

See next chapter.

Prediction problems: classification vs. numerical prediction

Classification:

Predicts **categorical class labels** (discrete, nominal).
Constructs a model based on the training set and the values (class labels) in a classifying attribute and uses it in classifying new data.

Numerical prediction:

Models **continuous-valued functions**.
I.e. predicts missing or unknown (future) values.

Typical applications of classification:

Credit/loan approval: Will it be paid back?
Medical diagnosis: Is a tumor cancerous or benign?
Fraud detection: Is a transaction fraudulent or not?
Web-page categorization: Which category is it?

Classification – a two-step process

Model construction: describing a set of predetermined classes:

Each tuple/sample is assumed to belong to a predefined class, as determined by the **class-label attribute**.

The set of tuples used for model construction is the **training set**.

The **model** is represented as classification rules, decision trees, or mathematical formulae.

Model usage, for classifying future or unknown objects:

Estimate **accuracy** of the model:

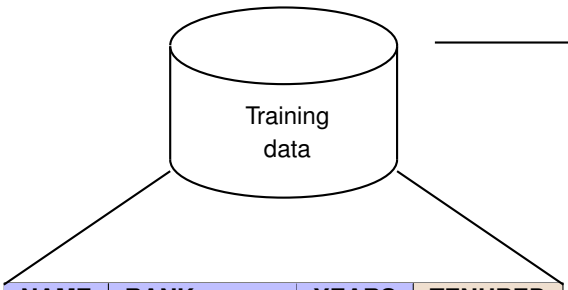
The known label of **test samples** is compared with the result from the model.

Accuracy rate is the percentage of test-set samples that are correctly classified by the model.

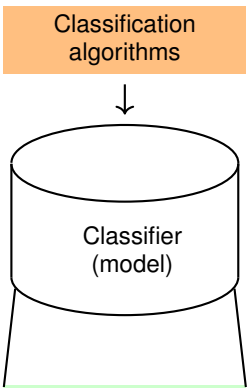
Test set is independent of training set (otherwise overfitting).

If the accuracy is acceptable, **use the model** to classify data tuples whose class labels are not known.

Classification – a two-step process



NAME	RANK	YEARS	TENURED
Mike	Assistant Prof	3	no
Mary	Assistant Prof	7	yes
Bill	Professor	2	yes
Jim	Associate Prof	7	yes
Dave	Assistant Prof	6	no
Anne	Associate Prof	3	no




```
if RANK ='Professor'
or YEARS >6
then TENURED ='yes'
```

Process (II): using the model in prediction

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Thank you for your attention.
Any questions about the sixt chapter?

Ask them now, or again, drop me a line:
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