Classification and Prediction

——Basic Concepts——

徐华

清华大学 计算机系 智能技术与系统国家重点实验室

xuhua@tsinghua.edu.cn

1

Classification and Prediction

- **Basic Concepts**
- **Issues Regarding Classification and Prediction**
- **Decision Tree**
- **Bayesian Classification**
- **Neural Networks**
- **Support Vector Machine**
- **K-Nearest Neighbor**
- **Associative classification**
- **Classification Accuracy**

2

Classification vs. Prediction

- **Classification:**
  - Predicts categorical class labels (discrete or nominal)
  - Classifies data (constructs a model) based on the training set and the values (class labels) in a classifying attribute and uses it in classifying new data
- **Prediction:**
  - models continuous-valued functions, i.e., predicts unknown or missing values
- **Typical Applications**
  - Credit approval
  - Target marketing
  - Medical diagnosis
  - Fraud detection

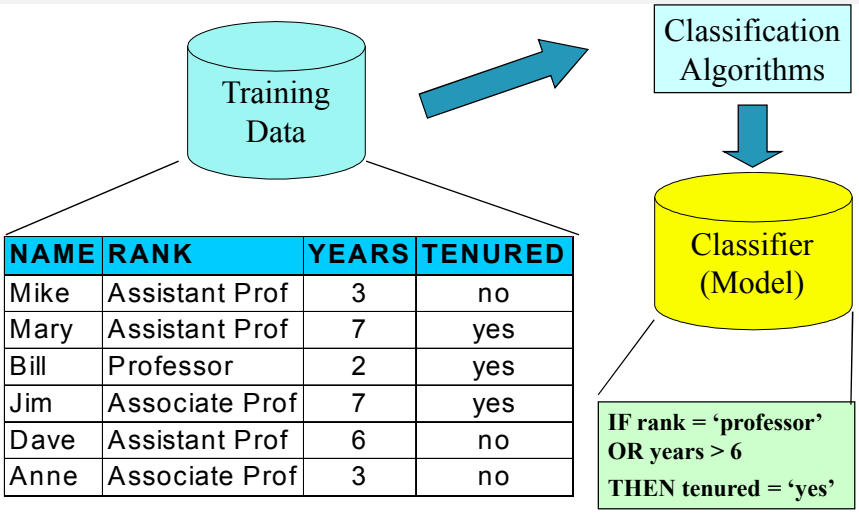
3

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 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 sample is compared with the classified 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 over-fitting will occur
  - If the accuracy is acceptable, use the model to classify data tuples whose class labels are not known

4

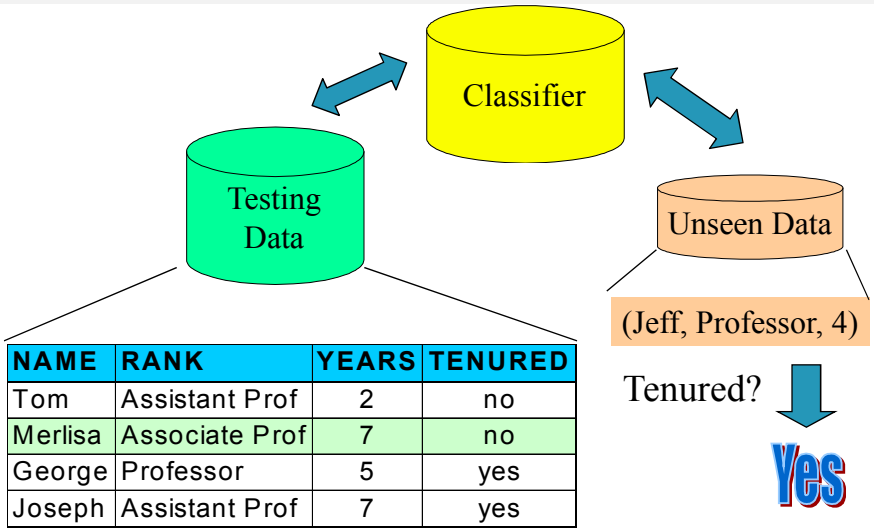
Classification Process (1): Model Construction



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

5

Classification Process (2): Use the Model in Prediction



NAME	RANK	YEARS	TENURED
Tom	Assistant Prof	2	no
Merlisa	Associate Prof	7	no
George	Professor	5	yes
Joseph	Assistant Prof	7	yes

6

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 are classified based on the training set
- **Unsupervised learning (clustering)**
  - The class labels of training data is unknown
  - Given a set of measurements, observations, etc. with the aim of establishing the existence of classes or clusters in the data

7

Thanks !

8