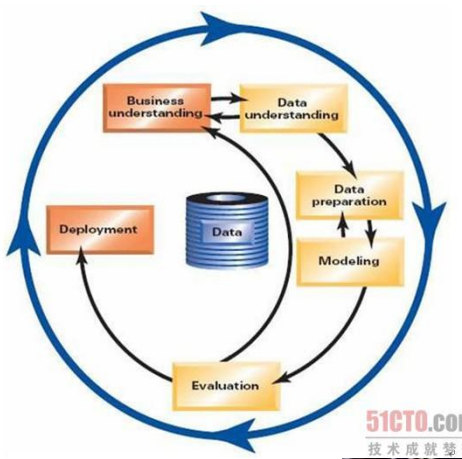
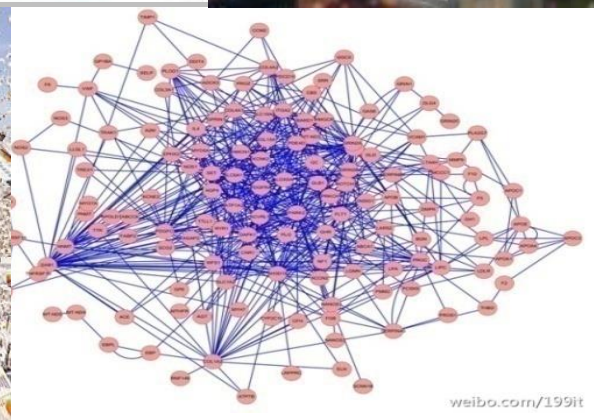




Chapter 1 Data Mining Overview

2025 Autumn

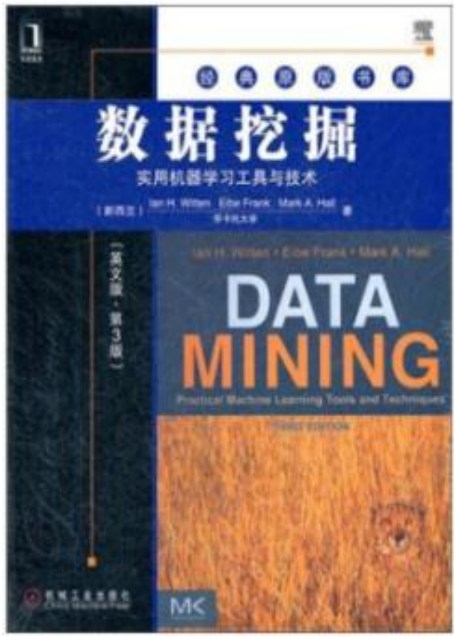
Lei Sun

Course material

- Recommended books

刘金玲，Python数据挖掘算法与应用，清华大学出版社，2024
数据挖掘导论(完整版)》，（美）Pang-Ning Tan，人民邮电出版社
薛薇，R语言数据挖掘方法及应用，电子工业出版社，2016.

- Python R and Rstudio



Grade

- Assignments: 40%
- Final exam： 60%

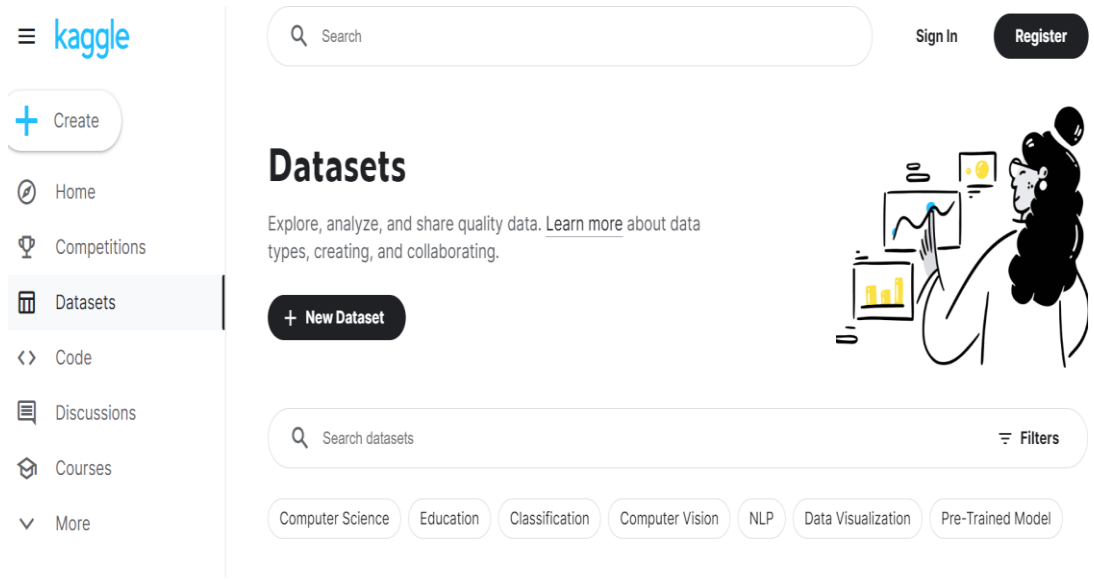
Course material

UCI Machine Learning Repository
Center for Machine Learning and Intelligent Systems

python™

R

Kaggle.com

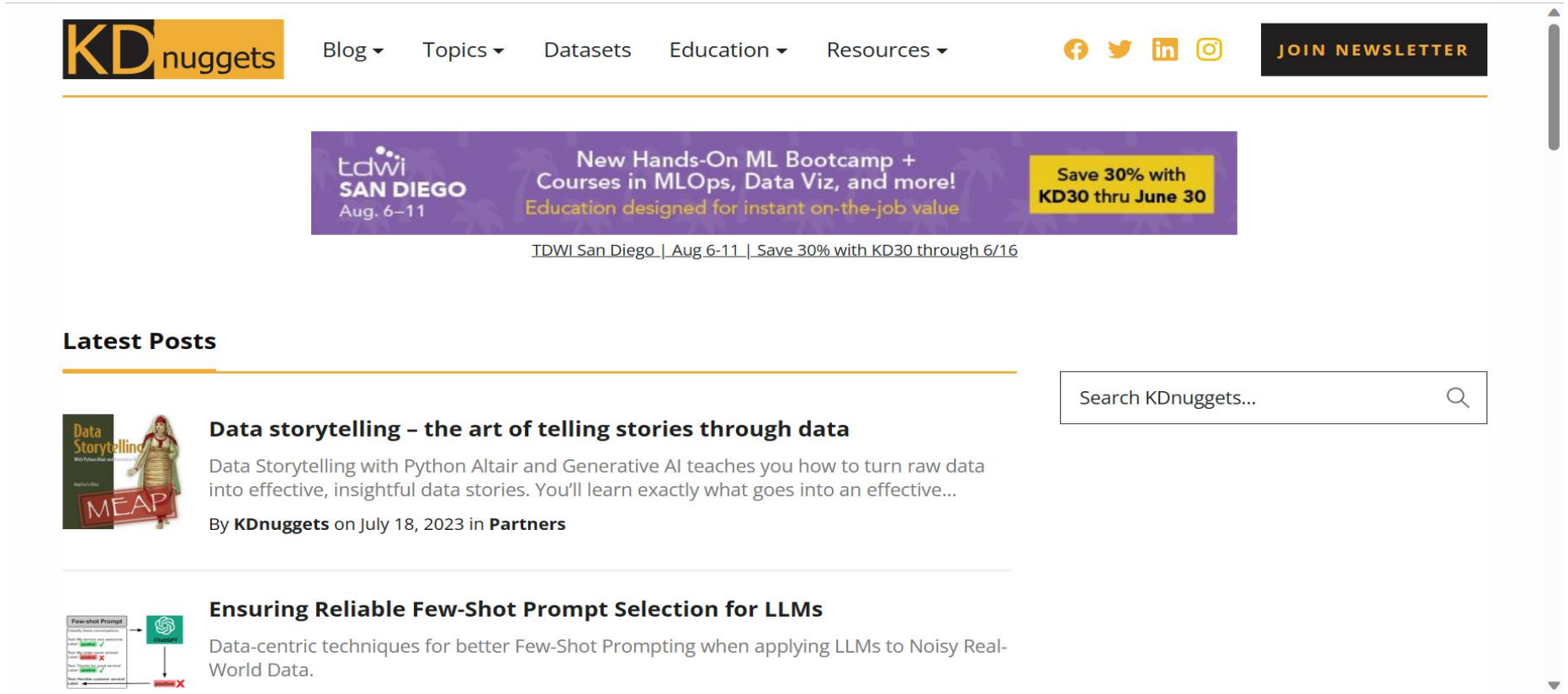


Github.com

基于git的代码托管平台

Course material

Resources---kdnuggets.com



[Data Science, Machine Learning, AI & Analytics - KDnuggets]

01 Why data mining

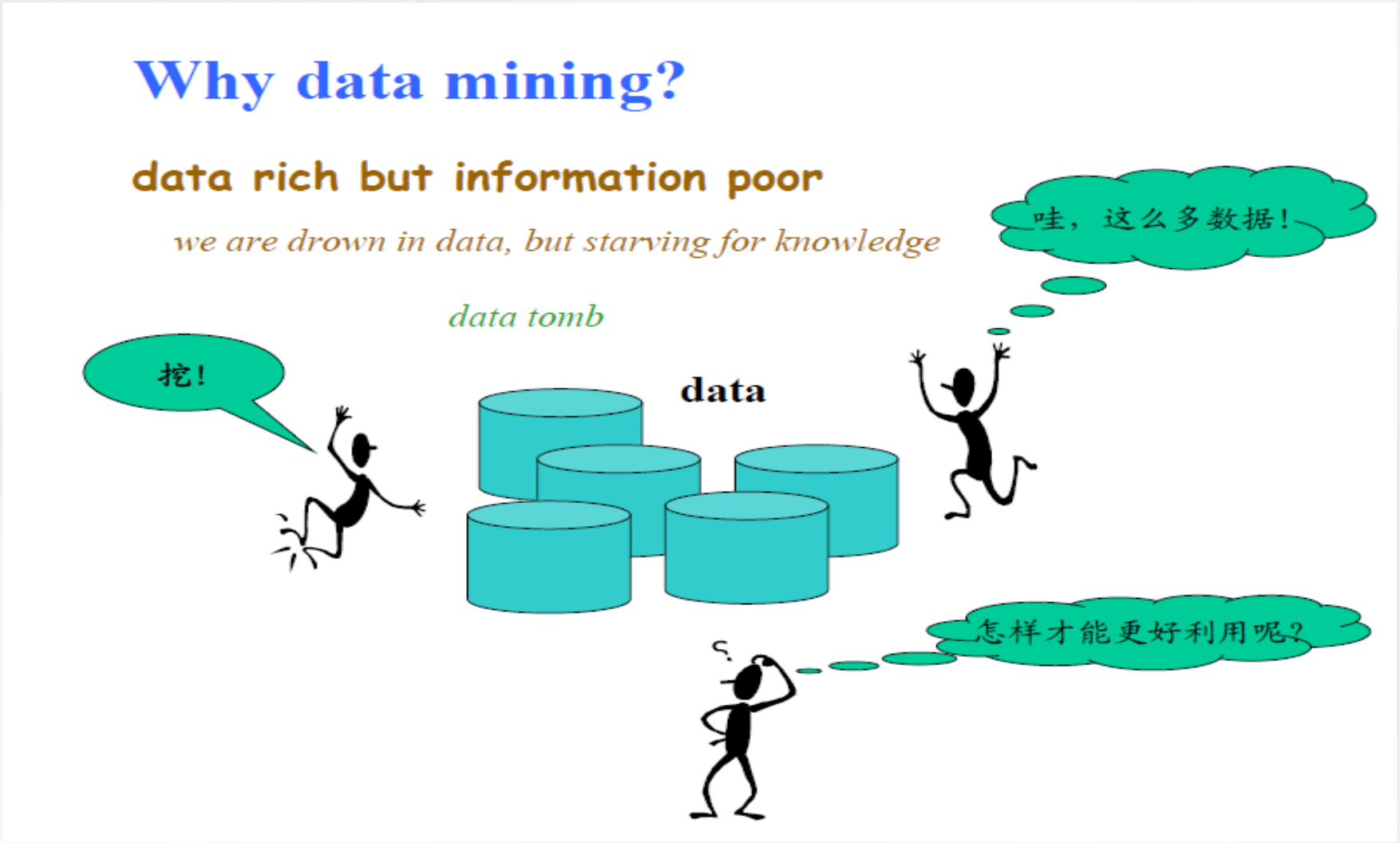
02 What is data mining

03 Applications

04 Data mining activities

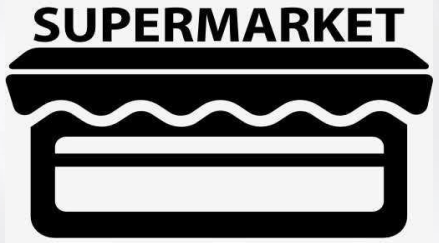
Why data mining

Why data mining



Why data mining

Problems

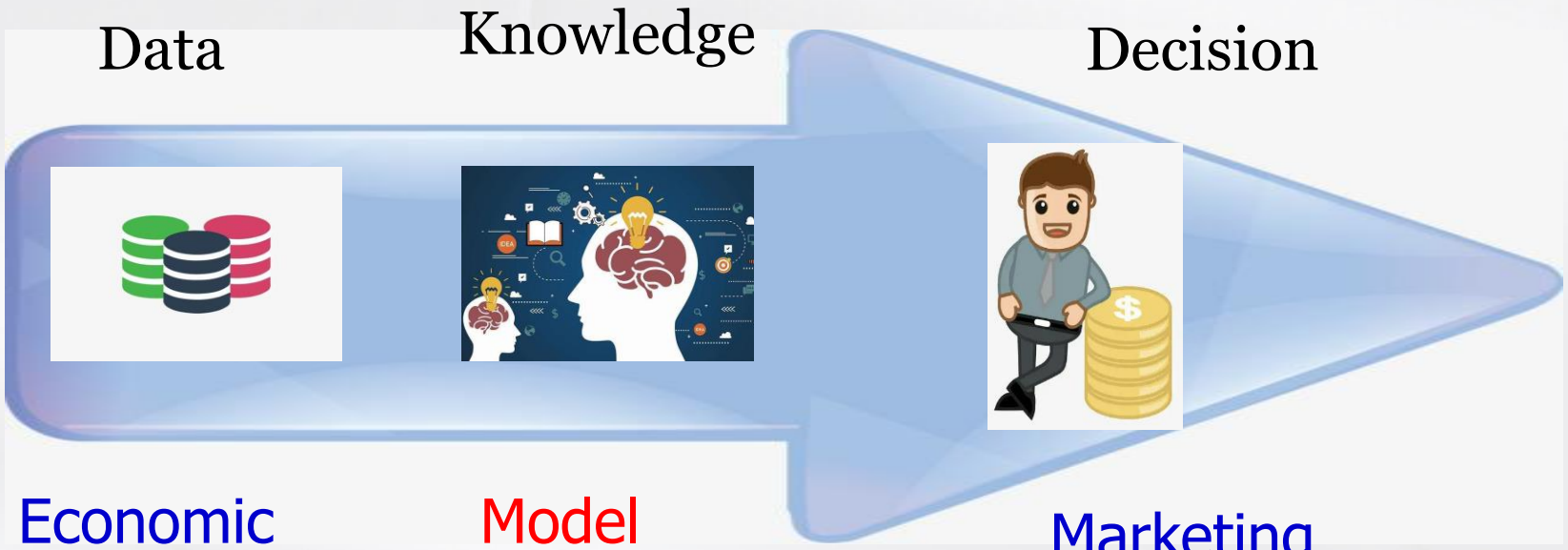


How to place supermarket shelves?
What kinds of promotion for certain person?

Customer churn and package strategy development

Bundles sell, personalized recommendations and ad placement and value

Why data mining

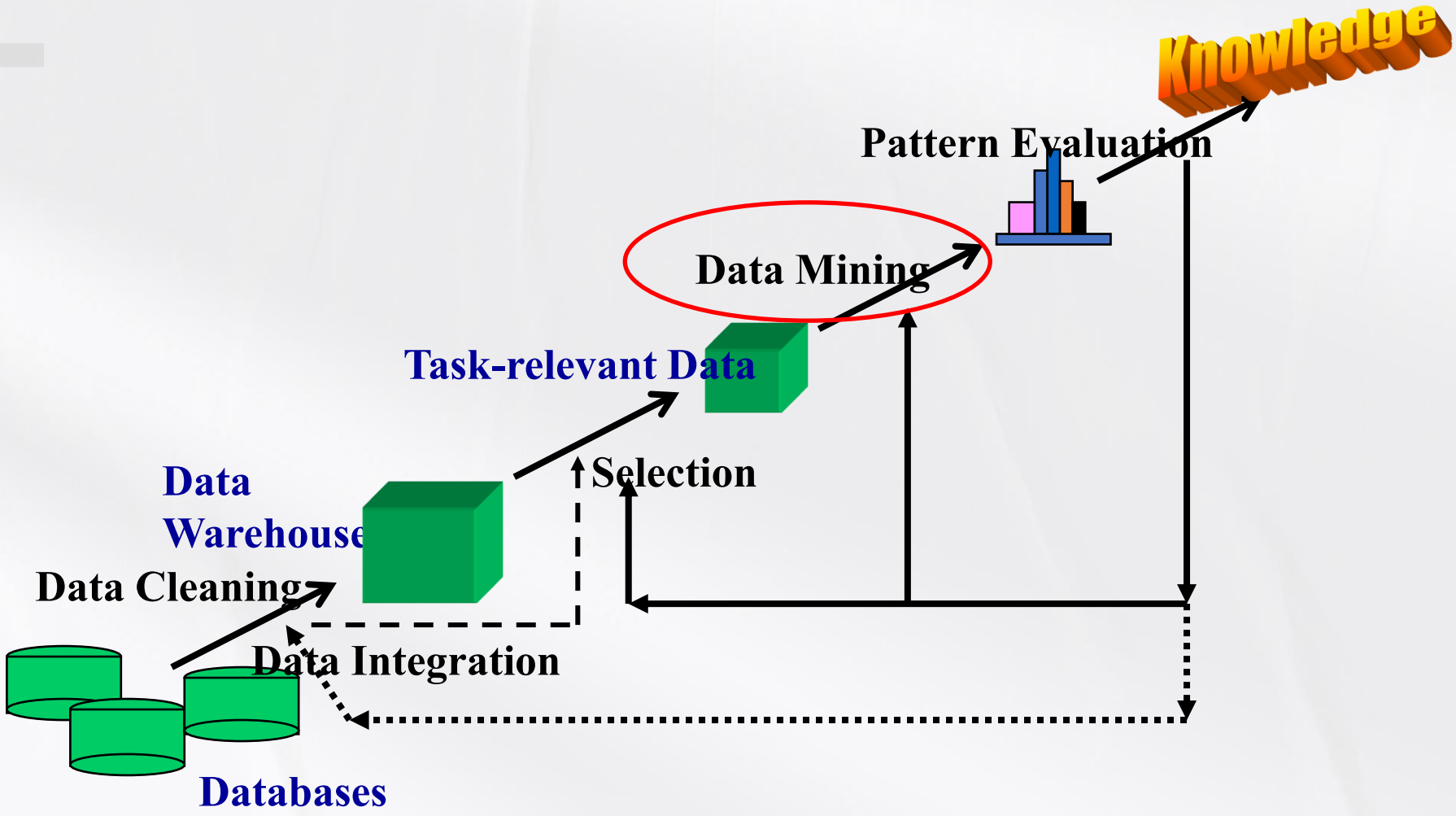


Economic
Government
eMail
Video
Text
.....

Model
Relationship
Paten
Rules
.....

Marketing
Relationship
Optimize ads
.....

What is data mining



02

What is data mining

Problems:

- ✓ Why select these data?

  Fayyad model ignores business problems specific issue that will be analyzed.

- ✓ How to apply the model?

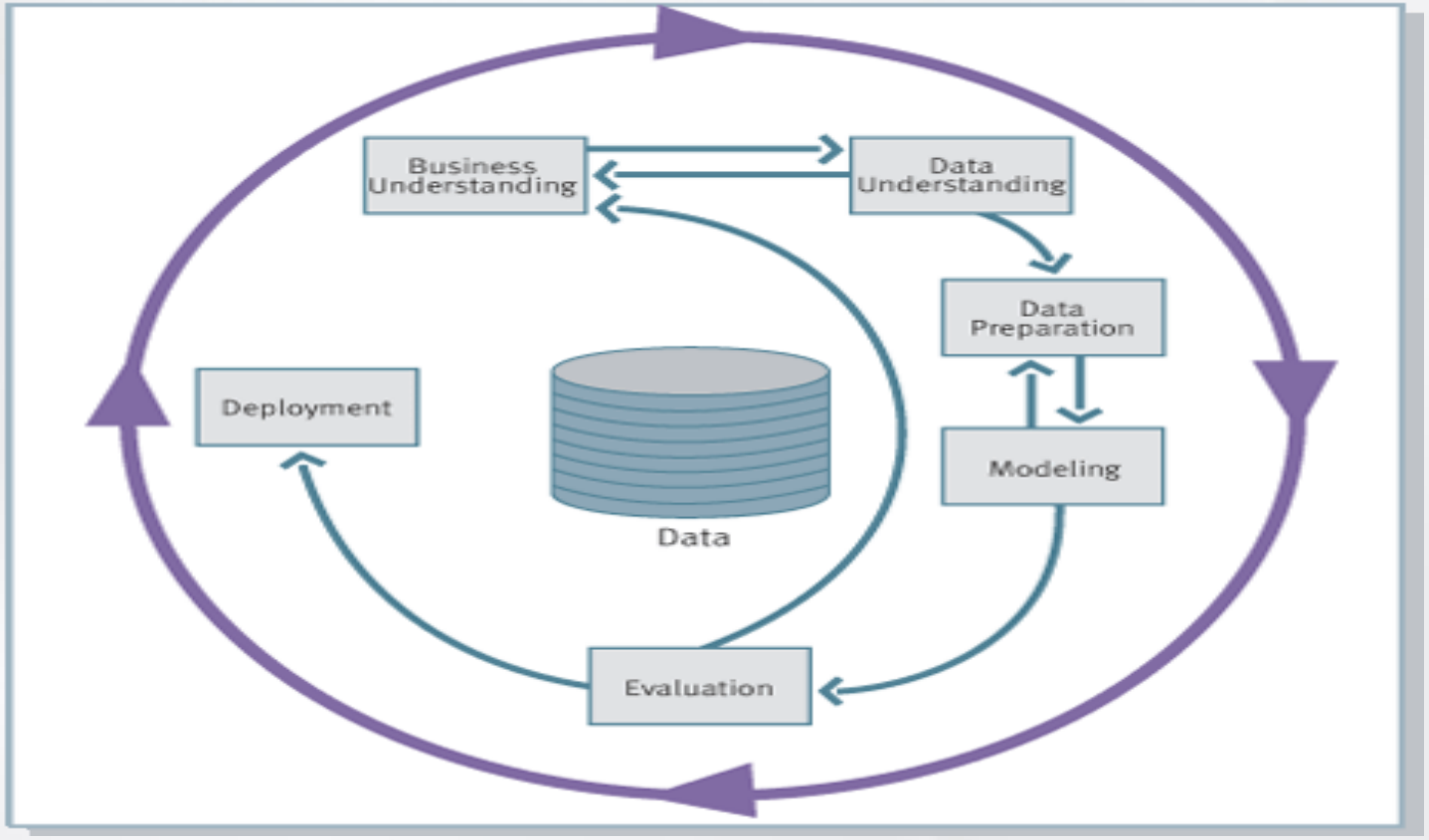
  Round information flow

  feedback

What is data mining

CRISP-DM is an iterative, adaptive process.

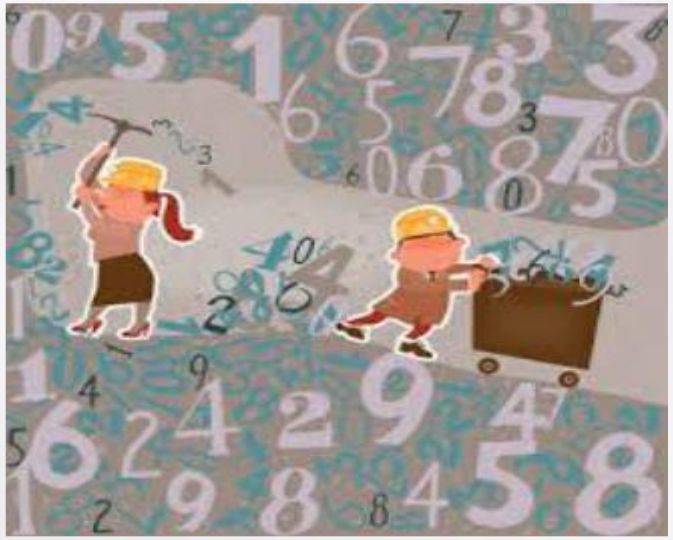
Cross-Industry Standard Process for Data Mining



http://www.crisp-dm.org

02

What is data mining



Exploration and analysis of large quantities of data to discover meaningful patterns.

Data mining is the non-trivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns from huge volume of data.

derived from U.Fayyad,et al.'s definition of KDD at KDD96

数据挖掘是从海量数据中获取正确的、新颖的、潜在有用的、最终可理解的模式的非凡过程。

02

What is data mining

Interdisciplinary Studies

Data mining draws from a wide range of disciplines, such as **statistics, machine learning, artificial intelligence, and database management**.

This multidisciplinary approach enables data miners to employ various techniques and tools to address different data analysis challenges effectively.

Medical field

- Infections Disease Prediction
- Customer Assisted Therapy Program

Finance

Identify defaulting customers ▪

Media

▪ Box Office Forecast

E-commerce

Sales performance analysis ▪

Products Recommended ▪

website

▪ Click-through rate analysis

▪ Advertising analysis

CPDA

Certified Projects Data Analysts

Telecommunication

CRM ▪

Telecom Package Decision ▪

service industry

- Associated Food
- Recommendations
- Airbnb room classification

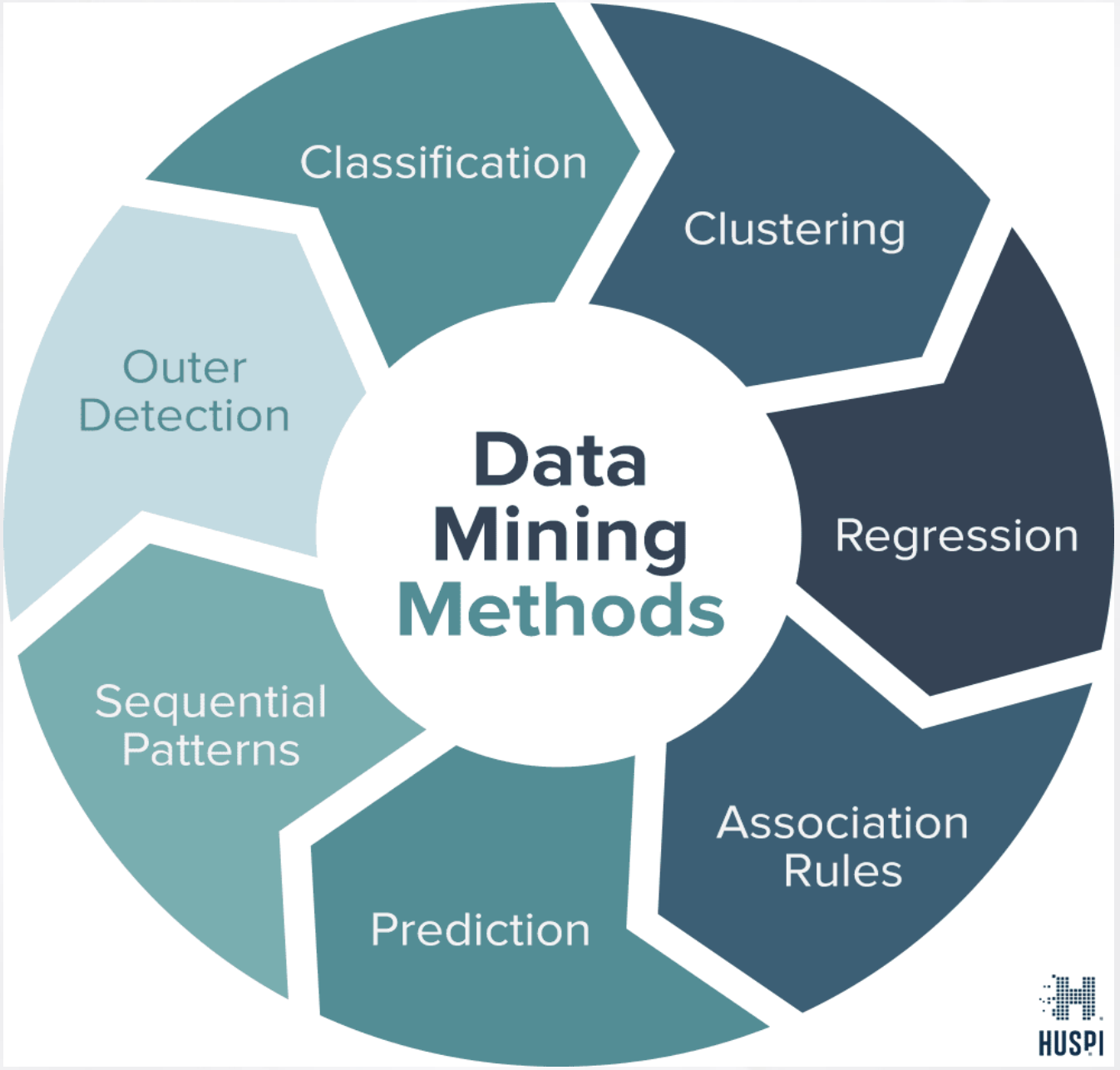
Government

- GDP trend analysis
- City Classification by pollution

Data mining activities

Classification: build a model that accurately predicts the class labels of new instances based on their features. Each instance in adataset is assigned a class label.

Clustering: divide a dataset into groups (or clusters) such that the data points within each group are more similar to each other than to data points in other groups. Without class label



Data mining activities

Data Mining Algorithms

Supervised

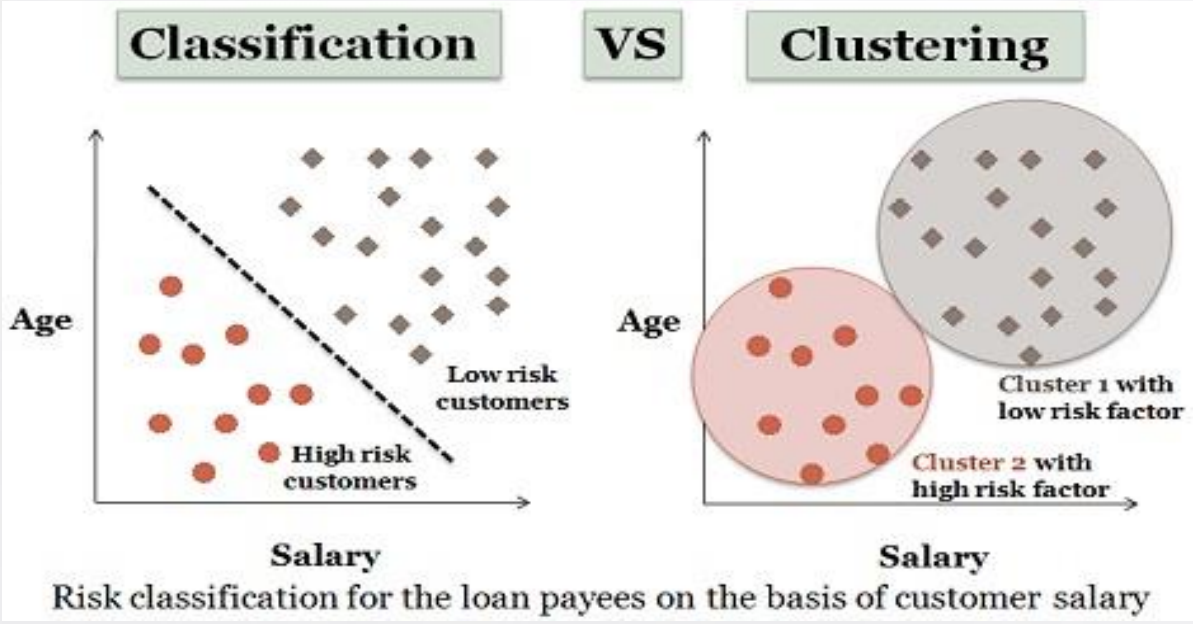
- Classification
  - -- Decision Tree
  - -- KNN
  - -- NB
  - -- SVM
  - -- ANN
  - ……

Unsupervised

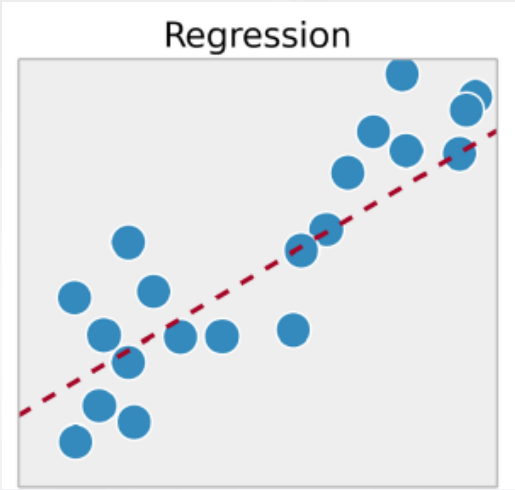
- Clustering
  - -- K-means
  - -- Density-Based Method
  - -- hierarchical
  - -- Korhonen
  - ……

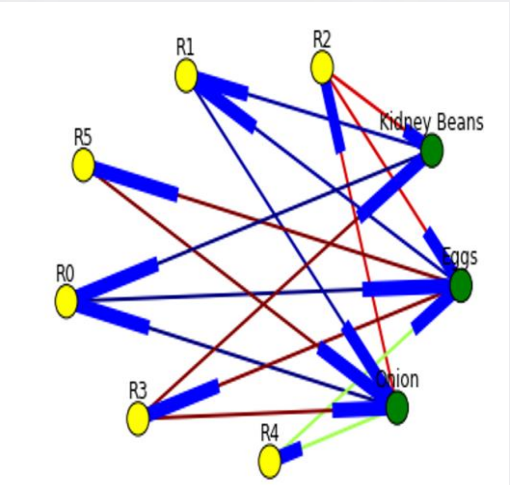
- Regression
  - -- linear
  - -- Polynomial

- Association Analysis
  - -- Apriori
  - -- FP-Growth
  - -- Eclat Algorithm
  - ……



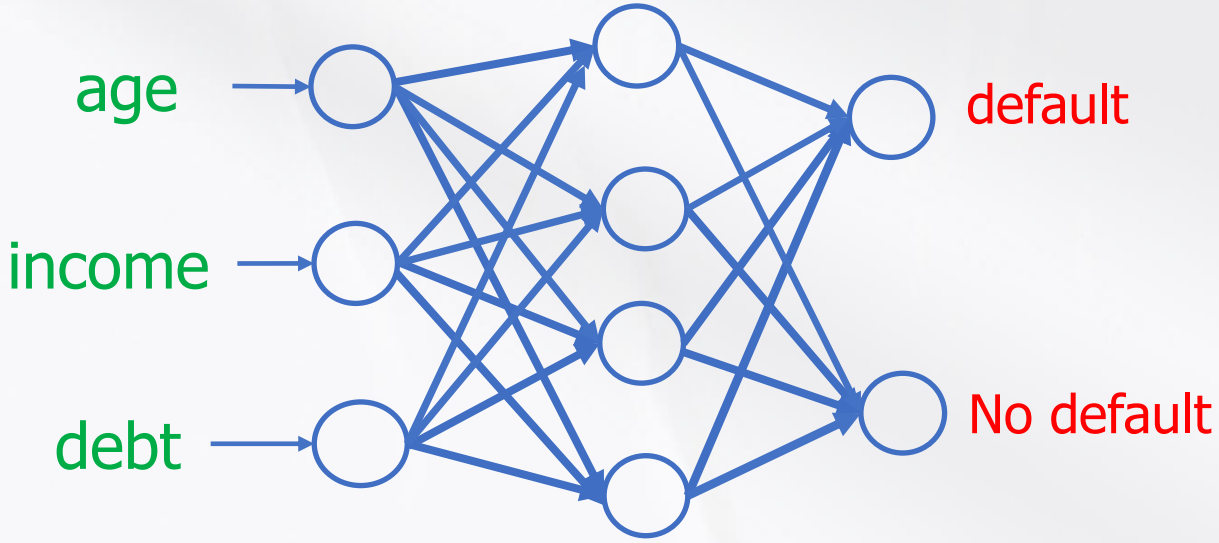
Risk classification for the loan payees on the basis of customer salary

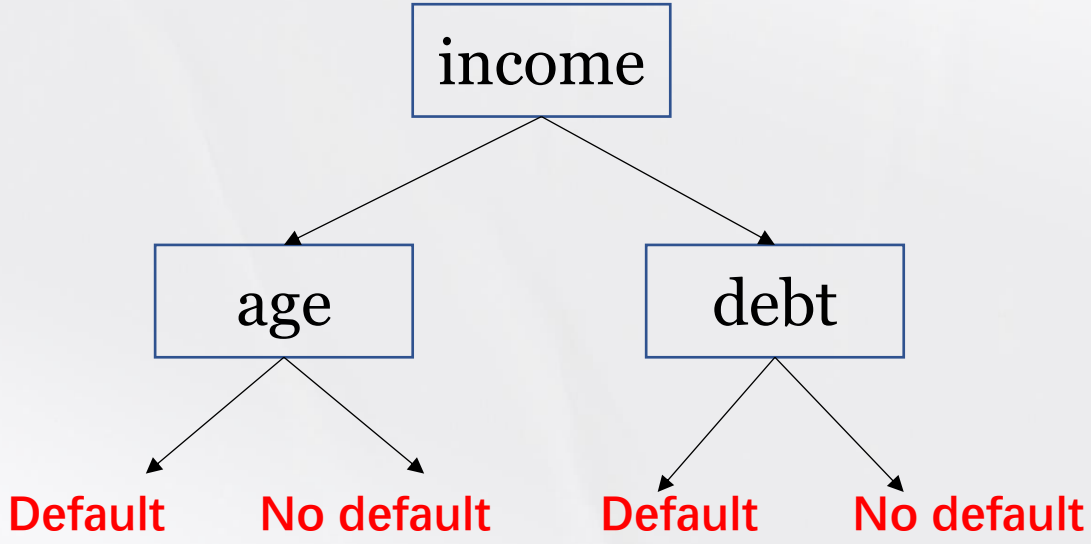




Data mining activities

- ✓ **Classification**
  Assign object to one of a number of predefined classes.





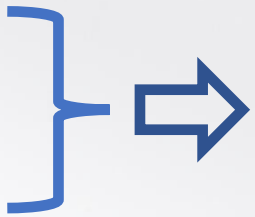
Data mining activities

✓ **Clustering**

Segmenting a population into some non-predefined classes

– Customer classes

call duration during working hours
call duration at other times
local call duration



business users
common users
users who make fewer calls

– Market segments

Data mining activities

✓ **Affinity grouping（关联分组）/association Rules**

Determine what things go together

- Heart of “market-basket analysis”
- Examples:
  – People who liked the book of “ Jane Eyre ” often liked “Pride and Prejudice ”

  - The Advanced Scoutsystem analyzed the logs of NBA games to uncover interesting pieces of information which might otherwise go unnoticed by coaches (e.g., “IF player X is on the floor, then player Y’s shot accuracy decreases from 75% to 30% (sup.=80%, conf.=70%) .”)

POPULAR DATA MINING TOOLS

IBM SPSS

IBM'S STATISTICAL PACKAGES FOR THE SOCIAL SCIENCES IS A HIT FOR LARGE-SCALE PROJECTS

PYTHON

THE EASE OF USE HAS MADE PYTHON ONE OF THE MOST EFFECTIVE DATA MINING TOOLS

KNIME

KNIME'S USER-FRIENDLY FRAMEWORK FOCUSES ON DATA PIPE-LINING AND INTERACTIVE TABLES

H2O

WITH CUTTING-EDGE TECHNOLOGY, H2O HAS AN ENTHUSIASTIC USER COMMUNITY

R

FREE AND EASY TO PICK UP FOR NON-PROGRAMMING BACKGROUNDS

RAPIDMINER

AN OPEN-SOURCE PREDICTIVE ANALYTICS SOFTWARE FOR DATA MINING PROJECTS

SAS

THE DATA MINING TASKS IN SAS ARE GREAT FOR ENTERPRISE-LEVEL WORK

ORANGE

FREE AND IDEAL FOR BEGINNERS, IT HAS PRE-INSTALLED DATA MINING WORKFLOWS

SPARK

SPARK ALLOWS YOU TO FLOAT THROUGH OCEANS OF COLLECTED DATA WITH EASE

GLOBAL TECH™ COUNCIL

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