Where does computing lead?

COMP10001 Foundations of Computing

Week 12 Lecture 1

Careers in computing

Four major career directions

- Computer science
- Software engineering
- Information systems
- Data science

Computer Science

- How to solve problems using computing
- Types of work would you might do:
  - Devising better ways to store, index and search in databases
  - Developing techniques to manage and optimise complex systems
  - New solutions in fields such as computer vision, natural language, cybersecurity
- Programmer, analyst, researcher

Software Engineering

- How to design, build, test and deploy large, complex software systems
- Types of work would you might do:
  - Understanding user requirements
  - Designing the architecture of software systems
  - Implementing, testing, documenting software
  - Building distributed and mobile applications
- Software engineer, interface design, systems integration, database analysts, operations managers

Information Systems

- How do organisations or individuals use computer systems
- Types of work would you might do:
  - Designing management information systems
  - Usability analysis
  - Security analysis
- Usability analysts, business analysts, project managers

Data Science

- How to manage large volumes of data and extract useful insights
- Types of work would you might do:
  - Data analysis
  - Large scale analytics
  - Information visualisation
- Bioinformaticians, market analysts, computational physicists, data miners

Introduction to Data Mining

Styles of Decision Making

Overview

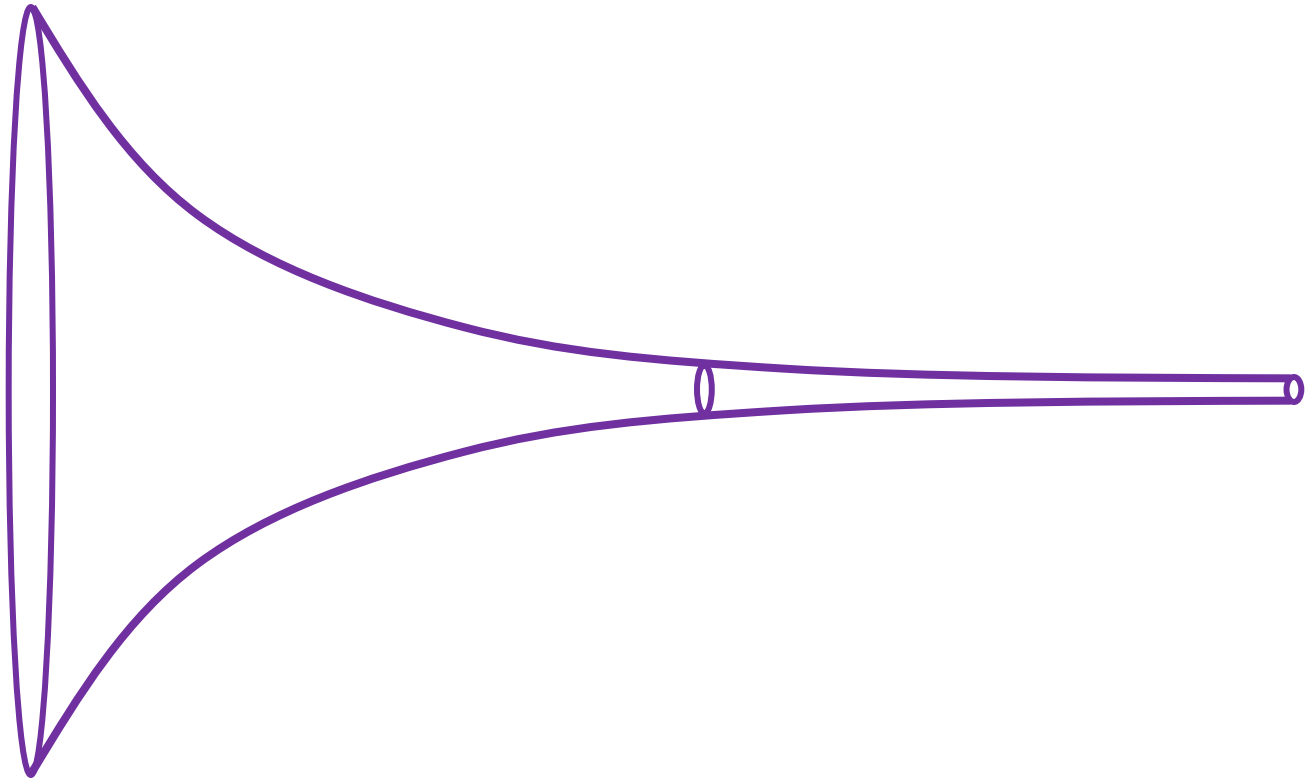
Data mining aims to find useful patterns in large databases

For example:

- **Market segmentation studies**
  - **Find categories of customers with similar buying behaviour**
  - **Example of "unsupervised learning"**

- **Predictive modelling**
  - **Find customers who are likely to commit fraud based on their transaction history**
  - **Example of "supervised learning"**

The Common Theme – Big Data

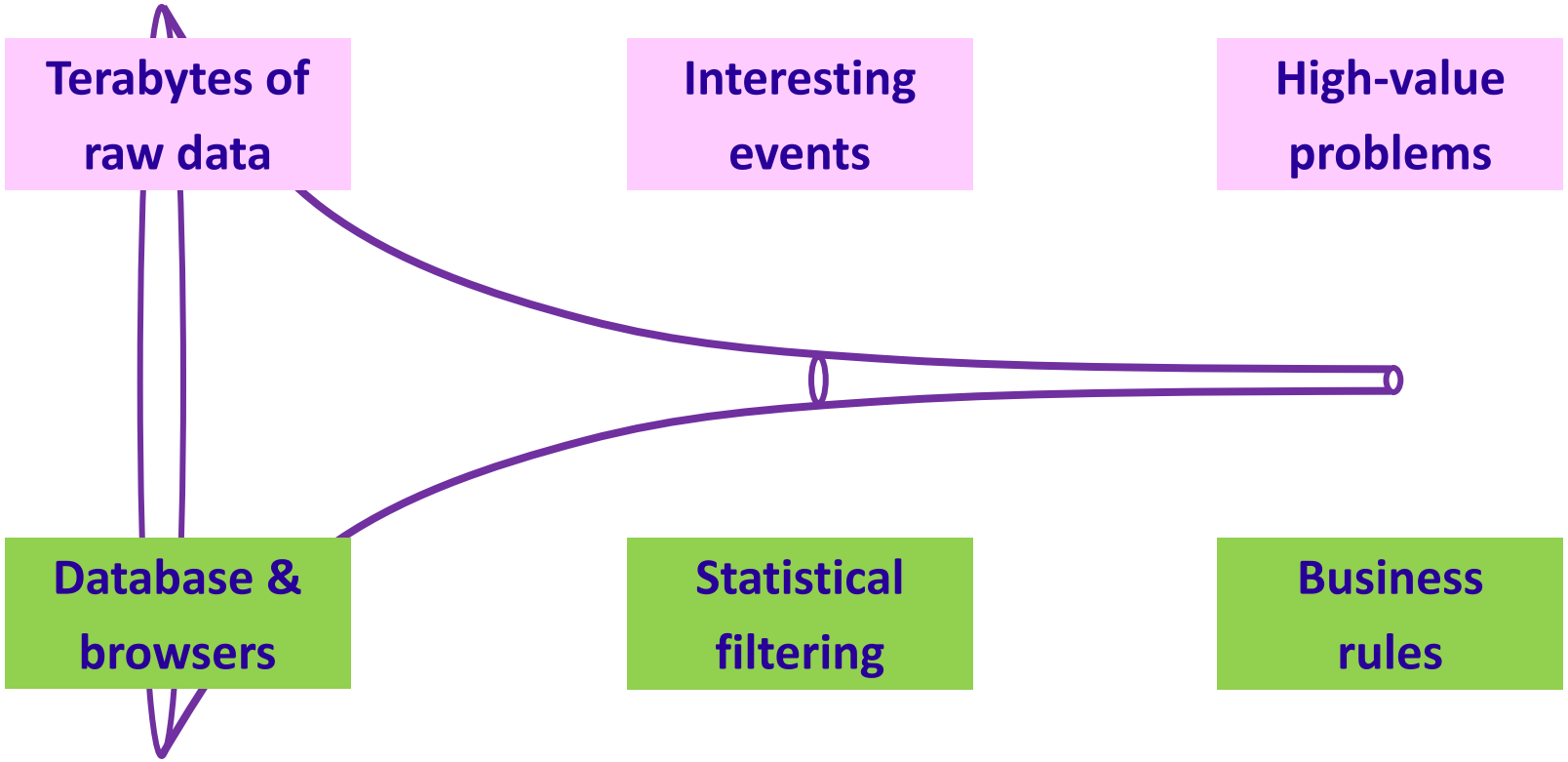


Terabytes of raw data

Interesting events

High-value problems

Automating the Data Analysis Pipeline



Part of the field of **data analytics / machine learning**

Clustering to Learn Categories (Unsupervised Learning)

What are the natural categories in a database?





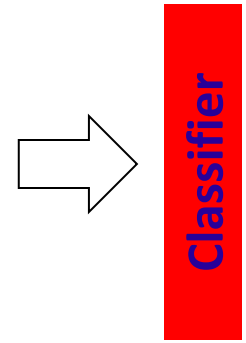

Consider a database of animals.

How many different types of animals are there here?

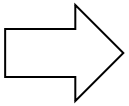
Learning a Classifier (Supervised Learning)

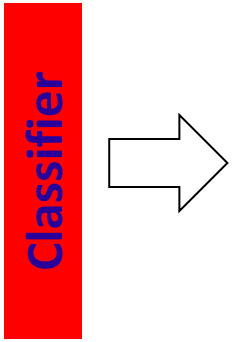
Training a classifier

cat cat dog dog cat



Classifying new examples



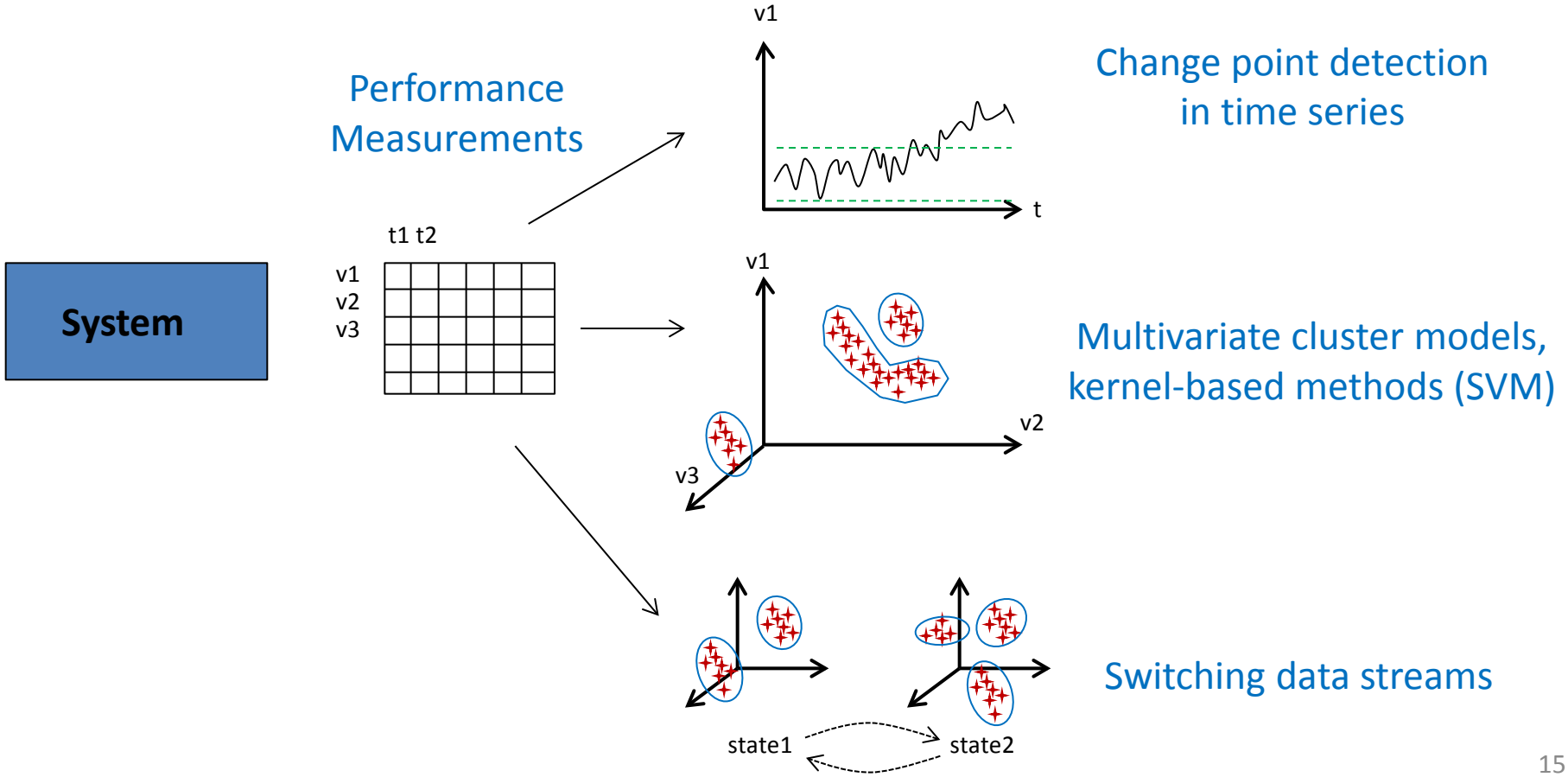


dog

Learning Unusual Patterns (Anomaly Detection)

- Learn a model of “normal” database records
- Use this model to test new records for anomalies
- Any anomalies can be either interesting or errors

Modelling Normal Behaviour



Summary

Data mining aims to find useful patterns in large databases

Useful in marketing, operations, security …

Many patterns discovered using data mining are interesting, but which ones are useful?

Want more?

Computing and Software Systems major (BSc)

- The next stop is ...
  COMP10002 Foundations of Algorithms
- Maybe also ...
  INFO20003 Database Systems

Informatics major (BSc) or Diploma in Informatics

- The next stop is ...
  INFO20002 Foundations of Informatics
- Maybe also ...
  INFO20003 Database Systems

Breadth options (all)

- ISYS20006 Shaping the Enterprise with ICT