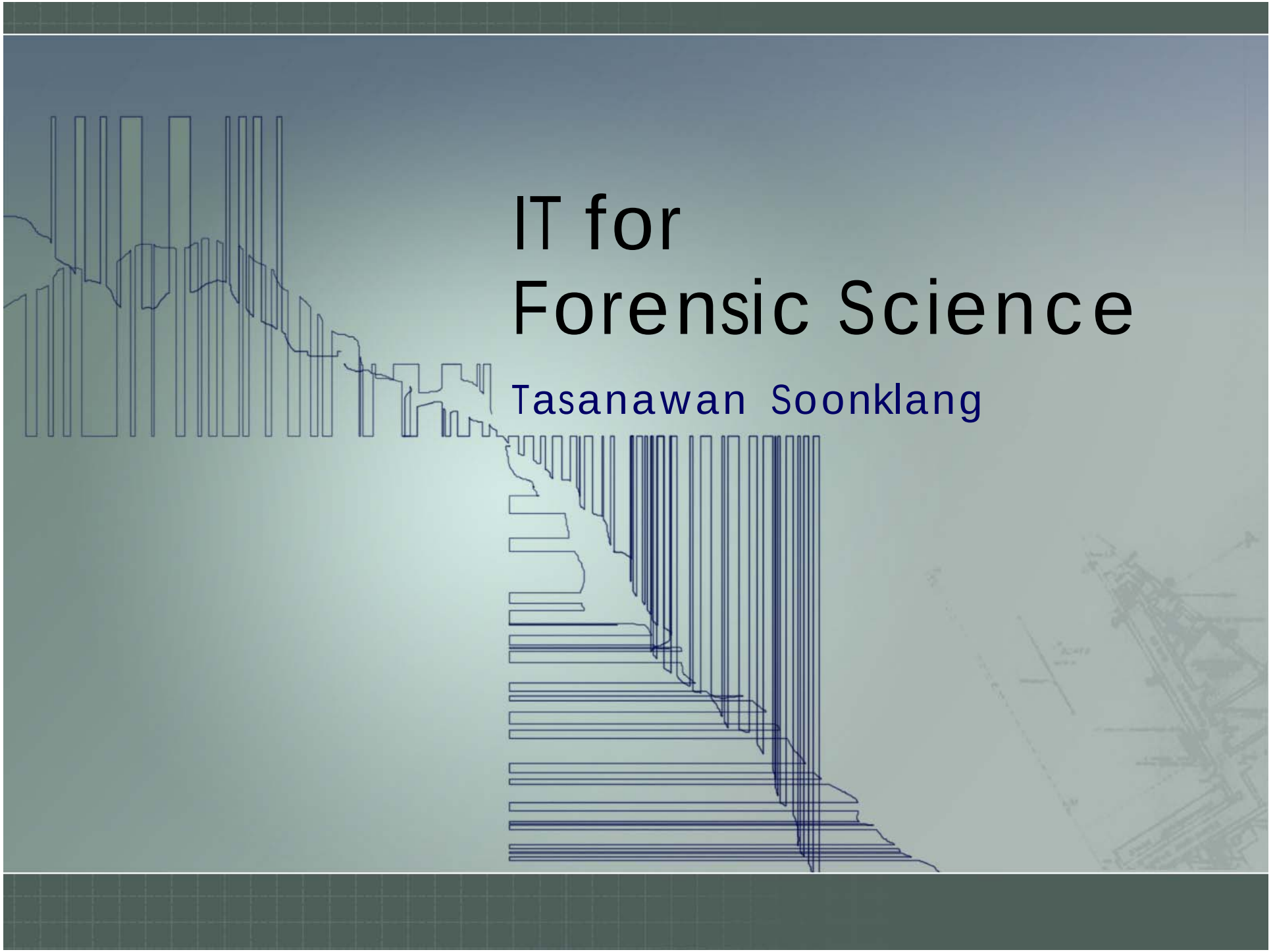

IT for
Forensic Science
Tasanawan Soonklang

Introduction

What is ?

- IT: two terms

Information Technology

- "Any technology that helps to produce, manipulate, store, communicate, and/or disseminate information" - Wikipedia
- "the use of computers and software to manage information" - About.com

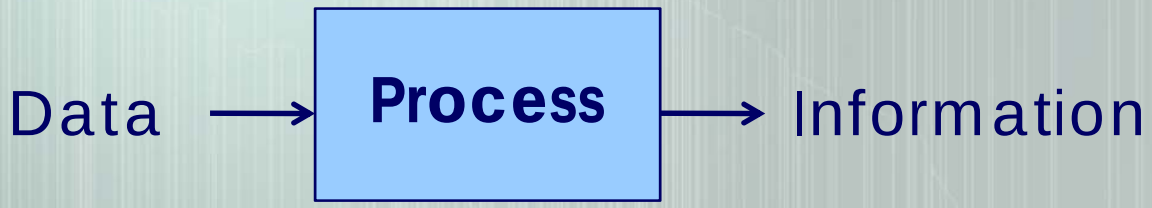
Technology

Technology

- the practical, especially industrial, use of scientific discoveries
  - Cambridge dictionary
- the practical application of science to commerce or industry

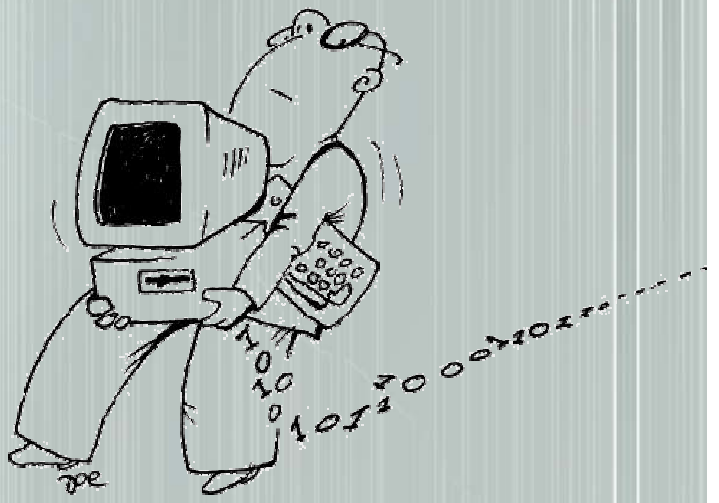
Information

- The end product of data processing
- Processing raw data into useful information

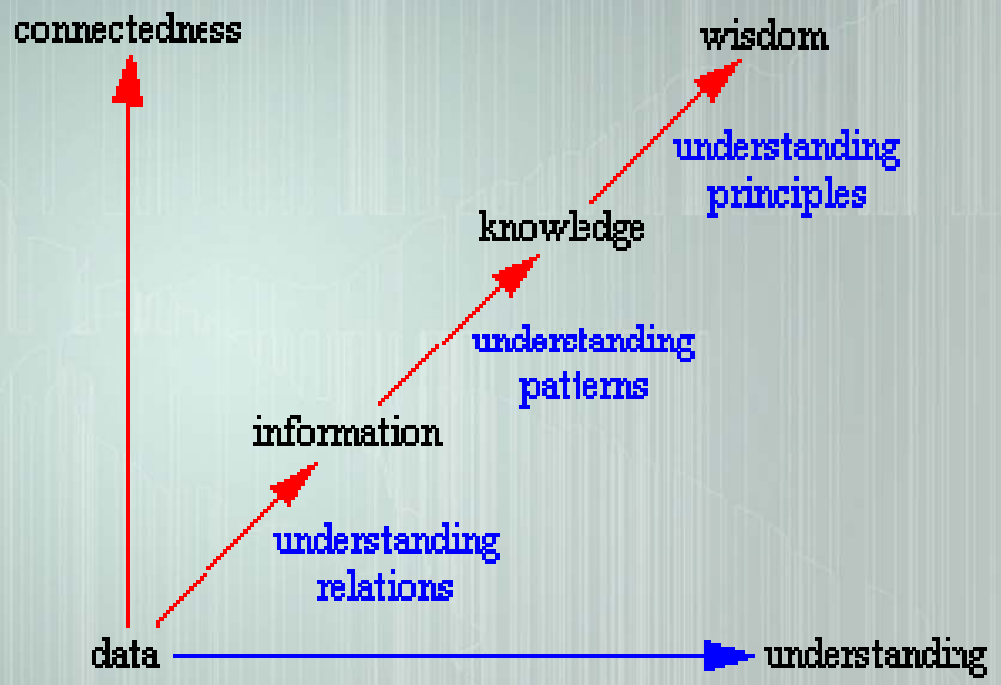


Data

- Raw data
  - Text
  - Image
  - Files
  - Sound
- Any kind of data



Information



Source : www.systems-thinking.org

Information

Process

- Storage
- Retrieve
- Classification
- Sorting
- Analyze
- Calculate
- Summarize

Tool

- Computer
- Computer network
- Telecommunication technology

Method

Method

- Methodology in computer science
- Knowledge of a particular discipline

Areas of CS

Computer Science

- Theory of computation
- Computational science
- Artificial Intelligence
- Computer networking
- Database systems
- Operating systems
- Computer graphics

Computing and Forensic Science

Data in forensic science

- Evidence
  - Person
  - Object
- Face
- Voice
- Statement
- Location

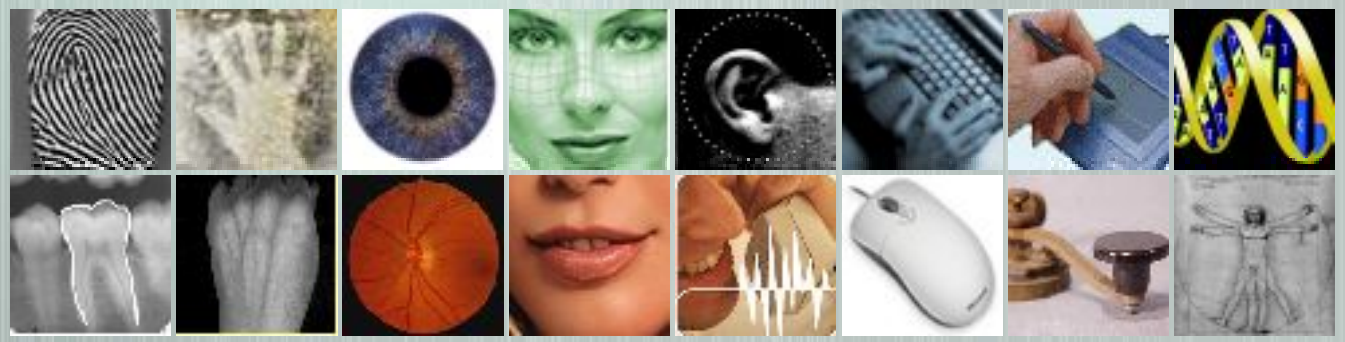
Identification Methods

- Traditional
  - Something you know: PIN, password…
  - Something you have: key, token, card…

  But does not insure that you are here and the real owner.

- Biometrics
  - Something you are: a biometric.

Types



Examples

- Fingerprint
- Palm print
- Facial recognition
- Voice recognition
- Handwriting recognition
- Gait recognition

Fingerprint

How does it work ?

Enrollment

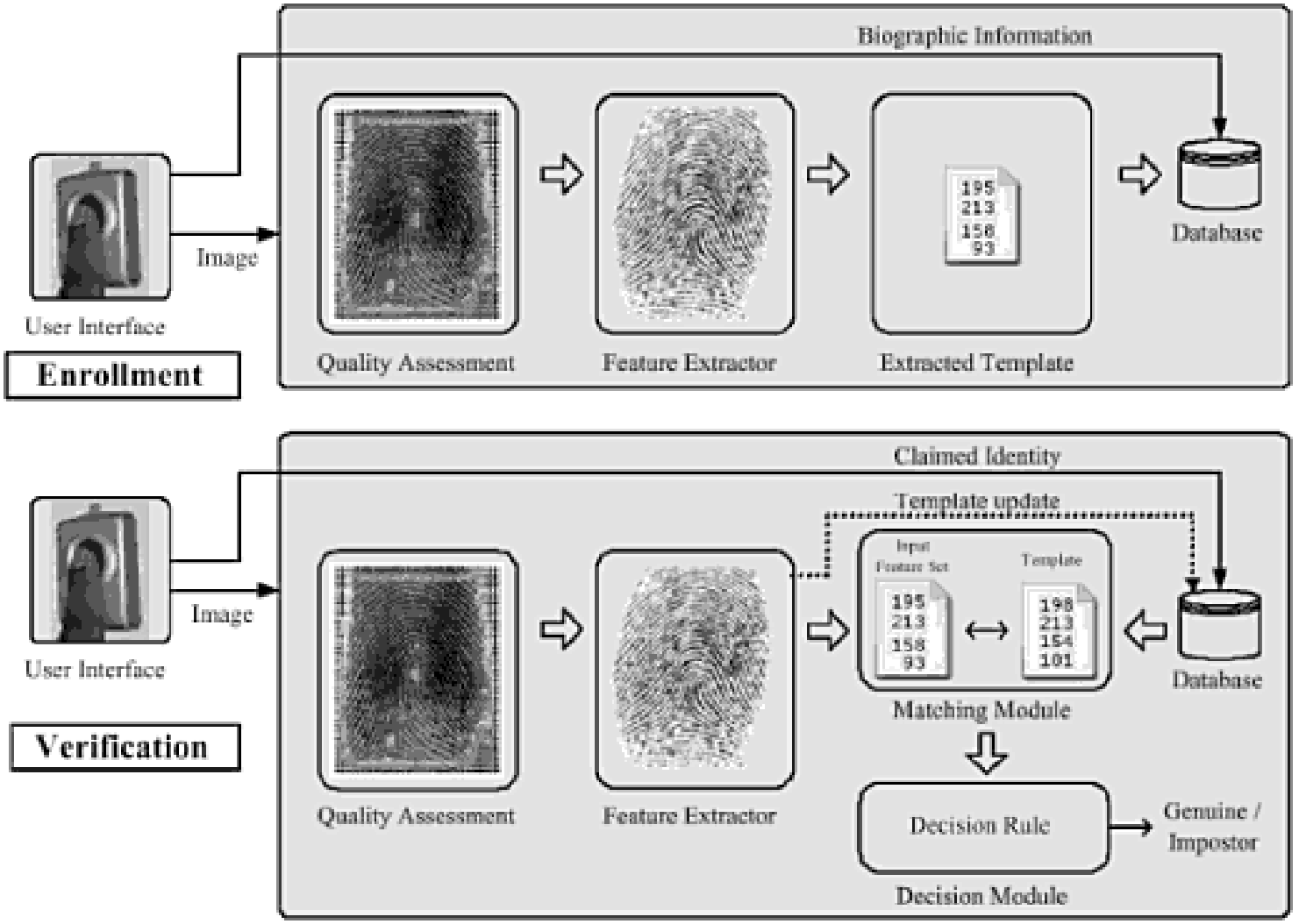
Capture → Process → Store

Store → Compare → No Match / Match

Capture → Process → Compare

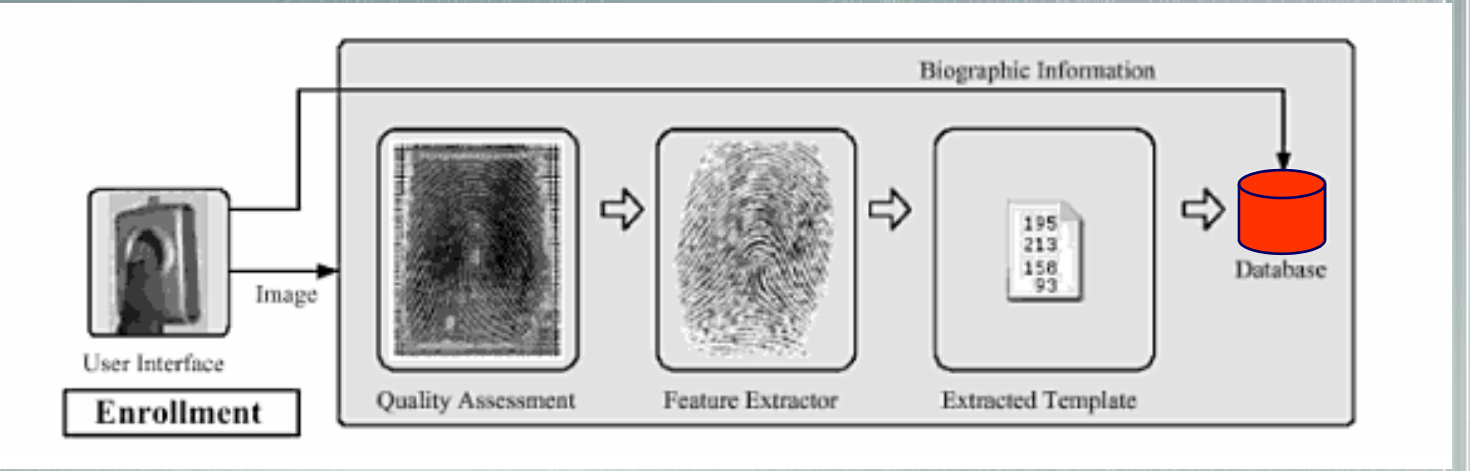
Verification

Example



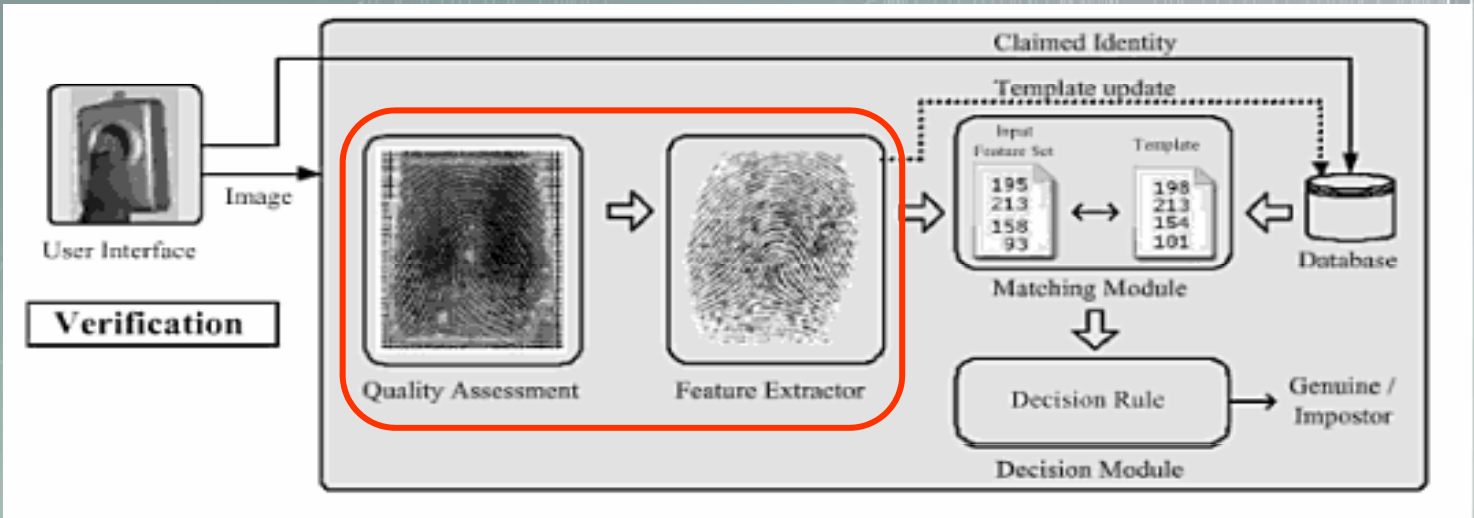
Original source : Anil Jain and Arun Ross (1999)

Example



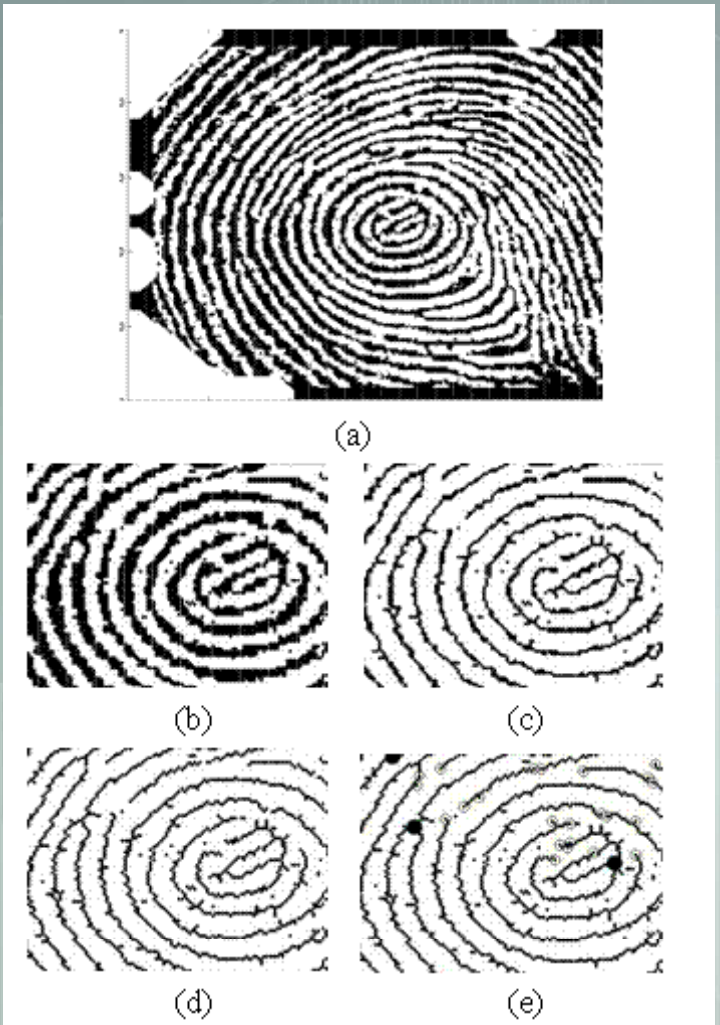
- Database
  - Storing matching templates
  - Querying templates
  - Database management
  - Security issues

Example



- Image processing
  - Assessing the quality
  - Enhancing the image

Example

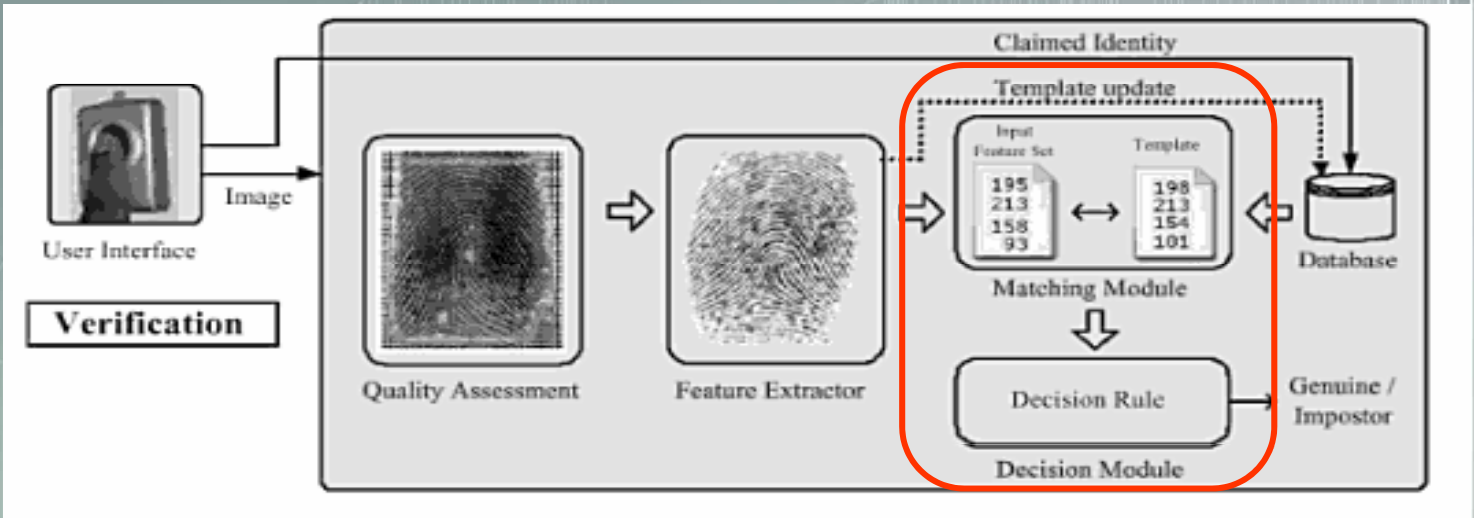


- **Image processing**

a) The original
b) A close-up of the original
c) After 1st stage of thinning
d) After 2nd stage of thinning
e) After applying algorithm, showing bifurcations (black) and endpoints (grey)

Original source : http://www.ee.ryerson.ca/opr/research_projects/graph_fingerprint.html

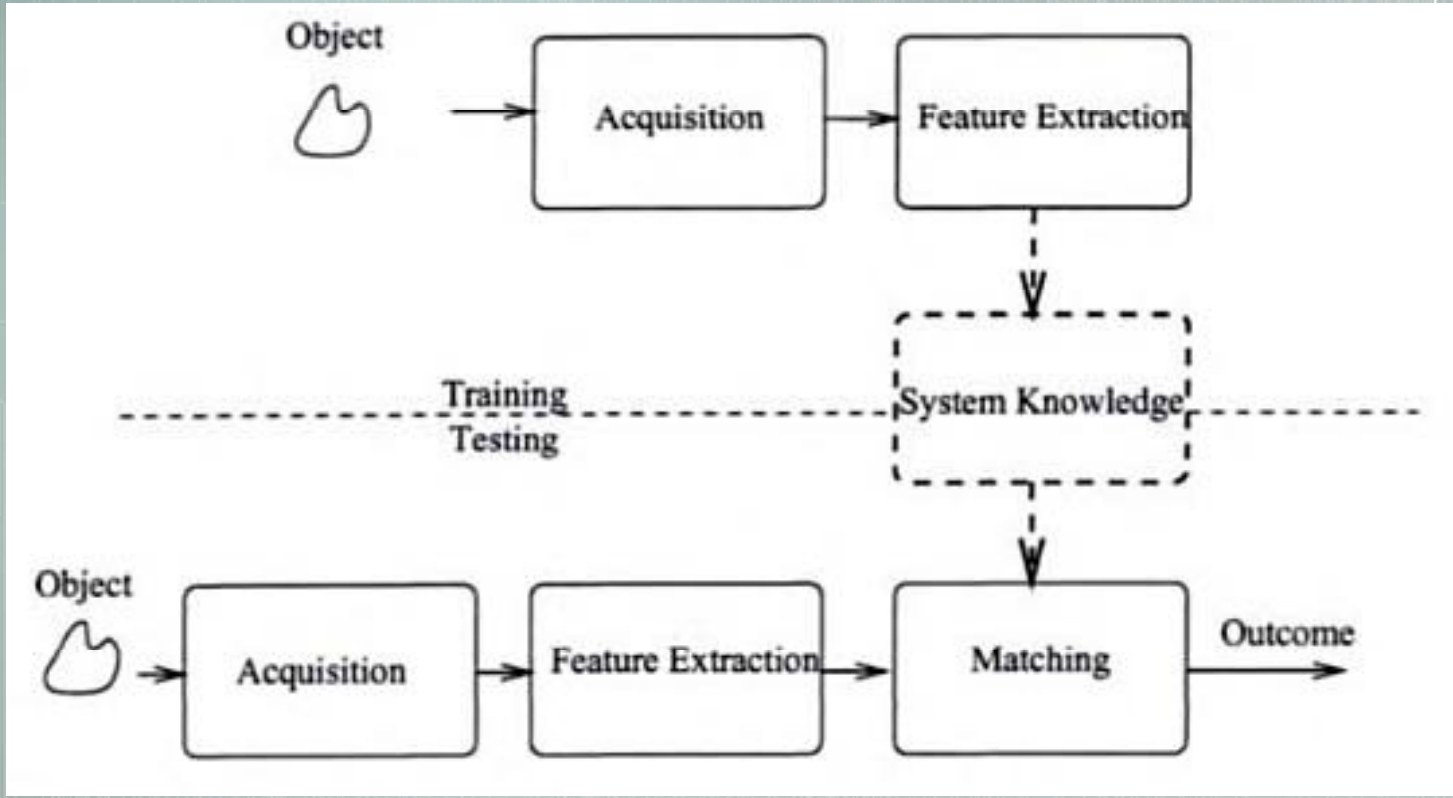
Example



- Intelligent system
  - Pattern classification & recognition
  - Decision rules

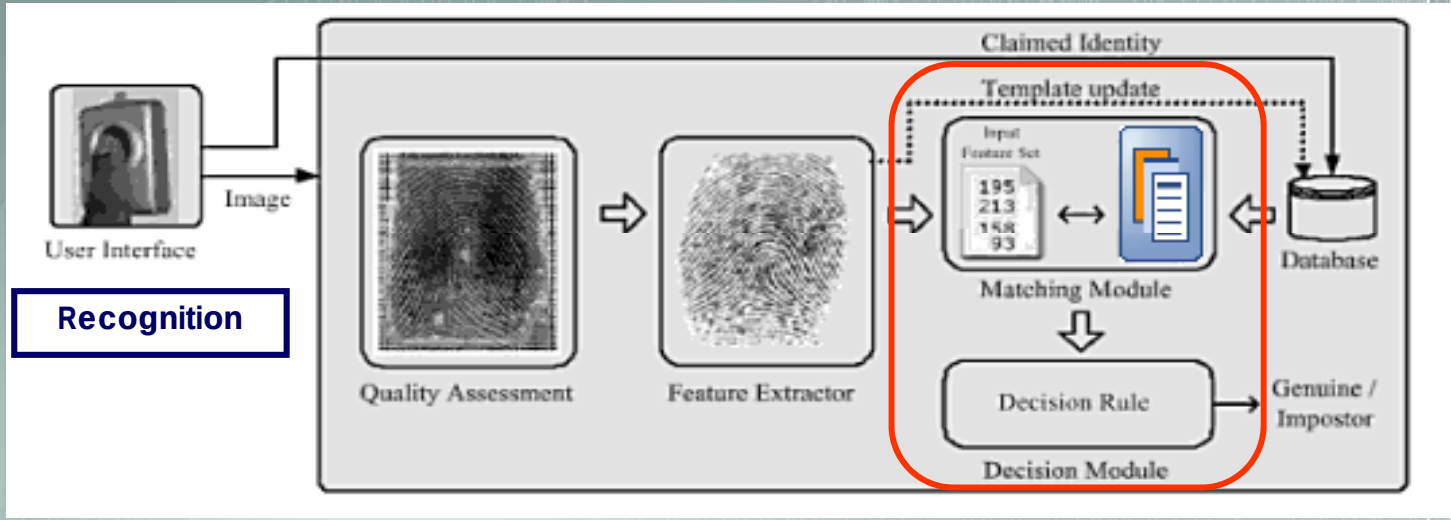
Example

- Pattern classification & recognition
  - Training and testing data
  - Machine learning



Original source : Anil Jain and Arun Ross (1999)

Example



- Information retrieval
  - Retrieval templates for recognition
  - Scoring
  - Evaluation

- Database system
- Data mining
- Knowledge-based system
- Intelligent system
- Information storage and retrieval
- Digital image processing
- GIS
- Computer modeling & simulation
- Computer network & security
- Cyber crime
- Computer & internet forensic

Database System

- An organized collection of data for one or more multiple uses.
  - Design
  - Management
  - Tools

Data Mining

- The process of extracting patterns from data.
  - Large volume of data
  - Uncover patterns
  - Mining process
  - Tools

Knowledge-based System

- The systems that use knowledge-based techniques to support
  - human decision-making,
  - learning
  - action.

Intelligent System

- The systems that perceive, reason, learn, and act intelligently.
  - Science and engineering
  - Making intelligent machines/agents

Information Storage & Retrieval

- The science of storing & searching for
  - documents,
  - information within documents
  - metadata about document
- Analysis, indexing, representation, storing, searching and retrieving, models and document processing

Image Processing

- The use of computer algorithms to perform image processing, usually, on digital images.
  - Output is
    - A modified image
    - A set of characteristics
    - Parameters related to the image

Geographical Information System

- The system that captures, stores, analyzes, manages, and presents data that are linked to location.
  - Applications and tools in GIS
  - Analysis and mapping crime investigation
  - Analysis of hot spots, density patterns and forecasting of crime patterns.

Computer Modeling & Simulation

- A computer program that attempts to simulate an abstract model of a particular system
  - Projectile simulator
  - Face modeling from a skull

Computer Network & Security

- The discipline concerned with connected communication between computer systems/devices
  - Computer networking
  - Internet
  - Devices
  - Security issues

Cyber Crime

- Any crime that involves a computer and a network
- Traditional crimes conducted through the Internet
  - Types of crime
  - Protection
  - Laws concerning IT security

Computer & Internet Forensic

- The study to explain the current state of legal evidence found in computers and storage media.
  - Extracting information
  - Gathering evidence
  - Sequence of events
  - Laws concerning this issue

Other Courses

- Internet Crime and Protection
- Data Warehouse for Crime Investigation
- Information Storage and Retrieval for Crime Investigation
- Applications of Geographical Information Systems in Forensic Science
- Digital Image Processing and Applications for Forensic Science