Matlab 6: Introduction to Pattern Recognition

Cheng-Hsin Hsu

National Tsing Hua University

Department of Computer Science

Slides are based on the materials from Prof. Roger Jang
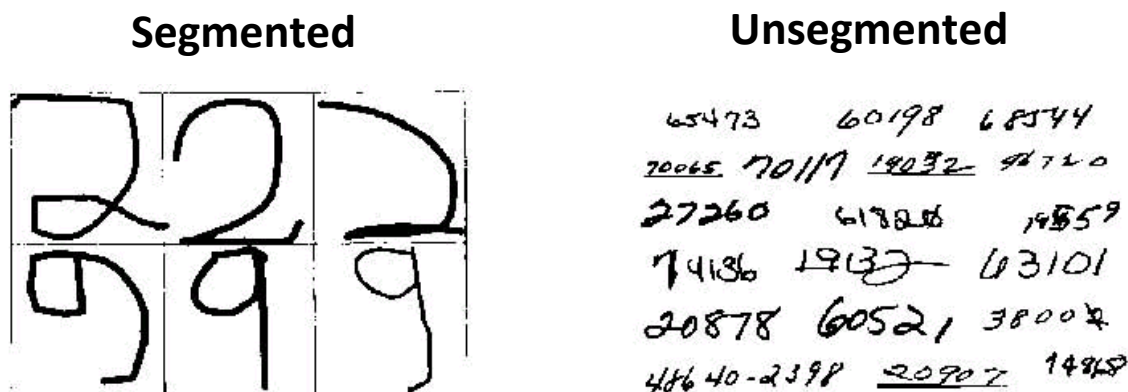
Related Terms of Pattern Recognition

- Data classification
- Machine learning
- Information retrieval
- …

Pattern Recognition Applications

- Biometric ID: Identification of people from physical characteristics
- License plate recognition
- Autonomous driving
- Robo-advisors for wealth management
- Recommendation
- Signal classification
    - Classification of seismic signals
    - Medical waveform classification (EEG, ECG)
    - Wave-based nuclear reactor diagnosis
- User modeling
- Satellite picture analyses
- Medical image analyses (CAT scan, MRI)
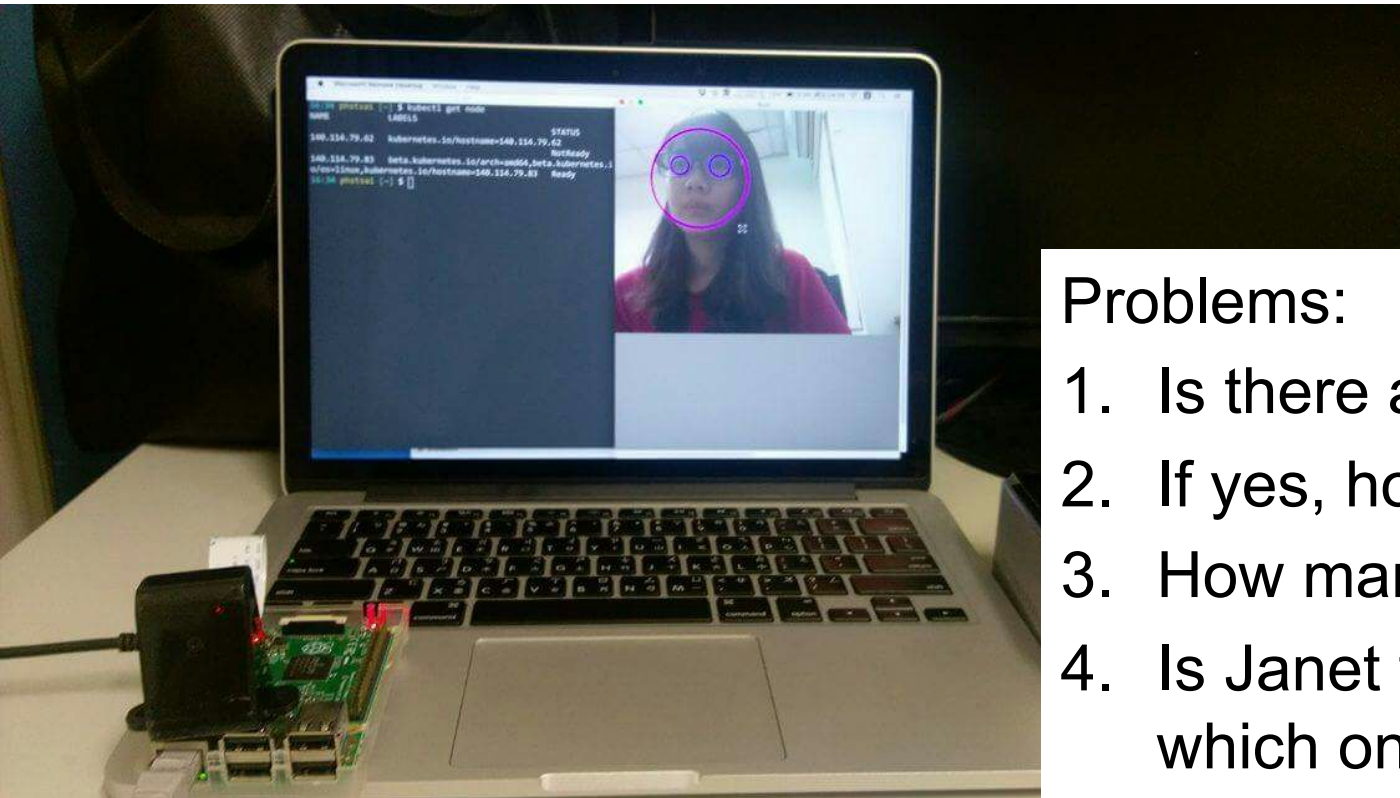
Optical Character Recognition (OCR)

- Handwritten digit recognition

Segmented   **Unsegmented**

- Handwritten character recognition

Face Detection & Recognition

Problems:

1. Is there a face?
2. If yes, how many?
3. How many are female?
4. Is Janet there? If yes, which one?

Face Recognition and Validation

Image databases:

A:

B:

C:

D:

E:

F:

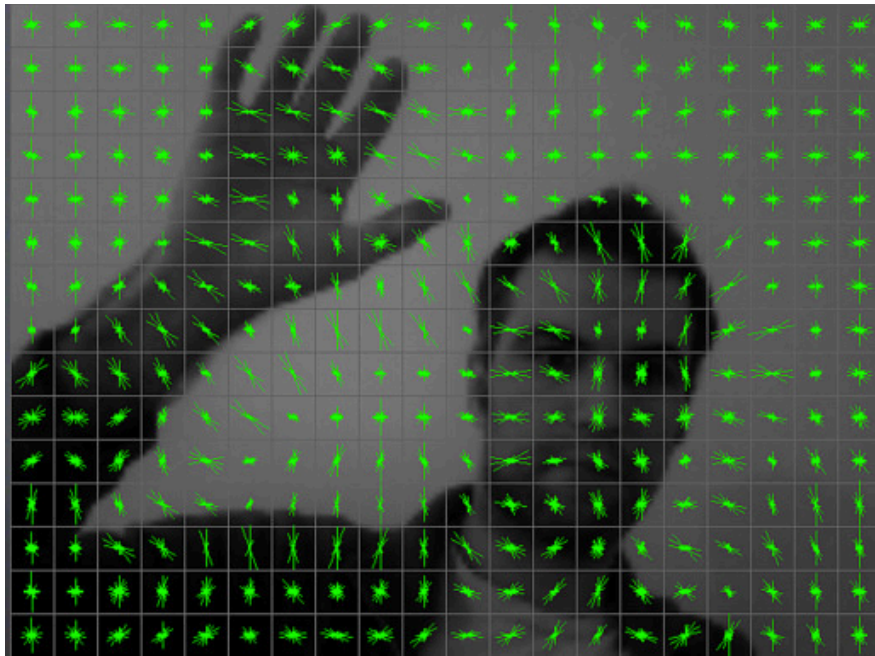**G:**

Test image:

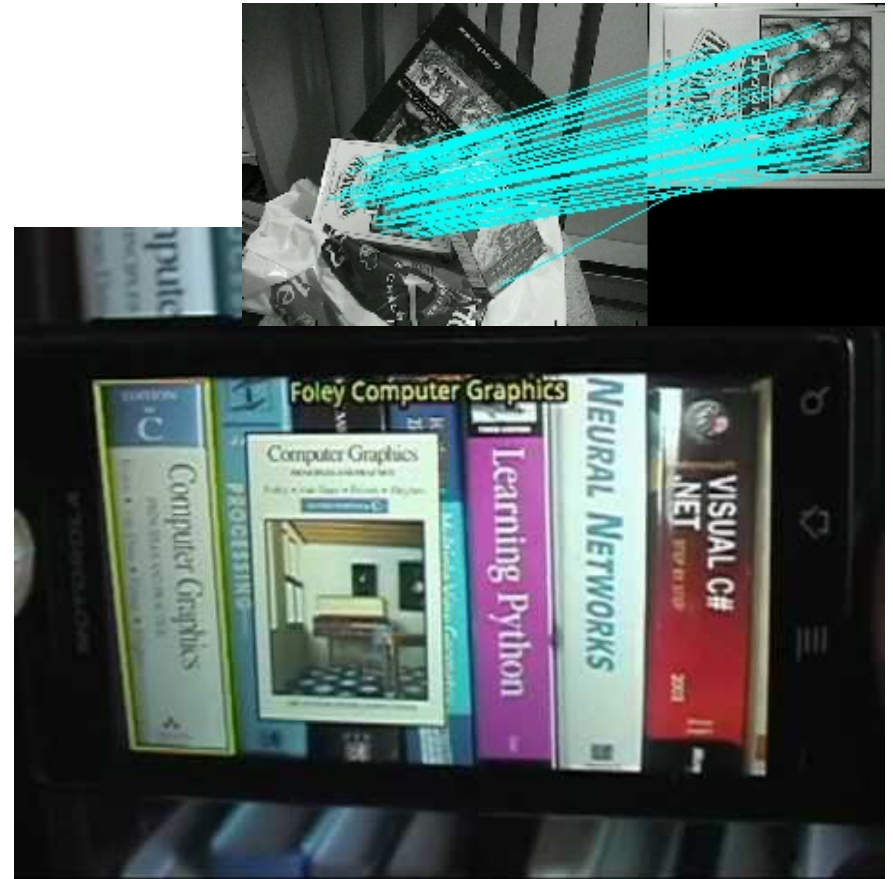**Who is this guy?**

- Tasks:
  - Face detection
  - Local feature extraction
  - Global feature extraction
  - Data classification

Global/Local Features

Histogram of Oriented Gradients

Scale-Invariant Feature Transform

Biometric Identification

•Identification of people from their physical characteristics, such as

- faces

- voices

- fingerprints

- palm prints

- hand vein distributions

- hand shape

- ear shape

- retinal scans

Audio Signal Processing/Recognition

Applications of PR to audio signal processing and recognition

- – Endpoint detection
- – Pitch determination
- – Music note segmentation
- – Tone recognition
- – Speaker verification/recognition
- – Speech recognition

Who's Doing Pattern Recognition?

Computer science (machine learning, data mining and knowledge discovery)

- Nearest neighbor rule
- Support vector machines
- Neural networks
- …

Statistics/Mathematics (multivariate analysis)

- Discriminant analysis
- CART: Classification and Regression Trees
- MARS
- Jackknife procedure
- Projection pursuit
- …

Questions?