Fundamentals of Digital Image Processing 2

Pengolahan Citra

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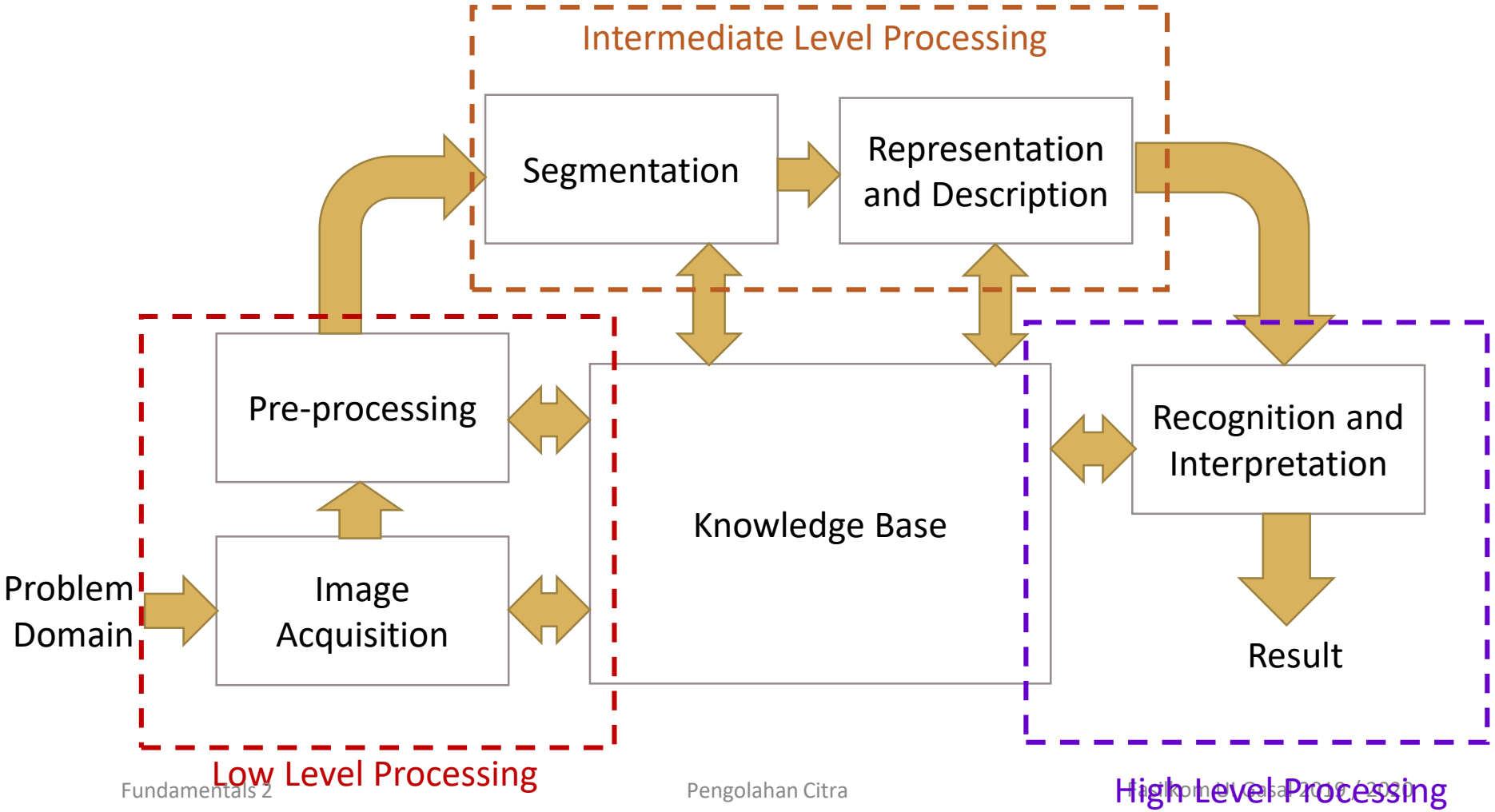
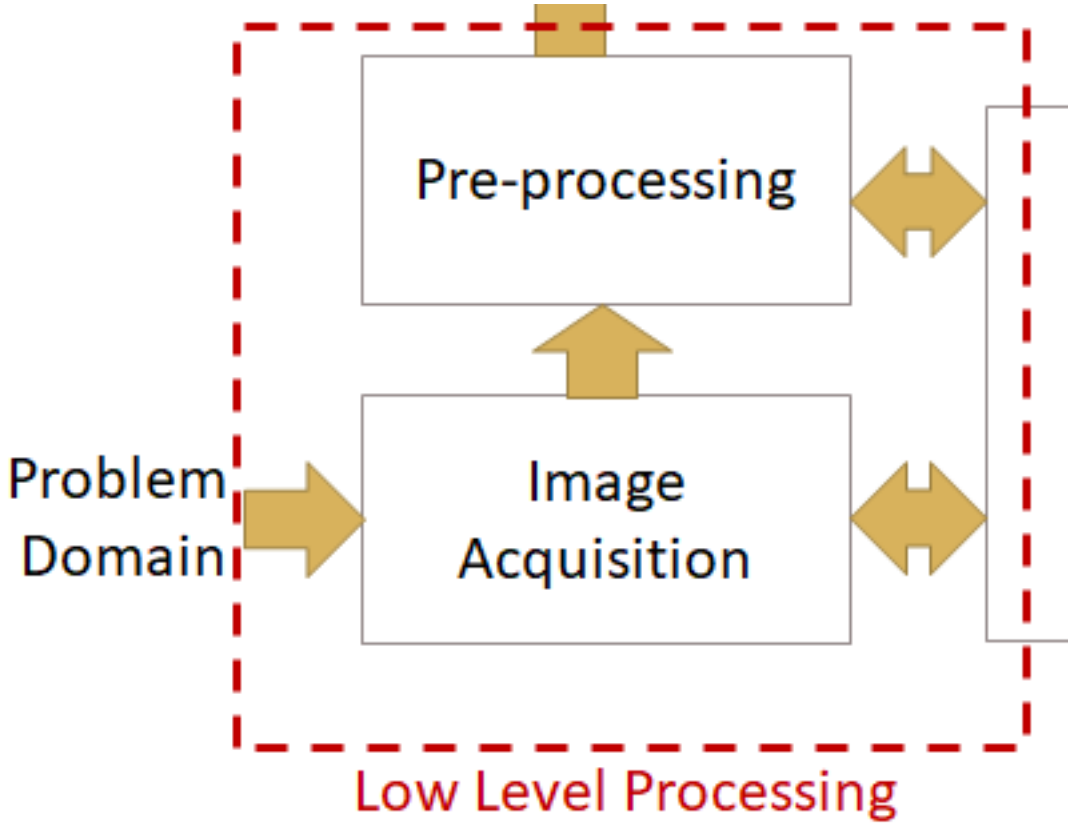
Image Analysis System (2)

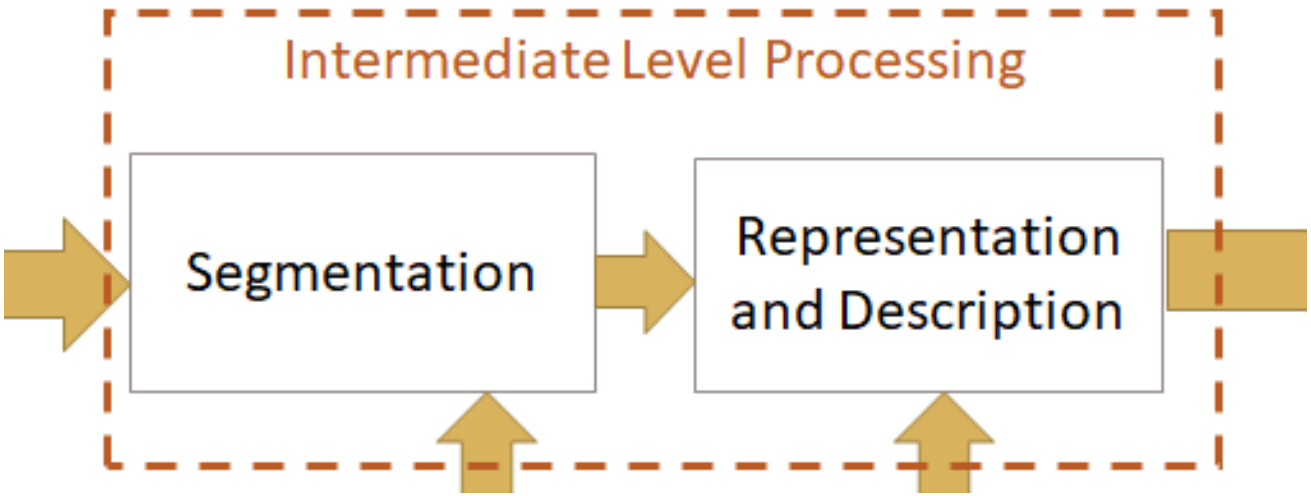
(Source: Gonzalez & Woods, 1992)



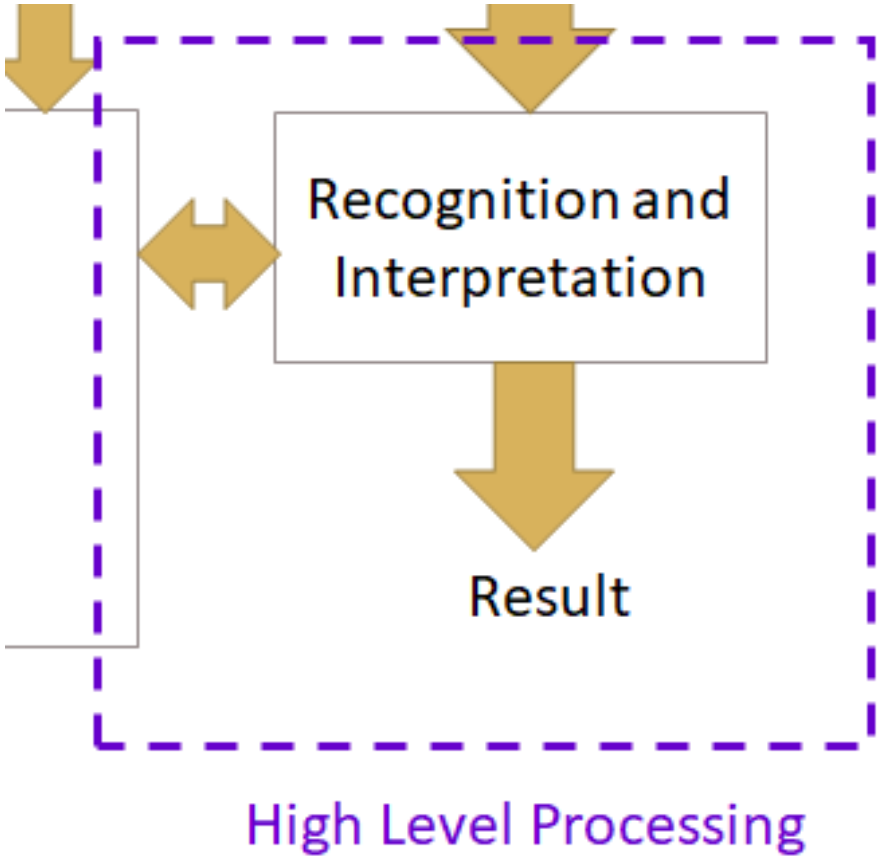
Low-Level Processing



Mid-Level Processing



High-Level Processing



Pattern Recognition System

Pattern Recognition System (2)

- **Latihan – Pengenalan - Evaluasi**

Beberapa Pendekatan Interpretasi Citra

- **Clustering** (**unsupervised classification**):
  - Memasukkan suatu pola obyek yang diamati ke suatu kelas pola yang belum diketahui dan disebut sebagai kluster pola
- **Classification** (**supervised classification**)
  - Melakukan identifikasi suatu pola obyek yang diamati sebagai anggota dari suatu kelas pola yang sudah diketahui

Clustering Citra Dijital












Clustering Citra Dijital (2)

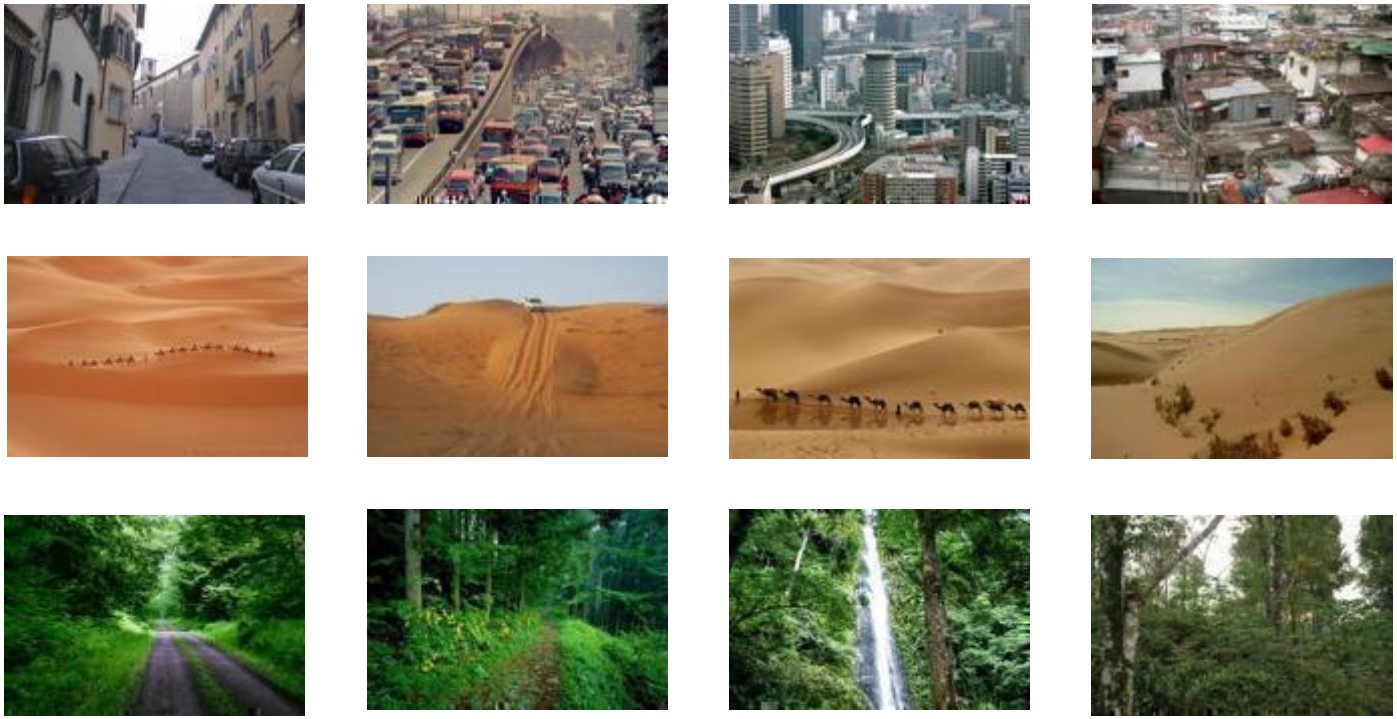
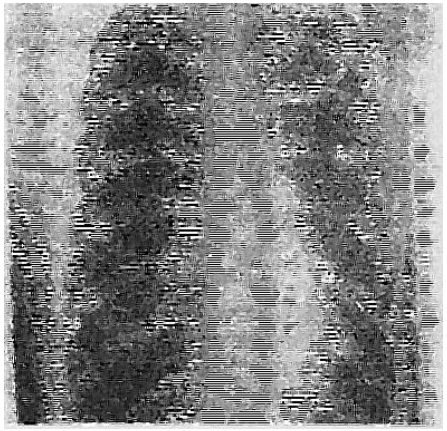
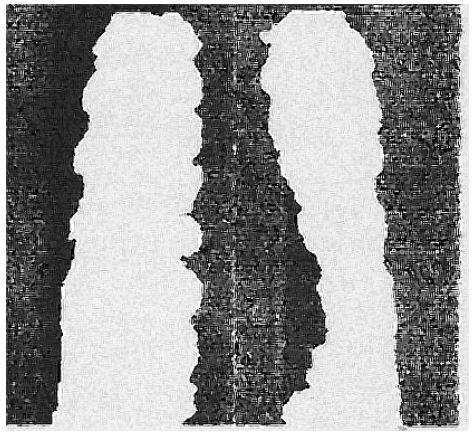


Image Clustering (Unsupervised)

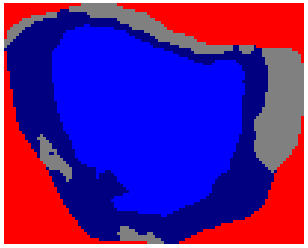
- Cluster yang dihasilkan masih belum mempunyai label kategori objek



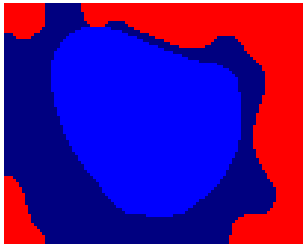


- K-Means Clustering
- AND operation to obtain soft tissue of the lungs

(Source: Kartono dan A. Murni)

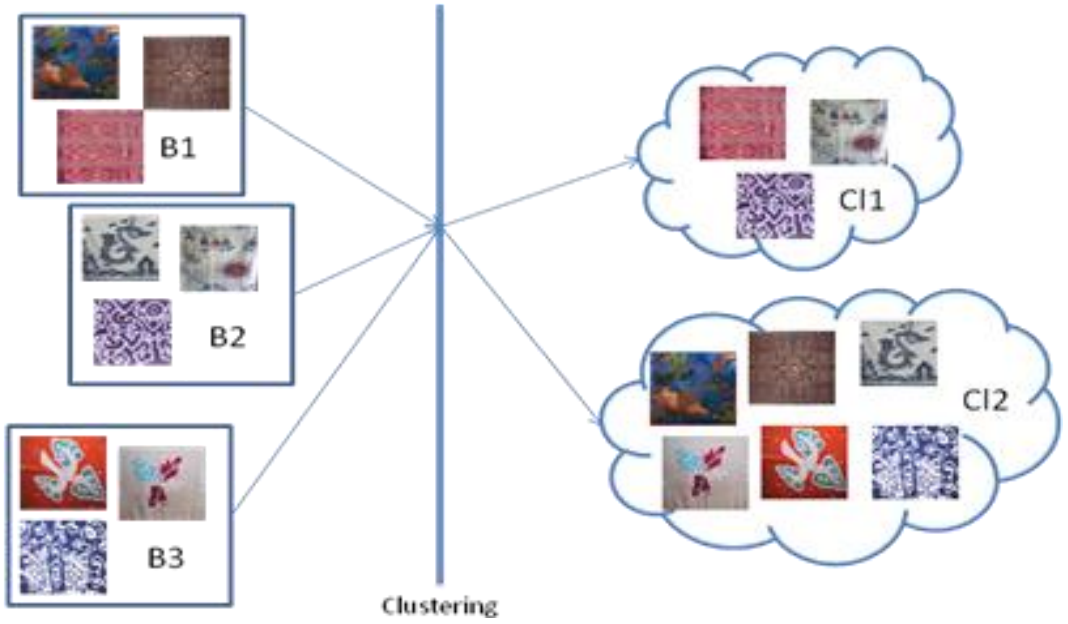


Input image TUD Reference (Jantzen *et al.*, 2005)



Clustered image (T. Farida, 2007) FCM Clustering

Batik Motif Clustering



- Automatically clustering Batik images that are known to belong to separate classes
- We then observe how well the clusters approximate the known classes.

Klasifikasi Citra Dijital







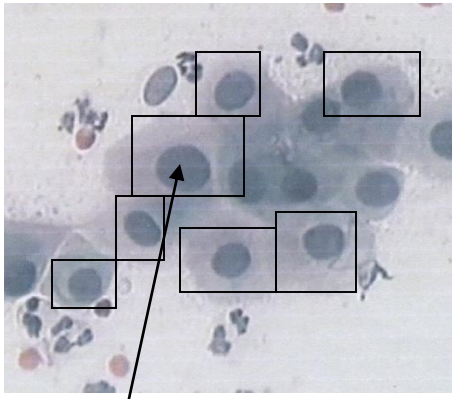





Query

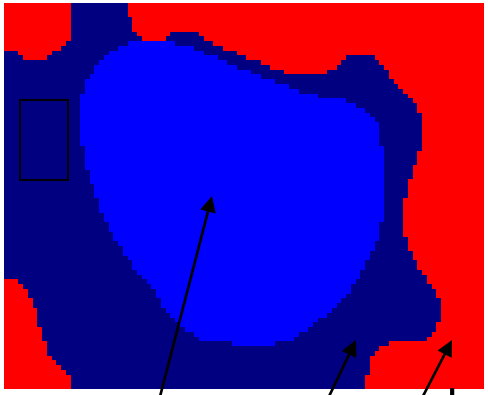
Diagnosing a Pap Smear Cell Image Based on Image Segmentation and Classification Methods

(J. Indarti, FKUI)



Single pap smear cell image

(T. Farida, Fasilkom UI)

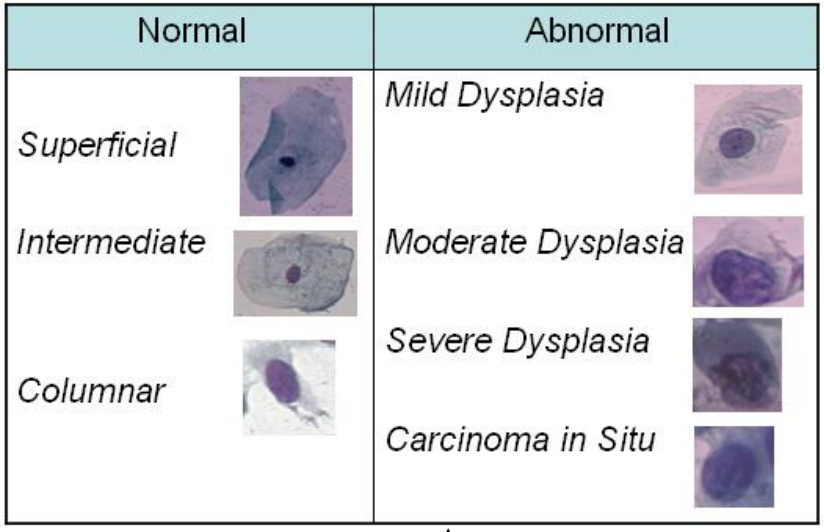


Nucleus

Cytoplasm

Background.

(Jantzen *et al*., TUD)

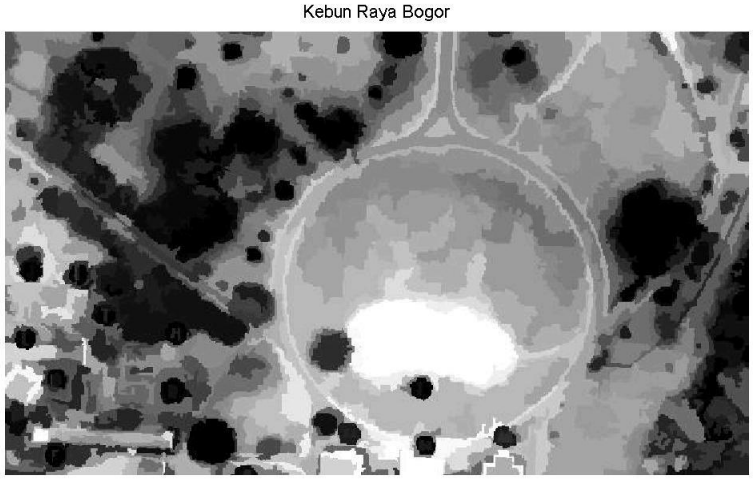


Seven condition categories

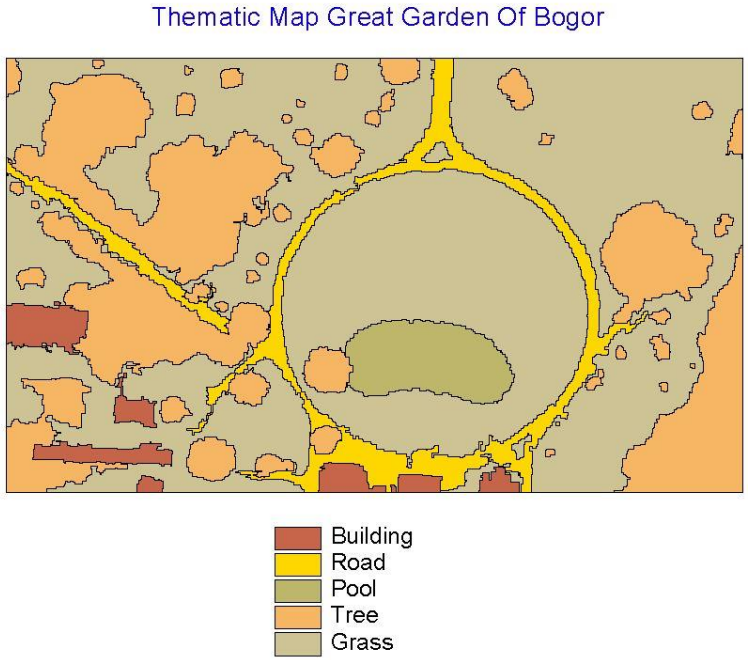
20 Features → Classification Method

Rule-Based Object Recognition

(Sumber gambar asli: PT. Map Indonesia
Sumber gambar hasil: Wiweka H. and A. Murni)



Original Image



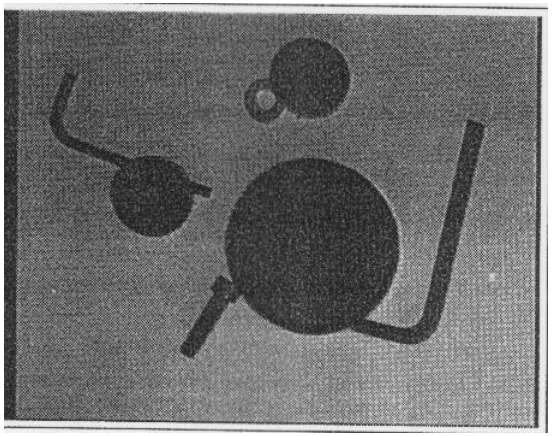
Thematic Image

Kita dapat mengamati feature vector library untuk setiap objek, menggunakan nilai rata-rata, atau minimum dan maksimum, sehingga kemudian dapat disusun suatu rule-based decision untuk klasifikasi.

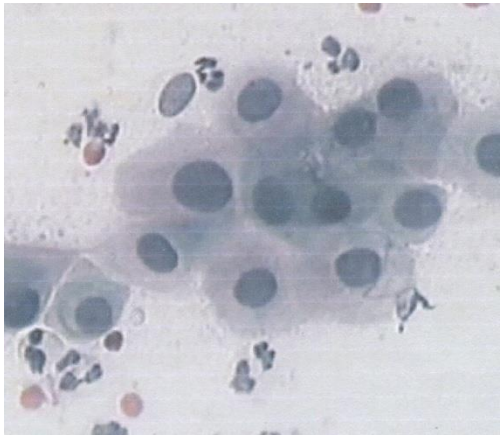
Object Recognition
(Shape Matching)

- Problem: Identify circular objects in the input image

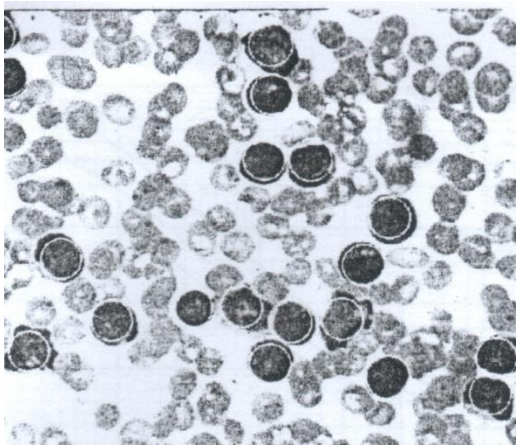
(aplikasi biomedis: pengenalan jaringan kanker atau sel darah)



(MSU, 1990)



(dr. Yuanita, FKUI)



(Karkavitsas and Rangoussi, 2004)

Pattern Recognition, Computer Vision, and Artificial Intelligence

- ***Pattern Recognition:*** Segmentation and Classification
  - **Image Classification**

Termasuk kelompok apakah citra ini?

- ***Computer Vision:*** Object Recognition and Description (Object Structure)
  - **Object Detection and Recognition**

Obyek apa yang ada di dalam citra?

- ***Artificial Intelligence:*** Higher-level understanding
  - **Image Understanding**

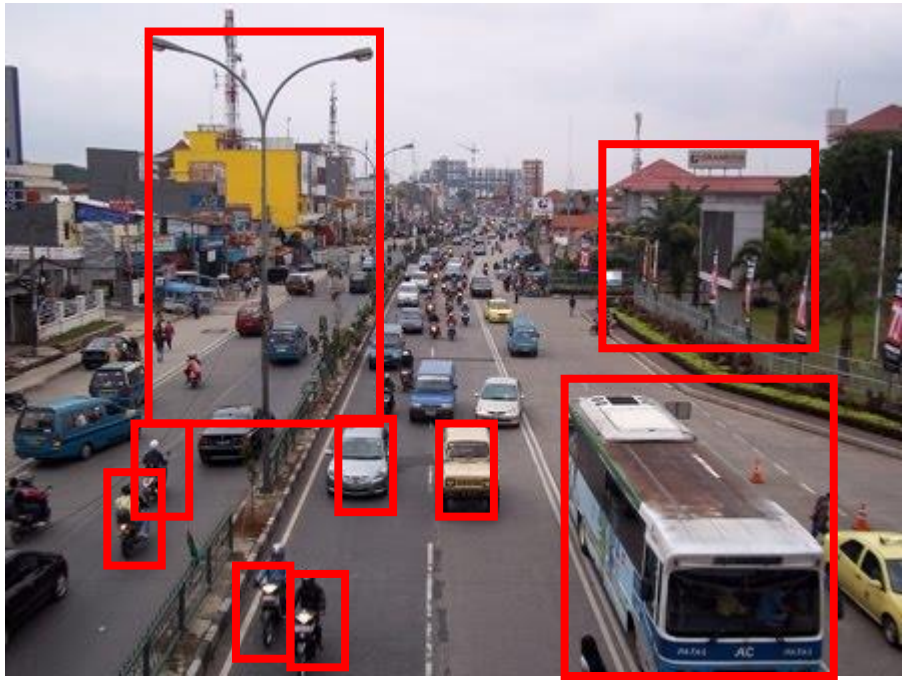
Apa yang sedang terjadi dalam citra?

Studi Kasus: Menghitung jumlah motor yang melalui jalan Margonda Raya.

- Low-Level Processing

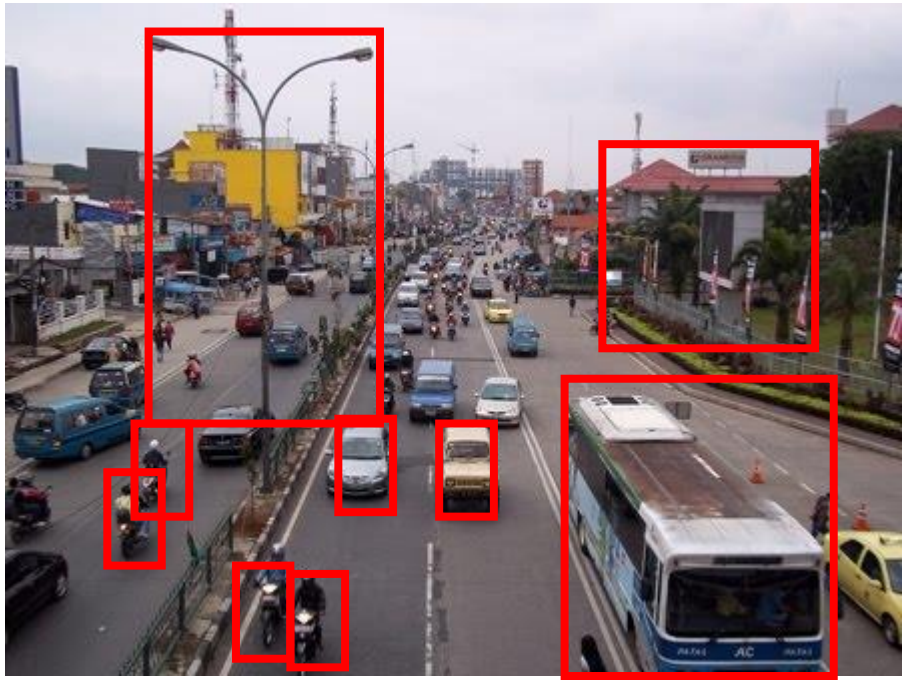
Studi Kasus: Menghitung jumlah motor yang melalui jalan Margonda Raya.

- Mid-Level Processing



Studi Kasus: Menghitung jumlah motor yang melalui jalan Margonda Raya.

- High-Level Processing



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Studi Kasus

- Membuat *early warning system* untuk mendeteksi pencuri di museum.
- Membuat sistem pengenal obat-obatan untuk lansia.
- Membuat sistem *auto-door-lock* untuk akses laboratorium rahasia.

Tentukan proses-proses pada low-level, mid-level, dan high-level processing.