REVISITING AKAR DAN CABANG KECERDASAN BUATAN
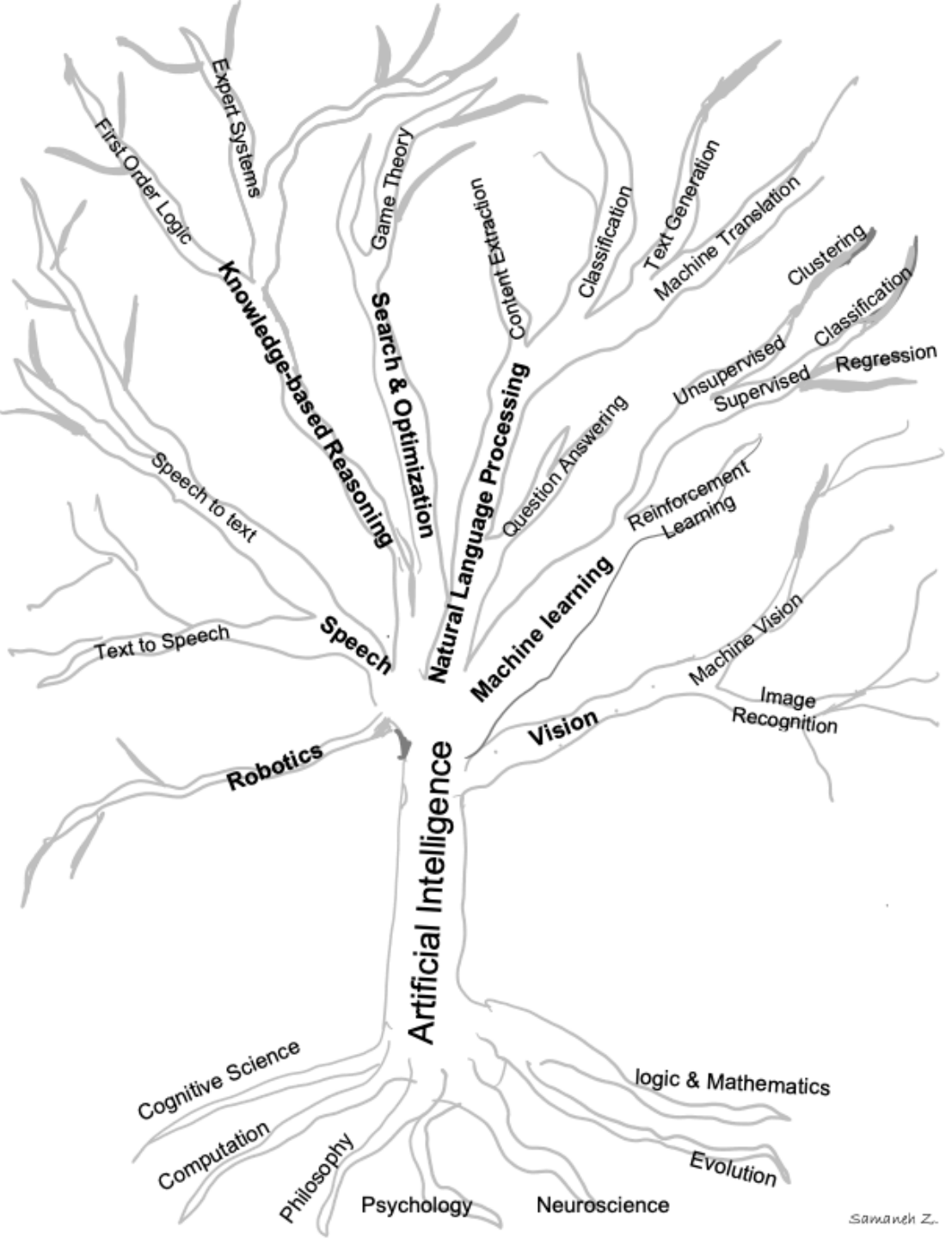
IF422102

Margaretha Sulistyoningsih, S.T., M.Sc., M.T., Ph.D

CABANG DAN AKAR KECERDASAN BUATAN

DASAR ILMU KECERDASAN BUATAN (AKAR KECERDASAN BUATAN)

- Filsafat:
- Pertanyaan yang ingin dijawab:

  - Can formal rules be used to draw valid conclusions?

  - How does the mind arise from a physical brain?

  - Where does knowledge come from?

  - How does knowledge lead to action?

FILSAFAT

- Konsep-konsep filsafat yang mendasarai AI [3]:
  - Tindakan
  - Kesadaran,
  - Epistemologi (Asal, sifat, dan keterbatasan pengetahuan yang didapat manusia, justifikasi, rasionalitas).
  - Free will.

FILSAFAT → LOGIKA

- Silogisme (Syllogism):
  - Socrates is a man.
  - All men are mortal.
  - Therefore, Socrates is a mortal.
- Deductive Reasoning (Umum ke khusus).
  - Semua mahasiswa Teknik pintar.
  - Budi adalah mahasiswa Teknik.
  - Maka, Budi pintar.
- Inductive Reasoning (khusus ke umum):
  - Guru Matematika SD saya tinggi, guru Matematika SMP saya tinggi, berarti semua guru Matematika tinggi.

FILSAFAT → LOGIKA[4]

- Penalaran:
  - John danced if Mary sang.
  - Mary sang;
  - so John danced.

  Berikan contoh lain!

MATEMATIKA

- Pertanyaan yang ingin dijawab:

  - What are the formal rules to draw valid conclusions?

  - What can be computed?

  - How do we reason with uncertain information?

  Yang akan kita pelajari:
  - KNN
  - Naïve Bayes (Probabilitas)

MATEMATIKA

- Algoritma yang tidak sederhana, yang pertama: Dibuat oleh Euclid : Algoritma untuk pembagian.

- Kata Algoritma pertama kali diutarakan oleh: Al Khowarazmi (Persian Mathematician), pada abad 9. Tulisannya memperkenalkan Aljabar dan angka-angka Arab pada Eropa.

- Perhitungan Probabilitas untuk menyimpulkan (inferensi) dalam AI.

EKONOMI

- Pertanyaan yang ingin dijawab

  - How should we make decisions so as to maximize payoff?

  - How should we do this when others may not go along?

  - How should we do this when the payoff may be far in the future?

  - Decision theory
  - Operations Research
  - Gamification di bidang Ekonomi.

NEUROSCIENCE

- Ilmu yang mempelajari sistem syaraf manusia terutama otak.
- Bagaimana otak menghasilkan pikiran (mind)?
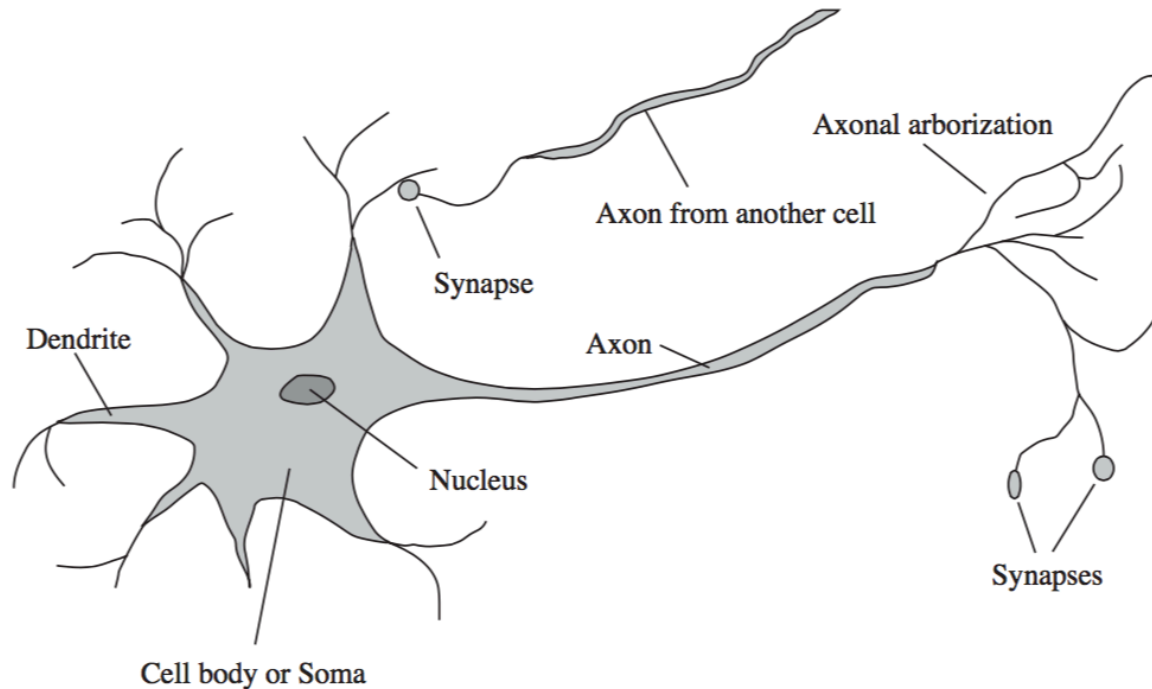- Bagaimana Otak menyimpan pengetahuan?
- Bagaimana otak belajar?

Figure 1.2 The parts of a nerve cell or neuron. Each neuron consists of a cell body, or soma, that contains a cell nucleus. Branching out from the cell body are a number of fibers called dendrites and a single long fiber called the axon. The axon stretches out for a long distance, much longer than the scale in this diagram indicates. Typically, an axon is 1 cm long (100 times the diameter of the cell body), but can reach up to 1 meter. A neuron makes connections with 10 to 100,000 other neurons at junctions called synapses. Signals are propagated from neuron to neuron by a complicated electrochemical reaction. The signals control brain activity in the short term and also enable long-term changes in the connectivity of neurons. These mechanisms are thought to form the basis for learning in the brain. Most information processing goes on in the cerebral cortex, the outer layer of the brain. The basic organizational unit appears to be a column of tissue about 0.5 mm in diameter, containing about 20,000 neurons and extending the full depth of the cortex about 4 mm in humans).

PSIKOLOGI

that introspection could not provide reliable evidence. Behaviorists insisted on studying only objective measures of the percepts (or *stimulus*) given to an animal and its resulting actions (or *response*). Behaviorism discovered a lot about rats and pigeons but had less success at understanding humans.

PSIKOLOGI

- Cognitive Psychology berpengaruh pada AI.
- Cognition[5]: Berpikir, termasuk didalamnya mengerti, belajar, memecahkan masalah, memutuskan, menyimpan memori.
- Dalam Pattern Recognition:
   - Template Matching
    - Feature Analysis

CYBERNETICS AND CONTROL

- Cybernetics: Norbert Wiener (1948): Studi mengenai kontrol dan komunikasi dalam hewan dan mesin[6].
- Biological and mechanical control systems and their connection to cognition [1].
- Tujuan: Merancang sistem yang bisa bertindak secara optimal.

LINGUISTICS

- Pertanyaan: Bagaimana bahasa berhubungan dengan pikiran?

- Dasar dari Pemrosesan Bahasa Alami (Natural Language Processing).

- Pengembangannya adalah Knowledge Representation untuk Sistem Berbasis Pengetahuan (Knowledge Based Systems).

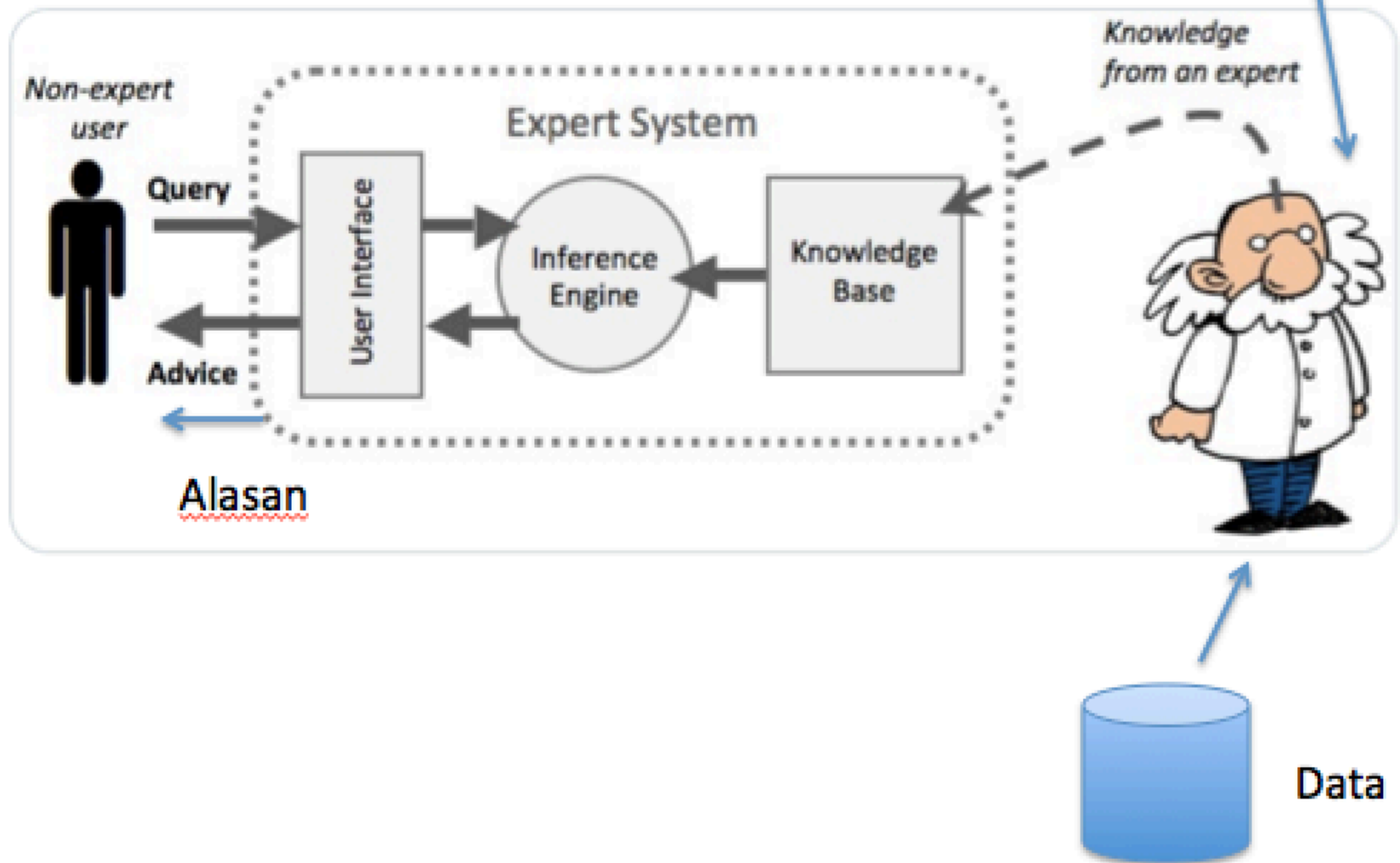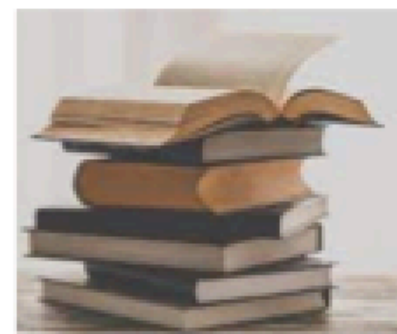 - Knowledge Representation: Studi mengenai bagaimana pengetahuan disimpan dalam komputer.

CABANG DAN AKAR
KECERDASAN BUATAN
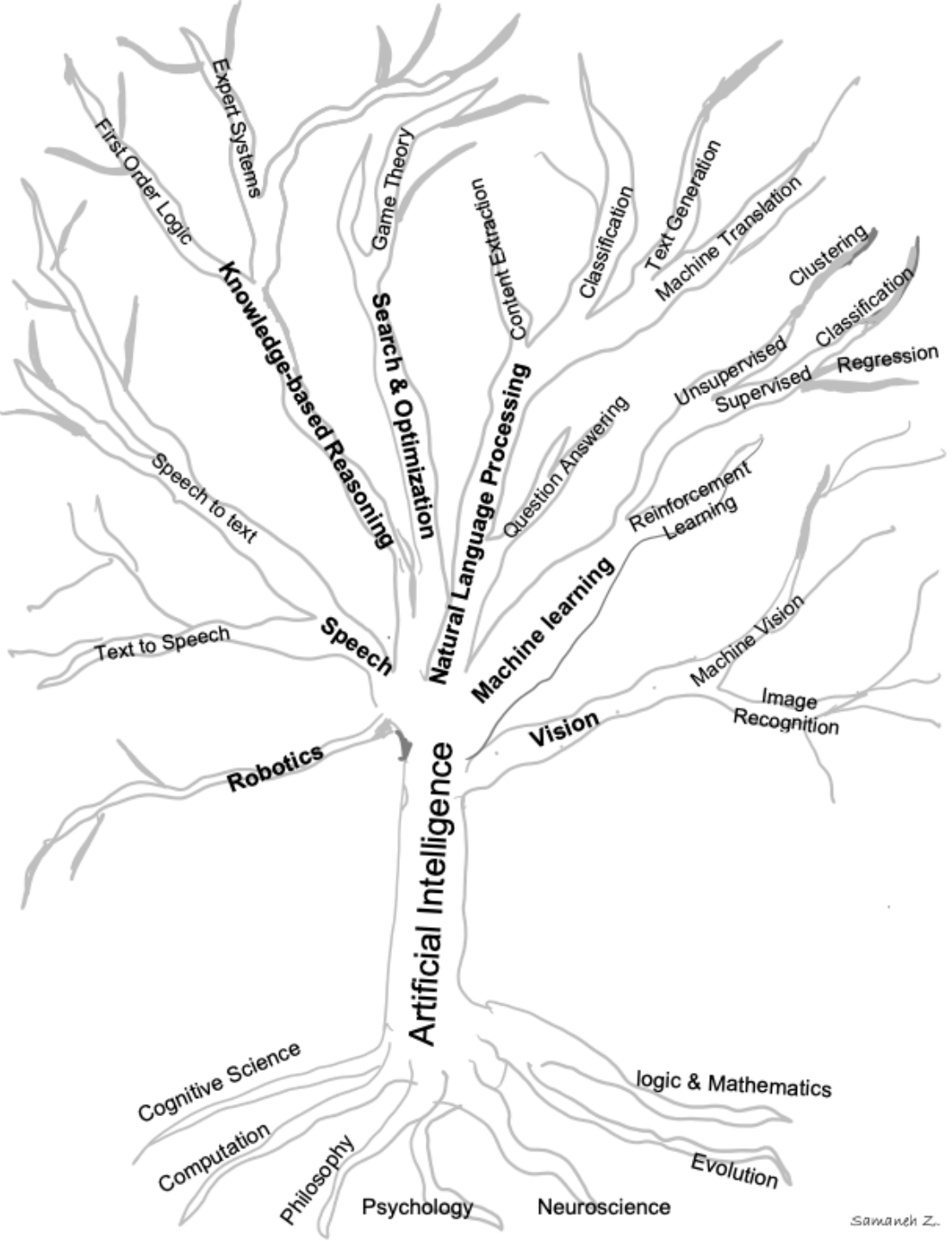
Sistem Pakar (Expert System)

REFERENSI

1. Stuart Russell, Peter Norvig, 2010, "Artificial Intelligence, 3rd Ed", Prentice Hall, USA, chapter 2.
2. Samaneh Zolfagharian, "What is th –difference between artificial intelligence and machine learning", https://samaneh-zolfagharian.medium.com/what-is-the-difference-between-artificial-intelligence-and-machine-learning-1201b9980fad accessed on March 8, 2022.
3. John McCarthy, "The Philosophy of AI and the AI of Philosophy", http://jmc.stanford.edu/articles/aiphil2/aiphil2.pdf, accessed on March 23, 2022
4. Stanford University, "Logical Form", https://plato.stanford.edu/entries/logical-form/
5. Washington State University, "What is Cognition", https://opentext.wsu.edu/psych105/chapter/7-2-what-is-cognition/ accessed on March 23, 2022.
6. Norwegian University of Science and Technology, "What is Cybernetics", https://www.ntnu.edu/itk/what-is accessed on March 23, 2022.