Expert System

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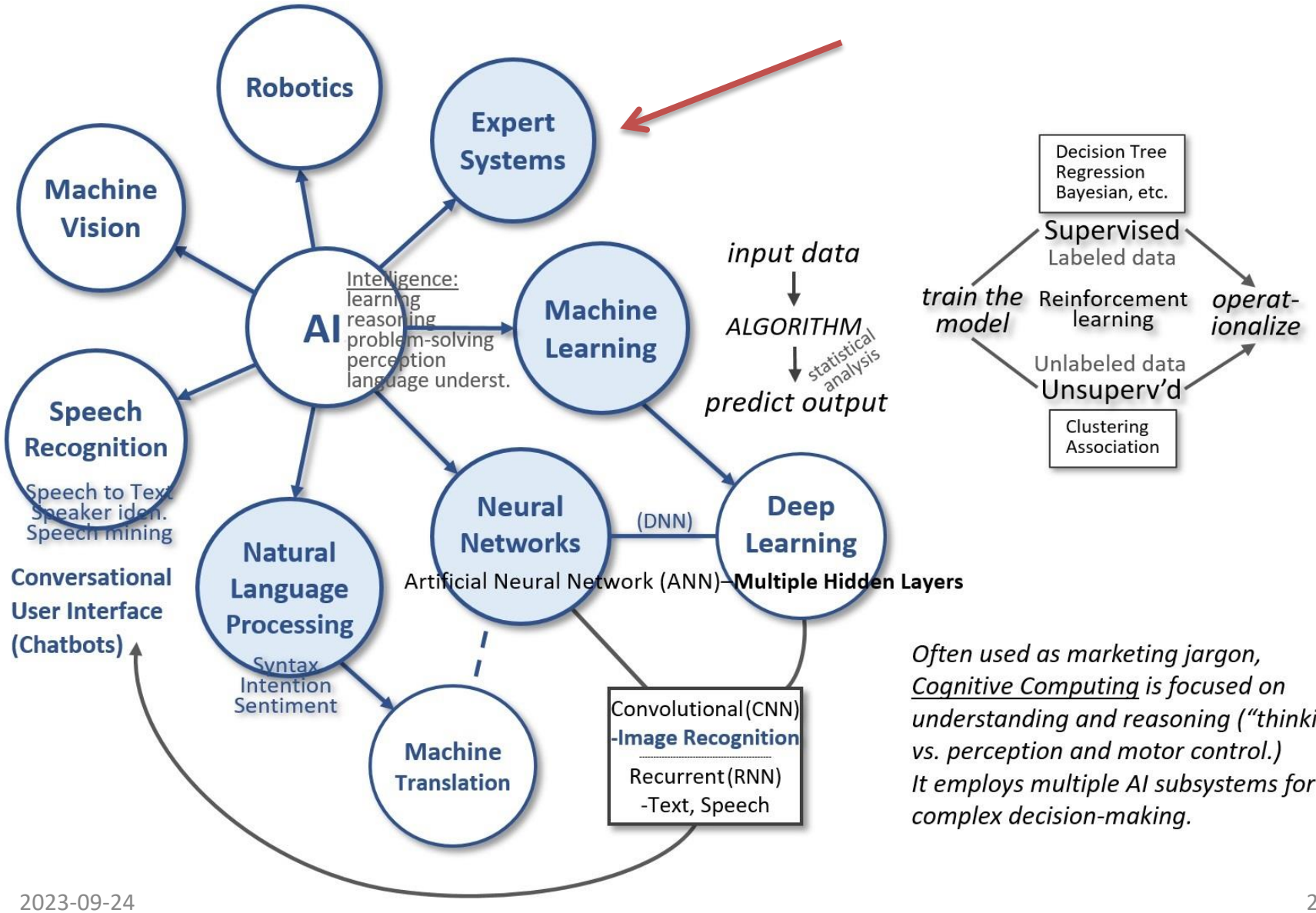
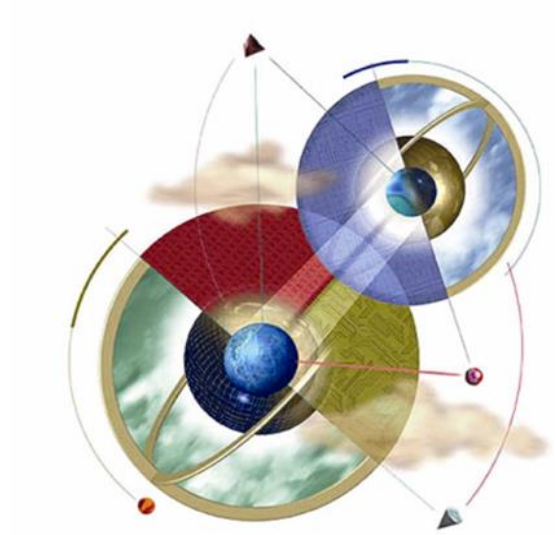
Areas of AI



Often used as marketing jargon, Cognitive Computing is focused on understanding and reasoning ("thinking" vs. perception and motor control.)
It employs multiple AI subsystems for complex decision-making.

What Is Expert System?

" An **Expert System (ES)** is a Computer System that emulates, or acts in all respects, with the decision-making capabilities of a human expert."

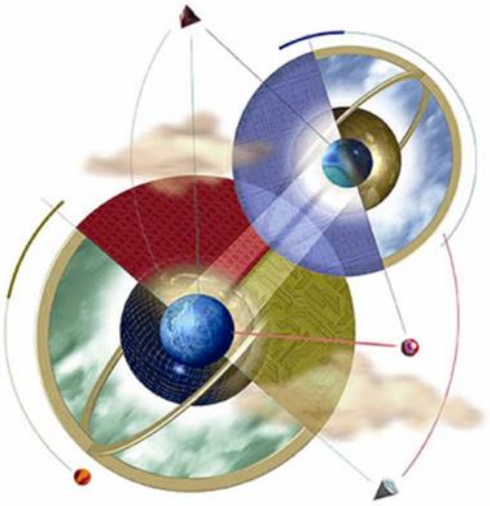


Professor Edward Feigenbaum

Stanford University

What Is Expert System…?

"A piece of **software** which uses databases of expert knowledge to offer advice or make decisions in such areas as **medical diagnosis (ECG test)**, **accounting**, **coding**, **gaming**, etc."



ES Technology May Include

- Special expert system Languages – Python, CLIPS
- Programs-To represent the system
- Hardware designed to facilitate the implementation of those systems.

ES Main Components

Knowledge Base – Obtainable from books, journals, knowledgeable persons etc.

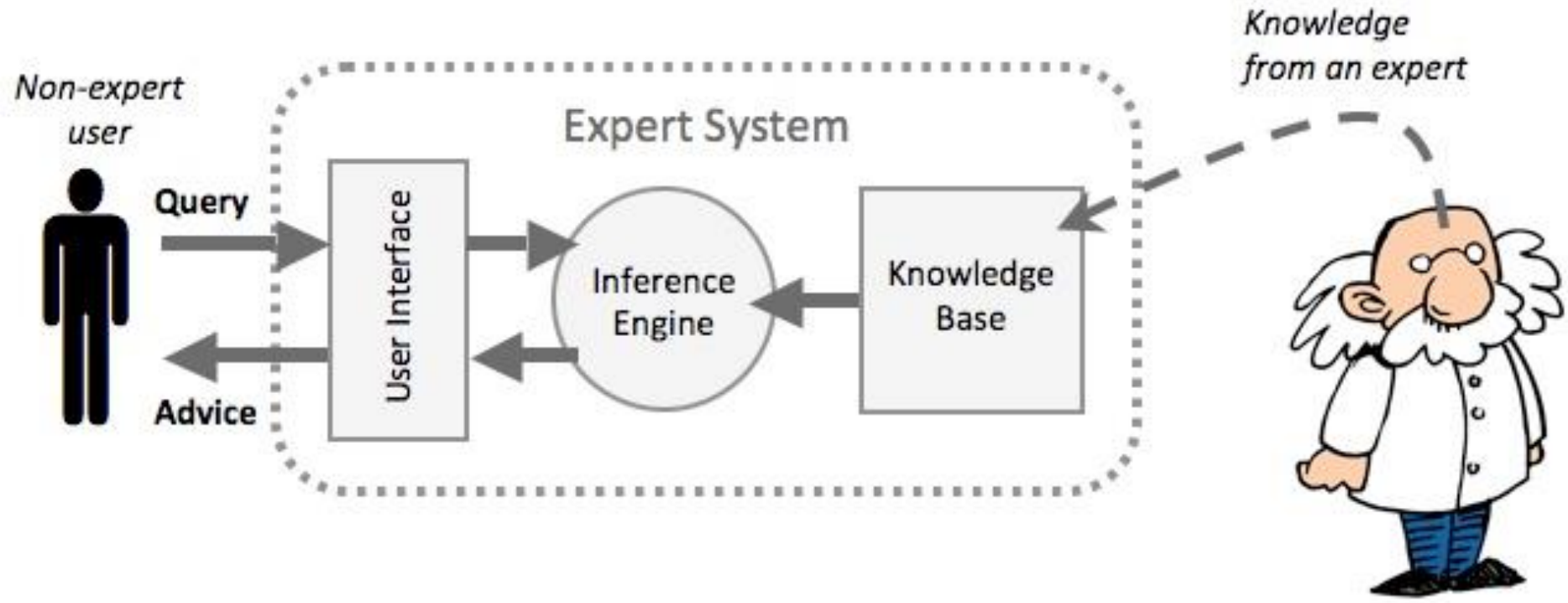
Inference Engine – Draws conclusions from the knowledge base.

Knowledge Acquisition and Learning Module-The function of this component is to allow the expert system to acquire more and more knowledge from various sources and store it in the knowledge base.

User Interface-This module makes it possible for a non-expert user to interact with the expert system and find a solution to the problem.

Explanation Module-This module helps the expert system to give the user an explanation about how the expert system reached a particular conclusion.

Basic Functions of ES



Basic Functions of ES-Example

Click Here

Video Link: https://www.youtube.com/watch?v=qGiQed6Cwqs

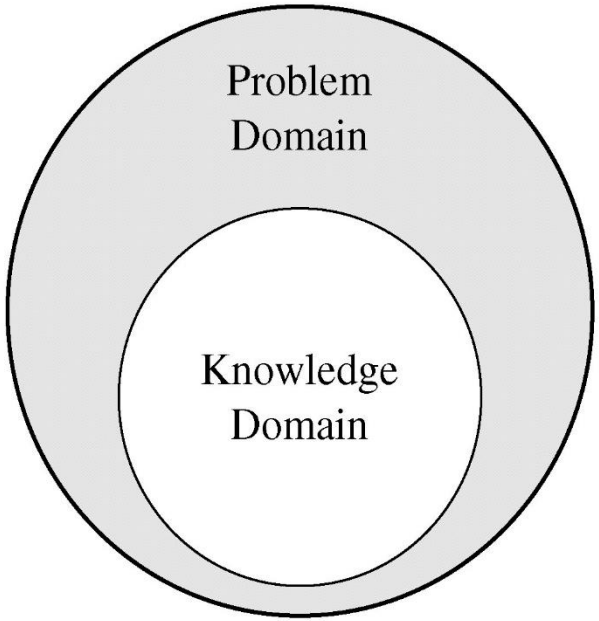
Problem Domain

- A problem domain is the **area of expertise** or application that needs to be examined to solve a problem.
- Focusing on a problem domain is simply looking at only the topics of an individual's interest, and excluding everything else.
- **For example**, when developing a system to measure good practice in medicine, carpet drawings at hospitals would not be included in the problem domain. In this example, the domain refers to relevant topics solely within the delimited area of interest: Medicine.

Knowledge Domain

- The **Expert's Knowledge** about solving a specific problem is called the **Knowledge Domain**.
- The **Problem Domain** is always a **Superset** of the knowledge domain.

Problem & Knowledge Domain Relationship



Advantages of ES

- Increased availability
- Reduced cost
- Reduced danger
- Performance
- Multiple expertise
- Increased reliability

Advantages of ES…

- Explanation
- Fast response
- Steady, unemotional, and complete responses at all times
- Intelligent tutor
- Intelligent database

Limitations of ES

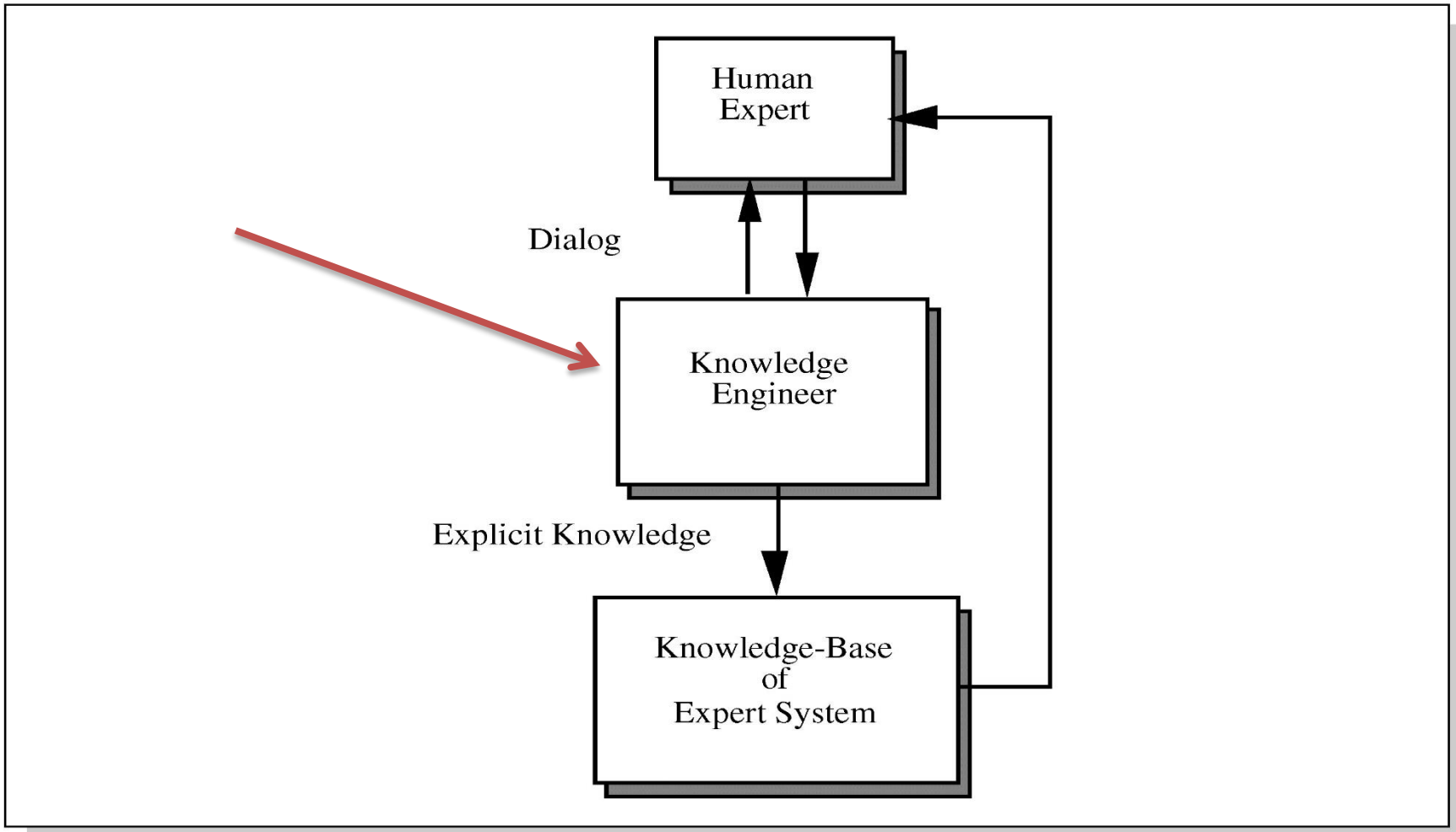
- Typical expert systems **cannot generalize** through analogy to reason about **new situations** in the way people can.
- A knowledge acquisition bottleneck results from the time-consuming and **labor intensive task of building an expert system**.

Knowledge Engineering OR Development of an ES

The process of building an **Expert System**:

1. The knowledge engineer establishes a dialog with the human expert to produce knowledge.
2. The knowledge engineer codes the knowledge explicitly in the knowledge base.
3. The expert evaluates the expert system and gives a critique to the knowledge engineer.

Knowledge Engineering OR Development of an ES…



Early ES

- DENDRAL – used in chemical mass spectroscopy to identify chemical constituents.
- MYCIN – medical diagnosis of illness
- DIPMETER – geological data analysis for oil.
- PROSPECTOR – geological data analysis for minerals
- XCON/R1 – configuring computer systems

https://www.geeksforgeeks.org/expert-systems/

Broad Classes of ES

Class	General Area
Configuration	Assemble proper components of a system in the proper way.
Diagnosis	Infer underlying problems based on observed evidence.
Instruction	Intelligent teaching so that a student can ask *why*, *how,* and *what if* questions just as if a human were teaching.
Interpretation	Explain observed data.
Monitoring	Compares observed data to expected data to judge performance.
Planning	Devise actions to yield a desired outcome.
Prognosis	Predict the outcome of a given situation.
Remedy	Prescribe treatment for a problem.
Control	Regulate a process. May require interpretation, diagnosis, monitoring, planning, prognosis, and remedies.

Considerations for Building an ES

- Can the problem be solved effectively by conventional programming?
- Is there a need and a desire for an expert system?
- Is there at least one human expert who is willing to cooperate?
- Can the expert explain the knowledge so that the knowledge engineer can understand it?
- Is the problem-solving knowledge mainly heuristic and uncertain?

THANKS