

AI tools & Knowledge Engineering



Learning Outcomes of today lecture

Student is expected to be able to

- List AI technologies or tools

- Define knowledge engineering, prototype, symbolic and noisy data

- Describe knowledge engineering process

- Identify and describe problem types

- Compare data and knowledge acquisition process

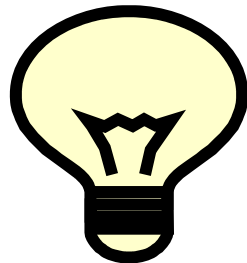
Technologies/Tools in AI

- Expert systems
- Fuzzy systems
- Artificial Neural Networks
- Genetic Algorithms
- Hybrid neuro-fuzzy
- Fuzzy evolutionary systems

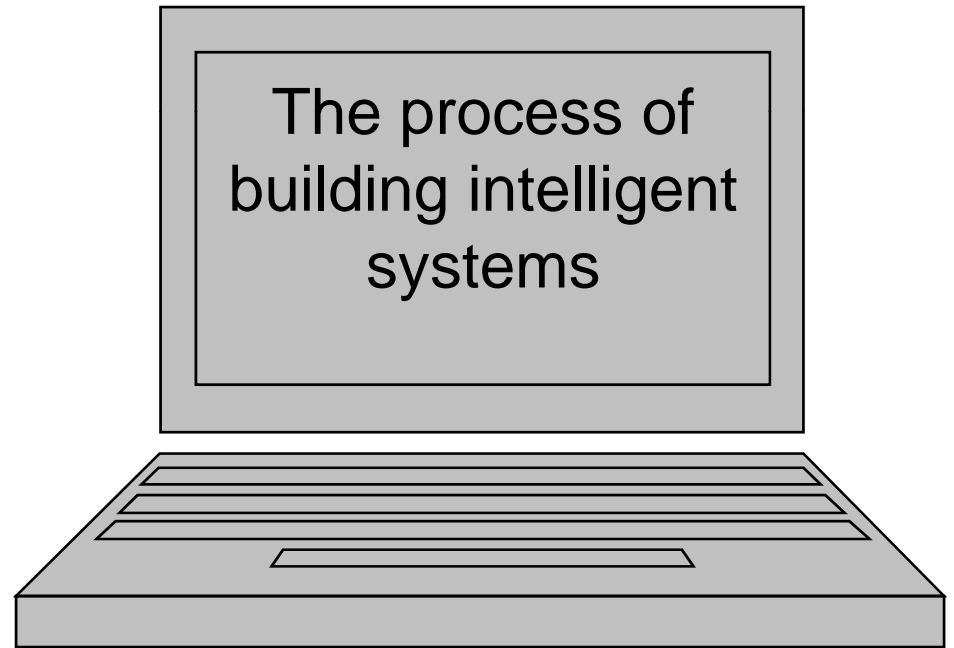
Selecting one tool/technology that best suited to particular problem can be difficult

What is Knowledge Engineering?

Assess the problem, determine what data are available and what needed to solve the problem

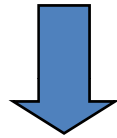


The process of building intelligent systems

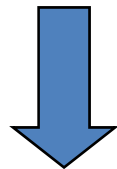


Process of building intelligent system

Understand the
problem



Choose an appropriate tool



Develop the system with the tool

Process of Knowledge Engineering (Waterman, 1986; Durkin, 1994)

1. Problem assessment
2. Data and knowledge acquisition
3. Development of a prototype system
4. Development of a complete system
5. Evaluation and revision of the system
6. Integration and maintenance of the system

Problem assessment

Determine what is the problem types:

Diagnosis, Selection, Prediction, Classification,
Clustering, Optimization, Control

What is the best tool for each of the problem types?

Can you give examples of such problem types? Given problems, can you identified the problem types? What type of data that we are going to deal with?

Problem assessment

- Diagnosis – inferring/detecting malfunctions/faults and recommending solutions
- Selection – recommending the best option from a list of possible alternatives
- Prediction – predicting the future behavior from its behavior in the past
- Classification – assigning an object to one of the defined classes

Problem assessment

- Clustering – dividing a heterogenous group of objects into homogeneous subgroups
- Optimization – improving the quality of solutions until optimal one is found
- Control – governing the behavior of an object to meet specified requirements in real time

1. Problem assessment

- Specify the project's objectives
 - Improving quality of product, reducing labor cost, gaining competitive edge, improving quality of decisions
- Determine resources needed
 - Computer facilities, development software, knowledge and data sources (human expert, textbook, manuals, examples, www and databases), MONEY

2. Data and knowledge acquisition

Symbolic data

versus

Numerical data

Noisy data

versus

Clean data

Issues about data:

- incompatible data (different coding)
- inconsistent data
- missing data

2. Data and knowledge acquisition

- Knowledge acquisition process through interviewing the domain expert (knowledgeable person)
- Iterative process
- Difficult process – knowledge acquisition bottleneck. Example: a smart person is not necessary a good teacher. Why?

3. Development of a prototype system

- Choose tool/technology
- Transform data and represent knowledge
- Design and implement a prototype system
- Test the prototype with test cases (validation)

Test case – problem successfully solved in the past for which input and output solution are known

4. Development of a complete system

- This phase associates with adding data and knowledge to system (such as prediction system) to make prediction more accurate.
- Develop user interface – how to deliver information to user – example: represent results in graphical form
- Implement the complete system

5. Evaluation and revision of the system

- Intelligent systems are designed to solve problems that do not have clearly right and wrong solutions.
- How to evaluate the performance? Test cases selected by user
- The evaluation reveals the system's limitations and weaknesses, so revised and relevant development phases are repeated

6. Integration and maintenance of the system

- Integrating the system into the environment where it will operate and establishing effective maintenance program
- Integrating – interfacing new intelligent system with existing systems in an organization

Conclusion

- Intelligent systems are knowledge-based systems, and because knowledge evolves over time, we need to be able to modify the system.

Assignment/Project 1

Literature survey

- Describe and explain 7 different examples that can show us 7 different problem types
- Identify type of data and AI tool used
- List your references

Due next 2 weeks
