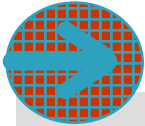# MIS

CHAPTER 13

INTELLIGENT INFORMATION SYSTEMS
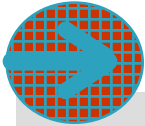
Att and future

Hossein BIDGOLI

learning outcomes

LO1 **Define artificial intelligence and explain how these technologies support decision making.**

LO2 **Explain an expert system, its applications, and its components.**

LO3 **Describe case-based reasoning.**

LO4 **Summarize types of intelligent agents and how they're used.**

LO5 **Describe fuzzy logic and its uses.**

l e a r n i n g   o u t c o m e s (cont'd.)

LO6   Explain artificial neural networks.

LO7   Describe how genetic algorithms are used.

LO8   Explain natural language processing and its advantages and disadvantages.

LO9   Summarize the advantages of integrating AI technologies into decision support systems.

What Is Artificial Intelligence?

▸ **Artificial intelligence (AI)**
  - ◦ Consists of related technologies that try to simulate and reproduce human thought and behavior
  - ◦ Includes thinking, speaking, feeling, and reasoning

▸ AI technologies

▸ Concerned with _____ and displaying knowledge and facts

▸ Capabilities of these systems have improved in an attempt to close the gap between artificial intelligence and human intelligence

Att and future

AI Technologies Supporting Decision Making

▸ Decision makers use information technologies in _____-making analyses:
  ◦ What-is (TPS)
  ◦ What-if (DSS)
▸ Other questions:
  ◦ Why?
  ◦ What does it mean?
  ◦ What should be done?
  ◦ When should it be done?

Table 13.1   **Applications of AI Technologies**

Table 13.1

Applications of AI technologies

Field	Example of an organization	Applications
Energy	Arco & Tenneco	Neural networks used to help pinpoint oil and gas deposits
Government	Internal Revenue Service	Testing a software to read tax returns and spot fraud
Human Services	Merced County in California	Expert systems used to decide if applicants should receive welfare benefits
Marketing	Spiegel	Neural networks used to determine most likely buyers from a long list
Telecommunications	BT Group	Heuristic search used for scheduling application that provides the work schedules of more than 20,000 engineers
Transportation	American Airlines	Expert systems used to schedule the routine maintenance of its airplanes
Inventory/forecasting	Hyundai Motors	Used neural nets and expert systems to reduce delivery time by 20% and increased inventory turns from 3 to 3.4
Inventory/forecasting	SCI Systems	Used neural nets and expert systems to reduce on-hand inventory by 15% resulting in $180 million in annual savings
Inventory/forecasting	Reynolds Aluminum	Used neural nets and expert systems to reduce forecasting errors by 2% that resulted in a reduction of one million pounds in inventory
Inventory/forecasting	Unilever	Used neural nets and expert systems to reduce forecasting errors from 40% to 25% yielding resulting in multi-million dollar savings

Robotics

- Perform well at simple, repetitive tasks
- Currently used mainly on assembly lines in Japan and the United States
- Cost of industrial robots
- Some robots have limited vision

Expert Systems

- Mimic human expertise in a field to solve a problem in a well-defined area
- Consist of programs that mimic human thought behavior
  - In a specific area that human experts have solved successfully
- Work with _____

Components of an Expert System

- **Knowledge acquisition facility**
- **Knowledge base**
- Factual knowledge
- Heuristic knowledge
- Meta-knowledge
- **Knowledge base management system (KBMS)**
- **Explanation facility**
- **Inference engine**

Exhibit 13.1
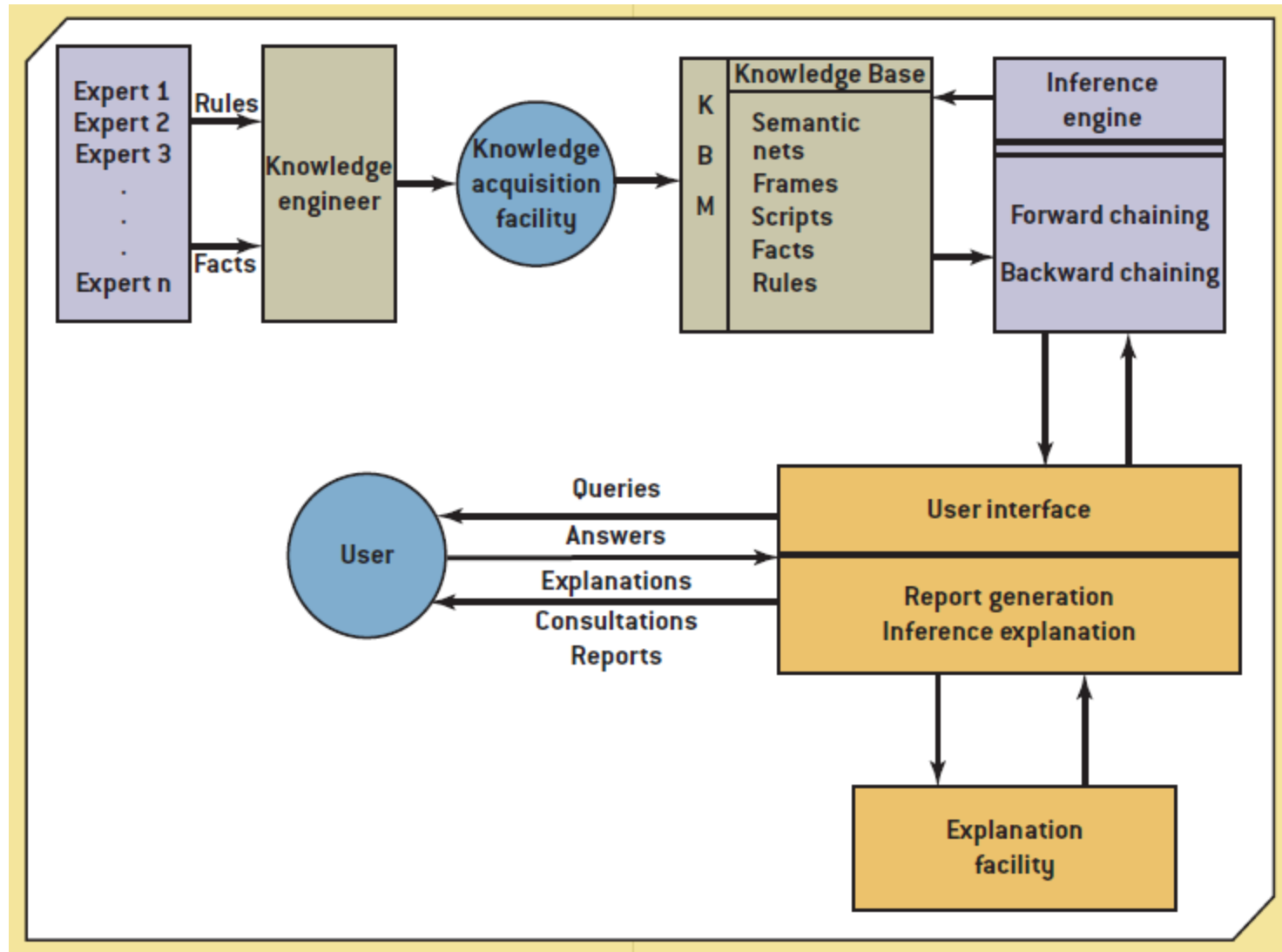
Uses of Expert Systems

- Airline industry
- Forensics lab work
- Banking and finance
- _____
- Food industry
- Personal management
- Security
- US Government
- Agriculture

Criteria for Using Expert Systems

- Human _____ is needed but one expert can't investigate all the dimensions of a problem
- Knowledge can be represented as rules or heuristics
- Decision or task has already been handled successfully by human experts
- Decision or task requires consistency and standardization
- Subject domain is limited
- Decision or task involves many rules and complex logic
- Scarcity of experts in the organization

Criteria for Not Using Expert Systems

▸ Very few rules

▸ Too many rules

▸ Well-structured _____ problems are involved

▸ Problems are in areas that are too wide and shallow

▸ Disagreement among experts

▸ Problems are solved better by human experts

Advantages of Expert Systems

▸ Never becomes _____, forgetful, or tired

▸ Duplicates and preserves the expertise of scarce experts

▸ Preserve the expertise of employees who are retiring or leaving an organization

▸ Creates consistency in decision making

▸ Improves the decision-making skills of nonexperts

Intelligent Agents

- Bots (short for robots)
- Applications of artificial intelligence
- Are becoming more popular
  - Particularly in e-commerce
- Consist of software capable of reasoning and following rule-based processes

Shopping and Information Agents

▸ Help users navigate through the vast resources available on the Web

▸ Provide better results in finding information

▸ Examples

   ◦ PriceScan

   ◦ BestBookBuys.com

   ◦ www.mysimon.com

   ◦ DogPile

      • Searches the Web by using several search engines

      • Eliminates duplicate results

Personal Agents

▸ Agents perform specific tasks for a user
▸ Such as:
  ◦ Remembering information for filling out Web forms
  ◦ Completing e-mail addresses after the first few characters are typed

Data-Mining Agents

▸ Work with a data _____

▸ Detect trend changes

▸ Discover new information and relationships among data items that aren't readily apparent

▸ Having this information early enables decision makers to come up with a solution that minimizes the negative effects of the problem

Monitoring and Surveillance Agents

- Track and report on computer equipment and network systems
  - To predict when a system crash or failure might occur
- Example: NASA's Jet Propulsion Laboratory

Fuzzy Logic

▸ Allows a smooth, _____ transition between human and computer vocabularies
▸ Designed to help computers simulate vagueness and uncertainty in common situations
▸ Used in:
  ◦ Search engines, chip design, database management systems, software development, and more
▸ Examples:
  ◦ Dryers
  ◦ Refrigerators
  ◦ Shower systems
  ◦ TVs
  ◦ Video camcorders

Artificial Neural Networks

▸ Networks that learn and are capable of performing tasks that are difficult with conventional computers

▸ Examples:
  ◦ Playing _____
  ◦ Recognizing patterns in faces

▸ Used for poorly structured problems

▸ Uses patterns
  ◦ Instead of the "If-Then-Else" rules that expert

▸ Creates a model based on input and output

Exhibit 13.4
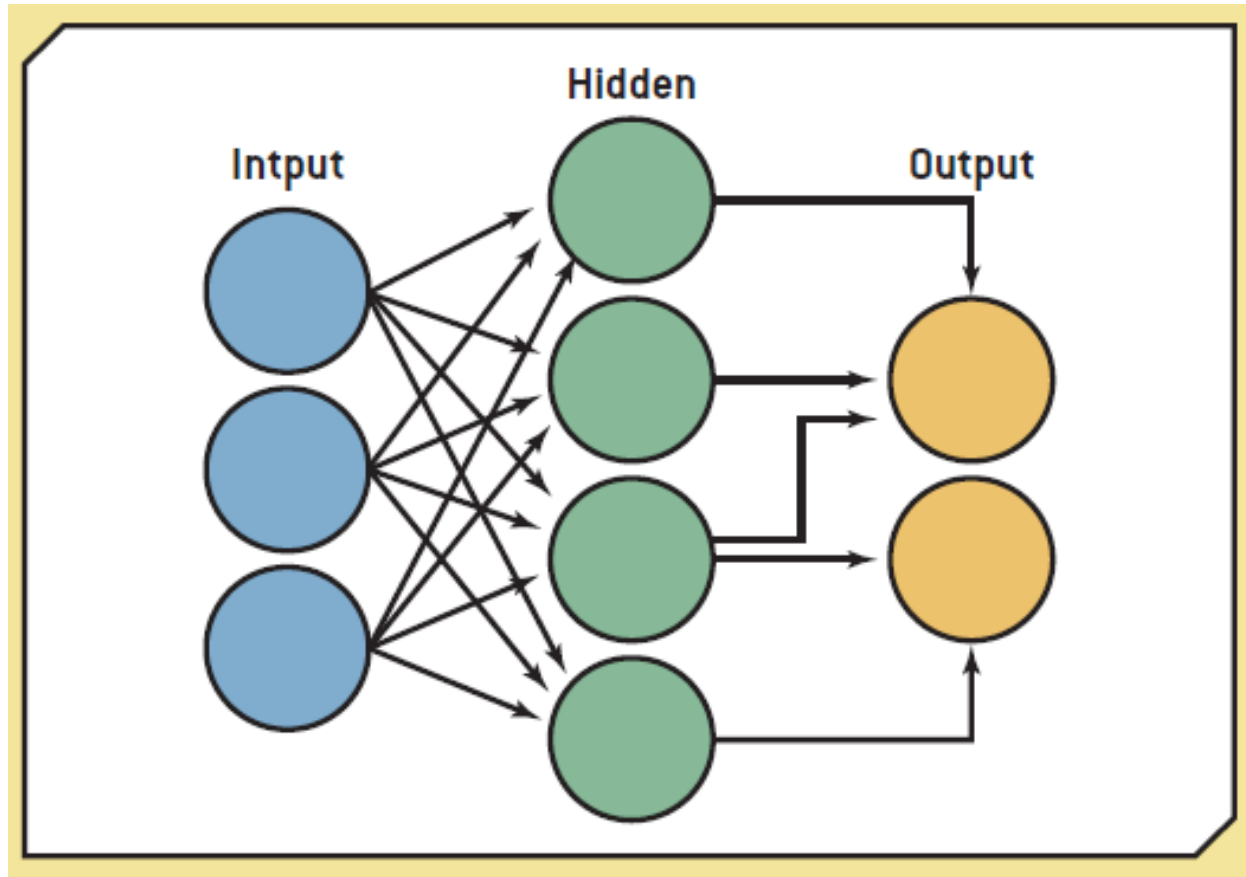
Artificial Neural Networks (cont'd.)

▸ Many companies are able to predict customers' shopping behavior based on past purchases

▸ Used for many tasks, including:
  ◦ _____ prediction
  ◦ Credit rating
  ◦ Investment analysis
  ◦ Oil and gas exploration
  ◦ Target marketing

Genetic Algorithms

- Used mostly in techniques to find solutions to optimization and search problems
- Applications:
  - Jet engine design, portfolio development, and network design
- Find the _____ of inputs that generates the most desirable outputs
- Techniques
  - Selection or survival of the fittest
  - Crossover
  - Mutation

Natural Language Processing

- Developed so that users can communicate with computers in their own language
- Provides question-and-answer setting that's more natural and easier for people to use
- Products aren't capable of a dialogue that compares with conversations between human
  - However, progress has been steady

Table 13.2   **NLP Systems**

Table 13.2 *NLP systems*

NLP system	Use
DragonBusiness, DragonLaw, DragonMed, and DragonPro (Nuance Communications, Inc., *www.nuance.com/naturallyspeaking/*)	Business data retrieval, legal document processing, medical and ER applications, professional dictation systems, respectively
AT&T Natural Voices (*http://www.wizzard-software.com/att_nv_landing.php*)	Creates speech from computer-readable text
e-Speaking Software (*www.e-speaking.com*)	Voice control of Windows computers

Natural Language Processing (cont'd.)

- Categories:
  - Interface to databases
  - Machine translation
  - Text scanning and intelligent indexing programs for summarizing large amounts of text
  - Generating text for automated production of standard documents
  - Speech systems for voice interaction with computers

Summary

- Intelligent information systems
  - AI technologies are used to support decision-making processes
- Expert systems
  - Components
- Case-based reasoning
- Intelligent agents
- Fuzzy logic and genetic algorithms
- Natural language processing