

INTRODUCTION to COMPUTER AND ICT

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For BS Computer Science, BS (IT),
BS Geology, BS Mathematics,
BS Commerce, BS Statistics

MANAGEMENT Information System **1st Edition** Dr. Rahman Ali



MANAGEMENT Information System

1st Edition

In accordance with approved curriculum
for BS Commerce, Master of Commerce,
BBA and MBA program of the HEC
and University of Peshawar.



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Chapter 8:

IS and Artificial Intelligence Technologies

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Outlines

✓ 8.1 Human Information Processing and AI

- Machine Learning for Business Data Analytics
- Data Mining for Business Data Analytics
- Deep Learning for Business Data Analytics

✓ 8.2 Expert Systems.

- Components of Expert System
- Types of Expert Systems
 - Rule-Based Expert System
 - Case-Based Expert System
 - Probabilistic Expert System

Artificial Intelligence (AI)

➤ Definition of AI

- AI is the branch of computer science that is related with the creation of machines that imitate human intelligence and work and react like humans.

➤ Aims/Objective of AI

- to create intelligent machines that perceive their environment and take actions that maximize their chances of achieving their goals.

➤ Problems/Branches of AI

- Knowledge engineering
- Problem solving
- Machine learning
- Reasoning
- Planning
- Speech recognition
- Machine translation
- The ability to move objects.



Figure 8.1: Artificial Intelligence and Its Applications

8.1 Human Information Processing and AI

➤ Human information processing (HIP)

- Deals with how human receive, store, retrieve and use information.
- humans learn from their environment.

➤ Activities of HIP

- Sensory Processing, e.g. sight, sound, smell and touch.
- Perception that is driven by sensory input, long-term memory and attention
- Cognition that requires efforts, time, memory and attention.
- Memory includes long term and short-term that is working memory for cognition
- Response selection
- Response execution
- Attention
- Feedback

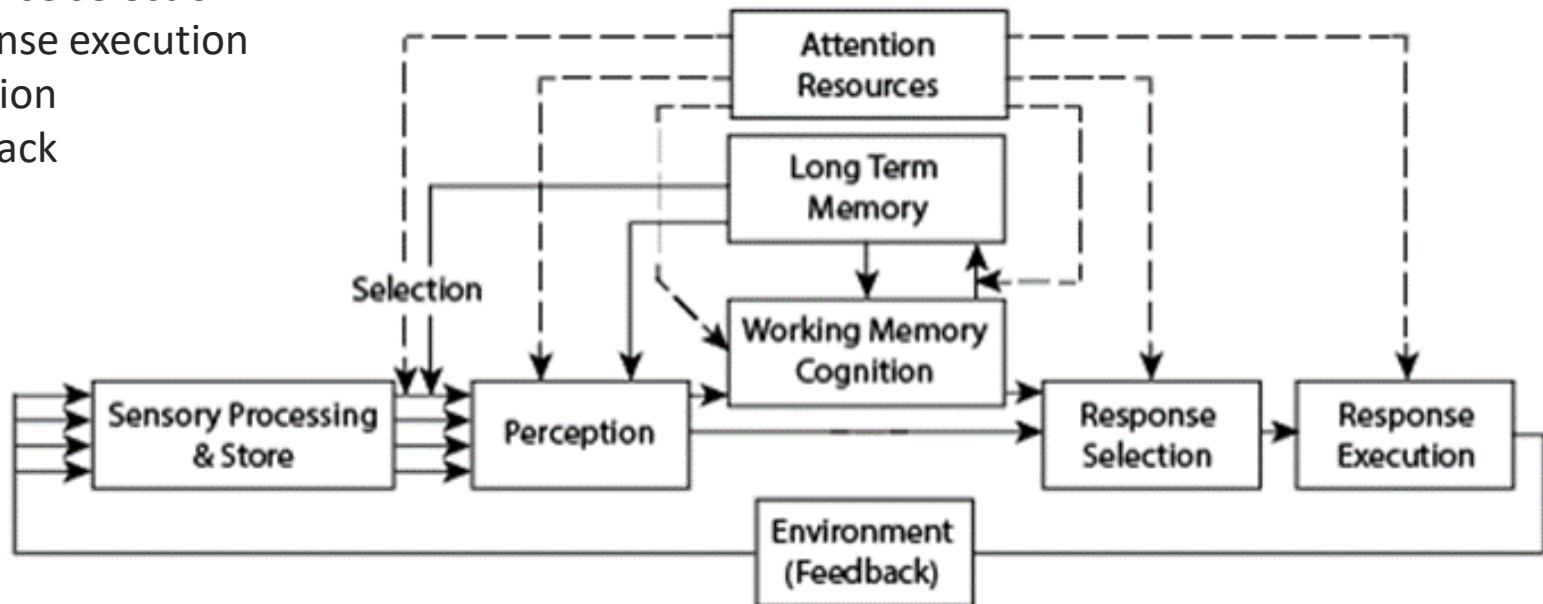


Figure 8.2: Human Information Processing Model

8.1.1 Machine Learning for Business Data Analytics

➤ Definition of Machine Learning (ML)

- is the field of AI that enables the computer systems to learn, identify patterns and relationships in the data and make decisions with minimal human intervention.

• ML Process

• *Inputting/Training Data:*

- Providing the machine with training Data (i.e., examples with answers).

• *Learning Model:*

- From the training data, machine learns relationships, patterns, dependencies, and hidden structures by using ML algorithms and techniques.

• *Decision Making:*

- The learned model is used to generate decision for the new data/example.

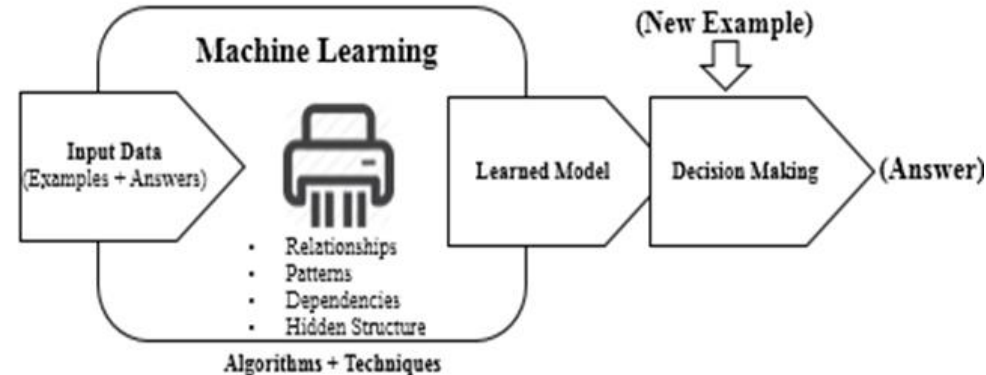


Figure 8.3: Machine Learning for Decision Making

Uses of ML in Business Applications

- **Identifying important insights in data.**
 - For example, with machine learning, we can identify investment opportunities and know when to trade.
- **To prevent fraudulent transactions**
 - and money-laundering.
- **Recommendation systems,**
 - which are used to promote products and services using the browsing and purchase history of the customers.
- **Understanding customer's behavior**
 - It provides us with insights into market situations and ensure a better understanding of customer's behavior and preferences.
- **Search engine**
 - uses big data to understand users' preferences and combine it with machine learning algorithms to provide relevant results for each query a user submits.
- **targeted advertisements**
 - It is used in targeted advertisements by various websites that target the audience with advertisements which are based on learned preferences.
- **Automatic notifications**
 - of breakdowns in business-critical processes, so that an important incident may not be missed.

8.1.2 Data Mining for Business Data Analytics

➤ Data mining

- the process of extracting information from large datasets and transforming it into an understandable structure in the form of knowledge for generating future business decisions.
- Classical data mining process

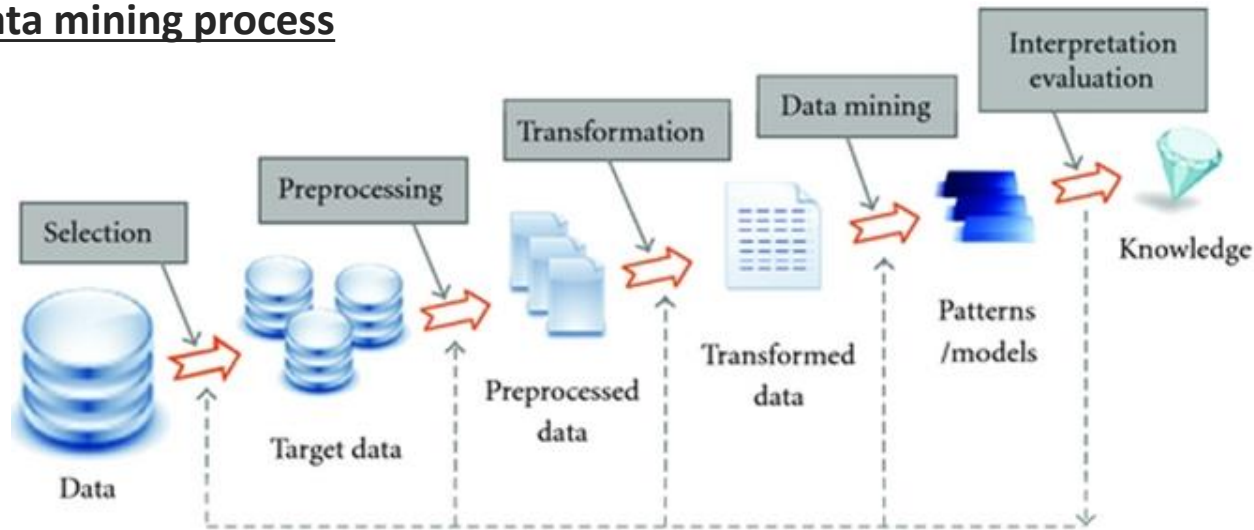


Figure 8.4: Data Mining Process

- Identifying the source of data.
- Selecting the targeted data points from the data source which need to be analyzed.
- Preprocessing the targeted data to be consistent and cleaned for onward processing
- Transforming the cleaned data into machine learning algorithm. Format
- Extracting the relevant information or hidden insights from the transformed data using machine learning algorithms
- Interpreting and reporting the results in the form of knowledge for business decision making.

Businesses Uses of Data Mining

- **Perform market analysis**
- **Identify new product bundles**
- **Find cause of manufacturing problems**
- **Prevent customer attrition**
- **Acquire new customers**
- **Target customers with more accuracy**
- **Market basket analysis:**
 - a modelling technique, which identify if you buy a certain group of items you are more likely to buy another group of items as well.
- **Monitoring Business processes**
 - Used in product manufacturing and monitoring.
- **Prediction of development time**
 - Predicts the product development span time, cost, and dependencies among other tasks.
- **Identification of fraudulent and non-fraudulent transactions.**
- **Customer segmentation**
 - helps in aligning the customers into distinct segments and helps in tailoring the customers' needs accordingly.

8.1.3 Deep Learning for Business Data Analytics

➤ Deep learning

- is a type of machine learning algorithms in which there are multiple layers used for processing the data.
- Each layer uses the outputs from the previous layer as inputs and further processes the data.
- The data passes through a series of transformations before it becomes output.

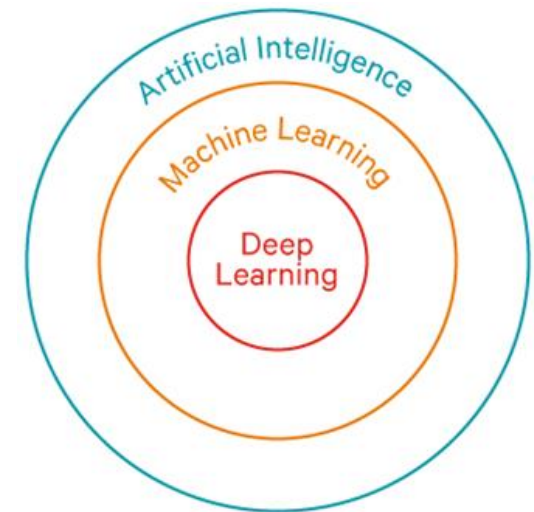
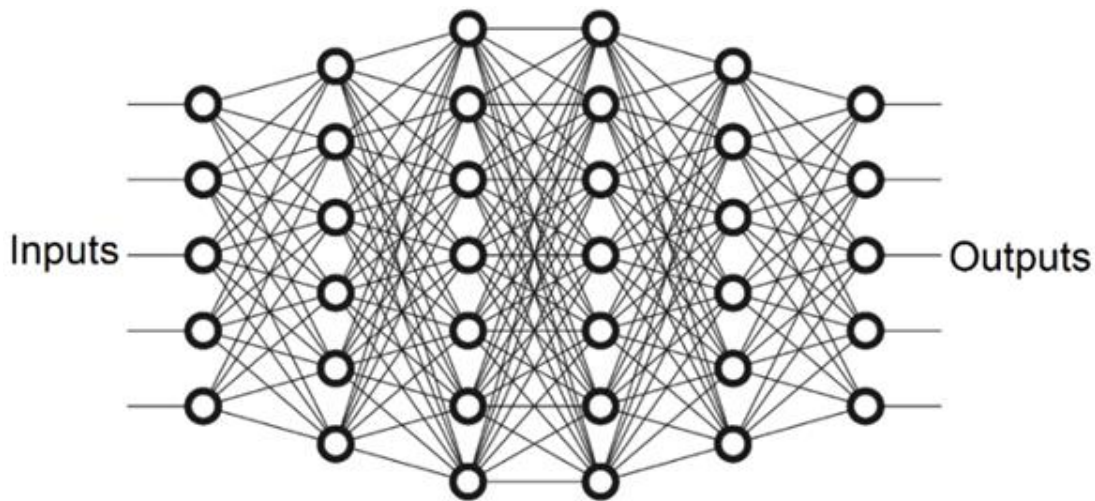


Figure 8.5: Deep Learning Process

Business Uses of Deep Learning

- **Identifying important insights in data,**
 - building recommendation systems,
- **Understanding the market situations,**
 - customer behavior and preferences,
- **results in search engines**
 - Presenting more relevant search results in search engines
- **perform manufacturing tasks**
 - Making smart robots that perform manufacturing tasks in factories
- **Helping self-driving car companies to manufacture autonomous cars**
- **Read X-rays better than a radiologist**
- **Discovering drugs**
- **Picking up a profitable business startups**
 - for investment(Signal firecompany is using unstructured data from 2 million data sources to decide which startup to choose)
- **Used by both publishers and advertisers**
 - to increase the relevancy of their ads and boost the return on investment of their advertising campaigns
- **Recommending relevant contents and products.**

Expert System

➤ Expert systems

- is an information system that captures and stores the knowledge of human expert and then emulates human reasoning and decision making process for those who have less expertise.
- The first expert systems were created in the 1970s and then increased in the 1980s.
- Expert systems were among the first truly successful forms of artificial intelligence (AI) software.

• Components

- User interface
- Knowledge Acquisition
- Knowledge base
- Inference engine
- Explanation Facility
 - Perform reasoning
 - Rule-based reasoning
 - Case-based reasoning
 - Inference
 - Probabilistic

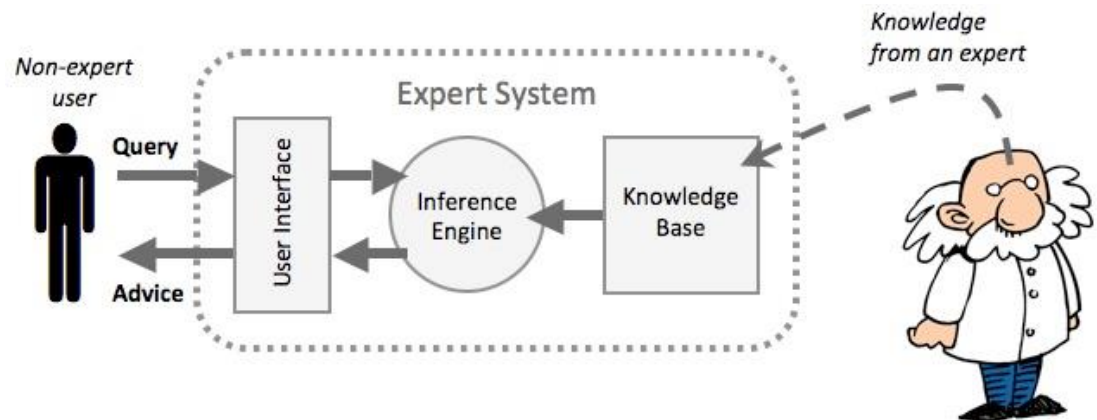


Figure 7.11: Working of ES

8.2.2 Types of Expert Systems

- **Types of Expert Systems**
 - **Rule-based expert systems,**
 - **Probabilistic expert system**
 - **Case-based expert systems**

8.2.2.1 Rule-Based ES

➤ Rule-Based ES

- Simplest expert systems that use rules as knowledge. The system can be created by using a set of assertions and a set of rules that specify how to use the assertions set. Rule based systems basically consists of
- **Elements of Rule-Based ES**
 - *A set of facts:*
 - These facts are the assertions that are relevant to the system.
 - *A set of rules:*
 - A rule is an IF-THEN statement that relates the fact in the IF part to some action in the THEN part.
 - The statement is in the form “IF P THEN Q” or “ $P \Rightarrow Q$ ”. For example, “IF it is raining THEN weather is cloudy”.
 - *Inference engine:*
 - Reasons over the KB, using facts, for decision making.
 - *Explanation facility:*
 - describe rationales behind the decision.
 - *User interface:*
 - Used for interaction with the expert system.

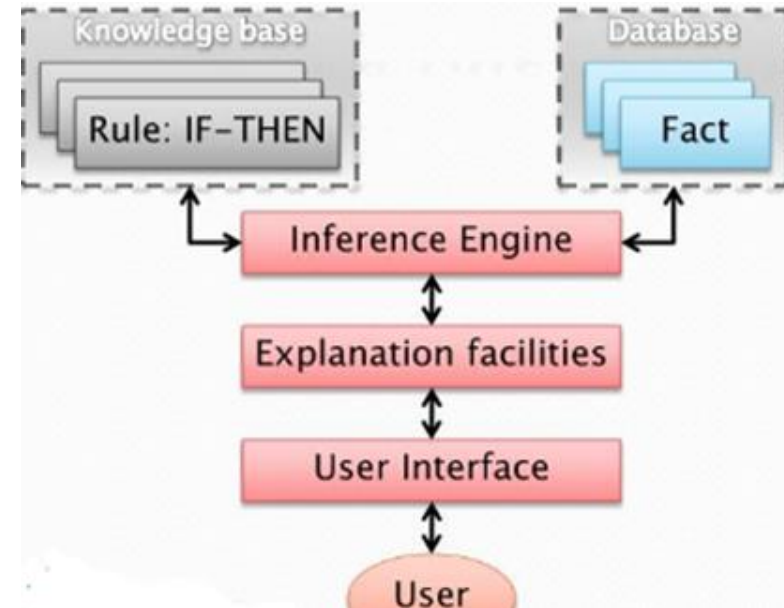


Figure 8.7: Working of Rule-Based ES

➤ Case-based expert systems

- These ES are based on case-based reasoning (CBR)
- CBR is the process of solving problems based on the solutions of similar past problems that were solved and the solutions were found valid.
- **For example,**
 - ES for diagnosis of disease recalling a past patient that exhibited similar symptoms.
- **CBR Process**
 - *Retrieve:*
 - Given a problem (New Case), retrieve Past Cases from the Knowledge Base to solve the problem.
 - *Reuse:*
 - Map solutions of the Past Cases, one by one, to New Case.
 - This may involve adapting the solution as needed to fit the new situation.
 - *Revise:*
 - Having mapped the Past Cases to the New Case, test the New Case in the real world (or a simulation) and if necessary, revise.
 - *Retain:*
 - After the solution has been successfully adapted to the New Case (problem), store the resulting experience as a new case in Knowledge Base.

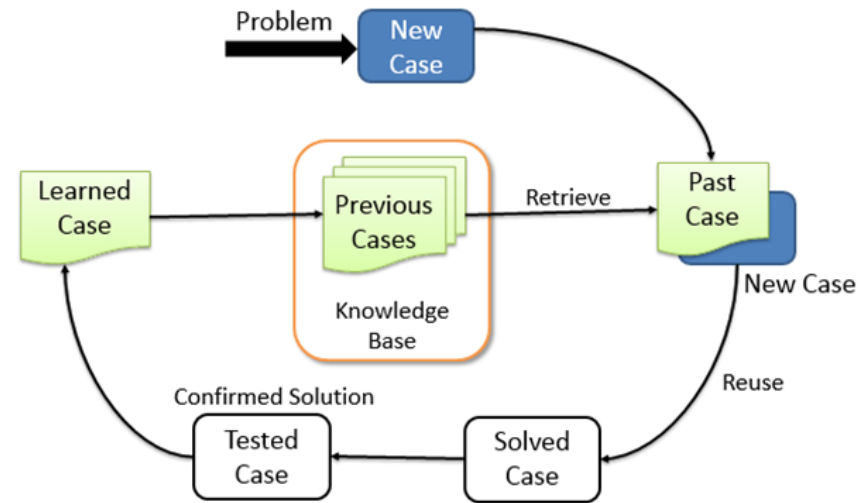


Figure 8.8: The Processes of Case Based Reasoning in ES

Business applications of CBR

- **Business Process Redesign (BPR)**
 - Previously successful designs are adopted to redesign similar business process.
- **SMART**
 - is a CBR customer services application developed by Compaq Computer in 1992.
 - The system analyses incoming Compaq's customer problems and retrieves the most similar cases from its case base and present them to the customer service analyst, who then uses them to resolve the problem.
- **Prism telex classification system**
 - is a CBR system developed by Cognitive Systems, Inc in 1990.
 - The system is used in several banks to route incoming international telex communications to appropriate recipients.
- **Workflow design**
 - CBR has also been employed successfully to workflow design using previous redesigned processes
- **Concurrent product development**
- **Business automation**
- **Predicting business failures**

➤ Probabilistic Expert Systems

- Emphasizes the basic computational principles that make probabilistic reasoning feasible in expert systems.
- The key to computation in these systems is the modularity of the probabilistic model.
- Shafer describes and compares the principal architectures for exploiting this modularity in the computation of prior and posterior probabilities.
- These expert systems are more preferably used in situations where uncertainty is at its peak.
- Probabilistic models are built using Naïve Bayes, Bayesian Network etc. to learn data.
- Inference processes is activated for the new case to generate final decision.

References

- Ali, R. & Ali, A. (2018). Chapter 8: IS and Artificial Intelligence Technologies. *Management Information System – 1st Edition* (pp. 156 - 171). Muhalla Jangi, Qissa Khawani, Peshawar, Pakistan: Al-ilum Publications.

Thanks!
Any Questions
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