

SPPU-TE-COMP-CONTENT – KSKA Git

Q1.)

What is Rule-Based Expert System?

ANS.

A Rule based Expert System is an AI system that mimics human expertise to solve problems, using a set of pre-defined rules.

It follows IF... THEN logic to infer conclusion and make decisions.

These systems are commonly used in domains where structured decision making is required, such as medical diagnosis, fault detection, and financial analysis.

A Rule-based Expert System consist of the following components:-

- Knowledge Base: Contains domain specific rules and facts.

- Inference Engine: Applies rules to known facts to deduce new information.

- User Interface: Allows users to interact with the system.

- Explanation Module: Provides reasoning behind the system's conclusion.

For Example:-

In a Medical Diagnosis system, rules like "IF Fever AND Cough, THEN Flu." helps doctor identify diseases. The system uses logical reasoning to suggest possible diagnoses based on symptoms provided by the user.

However, rule-based systems have limitations. They require normal manual rule definition, struggle with uncertain data, and are not adaptive like machine Learning models. Despite this, they remain useful in structured decision making environments where expert knowledge can be formally encoded.

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Q2) How to do Analysis of Data sets?

ANS. Data Analysis is the process of cleaning, transforming, and interpreting data to extract meaningful insights. It is widely used in business intelligence, scientific re-search, and AI Applications to support decision-making.

STEPS IN DATA ANALYSIS

1. Data Collection.

Gather raw data from sources like databases, APIs or surveys.

2. Data Cleaning.

Handles missing values, remove duplicates, and correct inconsistencies.

3. Exploratory Data Analysis (EDA)

Use statistical methods and visualizations (like histogram and scatter plots) to identify patterns and anomalies.

4. Feature Engineering.

Select and transform relevant variables to improve the model performance.

5. Statistical Analysis.

Apply techniques such as mean, variance, correlation, and hypothesis testing.

6. Data Modelling.

Use Machine Learning or statistical models to derive predictions or classifications.

7. Interpretation and Reporting.

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• Present findings using data visualization tools (Tableau, Power BI, Matplotlib) to assist decision-making.

For Example, In Marketing, Data Analysis helps businesses understand customer behaviour by analyzing purchase history, allowing for targeted advertising and better customer engagement. Proper data analysis improves efficiency, supports better decision-making, and helps uncover hidden trends in complex data-sets.

Q3.) What is Problem Decomposition?

ANS.

• Problem decomposition is the process of breaking down a complex problem into smaller, more manageable sub-problems.

• This approach simplifies problem-solving by tackling each component individually before combining the solutions.

• It is widely used in Software Engineering, AI,

• Mathematics and project Management.

• TYPES OF PROBLEM DECOMPOSITION:-

1. Hierarchical Decomposition.

• Splitting a problem into sub-problems arranged in a hierarchical structure. (Eg. breaking a software project into modules)

2. Functional Decomposition.

• Dividing a problem based on different functions or operations required (e.g., a self driving car's system decomposed into perception, planning, and control.)

3. Data Decomposition.

• Splitting large datasets into smaller parts for parallel processing (used in Big Data and cloud computing)

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For Example,

In AI and Machine Learning, a complex problem like image recognition is decomposed into multiple tasks: Edge Detection, Feature Extraction, and Classification. Each sub-task is handled separately to improve accuracy and efficiency.

Problem Decomposition enhances efficiency, reduces complexity, and allows for parallel processing, making it an essential technique for solving large scale, real-world problems.