1) Define its percepts, actions and goals.

Actions:

Actions are Operations the agent Performs in response to percepts:

* Recommeding relevant products.
* Sending notifications about discounts or price drops
* Personality Search results
* Filtering and Comparing products automatic
* learing from user feedback to improve recommendations.

Goals:-

Goals are the desired outcomes of the agent:

* Provide accurati and relevant Product Suggestions.
* Reduce the time and Effort required by the user to find products
* increase the likelihood of purchases.
* Continuously refine recommendations through learning.

Specify the type of Environment it Operates in

Environment type:

The personal Shopping assistant operates in:

<u>Partially Observable Environment</u>: Not all user Preferences are known up front; agent must infer them over time.

<u>Dynamic Environment</u>: Product availability, prices, and trends change frequently.

<u>Stochastic Environment</u>: User behavior is unpredictable (may change preferences Suddenly).

<u>Multi-agent Environment</u>: Competes or Collaborates with other recommendation Systems and sellers.

<u>Sequential Environment</u>: Each recommendation Can affect future user actions.

⇒ The personal shopping assistant operates in a Partially Observable, dynamic, Stochastic, multi-agent, and Sequential environment, where it must adapt and learn to provide better recommendations.

Suggest learning Mechanisms :

The agent Should adopt learning strategies Such as :

Supervised learning; Learn from past purchase data to predict future interests.

Reinforcement learning; Reward agent for Succesful recommendations.
(e.g., purchase made after recommendation).

Collaborative Filtering: Recommed products based on Similar users' preferences.

Content-Based learning: Analyze product descriptions and match them with uses Profiles

Online learning: Continuosly update model based on based on real-time feed back and clicks.

Context Aware learning:- Takes into account context like time of day, device used, Season, Or location to recommend relevant products.

Application in Real-World AI Systems

Medical Diagnosis Systems

knowledge Base :- symptoms, diseases, treatment rules.

Inference :- If a patient has fever, cough. and shortness of breath, infer likely Pneumonia.

Impact :- Suggests probable diagnoses, reducing diagnostic errors, and assisting doctors in decision making

Intelligent Virtual Assistants

knowledge Base :- user preferences, Calendar events, location

Inference : If user has a meeting at 9AM and travel time is 30 min, assistant infers that an alert should be triggered at 8:15 AM.

Impact :- Improves user experience by making Proactive, context-aware decisions.

Analyze how inference in first order logic can be applied in a real world AI system and its impact on decision making.

Inference in first-Order logic (FOL) plays a crucial role in real-World AI Systems because it enables machines to reason, deduce new facts, and make informed decisions from a knowledge base. let's break this down step by step:

Overview of Inference in first-Order logic

First-Order logic (FOL):- A formal System used to represent knowledge using objects, their Properties, and relations between them.

Inference: The process of deriving new knowledge from known facts and rules using logical reasoning techniques like modus Ponens, unification, resolution and forward chaining.

Rein-forcement learning

Concept:- learning through trail and error and receives feed back in the form of rewards.

Example:- If the user clicks and purchases a recommended product, the system gives a positive reward

Benefit:- Continuosly improves by optimizing future suggestions

Deep learning & neural Networks

Concept:- Users neural networks to process Complex data

Example:- Image recognition to recommend visually similar clothes or furniture.

Benefit: Captures very detailed patterns; leading to highbly personalized recommendations.

Supervised learning :-

Concept: The agent is trained using labeled historical data.

Example: If a user bought a mobile phone, the agent predicts they might need accessories like cases or head phones.

Use Case :- Predicting product recommendations based on previous user behavior.

Unsupervised learning :-

Concept :- The agent identifies hidden patterns and groups users or products without Predefined labels

Example :- Clustering users Who buy similar Products and recommending items popular in that group.

Use Case :- Market Segmentation, Product bundling, identifying new trends.

Explain rationality in this Scenario

Rationality means the agent takes actions that maximize Pb performance measure, given the knowledge it has.

Performance Measure: Customer Satisfaction, number of purchases, time Saved for uses.

Rational Behavior:

* Recommends the most relevant products given the available data.

* Adapts recommendations when uses preferences change.

* Balances between recommending trending Products and personalized products.

* Consider long-team engagement, not just Short-team Sales.

* Thus, a rational personal Shopping assistant will act in a way that maximizes uses Satisfaction and business goals Simultaneously, given the Current knowledge and constraints.

Artificial Intelligence for Problem Solving — CSA 1707

Assignment — 04

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