SNS COLLEGE OF ENGINEERING

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Department of Information Technology
Course Name – Software Engineering

II Year / III Semester

Unit-3 Reasoning Under Uncertainity

Symbolic Reasoning

- The reasoning is the act of deriving a conclusion from certain properties using a given methodology
- The reasoning is a process of thinking; reasoning is logically arguing; reasoning isdrawing the inference.

- When a system is required to do something, that it has not been explicitly told how to do, it must reason. It must figure out what it needs to know from what it already knows.
- Many types of Reasoning have been identified and recognized, but many questions

regarding their logical and computational properties still remain controversial.

Logical Reasoning

- Logic is a language for reasoning. It is a collection of rules called Logic arguments, weuse when doing logical reasoning.
- The logic reasoning is the process of drawing conclusions from premises using rules of inference.
- The study of logic divided into formal and informal logic. The formal logic is sometimes called symbolic logic.
- Symbolic logic is the study of symbolic abstractions (construct) that capture the formal features of logical inference by a formal system.
- The formal system consists of two components, a formal language plus a set of inference rules.
- The formal system has axioms. Axiom is a sentence that is always true within the system.
- Sentence derived using the system's axioms and rules of derivation called theorems.

Symbolic Reasoning

 The basis for intelligent mathematical software is the integration of the “power ofsymbolic mathematical tools” with the suitable “proof technology”.

 Mathematical reasoning enjoys a property called monotonicity, that says, “If a conclusion follows from given premises A, B, C… then it also follows from any larger set of premises, as long as the original premises A, B, C.. included.”

 Moreover, Human reasoning is not monotonic.

 People arrive at conclusions only tentatively; based on partial or incomplete information reserve the right to retract those conclusions while they learn new facts. Such reasoning non-monotonic, precisely because the set of accepted conclusions have become smaller when the set of premises expanded.

Formal Logic

Moreover, The Formal logic is the study of inference with purely formal content, i.e. where content made explicit.
Examples – Propositional logic and Predicate logic.

 Here the logical arguments are a set of rules for manipulating symbols. The rules are of two types,

1. Syntax rules: say how to build meaningful expressions.
2. Inference rules: say how to obtain true formulas from other true formulas.

 Moreover, Logic also needs semantics, which says how to assign meaning to expressions.

Uncertainty in Reasoning

 The world is an uncertain place; often the Knowledge is imperfect which causes uncertainty.

 So, Therefore reasoning must be able to operate under uncertainty.

 Also, AI systems must have the ability to reason under conditions of uncertainty rule.

Monotonic Reasoning

 A reasoning process that moves in one direction only.

 Moreover, The number of facts in the knowledge base is always increasing.

 The conclusions derived are valid deductions and they remain so.

A monotonic logic cannot handle

1. Reasoning by default: because consequences may derive only because of lack of evidenceto the contrary.
2. Abductive reasoning: because consequences only deduced as most likely explanations.
3. Belief revision: because new knowledge may contradict old beliefs.

Non-monotonic Reasoning

A logic is non-monotonic if some conclusions can be invalidated by adding more knowledge. The logic of definite clauses with negation as failure is non-monotonic. Non-monotonic reasoning is useful for representing defaults. A default is a rule that can be used unless it overridden by an exception.

For example, to say that b is normally true if c is true, a knowledge base designer can write a rule of the form

$b \leftarrow c \wedge \sim aba.$

where aba is an atom that means abnormal with respect to some aspect a. Given c, the agent can infer b unless it is told aba. Adding aba to the knowledge base can prevent the conclusion of b. Rules that imply aba can be used to prevent the default under the conditions of the body of the rule