

Backwards Chaining System

1. Overview

Logic is a formal language for representing information such that conclusions can be drawn. In logic, there is a knowledge base, which contains rules, or facts that are already known. In addition, rule-based systems allow for new data to be compared with and matched against the rules in the knowledge base. It is possible to also infer new data.

2. Types Of Rule-Based Systems

Forward chaining: Start with given rules and apply the rules to infer new information until the goal is reached

- Example:
 - Fact: detected that it's raining
 - Rule: if it's raining, bring an umbrella
 - Action: brought an umbrella

Backwards chaining: Start with the goal and work backwards to determine which rules and data to use to prove the goal is true

- Example:
 - Goal: find where I lost my phone
 - Steps: retrace my steps, working backwards from most current location to furthest location, until I find my phone
- Given: a set of rules and a set of facts (knowledge base). For the desired hypothesis/goal of finding out whether Opus is a penguin; this is a backwards chaining procedure to determine the truth of the statement

```
'opus is a penguin', # check whether hypothesis is in the knowledge base
AND( #otherwise, all these facts must exist in the knowledge base
  OR('opus is a bird', 'opus has feathers', AND('opus flies', 'opus lays
eggs'))
  'opus does not fly',
  'opus swims',
  'opus has black and white color' ))
```

(Example was gotten from Professor Gilpin's Assignment 4 from CSE 240)

Forward chaining may do excess work, but it is strong in situations where you have lots of information and need to reach a conclusion using that information. Backwards chaining is more similar to problem-solving and is used especially in scenarios where you have a piece of information and you are trying to work backwards to figure out the cause, for instance.