

Forward Chaining

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June 12, 2026

RECOMMENDED CITATION

mohammad looti (2026). *Forward Chaining*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=38347>

Forward chaining is one of the two main methods of reasoning when using inference rules (in artificial intelligence) and can be described logically as repeated application of modus ponens. Forward chaining is a popular implementation strategy for expert systems, business and production rule systems. The opposite of forward chaining is backward chaining.

Forward chaining starts with the available data and uses inference rules to extract more data (from an end user for example) until a goal is reached. An inference engine using forward chaining searches the inference rules until it finds one where the antecedent (If clause) is known to be true. When found it can conclude, or infer, the consequent (Then clause), resulting in the addition of new information to its data.

Inference engines will iterate through this process until a goal is reached.

For example, suppose that the goal is to conclude the color of a pet named Fritz, given that he croaks and eats flies, and that the rule base contains the following four rules:

If X croaks and eats flies - Then X is a frog

If X chirps and sings - Then X is a canary

If X is a frog - Then X is green

If X is a canary - Then X is yellow

This rule base would be searched and the first rule would be selected, because its antecedent (If Fritz croaks and eats flies) matches our data. Now the consequents (Then X is a frog) is added to the data. The rule base is again searched and this time the third rule is selected, because its antecedent (If Fritz is a frog) matches our data that was just confirmed. Now the new consequent (Then Fritz is green) is added to our data. Nothing more can be inferred from this information, but we have now accomplished our goal of determining the color of Fritz.

Because the data determines which rules are selected and used, this method is called data-driven, in contrast to goal-driven backward chaining inference. The forward chaining approach is often employed by expert systems, such as CLIPS.

One of the advantages of forward-chaining over backward-chaining is that the reception of new data can trigger new inferences, which makes the engine better suited to dynamic situations in which conditions are likely to change.