Artificial Intelligence

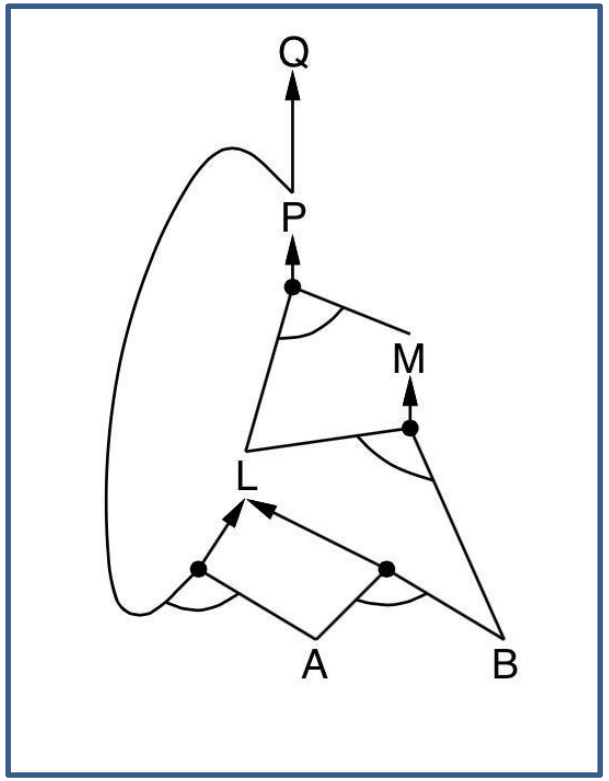
CSC-462

Forward/backward chaining

Idea:

Fire any rule whose premises are satisfied in the KB, add its conclusion to the KB, until query is found

$$P \Rightarrow Q$$
$$L \wedge M \Rightarrow P$$
$$B \wedge L \Rightarrow M$$
$$A \wedge P \Rightarrow L$$
$$A \wedge B \Rightarrow L$$
$$A$$
$$B$$



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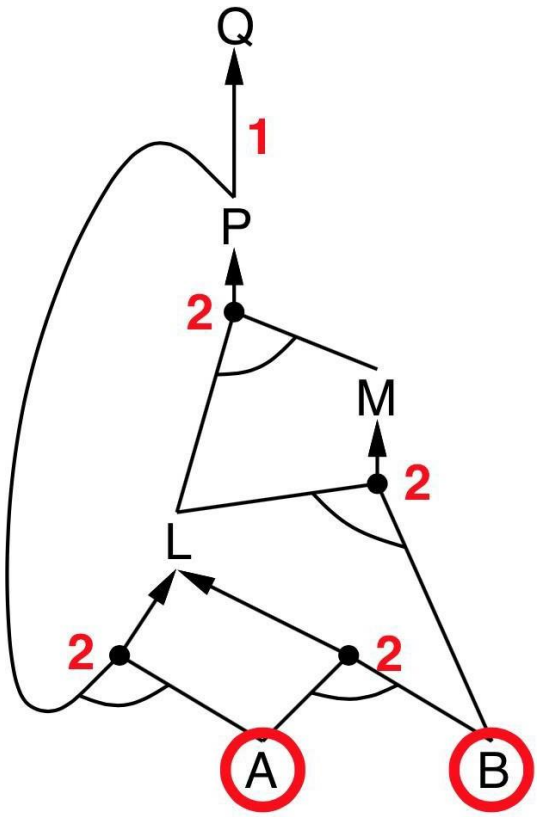

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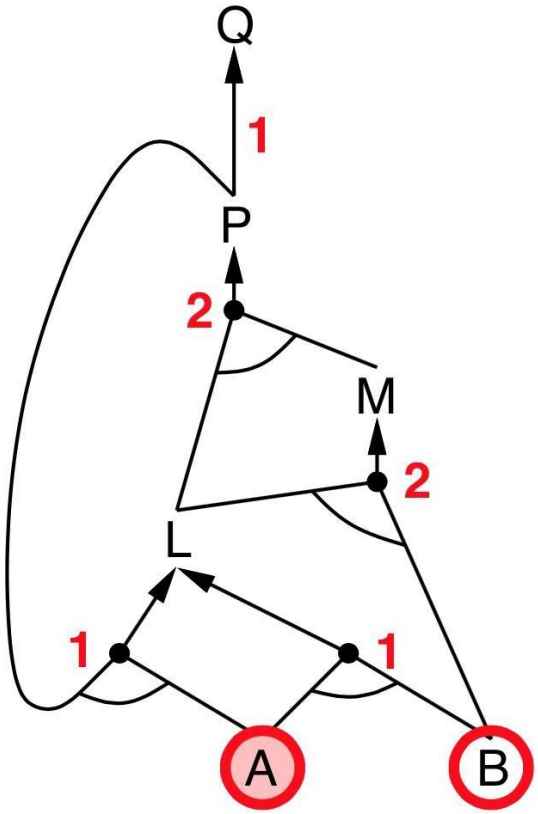

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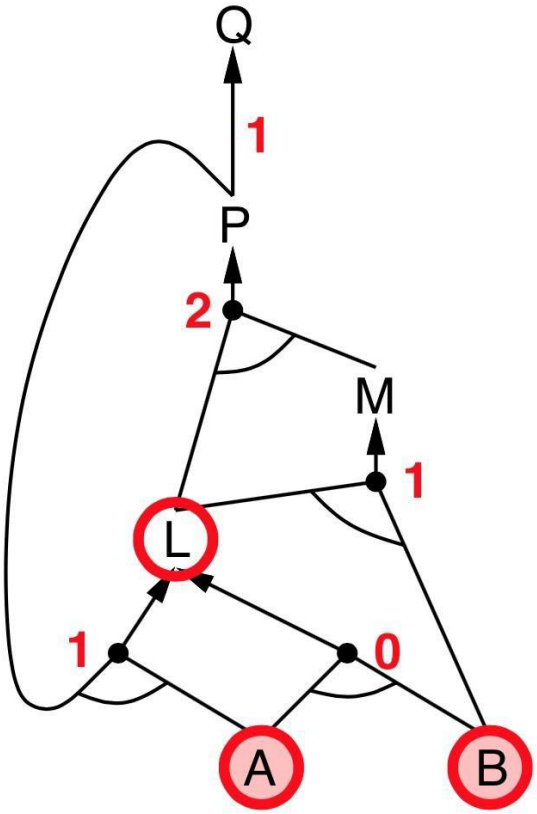

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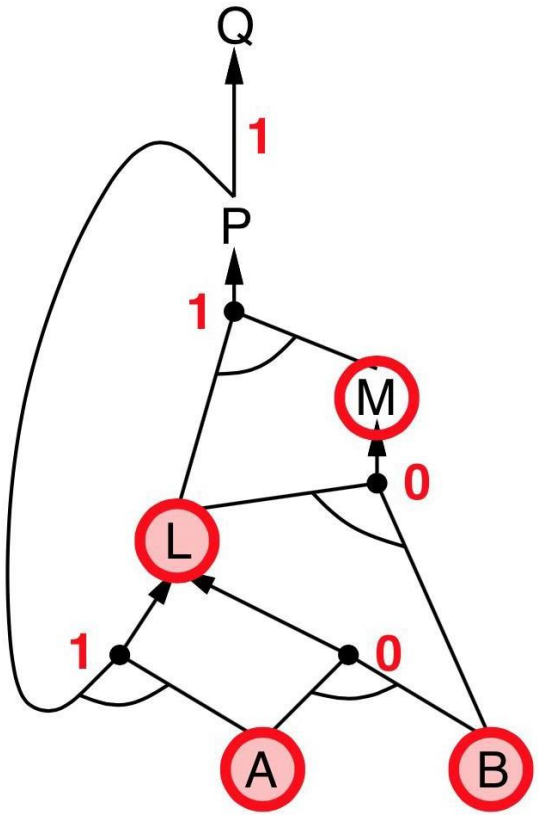

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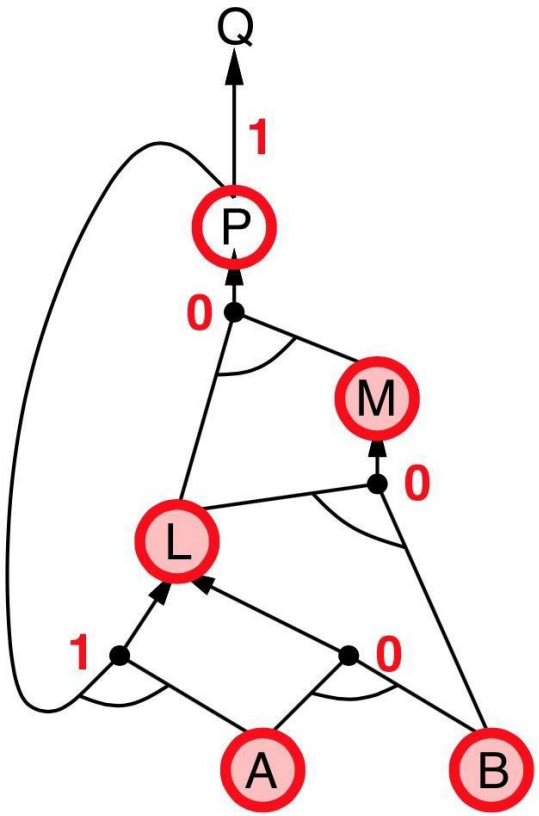

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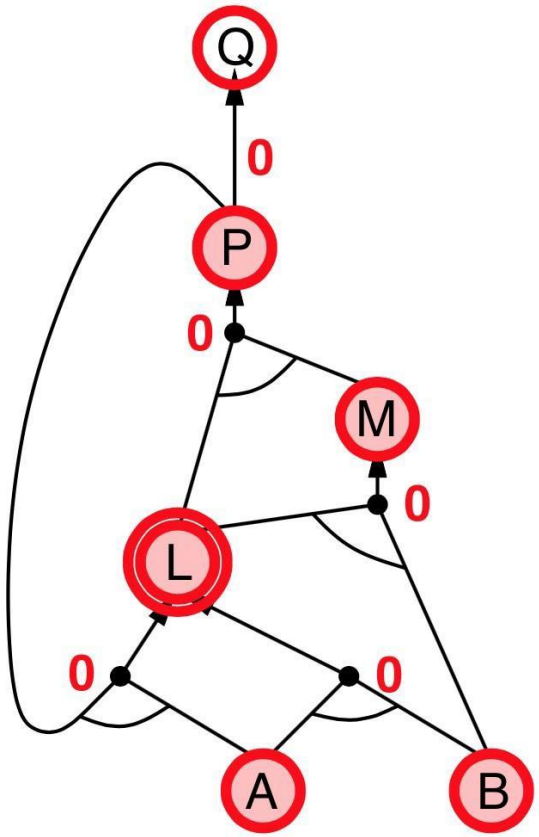

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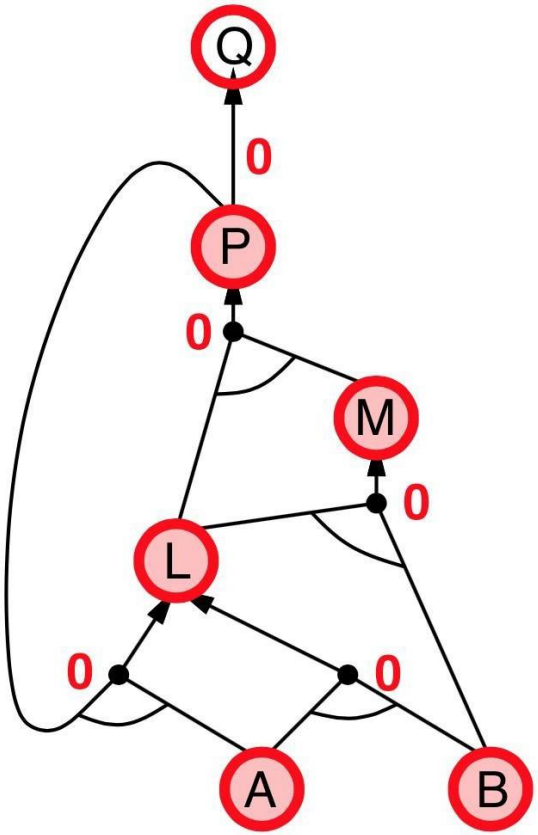

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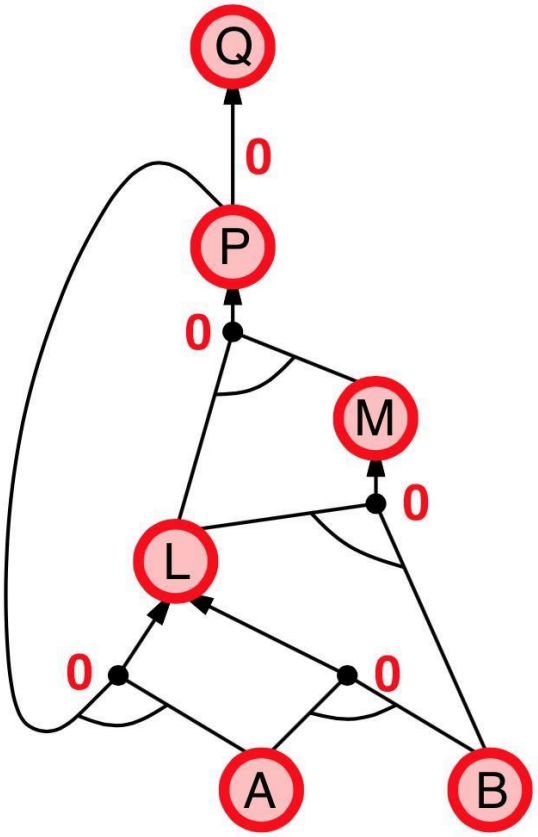

Backward chaining

Idea: Works backwards from the query *q*

- to prove *q* by Back ward Chaining:
  - Check if *q* is known already, or
  - Prove by Back ward Chaining all premises of some rule con- cluding *q*

- Avoid loops: check if new subgoal is already on the goal stack

- Avoid rep eated work: check if new subgoal
  - has already been proved true, or
  - has already failed

Backward chaining example

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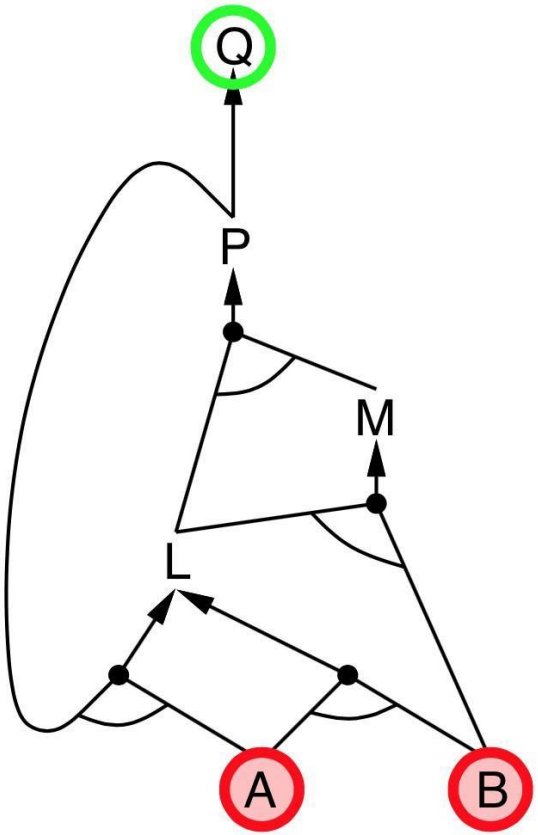

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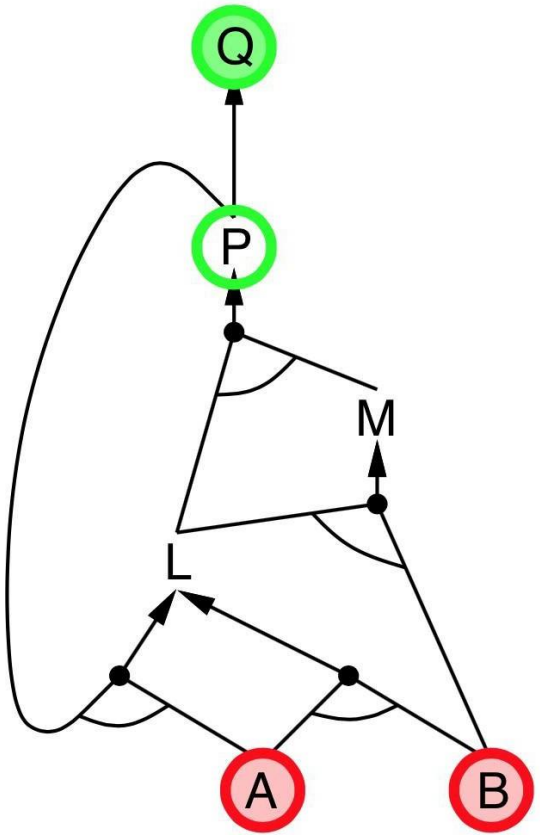

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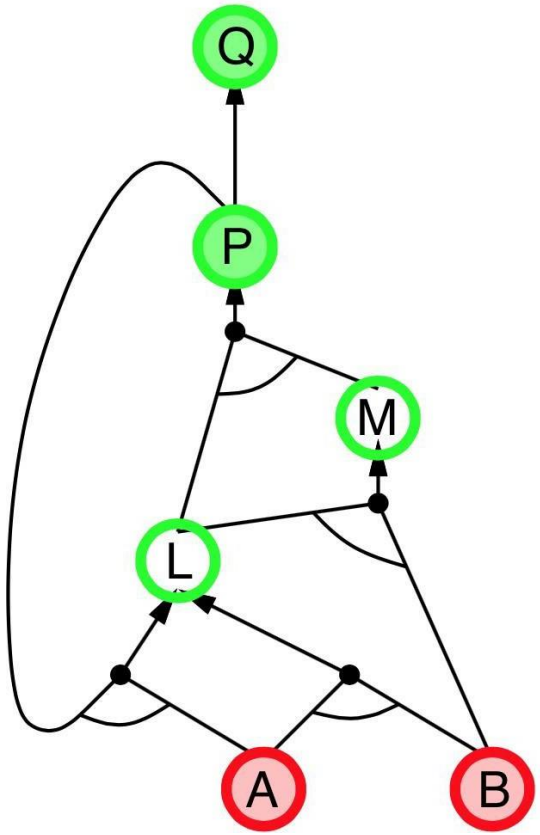

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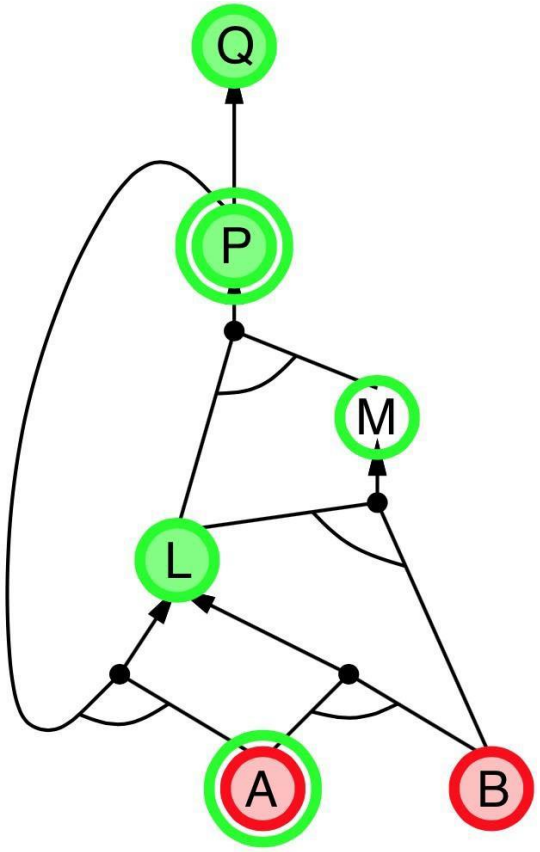

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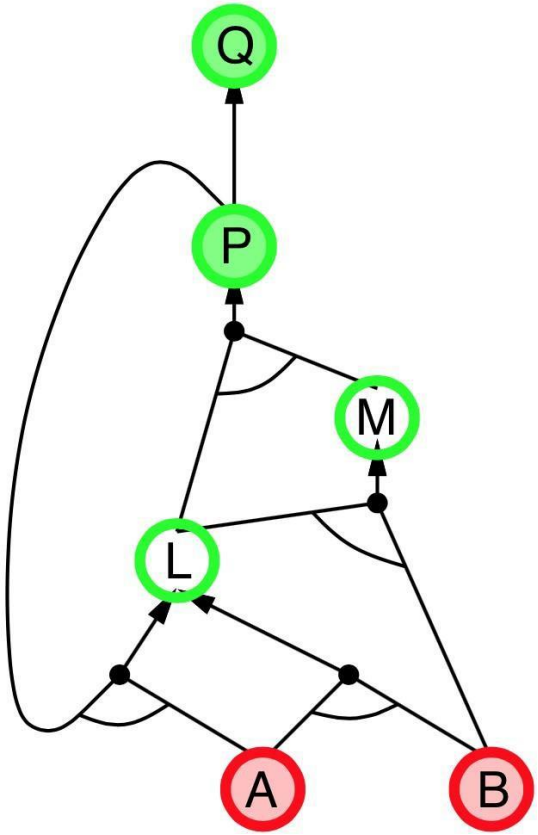

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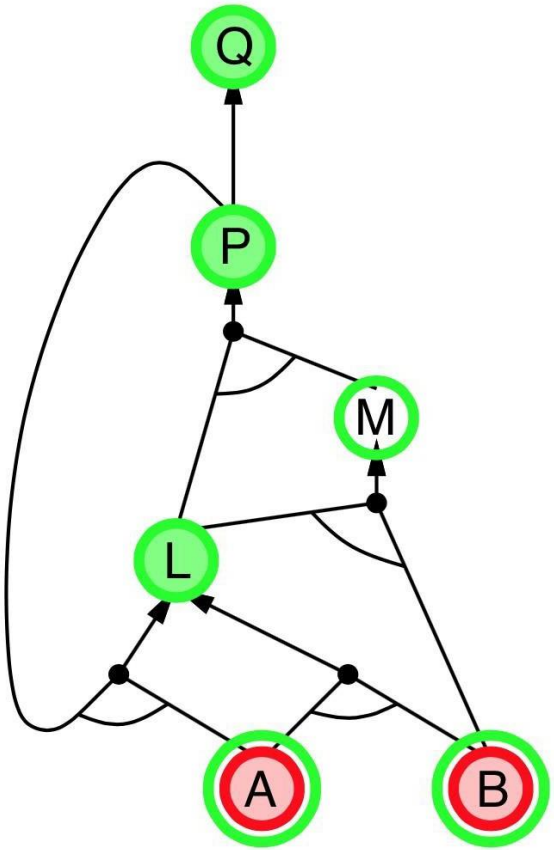

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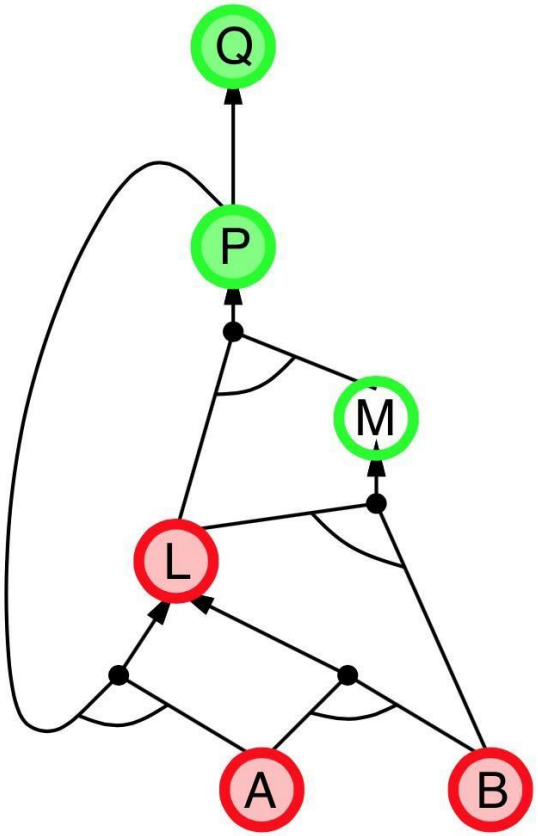

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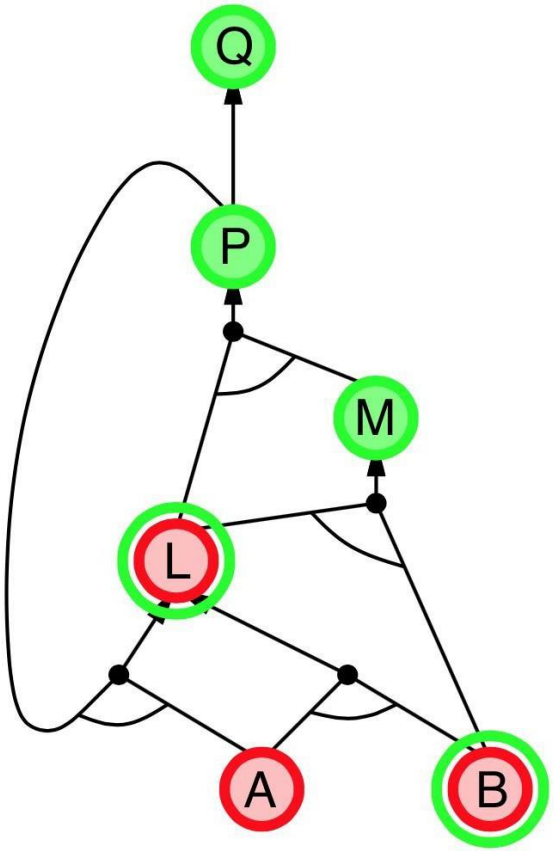

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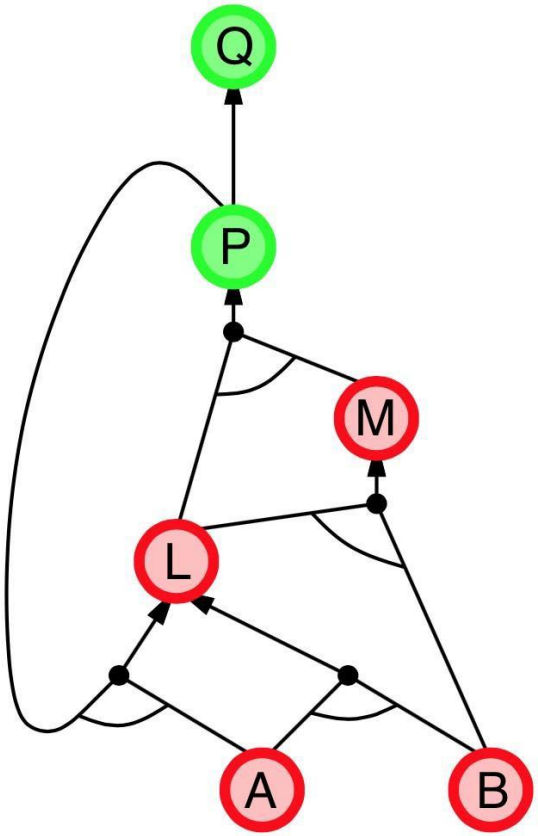

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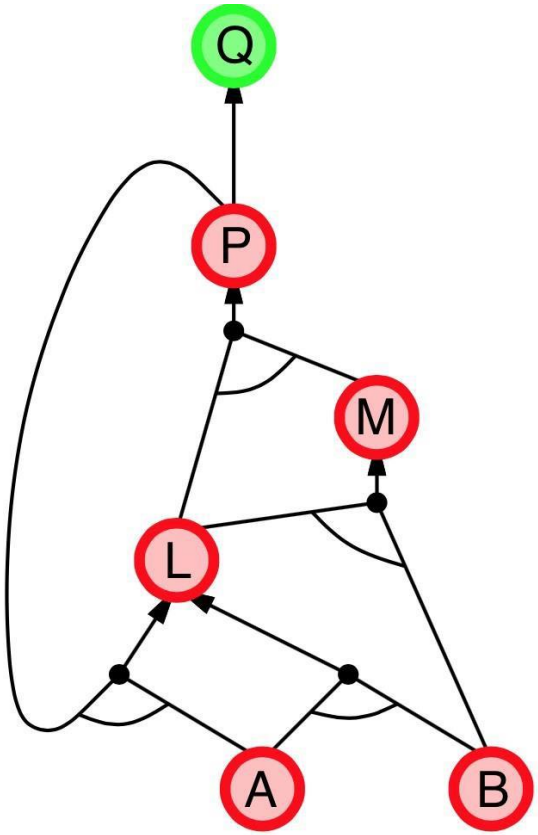

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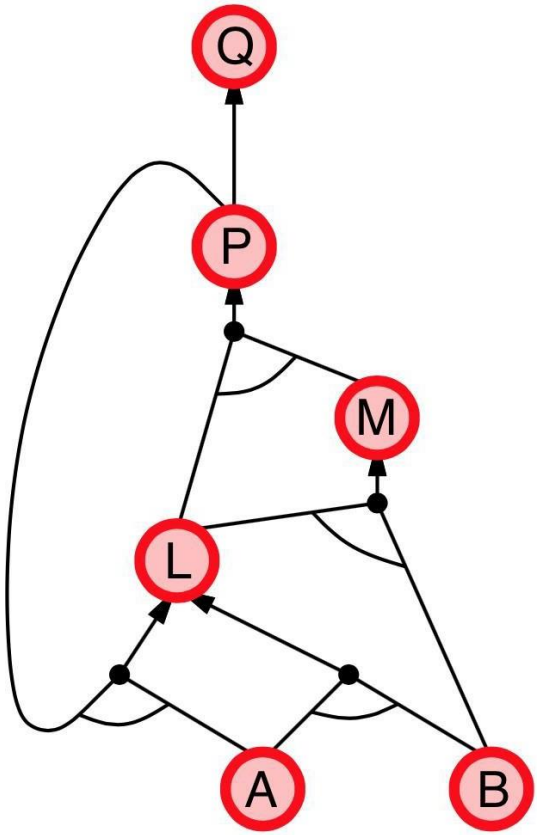

Forward vs. Backward

- Forward chaining:
  - Data-driven, automatic, unconscious processing,
  - May do lots of work that is irrelevant to the goal
- Back ward chaining:
  - Goal-driven, appropriate for problem-solving,
- Complexity of BC can be much less than linear in size of KB

Credit

- Artificia l Intelligence, A Modern Ap proach. Stuart Russell and Peter Norvig. Third Edition. Pearson Education.

http://aima.cs.berkeley.edu/