12/11/24

Knowledge Base:

R1: Alice is the mother of Bob.
R2. Bob is the father of Charlie
R3. A father is a parent
R4. A mother is a parent
R5. All parents have children.
R6. If someone is a parent, their children are siblings
R7. Alice is married to David.

Hypothesis
Charlie is a sibling of Bob.

Entailment Process
From the premise, Bob is the father of Charile and the fact that If someone is parent, their children are siblings.
So Charlie is not a sibling of Bob

Conclusion: Charlie is ~~not~~ a sibling of Bob

Propositional Logic ∧ ∨

1) Alice is the mother of Bob and A mother is a parent so
Alice is a parent

2) Bob is the father of Charlie and A father is a parent so
Bob is a parent

3) If someone is a parent, their children are siblings
Alice and Bob are parent, so their children

are sibilings

~~Alice~~ Bob is child of Alice.

Charlie is child of BOB

Therefore Bob and Charlie are sibilings.

Conclusion

Charlie is a sibling of Bob.

R1 → R4 : Alice is parent (P)

T → T ⇒ T

T → F — F

F → T — T

F → F — T

P → Q ⇒ T

P1 → P4 → T

F

R2 → R3 : Bob is parent (Q)

P → Q : Alice, Bob are parents (R)

~~R~~ → R6 : Bob and charlie are sibilings.

Output : Charlie and Bob are Siblings

```
class KnowledgeBase:
    def __init__(self):
        self.rules = []
        self.facts = set()

    def add_fact(self, fact):
        self.facts.add(fact)

    def add_rule(self, premise, conclusion):
        self.rules.append((premise, conclusion))

    def infer(self):
        new_inferences = True
        while new_inferences:
            new_inferences = False
            for premise, conclusion in self.rules:
                if all(fact in self.facts for fact
                       in premise):
                    if conclusion not in self.facts:
                        self.facts.add(conclusion)
                        new_inferences = True

    def entails(self, hypothesis):
        return hypothesis in self.facts

kb = KnowledgeBase()

kb.infer()

hypothesis = "Charlie and Bob are siblings"
kb.entails(hypothesis).
```