

Implementation of Unification & Resolution Algorithm

Aim: to implement unification and resolution algorithm using python.

Scenario: In an AI Based expert system for automated reasoning, the system needs to resolve queries by unifying logical predicates and applying resolution inference. For example.

Rule 1: if john is a human, then john is a mortal

Fact 1: Human(john)

Query: Is John mortal?

1) Define the unification function(unify):

- If both terms are identical, return the current substitution(theta).
- If one term is a variable, unify it with the other term.
- If both terms are compound expressions.

2) Define the variable unification(unify_{var}):

3) Define the resolver function.

4) Provide a knowledge base with facts & implications.

Program

function to check if two predicates can be unified.

```
def unify(x, y, theta = {}):
```

```
    if theta is None
```

```
        return None
```

```
    elif x == y:
```

```
        return theta
```

```
    elif isinstance(x, list) and isinstance(y, list) and len(x) == len(y):
```

```
        return unify(x[1:], y[1:], unify(x[0], y[0], theta))
```

```
    else
```

```
        return None
```

```
def unify_var(var, x, theta):
```

```
    if var in theta:
```

```
        return unify(theta[var], x, theta)
```

```
    elif x in theta:
```

```
        return unify(var, theta[x], theta)
```

```
    else
```

```
        theta[var] = x
```

```
    return theta
```



```
def resolution(kb, query):
```

```
    for clause in kb:
```

```
        theta = unify (clause[0], query[0])
```

```
        if theta is not None:
```

```
            new_kb = clause[1:]
```

```
            if not new_kb:
```

```
                return True
```

```
            else:
```

```
                return resolution(kb, new_kb[0])
```

```
    return False
```

```
knowledge_base = [
```

```
    ["Human", "John"], ["Mortal", "John"] ]
```

```
# Fact: Human(John)
```

```
fact = ["Human", "John"]
```

```
query = ["Mortal", "John"]
```

```
if resolution(knowledge_base, query):
```

```
    print ("Query is resolved : John is Mortal")
```

```
else:
```

```
    print ("Query could not be resolved")
```


5) Define a query to resolve.

6) Run the resolution function to check if the query can be proven.

7) Print whether the query is resolved