

PRINCIPLES OF ARTIFICIAL INTELLIGENCE

LAB – EXPERIMENT 6: UNIFICATION AND RESOLUTION

```
import re

# 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, str) and x.islower(): # x is a variable

        return unify_var(x, y, theta)

    elif isinstance(y, str) and y.islower(): # y is a variable

        return unify_var(y, x, 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


# Function to unify a variable with a term

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

Function to apply resolution rule

def resolution(kb, query):

for clause in kb:

theta = unify(clause[0], query, {})

if theta is not None:

new_kb = clause[1:]

if not new_kb: # If empty, means query is resolved

return True

else:

return resolution(kb, new_kb[0])

return False

Knowledge base (Implications)

knowledge_base = [

["Human", "John"], ["Mortal", "John"]] # Human(John) → Mortal(John)

]

Fact: Human(John)

fact = ["Human", "John"]

Query: Mortal(John)?

query = ["Mortal", "John"]

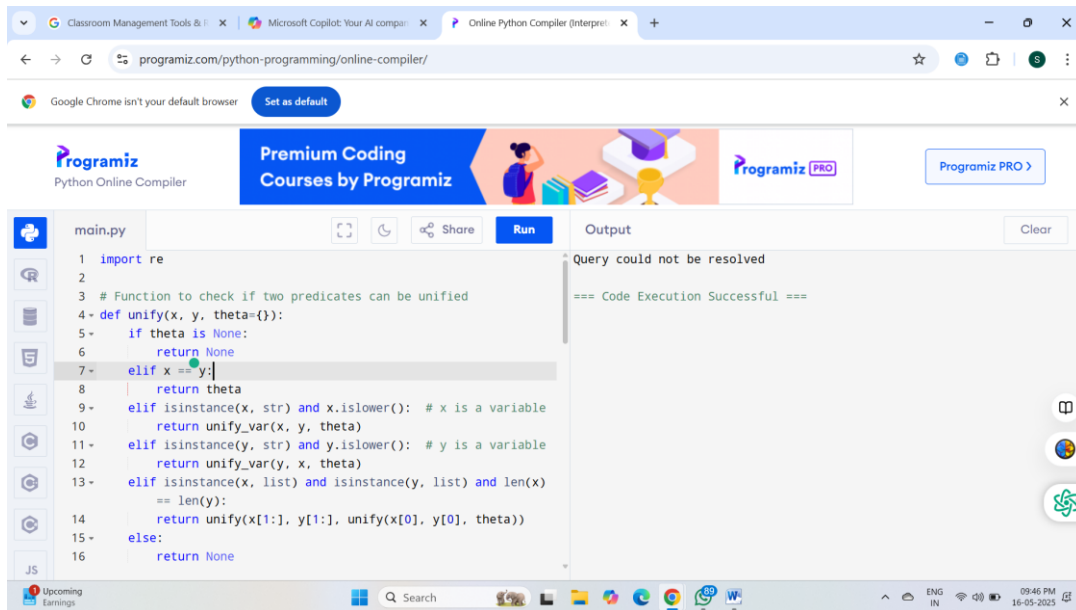
Apply resolution

if resolution(knowledge_base, query):

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

else:

 print("Query could not be resolved")



The screenshot shows the Programiz Python Online Compiler interface. The code editor on the left contains the following Python code:

```
main.py
1 import re
2
3 # Function to check if two predicates can be unified
4 def unify(x, y, theta={}):
5     if theta is None:
6         return None
7     elif x == y:
8         return theta
9     elif isinstance(x, str) and x.islower(): # x is a variable
10        return unify_var(x, y, theta)
11     elif isinstance(y, str) and y.islower(): # y is a variable
12        return unify_var(y, x, theta)
13     elif isinstance(x, list) and isinstance(y, list) and len(x) == len(y):
14        return unify(x[1:], y[1:], unify(x[0], y[0], theta))
15     else:
16        return None
```

The output pane on the right shows the result of the code execution:

```
Query could not be resolved
=== Code Execution Successful ===
```

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