

ARTIFICIAL INTELLIGENCE LAB OUTPUTS

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1. Tic Tac Toe

WELCOME TO A.I. TIC TAC TOE

BOARD:

1		2		3

4		5		6

7		8		9

Human goes first

GAME BEGIN:

Human's turn

Human enter option:4

GAME BOARD:

O				

Computer's turn

GAME BOARD:

O				

X				

Human's turn

Human enter option:3

GAME BOARD:

				O

O				

X				

Computer's turn

GAME BOARD:

				O

O				

X				X

Human's turn

Human enter option:1

GAME BOARD:

O				O

O				

X				X

Computer's turn

GAME BOARD:

O				O

O		X		

X				X

Human's turn

Human enter option::

Human won

O		O		O

O		X		

X				X

GAME OVER

2. Vacuum Cleaner

```
{'A': 1, 'B': 0}
Vacuum cleaner randomly placed at Location B.
Moving to Location A...
Location A is Dirty.
Location A has been Cleaned.
{'A': 0, 'B': 0}
Performance Measurement: 0
```

```
{'A': 1, 'B': 1}
Vacuum cleaner randomly placed at Location B.
Location B is Dirty.
Location B has been Cleaned.
Moving to Location A...
Location A is Dirty.
Location A has been Cleaned.
{'A': 0, 'B': 0}
Performance Measurement: 1
```

3. 8-Puzzle

```
Please enter number from 0-8, no number should be repeated or be out of this range
Enter the 1 number: 0
Enter the 2 number: 1
Enter the 3 number: 2
Enter the 4 number: 3
Enter the 5 number: 4
Enter the 6 number: 5
Enter the 7 number: 6
Enter the 8 number: 7
Enter the 9 number: 8
The puzzle is solvable, generating path
Exploring Nodes
Goal reached
printing final solution
Move : None
Result :
[[0. 1. 2.]
 [3. 4. 5.]
 [6. 7. 8.]]    node number:0
```

Please enter number from 0-8, no number should be repeated or be out of this range
Enter the 1 number: 8
Enter the 2 number: 6
Enter the 3 number: 4
Enter the 4 number: 1
Enter the 5 number: 3
Enter the 6 number: 0
Enter the 7 number: 7
Enter the 8 number: 5
Enter the 9 number: 2
The puzzle is insolvable, still creating nodes

4. A-Star

	R	R	R
[5, 2, 6]	[5, 2, 6]	[1, 5, 2]	[1, 2, 0]
[7, 0, 8]	[1, 4, 8]	[4, 0, 6]	[4, 5, 3]
[4, 1, 3]	[7, 3, 0]	[7, 3, 8]	[7, 8, 6]
D	U	D	D
[5, 2, 6]	[5, 2, 6]	[1, 5, 2]	[1, 2, 3]
[7, 1, 8]	[1, 4, 0]	[4, 3, 6]	[4, 5, 0]
[4, 0, 3]	[7, 3, 8]	[7, 0, 8]	[7, 8, 6]
L	U	R	D
[5, 2, 6]	[5, 2, 0]	[1, 5, 2]	[1, 2, 3]
[7, 1, 8]	[1, 4, 6]	[4, 3, 6]	[4, 5, 6]
[0, 4, 3]	[7, 3, 8]	[7, 8, 0]	[7, 8, 0]
U	L	U	
[5, 2, 6]	[5, 0, 2]	[1, 5, 2]	
[0, 1, 8]	[1, 4, 6]	[4, 3, 0]	
[7, 4, 3]	[7, 3, 8]	[7, 8, 6]	
R	L	L	
[5, 2, 6]	[0, 5, 2]	[1, 5, 2]	
[1, 0, 8]	[1, 4, 6]	[4, 0, 3]	
[7, 4, 3]	[7, 3, 8]	[7, 8, 6]	
D	D	U	
[5, 2, 6]	[1, 5, 2]	[1, 0, 2]	
[1, 4, 8]	[0, 4, 6]	[4, 5, 3]	
[7, 0, 3]	[7, 3, 8]	[7, 8, 6]	

5. 8-Puzzle (Iterative)

```
Enter the puzzle :
Enter the 1 number: 0
Enter the 2 number: 1
Enter the 3 number: 2
Enter the 4 number: 3
Enter the 5 number: 4
Enter the 6 number: 5
Enter the 7 number: 6
Enter the 8 number: 7
Enter the 9 number: 8
The puzzle is solvable, generating path
Exploring Nodes
[[0.0, 1.0, 2.0], [3.0, 4.0, 5.0], [6.0, 7.0, 8.0]]
printing final solution
Move : None
Result :
[[0. 1. 2.]
 [3. 4. 5.]
 [6. 7. 8.]]      node number:0
```

```
Enter the puzzle :
Enter the 1 number: 0
Enter the 2 number: 8
Enter the 3 number: 5
Enter the 4 number: 2
Enter the 5 number: 6
Enter the 6 number: 4
Enter the 7 number: 1
Enter the 8 number: 3
Enter the 9 number: 7
The puzzle is insolvable, still creating nodes
Exploring Nodes
Goal State could not be reached
```

6. Knowledge base using Propositional Logic (Entailment)

```
Enter rule    :p∨q
Enter the Query : p
*****Truth Table Reference*****
kb alpha
*****
True True
-----
False False
-----
True False
-----
The Knowledge Base does not entail query
```

```
Enter rule    :p^q
Enter the Query : p
*****Truth Table Reference*****
kb alpha
*****
True True
-----
False False
-----
False False
-----
False True
-----
The Knowledge Base entails query
```

7. Conjunctive Normal Form (CNF)

```
AND : & ; OR: | ; NOT: ~ ; IMPLIES : ==> ; EQUIVALENCE : <=>
Enter the propositional logic : A==>B
Eliminated Implications : (~A | B)
After DeMorgans Law : (~A | B)
After Distributivity Law : (~A | B)
CNF : (~A | B)
```

```
AND : & ; OR: | ; NOT: ~ ; IMPLIES : ==> ; EQUIVALENCE : <=>
Enter the propositional logic : A|B
Eliminated Implications : (A | B)
After DeMorgans Law : (A | B)
After Distributivity Law : (A | B)
CNF : (A | B)
```

8. Unification in First Order Logic

```
=====PROGRAM FOR UNIFICATION=====
Enter Number of Predicates:2
Enter Predicate 1 :
p
Enter No.of Arguments for Predicate p :
2
Enter argument 1 :
a
Enter argument 2 :
b
Enter Predicate 2 :
p
Enter No.of Arguments for Predicate p :
2
Enter argument 1 :
c
Enter argument 2 :
b
=====PREDICATES ARE=====
p (a,b)
p (c,b)
=====SUBSTITUTION IS=====
c / a
Do you want to continue(y/n): |
```

9. Forward Reasoning

Hostile?
{x: Coco}

Criminal?
{x: West}

10. Decision Tree Learning

```
Dataset Length: 625
Dataset Shape: (625, 5)
Dataset:      0  1  2  3  4
0  B  1  1  1  1
1  R  1  1  1  2
2  R  1  1  1  3
3  R  1  1  1  4
4  R  1  1  1  5
Results Using Entropy:
Predicted values:
['R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'L'
 'L' 'R' 'L' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'L' 'L'
 'L' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'L' 'R' 'L' 'L' 'R' 'L' 'L'
 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'L' 'R' 'L' 'L' 'L' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'L' 'R' 'R' 'L' 'R' 'L'
 'R' 'R' 'L' 'L' 'L' 'R' 'R' 'L' 'L' 'L' 'R' 'L' 'L' 'R' 'R' 'R' 'R' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L'
 'L' 'L' 'L' 'R' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R'
 'L' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'R' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'R' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'L' 'L' 'L' 'L' 'R'
 'R' 'R' 'L' 'L' 'L' 'R' 'R' 'R']
Confusion Matrix: [[ 0  6  7]
 [ 0 63 22]
 [ 0 20 70]]
Accuracy : 70.74468085106383
```

Report :	precision	recall	f1-score	support
B	0.00	0.00	0.00	13
L	0.71	0.74	0.72	85
R	0.71	0.78	0.74	90
accuracy			0.71	188
macro avg	0.47	0.51	0.49	188
weighted avg	0.66	0.71	0.68	188