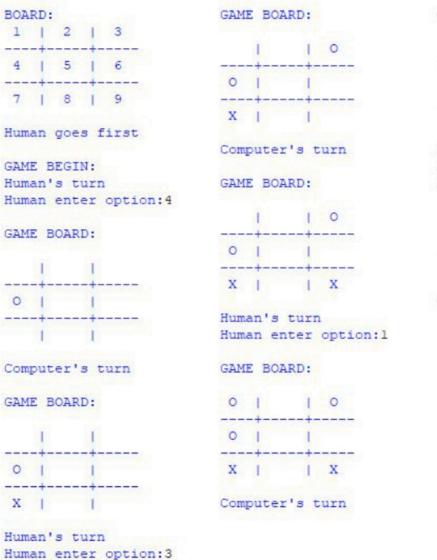
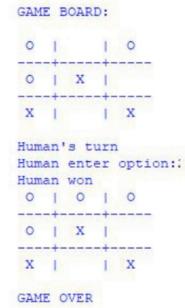
## AI LAB OUTPUTS

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#### 1. Tic Tac Toe

# WELCOME TO A.I. TIC TAC TOE





## 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. <u>8-Puzzle</u>

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

#### 6. Knowledge base using Prepositional Logic (Entailment)

```
Enter rule :pvq
Enter the Query: p
*********Truth Table Reference******
kb alpha
******
True True
False False
True False
The Knowlege 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 Knowlege 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. <u>Unification in First Order Logic</u>

```
======PROGRAM FOR UNIFICATION=======
Enter Number of Predicates: 2
Enter Predicate 1 :
p
Enter No. of Arguments for Predicate p :
Enter argument 1 :
Enter argument 2 :
Enter Predicate 2 :
Enter No. of Arguments for Predicate p :
Enter argument 1 :
Enter argument 2 :
======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. <u>Decision Tree Learning</u>

```
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' 'R' 'L' 'L' 'L' 'R' 'R' 'R']
Confusion Matrix: [[ 0 6 7]
[ 0 63 22]
[ 0 20 70]]
Accuracy: 70.74468085106383
```

Report :		p	recision	recall	f1-score	support
	В	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	