KNIGHT'S TOURS PUZZLE ON STANDARD 8×8 CHESSBOARD

IT257

MINI-PROJECT

DESIGN AND
ANALYSIS OF ALGORITHM

Presented to :
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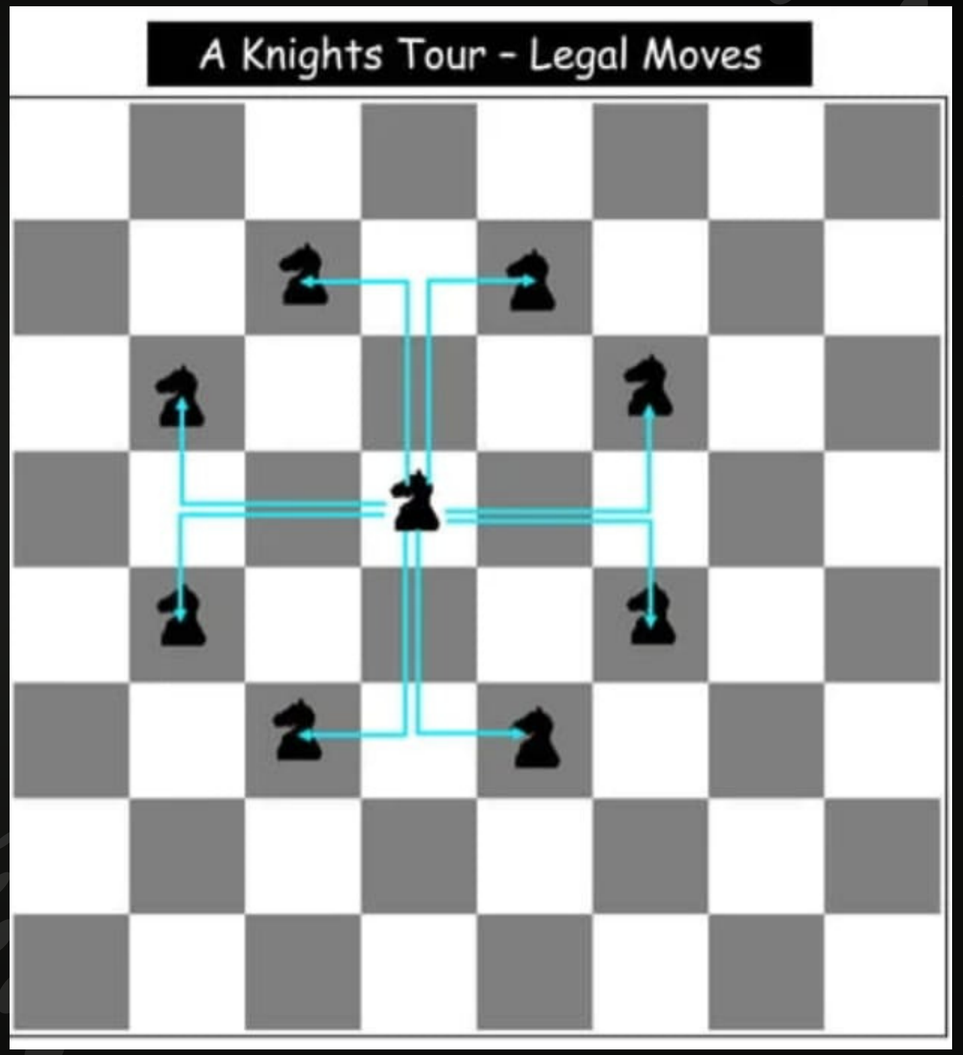
INTRODUCTION & MOTIVATION :

- The Knight's Tour Puzzle is a classic problem in recreational mathematics.
- It has a rich history and has been studied by many great mathematicians over the years.
- The problem has practical applications in computer science, such as in pathfinding algorithms and optimization problems.
- The case is that each square must be visited only once.



PROBLEM STATEMENT & OBJECTIVES

Does there exist a path of Knight's movements around the chess board such that every square is visited exactly once?
This type of path is known as a Knight's Tour. Our aim is to find this knight tour.

OBJECTIVES:

- To learn the concept of Warnsdorff's algorithm and its application in solving the Knight's Tour Puzzle.
- Using other methods like Recursive backtracking and Neural networks to solve Knight's Tour Puzzle on a standard 8x8 chessboard.
- To analyze the time and space complexity of our model.

INNOVATION IN THE FUNCTIONALITIES/ OBJECTIVES

WARNSDORFF'S

STRATEGY 1

Implement a feature to allow the user to adjust the size of the board

STRATEGY 2

Feature that displays the coordinates of each square visited by the knight during the tour

STRATEGY 3

Allow the user to make the choices for the initial position of the knight.

STRATEGY 4

Create an animation using Pygame to show the actual movement of knight on the board.

INNOVATION IN THE FUNCTIONALITIES/ OBJECTIVES

NEURAL NETWORKS'

STRATEGY 1

A neural network with a Hopfield architecture is used instead of traditional graph theory approach to solve the knight's tour problem.

STRATEGY 2

The code includes a visualization component using the Pygame library, allowing the user to see the progress of the algorithm in real-time.

POTENTIAL STRATEGY 1

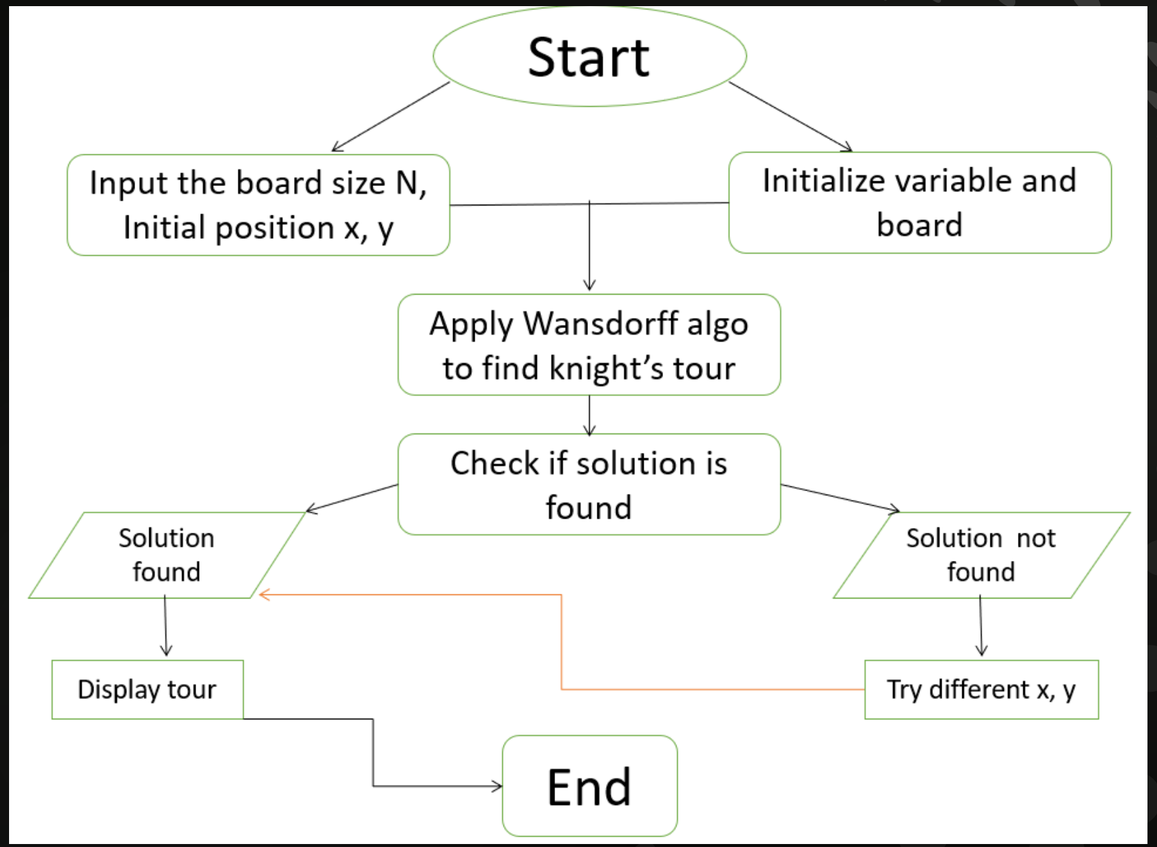
Implementing a different neural network architecture (e.g., a multi-layer perceptron or a convolutional neural network) to solve the problem and comparing its performance to that of the Hopfield network.

POTENTIAL STRATEGY 2

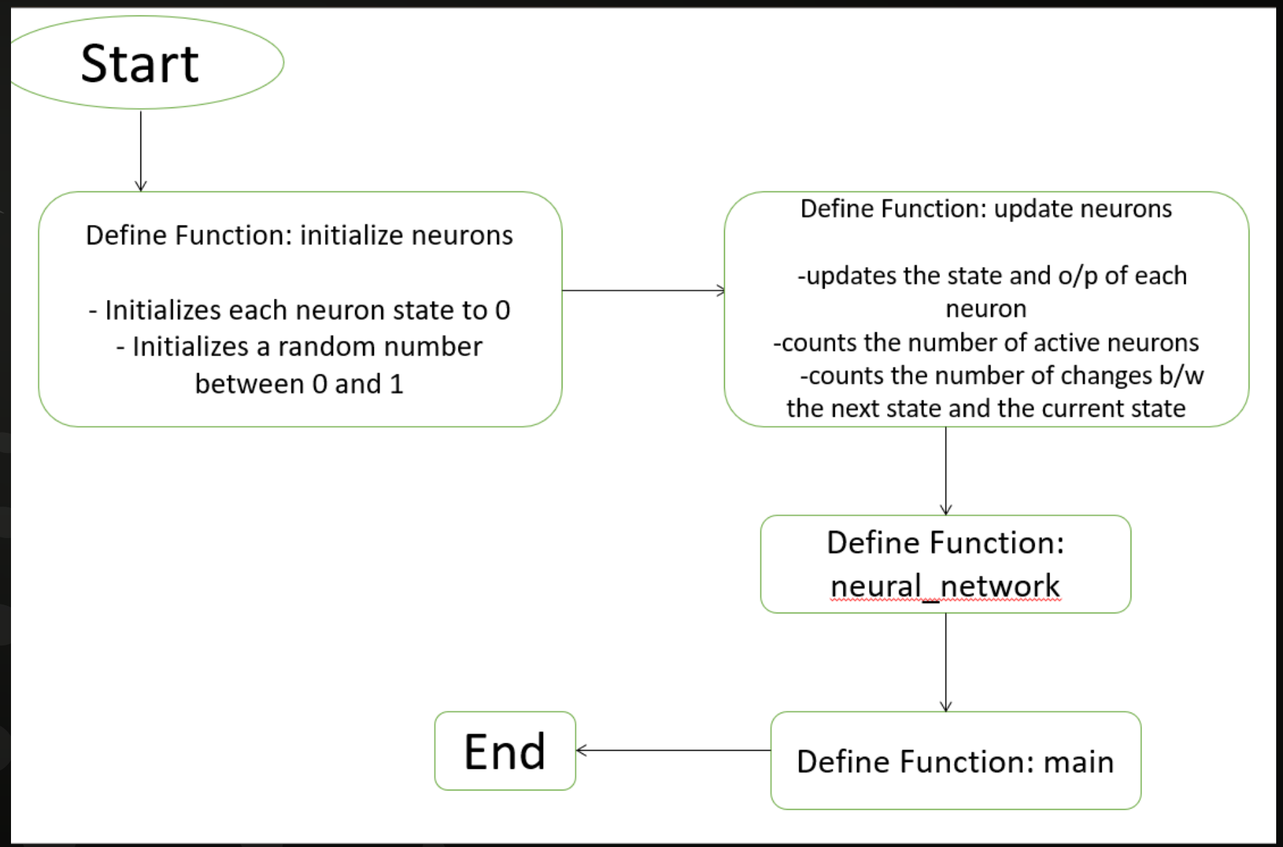
Fine-tuning the hyperparameters of the Hopfield network, use neural networks to generate possible intital positions.

METHODOLOGY

WARNSDORFF'S ALGO



NEURAL NETWORK APPROACH



RESULTS ANALYSIS

Warnsdorff's algo

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Hello from the pygame community. https://www.pygame.org/contribute.html
Enter N, size of the board (NxN): 8

Enter initial x position: 0

Enter initial y position: 0

[[ 1. 26. 15. 24. 29. 50. 13. 32.]
 [16. 23. 28. 51. 14. 31. 64. 49.]
 [27.  2. 25. 30. 63. 60. 33. 12.]
 [22. 17. 52. 59. 44. 57. 48. 61.]
 [ 3. 42. 21. 56. 53. 62. 11. 34.]
 [18. 39. 54. 43. 58. 45.  8. 47.]
 [41.  4. 37. 20. 55.  6. 35. 10.]
 [38. 19. 40.  5. 36.  9. 46.  7.]]

Knight's positions:  [[0, 0], [2, 1], [4, 0], [6, 1], [7, 3], [6, 5], [7, 7], [5, 6]
, [7, 5], [6, 7], [4, 6], [2, 7], [0, 6], [1, 4], [0, 2], [1, 0], [3, 1], [5, 0], [7
, 1], [6, 3], [4, 2], [3, 0], [1, 1], [0, 3], [2, 2], [0, 1], [2, 0], [1, 2], [0, 4]
, [2, 3], [1, 5], [0, 7], [2, 6], [4, 7], [6, 6], [7, 4], [6, 2], [7, 0], [5, 1], [7
, 2], [6, 0], [4, 1], [5, 3], [3, 4], [5, 5], [7, 6], [5, 7], [3, 6], [1, 7], [0, 5]
, [1, 3], [3, 2], [4, 4], [5, 2], [6, 4], [4, 3], [3, 5], [5, 4], [3, 3], [2, 5], [3
, 7], [4, 5], [2, 4], [1, 6]]_
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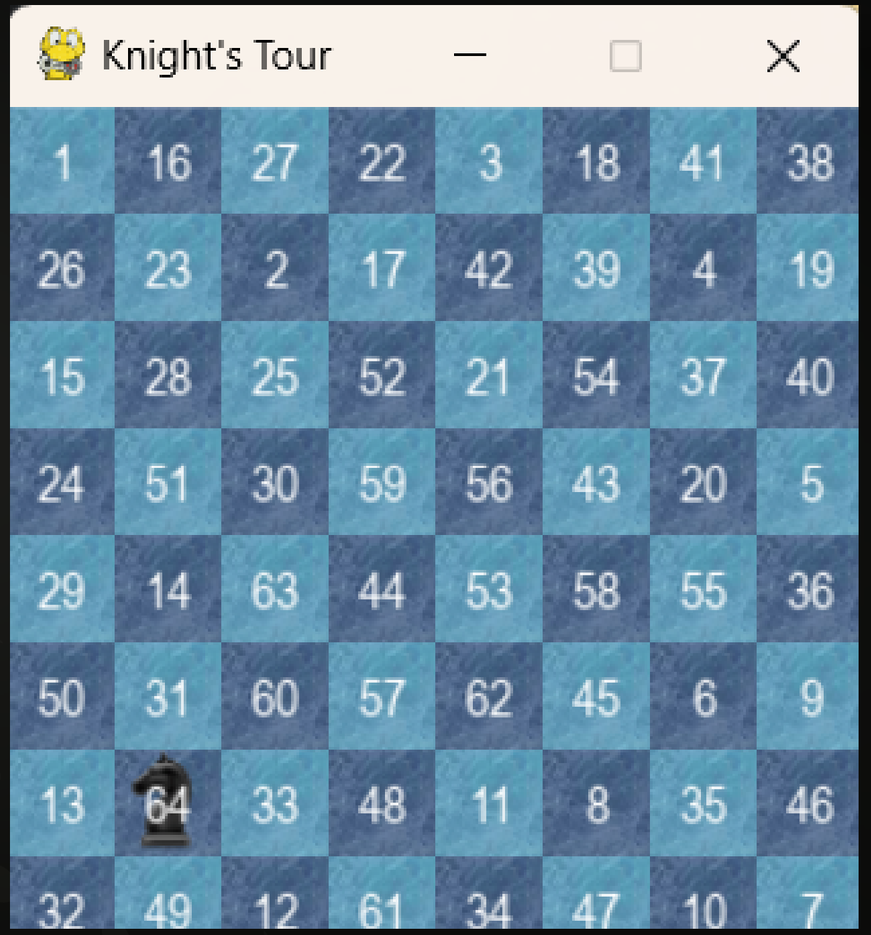

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THANK YOU

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