



# Exploring AI: From Concepts to Code

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# Course Overview

This course combined theory and application. We studied how intelligent systems make decisions, solve problems, and learn—then applied those ideas by coding algorithms and developing smart games.



# Theory Topics Covered

We covered a wide range of AI topics, including:

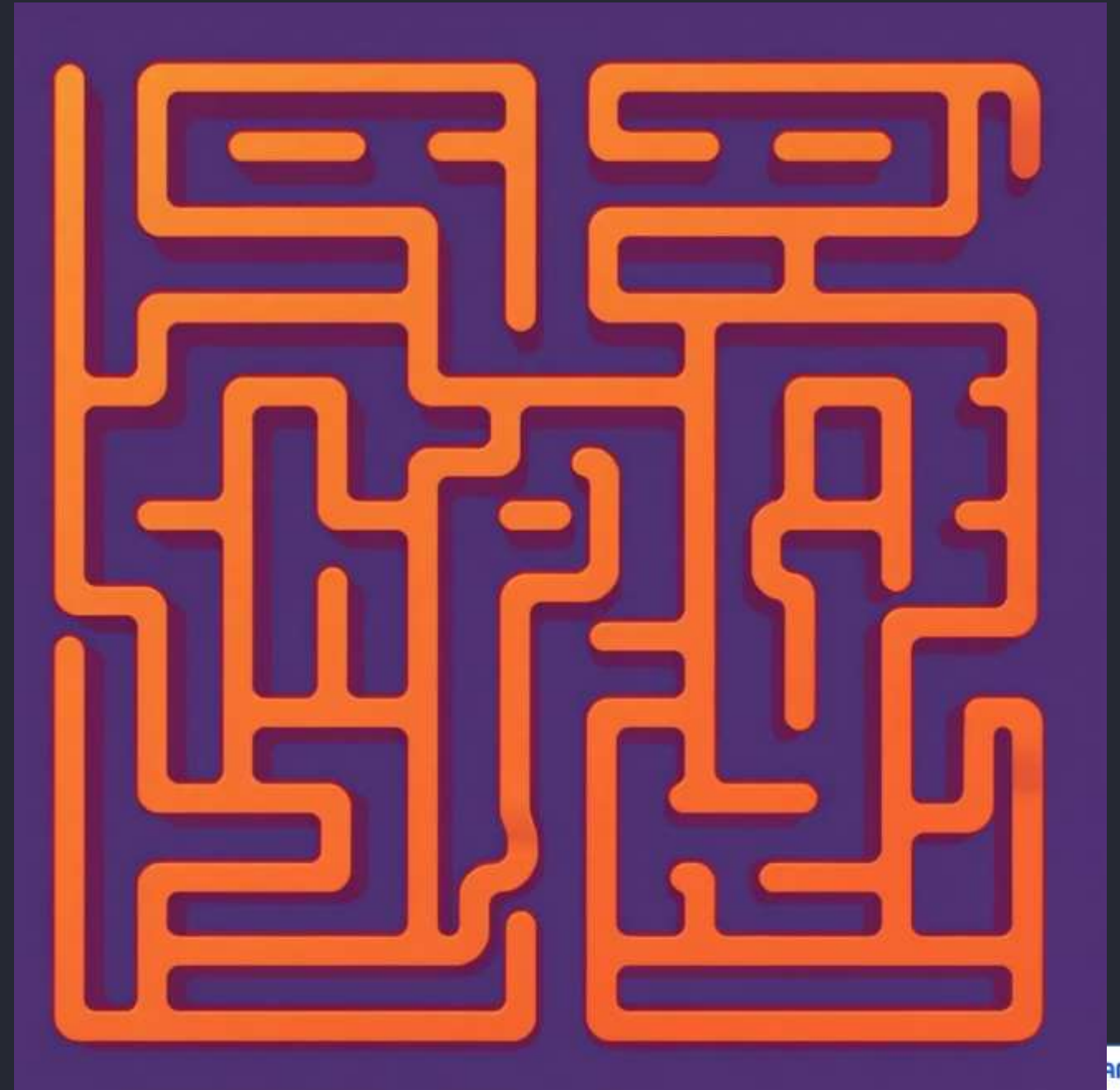
- Goals of Artificial Intelligence
- Types of intelligent agents
- Uninformed and informed search strategies
- Heuristics: 8-Puzzle, N-Queen
- Game algorithms: Minimax, Alpha-Beta pruning, IDS
- Constraint Satisfaction Problems and Cryptarithmic
- Branch and Bound
- Knowledge Representation and Reasoning
- Natural Language Processing (NLP)
- Robotics fundamentals



# Search Strategies in AI

We explored how AI solves problems through search.

Uninformed methods like BFS and DFS search blindly, while informed methods like A\* use heuristics to guide decisions intelligently. These concepts are essential for goal-directed behavior in intelligent agents.





# Heuristics and Puzzle Solving

Heuristics help AI choose smarter paths. We applied them to:



## The 8-Puzzle

where A\* quickly found optimal moves



## The N-Queen Problem

using backtracking with pruning

These examples showed how AI avoids brute-force and uses intelligent shortcuts.



# Game Search Algorithms

Game search algorithms brought strategy into play.



## Minimax

allowed AI to plan ahead in turn-based games



## Alpha-Beta pruning

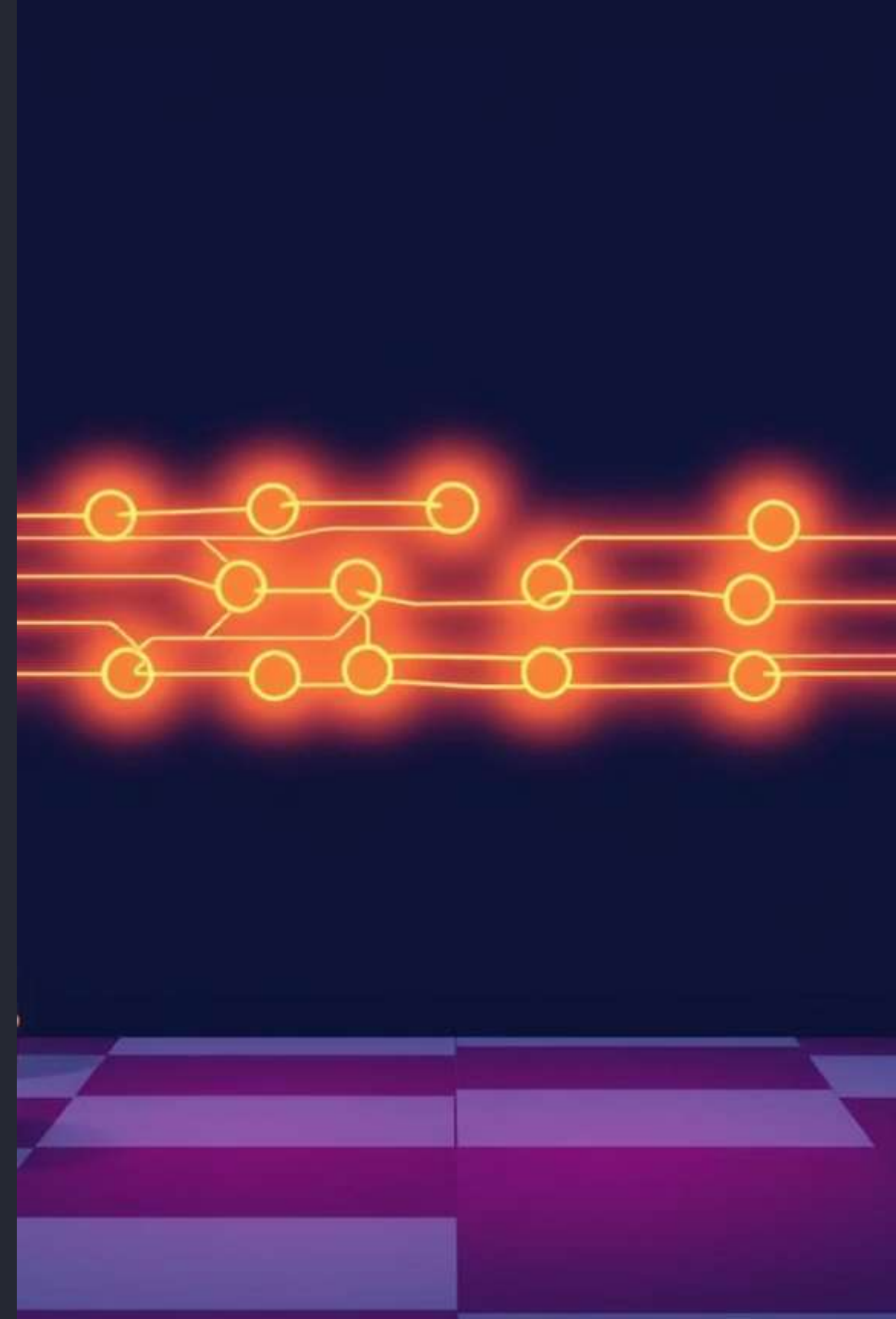
improved efficiency by cutting unnecessary branches



## IDS

helped us manage deep game trees

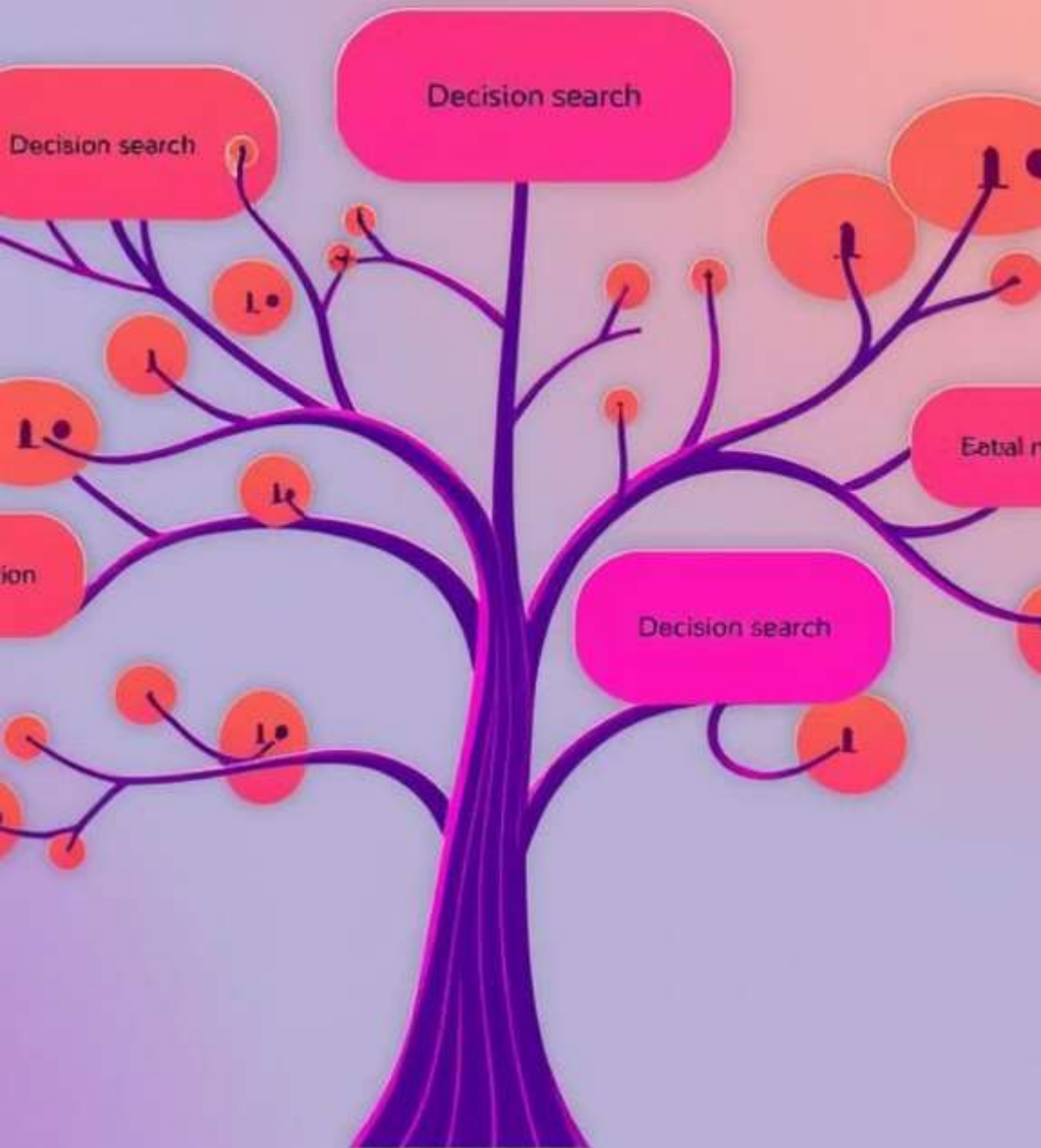
These are the brains behind many competitive AI agents.





# CSPs and Cryptarithmic

Constraint Satisfaction Problems taught us how to solve structured problems using rules and logic. We also solved Cryptarithmic puzzles by assigning digits to letters and ensuring consistency—a great way to apply CSP principles.



# Branch and Bound Algorithm

This optimization algorithm helped us discard poor choices early and focus only on promising paths. It's highly effective in reducing search time when solving puzzles or decision trees.



# NLP and Robotics



## Natural Language Processing

NLP showed us how AI can understand human language, like commands or conversations, enabling seamless interaction with intelligent systems.



## Robotics Fundamentals

Robotics connected AI to the real world, where sensors, actuators, and logic help machines act like intelligent beings, performing tasks autonomously.

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## Bringing AI to Life: Lab Highlights

Our lab tasks transformed theoretical concepts into practical action:

These hands-on experiences made AI real, testable, and exciting.



# Algorithm Implementation

We translated theoretical concepts into practical code, bringing AI algorithms to life. Each implementation included proper structure, logic, test inputs, and visual outputs.



## Clean Code Structure

Ensured well-organized, modular, and readable code for each complex algorithm.



## Robust Logic & Testing

Implemented core algorithm logic and validated performance with comprehensive test cases.



## Interactive Visual Outputs

Developed visual outputs to make abstract concepts more understandable and interactive.



# Game Logic & Learning Outcomes

I created AI-driven games including:



## Tic Tac Toe

Implemented with **Minimax** for optimal play.



## Chess

Featured simplified AI logic to manage complex moves.



## Connect Four

Utilized **heuristics** for strategic decision-making.

Through these, I learned how AI reacts, predicts, and adapts—just like a player.



# What I Learned

This course helped me turn logic into real solutions.



## Design Intelligent Behavior

Grasped how to conceptualize and implement decision-making processes for AI agents.



## Solve Complex Problems

Acquired skills in tackling intricate challenges using advanced AI algorithms and strategies.



## Create Smarter Systems

Developed practical expertise in coding and building intelligent, adaptable systems from the ground up.

# Conclusion

Thanks to our supervisor **Md. Razorshi Prozzwal Talukder**, for the continuous guidance.