🤖 Artificial Intelligence Course Overview: Exploring the Foundations of Intelligent Systems

Welcome to the Artificial Intelligence course experience! This presentation will provide an overview of the concepts, algorithms, and practical applications covered during the **Jan–June** 2025 session, led by instructor **Razorshi Prozzal Talukder.** Presented by **Oli Ahmed** (ID: **0562310005101019**).

🎯 Purpose of the Course: Unlocking AI's Potential

Understand AI Thinking

Explore how machines "think," perceive environments, and make intelligent decisions.

Develop AI Games

Build interactive, AI-powered games that demonstrate intelligent agent behavior.

Create AI Content

Utilize modern AI tools to generate visual and interactive digital content effectively.

Enhance Problem-Solving

Strengthen problem-solving skills by tackling real-world AI challenges and scenarios.

This course is designed to equip students with a comprehensive understanding of AI principles and practical skills for application.

Core AI Concepts & Agent-Based Modeling

Artificial Intelligence is a field dedicated to simulating human-like intelligence in machines. At its core, AI involves understanding how these machines can perceive their environment, process information, and make rational decisions to achieve specific goals.

Intelligent Agents

Agents are fundamental to AI, designed to perceive their environment through sensors and act upon it using effectors, aiming for optimal outcomes.

State-Space Search

Many AI problems are framed as state-space search problems, where the goal is to find a path from an initial state to a target state through a series of transitions.

Diverse Applications

These concepts are applied across various domains, including pathfinding (GPS navigation), strategic planning, complex decision-making systems, and Natural Language Processing (NLP).

🧠 Overview of Key AI Algorithms

Uninformed Search

Algorithms like Breadth-First Search (BFS) and Depth-First Search (DFS) explore states without prior knowledge of the goal's location.

Informed Search

A* Search and Best-First Search use heuristic functions to guide their search, making them more efficient for complex problems.

Local Search

Techniques such as Hill Climbing and Beam Search optimize solutions by iteratively improving a single state or a small set of states.

Adversarial Search

Minimax and Alpha-Beta Pruning are crucial for multi-agent environments where agents have conflicting goals, commonly seen in games.

Advanced Techniques

Other sophisticated algorithms, including AO* and Bidirectional Search, offer specialized solutions for various AI challenges.

🗺️ Favorite Algorithms We Explored

Minimax

Simulates an opponent's optimal moves in game theory, crucial for strategic decision-making in turn-based games.

Alpha-Beta Pruning

An optimization technique for Minimax that drastically reduces the number of nodes evaluated in the search tree, speeding up decisions.

A* Search

A highly efficient pathfinding algorithm that finds the shortest path between two points in a graph, widely used in navigation and puzzles.

Hill Climbing

A local search algorithm that iteratively moves towards a better solution, ideal for optimization problems where quick, but potentially suboptimal, moves are acceptable.

These algorithms are widely applied in pathfinding, robot navigation, and solving complex puzzles, demonstrating their versatility and importance in AI.

🎲 AI in Games: Strategic Decision-Making

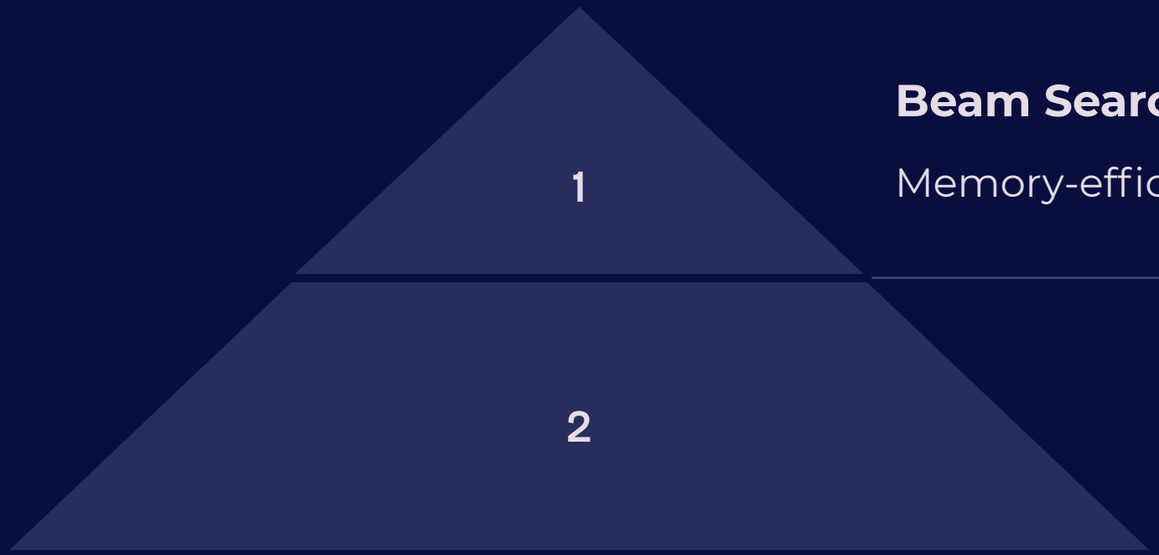
Game AI leverages sophisticated algorithms to create intelligent and challenging opponents.

- **Minimax:** Predicts the opponent’s best move and selects the optimal action to maximize the player's score, assuming the opponent plays perfectly.
- **Alpha-Beta Pruning:** An essential optimization for Minimax, it effectively prunes branches of the game tree that cannot influence the final decision, leading to faster gameplay.

💡 Common Applications:

- Tic Tac Toe
- Chess (Mini Version)
- Connect Four

⚙️ Optimization-Based AI Techniques



Beam Search

Memory-efficient, keeps the top 'k' most promising paths at each step.

Hill Climbing

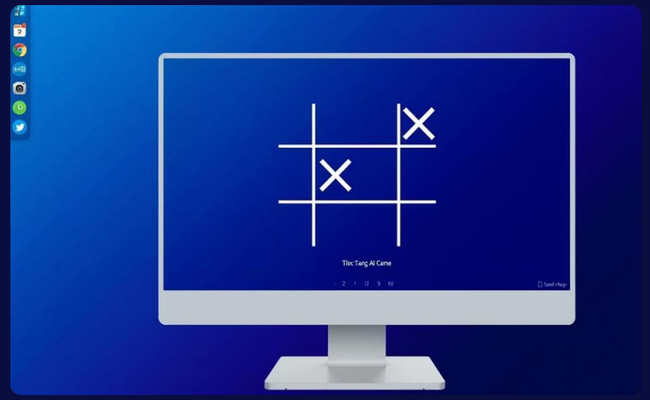
Chooses the best neighbor state, aiming for incremental improvement.

These optimization techniques are crucial for solving complex problems where finding the absolute global optimum is computationally expensive or impossible. They prioritize finding good, practical solutions efficiently.

🎯 Applications:

- Speech Recognition Systems
- Automated Planning and Scheduling
- Optimizing Large Game States
- Solving Combinatorial Optimization Problems

🕹️ AI Games Developed

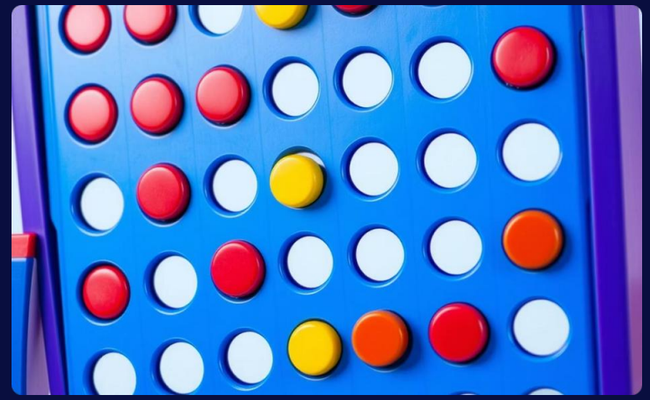


🎮 Tic Tac Toe

Developed with a Python GUI, this game features an unbeatable AI powered by the Minimax algorithm, ensuring strategic depth.

♟️ Chess (Mini Version)

A simplified Chess game implemented in Python, featuring Alpha-Beta pruning for an intelligent and challenging AI opponent.



🔴 Connect Four

Built with a heuristic-enhanced Minimax strategy, this game includes robust win detection across horizontal, vertical, and diagonal lines.

🔑 Features Across All Games:

- Human vs. Computer gameplay mode
- Authentic AI decision-making processes
- Intuitive Graphical User Interfaces (GUI)
- Well-documented code with clear comments

🛠️ Tools Used & Key Learning Outcomes

📦 Tools & Platforms

- **Python:** Core language for AI logic and game development.
- **Tkinter GUI:** For creating interactive game interfaces.
- **GitHub:** Version control and project collaboration.
- **AI Slide Generators (Canva, Gamma):** For presentation design automation.
- **AI Video Creators (Pictory, Invideo AI):** For multimedia content production.

🚀 Key Learnings

- Successfully implemented real-world AI algorithms, bridging theory and practice.
- Applied AI principles directly into game logic, creating intelligent opponents.
- Mastered professional documentation and showcasing of AI projects.
- Gained significant confidence in solving complex, logic-based problems through AI methodologies.

🙏 Conclusion & Acknowledgement

This Artificial Intelligence course has been a truly transformative journey. From exploring core concepts like search strategies and heuristic planning, to developing interactive games with real AI logic, I have acquired a robust set of skills that seamlessly bridge theoretical knowledge with practical application.

✅ I am grateful for the invaluable support and profound insights provided by our esteemed supervisor, **Razorshi Prozzal Talukder**. His guidance has been instrumental in navigating the complexities of AI.

🎓 This course has not only deepened my understanding of Artificial Intelligence but also empowered me with the courage and capability to create, present, and boldly dream within the ever-evolving landscape of AI.