**LAB LOGBOOK:**

***Week 1: Uses of AI in Games:***

* **NPC behaviors:** Pathfinding (A\* algorithm) and decision trees

Advantages: Creates immersive gameplay environments and characters

Disadvantages: Every character “state” needs to be coded

* **Procedural Generation:** Terrain generation, quest generation, narratives. EG (No Man’s Sky planets, PEAK Mountains, Binding of Isaac floors)

Advantages: Low effort to implement, adds replayability

Disadvantages: Less control over game cycle.

* **Adaptive Difficulty (Reinforcement Learning):** (Learning from the players actions and adjusting the difficulty accordingly)

Advantages: Increases player satisfaction.

Disadvantages: Needs to be balanced correctly. Could result in inconcistant spikes in difficulty. Hard to transfer to other games.

* **Using AI in testing:** AI can act as players and help to indentify bugs or flaws in the game. Can be automated.

Advantages: Reduces playtesting time.

* **Genetic Algorithms (GAs):** Similar to natural selection, AI is guided to optimal strategies by a scoring system, dropping ineffective strategies after sucessive generations.

Disadvantages: Suffers from premature convergence: (where an algorithm stops at a suboptimal solution rather than looking for the better option).

* **Neuroevolution of Augmenting Topologies (NEAT):** A development of GAs, which has flexible topologies allowing modification of network structure and connections. Nodes can be randomly added or remove and this change can stay if it proves beneficial.

Advantages: Highly effective for gameplay optimisation and real-time decision making.

Issues for AI:

* **Time and Space Resources:** AI is very complex which can lead to performance issues. Multiplayer games need to have uniform experiences for players.
* **Balanced AI Difficulty:**  Need to create an opponent that is competitive enough to provide a challenge but not to feel as if they are cheating.
* **Ethics:** AI needs to not be prejudice, stereotypical or discrminative when making decisions. AI personilisation can have privacy issues.

**Citations:**

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| **Date cited:** | **Citation** |
| **2/10/25** | *A. Waghale, N. Potdukhe and R. Rewatkar, "AI in Gaming: From Simple Algorithms to Complex Agents," 2024 2nd DMIHER International Conference on Artificial Intelligence in Healthcare, Education and Industry (IDICAIEI), Wardha, India, 2024, pp. 1-5, doi: 10.1109/IDICAIEI61867.2024.10842756. keywords: {Ethics;Video games;Machine learning algorithms;Reviews;Entertainment industry;Games;Virtual reality;Artificial intelligence;Protection;Testing;Game AI;Pac-Man;Video Games;3D Gaming;Virtual Reality (VR);competition},*  [*https://ieeexplore.ieee.org/document/10842756*](https://ieeexplore.ieee.org/document/10842756) |
| **2/10/25** | *V. Kumar, D. Tyagi, A. Kannaujia and I. Mittal, "Advancing Game AI: A Study on Genetic Algorithms and Neuroevolution," 2025 12th International Conference on Computing for Sustainable Global Development (INDIACom), Delhi, India, 2025, pp. 1-4, doi: 10.23919/INDIACom66777.2025.11115524. keywords: {Training;Automation;Network topology;Neural networks;Games;Switches;Machine learning;Topology;Genetic algorithms;Testing;Genetic Algorithm;NEAT;Machine Learning;Game AI},*  [*https://ieeexplore.ieee.org/document/11115524*](https://ieeexplore.ieee.org/document/11115524) |
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