

# PROJECT PROPOSAL

## SYSTEM OVERVIEW

**GOLAGULI** is a 2D platformer procedural shooter where **2 AI agents** operate in an environment defined by scarcity and incomplete information. Each match is procedurally generated, ensuring non-deterministic gameplay. AI agents must gather resources, craft upgrades, navigate terrain, and engage enemies while reacting to probabilistic sensor data.

## ARTIFICIAL INTELLIGENCE DESIGN

### FINITE STATE MACHINE

The primary behavioral logic of the AI agent is implemented using a **Finite State Machine** (FSM). The FSM evaluates the game state at fixed time intervals and transitions between states such as

- FIGHT
- FLEE
- SCAVENGE
- EAT
- UPGRADE.

Each state is triggered by explicit conditions involving health, ammo availability, inventory status, and confidence values using **fuzzy decisions**.

### COMBAT DECISION MAKING

When combat conditions are met, the AI employs a **Minimax algorithm** with a limited lookahead depth. The evaluation function considers multiple weighted factors including health differential, ammunition count, positional advantage, and agent personality parameters. This allows the AI to select actions that maximize survivability and combat effectiveness.

### VISIBILITY AND UNCERTAINTY MODELING

A confidence-based visibility system is used instead of absolute perception. The AI estimates enemy position using sonar-like directional data. At high confidence levels, precise targeting is possible, while low confidence restricts the AI to suppression or defensive behavior. This design enforces realistic decision-making under uncertainty.

### NAVIGATION AND PATHFINDING

Navigation is handled using the **A\* path-finding** algorithm on a tile-based map. Movement costs are dynamically assigned based on terrain type, encouraging efficient route selection.

### ECONOMIC AND SURVIVAL SYSTEMS

The game economy is divided into industrial and biological layers. One focuses on scrap collection and weapon upgrades, while the other manages health regeneration through consumables. AI agents must balance risk and reward when gathering resources, often making trade-offs between safety and progression.

## WINING CONDITION

When one agent's health drops below 0, the game ends and the other player wins .