

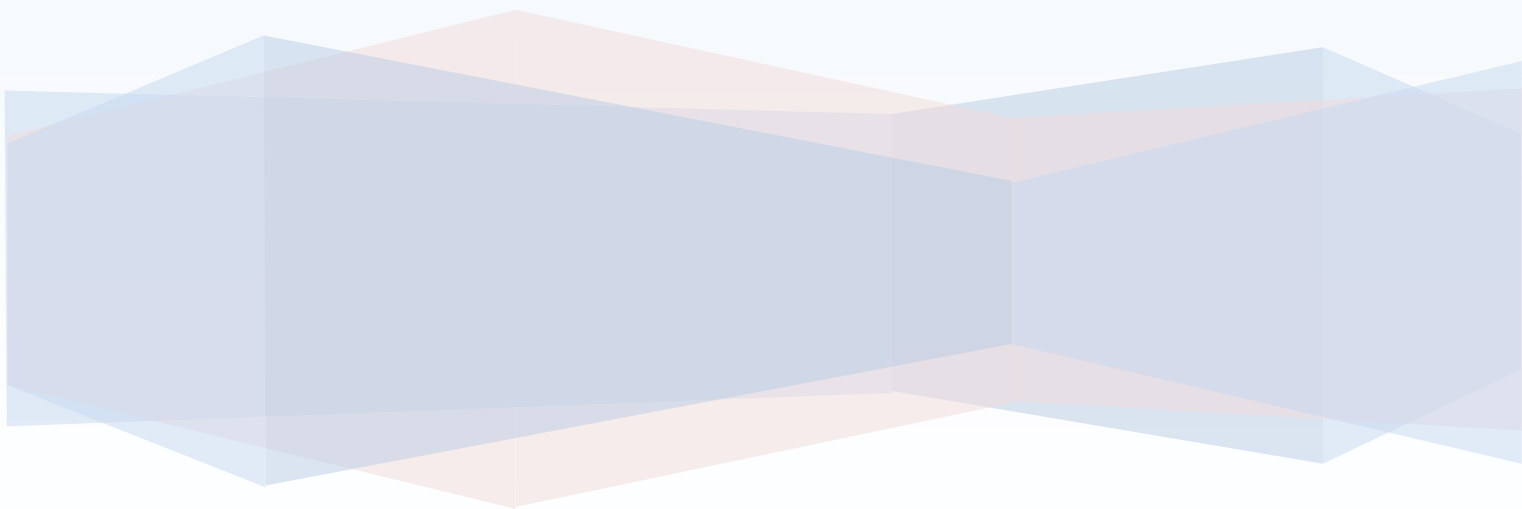
# COS30002 Artificial Intelligence for Games

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*Semester 1, 2025*

*Learning Summary Report*

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# Declaration

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I declare that this portfolio is my individual work. I have not copied from any other student's work or from any other source except where due acknowledgment is made explicitly in the text, nor has any part of this submission been written for me by another person or software service.

Signature: Marco Giacoppo

## Self-Assessment Details

The following checklists provide an overview of my self-assessment for this unit.

	Pass (P)	Credit (C)	Distinction (D)	High Distinction (Low HD)   (High HD)	
Self-Assessment (please tick)		✓			

*Self-assessment Statement*

	Included? (tick)
Learning Summary Report	✓
Complete Pass ("core") task work, approved in Canvas	✓

*Minimum Pass Checklist*

## Introduction

This report summarises what I learnt in COS30002 AI for games. It includes a self-assessment against the criteria described in the unit outline, a justification of the pieces included, details of the coverage of the unit intended learning outcomes, and a reflection on my learning.

## Overview of Pieces Included

This section outlines the pieces that I have included in my assignment...

*Describe the pieces you have included in your assignment.*

*This should contain a **list** of all the pieces, along with a short statement of **why** each piece was included.*

- **Assignment 1 Task 01: Lab - Bitbucket Setup**
  - Set up source control using Bitbucket, essential for managing code versions.
- **Assignment 1 Task 02: Lab - FSM & Python**
  - Implemented basic Finite State Machines (FSM) to understand AI state control.
- **Assignment 2 Task 1: Lab - Tic-Tac-Toe**
  - Developed a simple AI using basic decision-making strategies.
- **Assignment 2 Task 2: Spike - Graphs, Search & Rules**
  - Explored graphs and implemented early search algorithms like DFS and BFS.
- **Assignment 3 Task 1: Lab - Graphs, Paths & Search**
  - Applied advanced graph-based pathfinding algorithms (including A\* and GBFS).
- **Assignment 3 Task 2: Spike - Navigation with Graphs**
  - Implemented pathfinding in dynamic environments using graphs.
- **Assignment 4 Task 1: Lab - Goal Oriented Behaviour & SGI**
  - Created agents using Simple Goal Insistence models.
- **Assignment 4 Task 2: Spike - Goal-Oriented Action Planning (GOAP)**
  - Developed agents capable of planning optimal action sequences to meet goals.
- **Assignment 5 Task 1: Lab - PlanetWars**
  - Built tactical AI agents for a real-time strategy game environment.
- **Assignment 5 Task 2: Spike - Tactical Analysis with PlanetWars**
  - Combined multiple AI techniques to analyze and improve tactical performance.

## Coverage of the Intended Learning Outcomes

This section outlines how the pieces I have included demonstrate the depth of my understanding in relation to each of the unit's intended learning outcomes.

### ILO 1: Software Development for Game AI

*"Discuss and implement software development techniques to support the creation of AI behaviour in games"*

I demonstrated this by structuring my code into modular, reusable components across all labs. The PlanetWars project, in particular, required me to design tactical modules, clearly showcasing structured AI development suitable for a game environment. (Assignment 1 Task 2, Assignment 5 Task 1&2)

### ILO 2: Graphs and Path Planning

*"Understand and utilise a variety of graph and path planning techniques."*

This was addressed through the Graphs, Search & Rules spike and Graphs, Paths & Search lab, where I implemented DFS, BFS, GBFS, and A\* algorithms. The Navigation with Graphs spike further demonstrated practical application of pathfinding in dynamic spaces. (Task 3 Tic Tac Toe, Assignment 2 Task 2, Assignment 3 Task 1)

### ILO 3: Force-based Agent Movement

*"Create realistic movement for agents using steering force models."*

Although my main focus was on strategic AI, the concept of movement and dynamic decision-making was present in the Steering project, where agents had to move tactically across the map. ( Task 10, and Task 11)

### ILO 4: Goals and Planning Actions

*"Create agents that are capable of planning actions in order to achieve goals."*

Labs and spikes related to Goal-Oriented Behaviour (SGI) and GOAP showed my ability to design agents that autonomously plan sequences of actions to achieve objectives, selecting actions dynamically based on the environment. (Assignment 4 Task 1, Assignment 4 Task 2)

### ILO 5: Combine AI Techniques

*"Combine AI techniques to create more advanced game AI."*

In PlanetWars, I combined path planning, decision-making, and tactical analysis to develop agents capable of making strategic moves. This integrated multiple AI concepts into a single complex behaviour. (Assignment 5 Task 1&2)

## Reflection

### The most important things I learnt:

Throughout the semester, I learned how to develop AI agents from scratch, starting with basic finite state machines (FSM) and building up to goal-planning and tactical AI. Understanding how each layer of AI (planning, movement, decision-making) fits together was a major learning milestone for me.

### The things that helped me most were:

The labs and spike tasks were extremely helpful. All the sample codes and comments helped a lot and just made the concepts much clearer compared to just reading theories. Joining the discord server was a big help as well.

### I found the following topics particularly challenging:

At first, I found combining multiple AI techniques together quite challenging. It was hard to get agents to both plan strategically and move efficiently without bugs or conflicts in behaviour. Balancing this took time.

### I found the following topics particularly interesting:

I found PlanetWars lab particularly interesting. Building agents that could think ahead and adapt strategies based on dynamic conditions was very challenging, but rewarding in the end.

### I feel I learnt these topics, concepts, and/or tools really well:

Working on PlanetWars was a key highlight for me. It was my first time building a tactical AI system purely using Python. I learned a lot about managing complex agent behaviors and building strategic decision-making from scratch.

### I still need to work on the following areas:

I need to improve how I combine multiple AI systems more seamlessly, especially for real-time games. In the PlanetWars project, I sometimes struggled to make my agents flexible enough without overcomplicating the code.

### My progress in this unit was ...:

I feel that my progress was steady. I consistently submitted lab work and engaged with the spike tasks, although sometimes I needed extra time to fully understand the more complex tasks. Overall, my understanding deepened over the semester, and I'm happy with my development.

### This unit will help me in the future:

The techniques I learned in this unit will be useful for future game development or AI-heavy projects. Understanding how to design all of this will help me in my future plans for developments.

### If I did this unit again I would do the following things differently:

I would start the spike tasks earlier and spend more time experimenting with optional challenges.

## Conclusion

In summary, I believe that I have clearly demonstrated that my submission is sufficient to be awarded a Credit grade.