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School of Electrical Engineering and Computer Science

**DECO3801/DECO7381 Team Assessment Declaration Cover Sheet Course Code: DECO3801**

**Coursework Item:** AI-Controlled Player for shapez

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| **Team Name: Temu** |  |  |
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**The use of the following is permitted on this course only with full disclosure of how it was used and with proper attribution, you must make clear what is your teams and/or your own work:**

* Opensource code and libraries (excluding previous DECO projects).
* Open data sets.
* Royalty free, free to use icons, images.
* Use of generative AI code generation tools such as Copilot and others.
* Use of generative AI tools such as ChatGPT to assist with essay writing (but only with a complete list of the prompts used).
* Use of AI grammar checkers.

Please confirm each statement by ticking the boxes before signing the bottom of this sheet. Please note that if a team member does not agree and doesn’t sign off on the final submission of the assessment item, they must attach a statement explaining their reasons.

We declare that:

1. All team members confirm and acknowledge they have signed off on the submission of this work. Each team member agrees that:
   1. The work submitted accurately represents the work of the team. ☐



* 1. Changes to the final submission have not been made without approval from the entire team.

1. This work, except where otherwise indicated and fully attributed, is our own

original work. ☐



1. This work has not been submitted for any degree or examination at any other

university and/or for any other course at UQ. ☐



1. This work does not contain any other persons’ work, opensource work, and/or generative Artificial Intelligence (AI) code, data, images, graphs, tables, or any other information that has not been clearly disclosed and attributed in the ☐ appendix. Where these have been used then:



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* 1. They are fully listed and acknowledged in the appendix.
  2. Where generative AI has been used to aid code generation, the full set of prompts used are fully disclosed in the appendix.

1. This work does not contain other persons’ and/or generative AI writing, unless specifically acknowledged as being sourced from other sources. Where other written sources have been quoted, then:
   1. Their words have been re-written, but the general information attributed

to them has been referenced. ☐



* 1. Where their exact words have been used, their writing has been placed inside quotation marks, and referenced.
  2. Where generative AI has been used to aid writing, all prompts used are fully disclosed in the appendix.

1. We have checked this work to ensure that there are no instances of academic

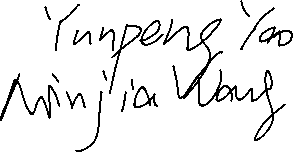
misconduct, including plagiarism herein. ☐



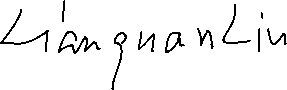
The University defines Academic Misconduct as involving ‘a range of unethical behaviours that are designed to give a student an unfair and unearned advantage over their peers’. The University takes Academic Misconduct very seriously and any suspected cases will be investigated through the University’s standard [policy.](https://ppl.app.uq.edu.au/content/3.60.04-student-integrity-and-misconduct)



We hereby declare that we understand the meaning of academic misconduct and recognise that the submission of work for assessment that includes instances of academic misconduct is an offence that may result in disciplinary action being taken against us.



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**Statement Of Work**

**Team name:** Temu

**Team leader:** Yize Xue

**List of team members:**

|  |  |
| --- | --- |
| Team member name | skill |
| Yunpeng Yao | Python programming skills and data analysis skills  Using NumPy, pandas, matplotlib. |
| Hantian Yu | Python programming and be familiar with ctypes in Python library to design interface |
| Hanxi Shen | Basic programming skills (C++ and Python), design interface experience |
| Yize Xue | Basic graph algorithm (Dijkstra, A\*) and AI knowledge (DQN, MDP, gymnasium) |
| Minjia Wang | Python programming skills with AI knowledge |
| Lianquan Liu | Front-end design experience  Experience about Figma  Python programming experience |

**Outline of our project:**

This project is mainly divided into three parts,

1. **game automation**
2. **AI research and training**
3. **User Interaction and Data Analysis**

1 for game automation, we decided to use the Python library function ctypes to write the script, which will pass the map composed of a two-dimensional array and the running status of the C++ game to the AI. Finally, we will use g++ to compile it into a dynamic link library so that it can be called by other programs.

2. I chose Figma for front-end design due to my prior experience, as its intuitive interface is perfect for creating and iterating on simple flat designs efficiently. I'm also using Figma and Python to develop the front-end page for game automation.

3. For AI training, as it need to have real-time decision making, we must use reinforcement learning like PPO (Proximal Policy Optimization) or DQN (Depp Q-network) to finish this task.

Meanwhile, we can use matplotlib to judge which algorithm performs better.

4. For data analysis, we will try to find the data of two AI playing the game and doing the data visualization using NumPy, pandas, matplotlib.

**Timeline:**

|  |  |  |
| --- | --- | --- |
| Phase 1 | Week 2 to 4 | allocate team members’ tasks, finish SOW. |
| Phase 2 | Week 4 to Week 6 | Minjia Wang && Yize Xue:Learning the basic reinforcement learning knowledge to prepare AI designing implement basic AI algorithm for examples from gym.  Yunpeng Yao: learning the  basic skills for game visualization, and know well with the shapez source code.  Lianquan Liu: Refine wireframes and create detailed mockups in Figma.  Hanxi Shen && Haotian Yu: research what skills should use in game automation  Prepare for the presentation. |
| Phase 3 | Week 6 to Week 8 | Minjia Wang && Yize Xue: design the AI and implement them in the game via the game automation tool.  Hantian Yu && Hanxi Shen: develop the game automation tool.  Yunpeng Yao: try to fetch data of game with source code, learning how the AI agent work  Lianquan Liu: Set up the front-end framework in Python.  Hanxi Shen && Haotian Yu: use skills in game automation to realize interface between AI and game basically |
| Phase 4 | Week 8 to Week 10 | Minjia Wang &&Yize Xue: Finish AI and game automation development, try to use AI agent to play the game via the automation tool.  Design the User interaction Analysis module to compare the performance of different AI.  Lianquan Liu: Make any last-minute adjustment based on feedback.  Hanxi Shen && Haotian Yu: use skills in game automation to realize interface between AI and game completely  Yunpeng Yao: Design the AI evaluation system. |
| Phase 4 | Week 11 to Week 13 | Improve AI and algorithm based on the evaluation result, finish the whole project. |

**Project Milestone:**

1: Project Planning and SOW completion (End of week 4)

2: Research AI and automation knowledge about this, design and implement basic game automation module and AI module. Prepare for the presentation (End of week 6)

3: Finish the game automation part, use AI agent to play the game (End of Week 8)

4: Design the AI evaluation system and compare different algorithms’ performances, design the user interaction module (if possible) (End of week 10)

4: Design the visualization tools, finish the whole project and submit the code,

Prepare the team documentation, the explainer video, and the individual reflection (End of Week 12)

5: Check if there is any miss in the project, submit the team documentation and the explainer video. Submit the individual reflection (End of week 13)

**Project deliverable:**

1: **Game Environment Module**: This includes the front-end design of Shapez, featuring item and background images, as well as the back-end design which encompasses the game logic.

2: **Real-Time Decision Making & Optimization Algorithms**: We will implement both the DQN and PPO algorithms and compare their performances. In the DQN implementation, the strategy will be optimized based on the experience replay buffer.

3: **Visualization Tools**: We will use time and matplotlib library to show and compare the efficiency of different strategies.

**Team Assumptions:**

1: Technical issues will be resolved in a timely manner.

2: The project's progress will remain on schedule without any delays.

3: Sufficient Computational Resources for AI training.

4: No major disruptions will occur; all team members will have adequate time to contribute effectively to the project.

**Team members’ task:**

Game automation and evaluation system front-end design: Lianquan Liu

Game automation back-end design: Hantian Yu, Hanxi Shen.

AI training and algorithm implementation: Yize Xue, Minjia Wang

AI evaluation system design and user interaction module: Yunpeng yao

**Potential risks:**

1. **Project management risks:**

If we cannot finish the game environment on time, this will affect project process a lot and as a result, People who are responsible for designing AI for this project may not have enough time to do it.

1. **Resources risks:**

In this project we will use reinforce learning algorithm like DQN to training AI which require a lot of computing resources, if it takes too much time it will lead to a failure.

**Risk matrix:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RISK ID | Risk Description | Likelihood | Severity | Priority | Mitigation Measures |
| 1 | Technical issues may not be resolved in a timely manner | Medium | High | High | Regularly review project progress, ensure timely and effective technical support, and establish fallback technical solutions. |
| 2 | Project progress may be delayed | Low | |  | | --- | | High |  |  | | --- | |  | | Medium | Adopt agile management methods, enhance progress monitoring, and adjust resource allocation as needed. |
| 3 | Insufficient computational resources for AI training | Medium | Medium | Medium | Pre-assess resource needs, prioritize resource allocation for critical tasks. |
| 4 | Major disruptions occur, affecting team members' contributions | Low | Medium | Low | Develop flexible work schedules, enhance team communication and collaboration, and prepare contingency plans. |
| 5 | AI decision-making may lead to unethical outcomes | Low | High | High | Implement fairness checks in AI algorithms, conduct regular ethical reviews |
| 6 | Improper handling of data may lead to privacy violations | Medium | High | High | Comply with data privacy regulations. |
| 7 | Unauthorized access to AI systems may lead to security problems | Low | High | High | Conduct regular security audits and monitor improper attempts |

**Collaboration plan:**

Our team has established a comprehensive collaboration plan to ensure effective communication and project progress. We designate Fridays as our primary working day, discussing and resolving project-related tasks. Additionally, we have also allocated Sunday afternoons from 1:30 PM to 5:30 PM for further collaboration.

To maintain consistent and timely communication, we use WeChat as our main communication tool, ensuring that all team members can respond to messages within an hour, seven days a week. This allows us to address issues promptly and stay aligned with project developments. We also make use of Microsoft Teams for more structured communication and formal discussions.

Task management and progress tracking are handled via Trello, where we regularly update our weekly goals and tasks that have been completed. This ensures that everyone has a clear understanding of the current progress and upcoming responsibilities.

For code sharing, we use GitHub which allows all team members to access the latest codebase and maintain transparency in the development process. By leveraging these tools, we aim to foster a collaborative environment that supports efficient project completion.