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**Stage 2 Research Project: 2024 Topic Approval Form**

**Name: Malachi Halliwell Class: 11Wh**

What is your proposed Research Project topic question? *Write the question below.*

How can I design and train a machine learning algorithm that can effectively and consistently balance a pendulum on a moving cart in a 2d physics simulation

What are the main subtopics/aspects of your project? *These can be questions or dot points.*

**1.** What is the best way to go around developing a physics simulation for my specific use case

**2.** How do I build a 2d pendulum and moving cart simulation in my chosen method

**3.** What is a machine learning algorithm (MLA) and how does it learn

**4.** How can an MLA be applied to my pendulum simulation

**5.** How does an MLA learn to balance a pendulum and how good is it at doing so

**6.** How long does an MLA take to learn a simple task/some form of time analysis?

Why did you choose this topic for your Research Project?

**1.** I think MLAs are very interesting and I want to learn more about them/how to apply them in applications where they could be useful

**2.** Additionally I want to learn how to program a simple physics simulation

**3.** I also really enjoy programming and learning to code new things

Which Capability/Capabilities will you develop in the Research Project and why? *See Student Guide*

**Information and Communication Technology** – A significant section of my RP will be programming and implementation of what I will research.

**Critical and Creative Thinking** – Apart from derived formulas, a rendering engine and an MLA library, most of the programming will be my own work. I will also be finding some training methods via the internet, however will create my own as comparisons that I expect could work well

Describe the main **research processes** you will use in your research project. *You must provide at least 3 types of research that you intend to undertake. You must also be specific – do not just write “I will do an interview/survey/find a mentor” you must be able to identify who you think you will interview/survey/select as a mentor*

**1.** I will do an interview with a lecturer from Adelaide University or University of South Australia

that teaches AI technology or MLAs and how to effectively train one, in addition to how to accurately build a 2d pendulum physics simulation.

**2.** I will search through archival research for examples of people doing similar things and understanding why their training methods worked the way they did or how their simulations work

**3.** I will make an MLA and physics simulation with various different training methods

**4.** I will get feedback from peers/lecturers about the realism and validity of the physics simulation in order to confirm its accuracy compared to a real world environment

What type is your Research Outcome likely to be?

By doing <training method> as a training method for an MLA, I can design an MLA and train it to balance a pendulum in a given time frame, which it does quickly and effectively.

How will you ensure that your research is ethical? *(“Does no harm” – Think about your own safety, the safety of others, hazards and risks: Think about confidentiality and privacy: Think about plagiarism and referencing: Think about offending others: Think about the nature of your proposed topic)*

In programming, the primary ethical risk is plagiarism and breaking copyright liscencing. Some

projects maybe open source (source code free for the public) but may have a liscence preventing

anyone from modifying the code, whether it be personal or public use. In order to remain ethical, I

will have to investigate the liscences of each program’s source code that I use as a reference or

other similar fashion in my research. Some projects may also be closed source (source code is not

publically available), which I have to be careful about researching each project and its source

because it could be an illegally decompiled version which displays itself as an original.

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**Topic Approval 2024**

[ ] Topic Approved

[ ] Provisional Approval\*(*Details:* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

[ ] Not Approved\* (*Details:* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

*\*You will need to resubmit another Topic Approval form*

Signed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Research Project Teacher)