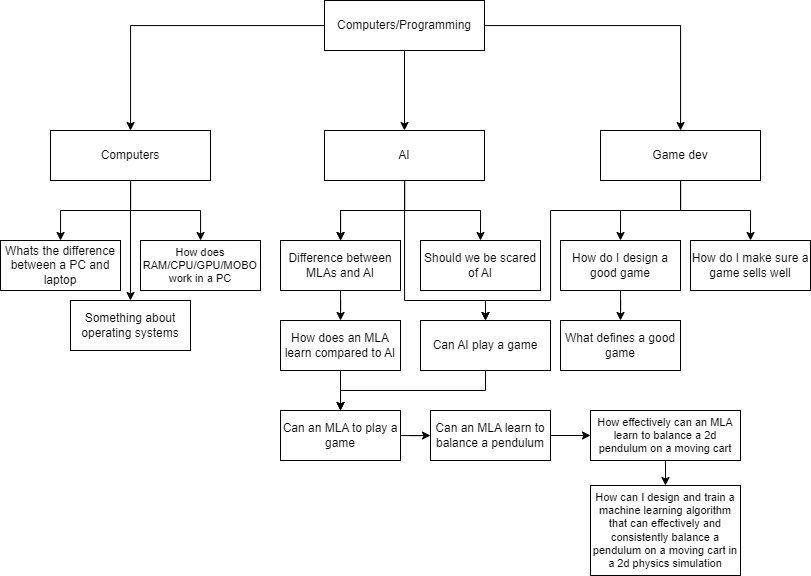
![A white background with black dots

Description automatically generated](data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAAE0AAABOCAYAAABlnZseAAAAAXNSR0IArs4c6QAAAARnQU1BAACxjwv8YQUAAAAJcEhZcwAADsMAAA7DAcdvqGQAAAC7SURBVHhe7dCxAYAwDMCwlP9/hg48EM/S4t3nvYaV5y8LpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpq3NfDrYBJgn4mvoAAAAAElFTkSuQmCC)![A white background with black dots

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Description automatically generated](data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAAE0AAABOCAYAAABlnZseAAAAAXNSR0IArs4c6QAAAARnQU1BAACxjwv8YQUAAAAJcEhZcwAADsMAAA7DAcdvqGQAAAC7SURBVHhe7dCxAYAwDMCwlP9/hg48EM/S4t3nvYaV5y8LpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpq3NfDrYBJgn4mvoAAAAAElFTkSuQmCC)![A white background with black dots

Description automatically generated](data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAAE0AAABOCAYAAABlnZseAAAAAXNSR0IArs4c6QAAAARnQU1BAACxjwv8YQUAAAAJcEhZcwAADsMAAA7DAcdvqGQAAAC7SURBVHhe7dCxAYAwDMCwlP9/hg48EM/S4t3nvYaV5y8LpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpgWmBaYFpq3NfDrYBJgn4mvoAAAAAElFTkSuQmCC)When deciding on a topic for my research project, I had 3 general topics that I wanted to investigate. These were computers, AI and game design. I had decided on these because I am very interested in all 3, and have been interested in most of them since a young age.

Recently with the AI boom, I was inspired to look deeper into AI and similar digital structures. I ended up developing more questions in the AI branch than any others (*figure 1*). However, I incorporated game development into some of my AI questions which helped guide me to my final question.

Ultimately, I believe it was a good idea to not follow into computers or game development as computers would be either very simple (Whats the difference between a PC and laptop) or very in depth and would take far longer to make (How does an OS work). It’s a similar story for game development, as designing a “good game” is not a simple answer, no matter how specific the question is. Making sure a game sells well is also something that cannot be completed in the given time frame for the research project, as it would likely take at least 12 months of analysis to be worthwile. (*figure 2*).

***Figure 1*** *– Thinking process and question development mindmap.*

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| --- | --- | --- |
| **General Topic** | **Strengths** | **Weaknesses** |
| Computers | * Wide range of topics * Career applicable knowledge | * Most options are either too easy or too hard to answer in a research project |
| AI | * Developing field of science * Applicable in other fields of knowledge | * Computer resource intensive * Technical knowledge barrier |
| Game development and design | * Largest interest of mine * Most creative options | * Timeframe is too large for RP * Games are difficult to develop |
| ***Figure 2*** *– Table consisting of strengths and weaknesses of general research topics* | | |

An interest in AI for me is the area of Machine Learning Algorithms (MLAs), which arent technically AI, but instead are closer to complex mathematical functions that turn some input values into output values.

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| **Questions** | **Strengths** | **Weaknesses** |
| Can AI learn to play games | * Combines 2 interests for me | * Closed question * Too broad, not specific |
| Can an MLA learn to balance a pendulum | * Slightly more specific * Gives me knowledge in how to apply MLAs in other situations | * Closed question * Unclear whether real world or simultaed pendulum * Requires running an MLA and potentially a physics simulation (very time and computer resource intensive) |
| How effectively can an MLA learn to balance a 2D pendulum on a moving cart | * Very specific * Gives me knowledge in how to apply MLAs in other situations | * Requires running an MLA and potentially a physics simulation * Unclear whether simulated or real world pendulum |
| **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** | * Very Specific * Gives me knowledge to apply in other applications * Directly explains the context of the simulation * Explains it is simulated and not real world | * Needs a physics simulation * Requires running an MLA over some times |
| ***Figure 3*** *– Table consisting of strengths and weaknesses of research question options* | | |

Learning how to apply MLAs has become a recent specific interest of mine, but they can be very indepth, and it can be difficult to apply them succesfully to have the intended result. Because of this, I have decided to to learn how to apply an MLA to a simple physics simulation and analyse its “learning” to figure out the best way to train an MLA for a specific use case.

Over the course of the research project, I will be developing my *Information and Communication Technology* skills and my *Critial and Creative Thinking*. This is because a significant portion of my research will be running and potentially programming a physics simulation that an MLA can learn from. Whether I use a pre-built simulation or start one from scratch, I will need to understand how an MLA works so I can pass in certain parameters so it can learn effectively. Additionally, I will have to think critically about what paramaters to pass in. I will also not be copying any code from others, meaning that I will have to think creatively about how I am going to approach a problem in the code.

My audience should be interested in learning how machine learning algorithms actually work, similar to myself. They would be interested in how they can apply this knowledge within their own programs or applications. My findings will be analytical over several different training methods, showing how each one would function and which is best for my use case. This can be helpful for my target audience analyse which method they should use for their own application.

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| --- | --- |
| **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**  ***Figure 4*** *– A table consisting of subquestions* | How can I use or build an accurate 2D simulation that models a cart pendulum system realistically |
| What are the fundamental concepts and ideas of MLAs, and how do they learn |
| How can I design the learning function of, and apply an MLA into my chosen cart pendulum simulation |
| How can I train and test an applied MLA to my cart pendulum simulation, ensuring it effectively and consistently balances the pendulum |

**EXPLAIN HOW I CAME TO THESE SUB-QUESTIONS**

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| --- | --- | --- |
| **What archival sources are appropriate** | **Name of specific resource** | **Ethical/Credibility Considerations** |
| Existing physics simulations | * [myPhysicsLab: Moveable Pendulum](https://www.myphysicslab.com/pendulum/moveable-pendulum-en.html) |  |
| Youtube videos | * [The Coding Train: "Coding Challenge #159: Simple Pendulum Simulation"](https://www.youtube.com/watch?v=NBWMtlbbOag) * [Pezzza's Work: "How to train simple AIs"](https://www.youtube.com/watch?v=EvV5Qtp_fYg&t) |  |
|  |  |  |

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| --- | --- | --- |
| **What qualitative sources are appropriate** | **Name of specific resource** | **Ethical/Credibility Considerations** |
| Interviews | * UniSA lecturer |  |
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**Also do quantitative and process**

**Finish tables**