- What is the topic you are most interested in exploring and why does it interest you?

The topic that interests me the most is programming on the GPU. This topic is interesting to me because I have seen videos on youtube of what programming on the GPU is like and would like to try to do that as well.

- What are some other topics you have considered and what are the pros and cons compared to that selected?

Another topic I considered was real-time rendering in VR. A benefit over my other topic is that it allows me the opportunity to work in VR as I have been meaning to try for a while. A con would be that if the VR breaks it would be expensive to buy a new one and will take a while to be delivered to me.

- What is the main point of innovation for your preferred topic?

The main point of innovation for GPU programming would be to figure out a better way of simulation that can be done on the GPU that is not possible on the CPU.

- What is the research value of your topic?

The research value of my topic is to discover what is possible on the GPU.

- What are your tangible goals and objectives for the final project?

The tangible goals and objectives for the final project are to learn how to program on the GPU and how different the GPU works from the CPU.

- What are your hardware and software needs for achieving your objectives?

A decent graphics card and computer for hardware. For software, I will be using unity.

- What steps do you foresee needing to take to achieve your objectives?

The steps that I foresee needed to be taken to achieve my objectives are deciding on what computer API and shader language I will be using. Learning how the GPU and CPU differ. Lastly what the limitations of the GPU are.

- Why is this relevant to the industry at-large and how will it advance the field?

With GPUs becoming more popular it becomes important as I might be working with them in the future. By being able to program on the GPU I might be able to make contributions that I would have not if I stayed working with CPUs.

- Why is this relevant to your professional development and how will it advance your career?

By becoming more aware of emerging advances in GPUs it allows me to get in the sense that I have to be able to learn new topics so that my skills do not become redundant.

Evanson, Nick. “The Rise and Fall of Multi-GPU Graphics Cards.” *TechSpot*, TechSpot, 21 Sept.

2020, www.techspot.com/article/2094-the-rise-and-fall-multi-gpu-graphics-cards/.

This article starts by describing the parts and formation of the circuit board. This leads to why there are so many processors. As the GPU frame rate is slower it is possible to use multiple GPUs to improve the frame rate. At the beginning to have multiple GPU cards, which were powerful. they were expensive. This then became a race to still have a powerful GPU but is less expensive soo more people would buy the product. Companies began releasing numerous GPUs to be the leader in the race. Eventually, it was decided the multi-GPUs were not practicable and most companies bailed out of the race. With the price being unreasonably companies switched focus to more practical improvements on regular GPUs.

Laboe, Daniel. “Nvidia vs. AMD: The Future of the GPU Space.” *Finance.yahoo.com*, 8 Aug. 2019, finance.yahoo.com/news/nvidia-vs-amd-future-gpu-232211231.html.

This article starts by describing the competition between Nvidia and AMD and how the GPU market is going to be like. Before going further into the competition, the author gives background information about GPUs. With the background information out of the way, AMD and Nvidia have been competing for years on how to make the best GPUs as the GPU market is mainly depicted by gamers. This means that the companies have to be constantly making new and better products to outshine the other company. AMD is generally less powerful but cheaper, while Nvidia is more powerful and expansive. The market is volatile as if there is not a need for a new GPU then their stocks could go down. As the gamers are the main focus of this market they will most likely only update their GPUs when they have the money or if necessary. In the end, the author predicts that GPUs are the biggest tech breakthrough and the market will make many jobs and trillions in the process.

Lewis, Adam. “GPU-Accelerated Black Hole Simulations.” *NVIDIA Developer Blog*, 12 July 2016, developer.nvidia.com/blog/gpu-accelerated-black-hole-simulations/.

This article starts with the announcement that gravitational waves have been first detected. It then goes onto explaining some of Einstein's equations and ideas about black holes. Afterward, it gives examples of simulations of the black holes and explains what is happening in each simulation. To run these simulations, GPU acceleration was used as they were highly compatible for running the simulations. After explaining tensors, examples of computer code are shown to describe what the simulation would be like. This includes graphs that show the effectiveness of the GPUs in the simulation.

Morelo, David. “GPU Programming Introduction.” *Linux Hint*, 1 Jan. 1967,

linuxhint.com/gpu-programming/.

The author starts out explaining what a GPU is and then moves into what fields it is used in. The article then describes what a CPU does and explains the shift from using solely a CPU to a mixture. This explains the benefits of using GPU and how the field of GPU is growing. The article tells a brief history of the parallel computing platforms: CUDA, OpenCL, and OpenACC. Lastly, the article talks about what each of these platforms is mainly used for and gives a further reading for each of the platforms.

Walton, Mark “The Past, Present, and Future of the GPU according to Nvidia and AMD.” *GameSpot*, 27 August, 2014 www.gamespot.com/articles/the-past-present-and-future-of-the-gpu-according-t/1100-6421893/.

The author talks about the two main companies making GPUs that are used for gaming on the PC, AMD, and Nvidia. It then goes into why GPUs have been becoming popular. The focus then switches to a field that is still being worked on and what it means to have a fast GPU. With AMD and Nvidia competing to have a better GPU and how some companies have to choose which GPUs they use when making games as some games work better on one company's graphic card than the other. The article ends with how the companies are commented on their failures differently and the future of each company.