MBARARA UNIVERSITY OF SCIENCE AND TECHNOLOGY FACULTY OF COMPUTING AND INFORMATICS

COURSE UNIT: SOFTWARE ENGINEERING INDUSTRIAL MINI PROJECT II

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PROJECT JUSTIFICATION

1. Problem Definition

I had noticed that in fields like CAD, algorithms, and machine learning, matrix operations were very important. The problem was that most libraries available at the time did not handle all these needs in one place. For example, CAD required reliable matrix multiplication, FFT was crucial for algorithms, and gradient descent was needed for supervised learning in machine learning. Because of this, people had to use multiple tools, which wasted time and made work harder as opposed to working smart.[1] [3]

2. Project Objectives

My Portable Matrix Library aimed to:

1. Provide efficient matrix multiplication [4] for CAD tasks, making calculations faster and more accurate.
2. Include FFT(*Fast Fourier Transformations*) for improving algorithm performance in areas like signal processing.
3. Add gradient descent functionality to help with optimizing supervised learning models in machine learning.
4. Be portable and easy to integrate into different systems and workflows.

3. Benefits of the Project

Benefits for Users:

- Made work easier by combining multiple tools into one library.
- Saves money since there is no need to buy separate software for each task.

Technical Benefits:

- Delivered faster and more accurate calculations for CAD and machine learning.
- Accelerated the development of algorithms by using optimized FFT and gradient descent.
- Was easy to use across different fields because it was portable and well-documented.

Environmental Benefits:

- Reduced wasted computing power, which saved energy.

4. Justification of Resources

To make this library, I had needed:

- **Time:** Sufficient time to test, improve, and document the library properly.
- **Computers:** Powerful computers to ensure the library worked well on most projects.
- **Effort:** Focus and dedication to make sure everything worked correctly and was user-friendly.

These resources were justified because this library had the potential to help many people across different fields.

5. Risk Mitigation

Possible Problems:

1. The library might not have worked well with some existing tools.
2. Some people might not have adopted it quickly.
3. Bugs might have appeared in the first version.

How I Planned to Solve These:

- Tested the library with different tools to ensure compatibility.[1]
- Wrote easy-to-follow guides to help users learn how to use it.

6. Alignment with My Goals

This library aligned with my goal of creating tools that were simple and useful for many people. It is intended to contribute in CAD(*Computer Aided Design*), algorithms, and machine learning by offering a single, portable solution. [2]

References

1. Proposaltemplate.ai. (2024). *How to Write Project Justification*. Retrieved from https://www.proposaltemplate.ai/how-to-write-project-justification/ on December 13, 2024.
2. FundsforNGOs.org. (2024). *How to Write a Project Justification in a Proposal on Community Livelihood Development Project*. Retrieved from https://www.fundsforngos.org/free-resources-for-ngos/how-to-write-a-project-justification-in-a-proposal-on-community-livelihood-development-project/ on December 13, 2024.
3. Badiru, A. B. (2008). *Project Management Essentials*. CRC Press, pp. 95-118.
4. Van De Geijn, R. A., & Watts, J. (1997). *SUMMA: Scalable Universal Matrix Multiplication Algorithm*. Proceedings of the Fourth ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming, pp. 84-90.