**Project Proposal**

***Area under the curve using Trapezoidal & Simpson Rule***

***in MPI & OpenMP***

**Project Team:**

* K214869 Yasir Raza
* K214915 Farzeen Khan
* K213440 Murtaza Ahmed

**Submitted to:**

* Miss Ayesha Ali

**Project Objectives:**

* Develop a parallel MPI-based solution to efficiently calculate the area under mathematical functions using the Trapezoid Rule and Simpson Rule.
* Showcase the benefits of parallel and distributed computing in reducing computation time and handling complex functions.
* Gain practical insights into parallel computing paradigms, algorithms, and frameworks.

**Problem Statement:**

The project addresses the challenge of accurately calculating the area under the curve. Computing this area can be time-consuming, especially for complex functions and large datasets. Parallel and distributed computing using MPI can significantly accelerate the process, enabling efficient handling of such tasks.

**Scope of Work:**

* Develop a user-friendly interface for inputting functions and defining integration intervals.
* Implement the Trapezoid Rule & Simpson algorithm in a parallel MPI-based solution.
* Test and benchmark the solution for efficiency, scalability, and accuracy.

**Methodology:**

* Develop a parallel MPI and OpenMP solution for both the algorithms.
* Evaluate efficiency and scalability across different complexities and dataset sizes.
* Conduct validation tests for accuracy.
* Analyze scalability by varying processor.

**Deliverables:**

* MPI and OpenMP programs for efficient area estimation.
* User and technical documentation.
* Efficiency and scalability analysis reports.
* A user-friendly interface for function input and result visualization.

**Conclusion:**

This project aims to leverage parallel and distributed computing using MPI and OpenMP to address the computational challenge of finding the area under a curve. By distributing the workload efficiently, we can significantly reduce computation time and handle complex functions and large datasets. This project not only provides a practical solution to a mathematical problem but also serves as a valuable educational experience in parallel and distributed computing paradigms. It emphasizes the importance of parallel computing in accelerating scientific and engineering computations, making it a valuable addition to our understanding of high-performance computing techniques.