Analysis of Data Structures and Algorithms

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1 Data Structures

The program utilizes the following data structures:

- **Struct ThreadData**: This structure stores essential information for the multithreading process. It includes fields for the data array, size, sum, minimum, and maximum values.

2 Algorithms

The program implements the following algorithms:

2.1 Single-Threaded Calculation

The `single` function calculates the sum, minimum, and maximum values in a single thread. It iterates through the given array of integers, updating the sum, minimum, and maximum values as it traverses the array.

2.2 Multi-Threaded Calculation

The `multi` function orchestrates the multithreading process using the `pthread` library. It divides the data into segments for each thread to process. Each thread, in the `threadFunction`, independently computes its portion of the sum, minimum, and maximum values. After threads complete their tasks, the main thread aggregates the results to determine the overall sum, minimum, and maximum values.

Table 1: Comparison of Execution Times for Different Functions and Thread Counts

Data	**Functions**			
	Single	**Multi(2)**	**Multi(4)**	**Multi(8)**
Large	0.235000	0.134000	0.086000	0.055000
Medium	0.023000	0.014000	0.007000	0.007000
Small	0.002000	0.002000	0.001000	0.002000