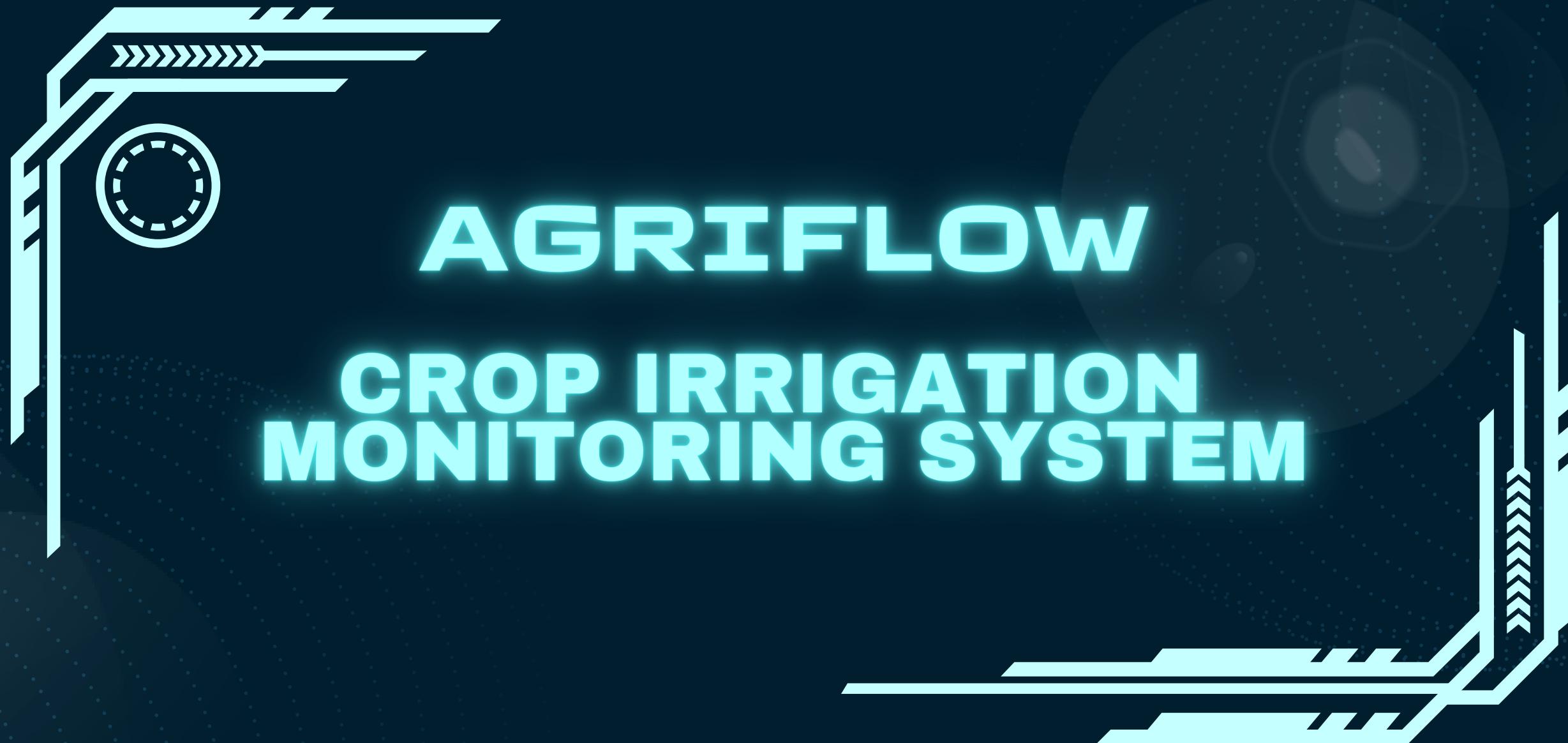




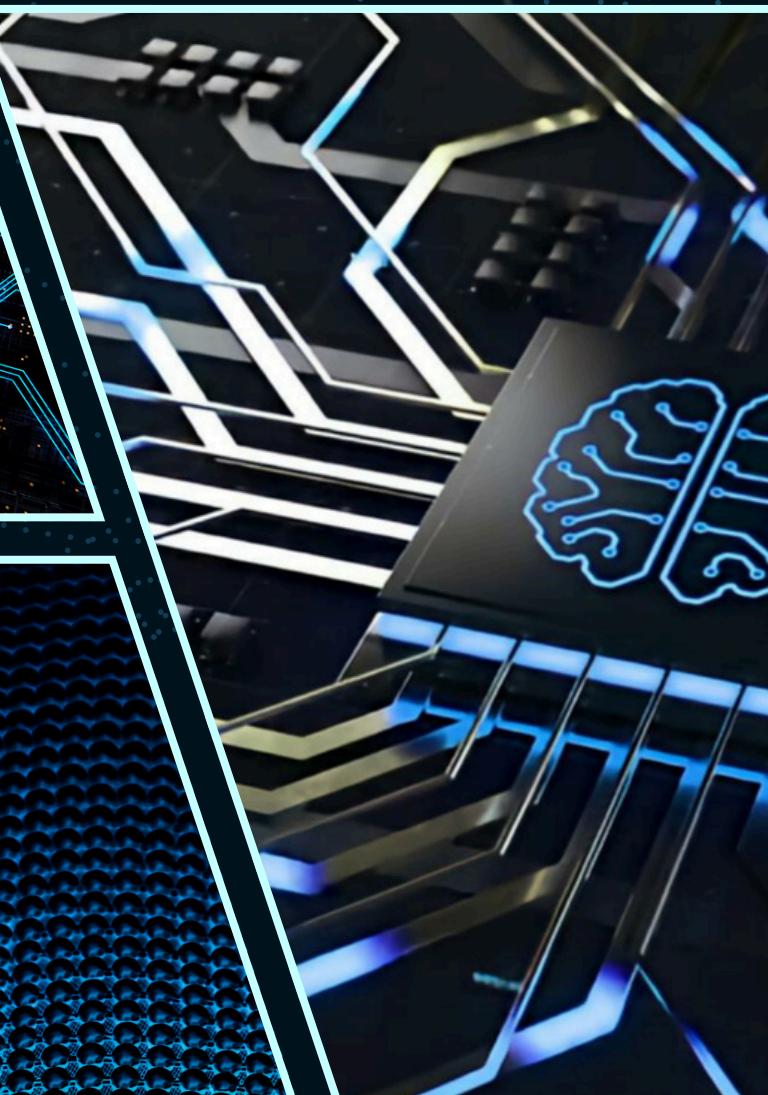
THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)



Introduction

This project presents a Parallel CUDA-based Crop Irrigation Monitoring System that determines whether irrigation is required based on temperature and soil moisture data. By implementing the same logic on both CPU and GPU, the system evaluates performance differences and demonstrates how parallel processing can enhance speed and efficiency in agricultural decision-making.

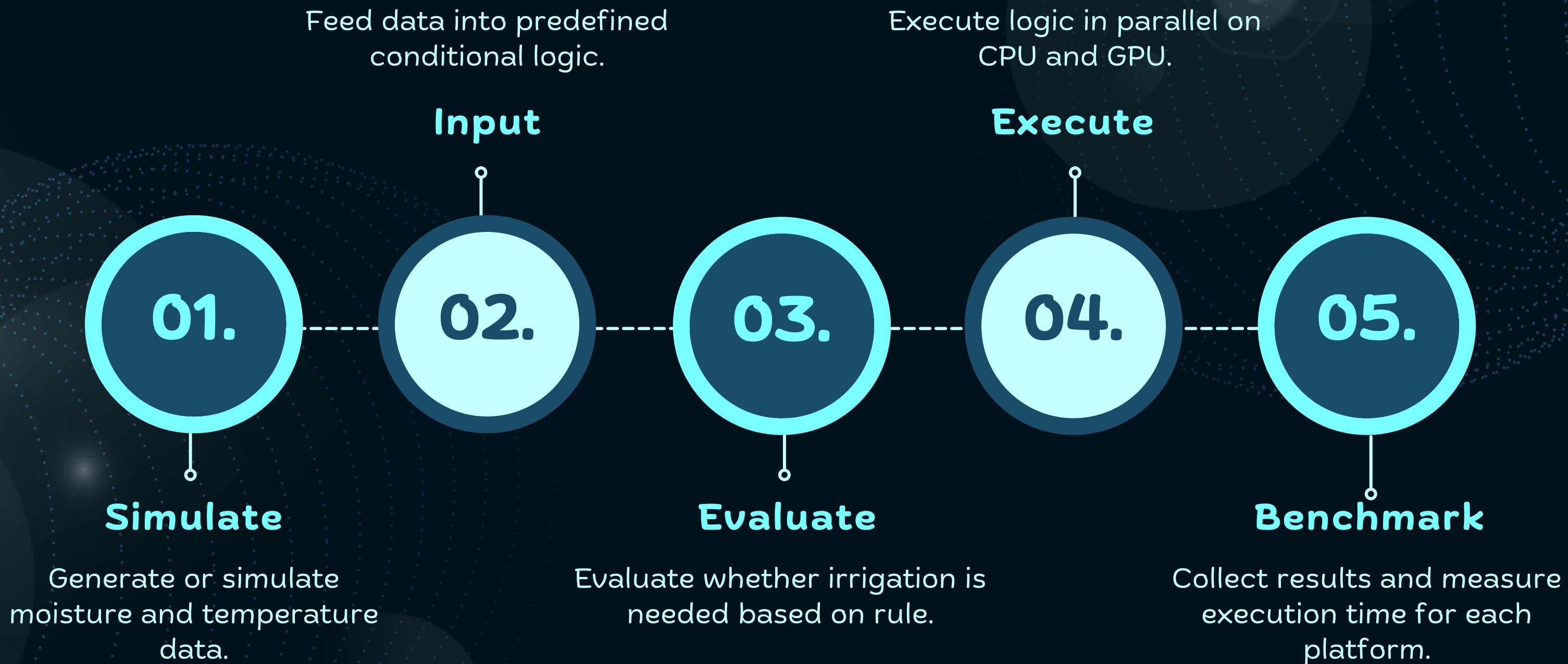
- CUDA-driven system for making irrigation decisions.
- Inputs: Moisture and temperature data (simulated).
- Implemented on both CPU and GPU for performance analysis.
- Goal: Improve speed, efficiency, and resource usage in farming.



Understanding the Project Framework

- Input: Simulated values of soil moisture and temperature.
- Decision Logic:
 - If Moisture < 5 AND Temperature > 33°C → Irrigation Needed
- Output: Yes or No (Irrigation required or not).
- Execution:
 - Same logic executed on both CPU and GPU to measure performance difference.

Workflow:



Parallelism:

- Parallel Execution Methods:
 - CPU: Iterative Multiprocessing in C++
 - GPU: CUDA for high-speed throughput oriented computing
- Nature of Tasks:
 - Each data point is independent of others.
 - No data sharing or dependencies – suitable for parallelism.
- Type: Fine-Grained Parallelism
- Best for tasks with minimal interaction between threads.

Comparison:

METRIC	CPU	GPU
LATENCY	16.1721ms	0.223168ms
THROUGHPUT	64838 ops/ms	4698594 ops/ms
BANDWIDTH	556.513 MB/s	2959.87 MB/s
EFFICIENCY	N/A	0.275754(for 256 threads)

Conclusion

- Parallel processing improves speed and scalability of irrigation decisions.
- GPU proves more efficient than CPU for large datasets where throughput is given more importance than latency i.e focus is on doing large number of smaller operations simultaneously rather than doing small operations iteratively with minimal gap between each successive iterations.

Team Members

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