

# PERFORMANCE MODELING ON GPUS

Balmiki R. Padhyaya<sup>1</sup>, Dr. Tanzima Islam<sup>1</sup>, Dr. Jed Brown<sup>2</sup>

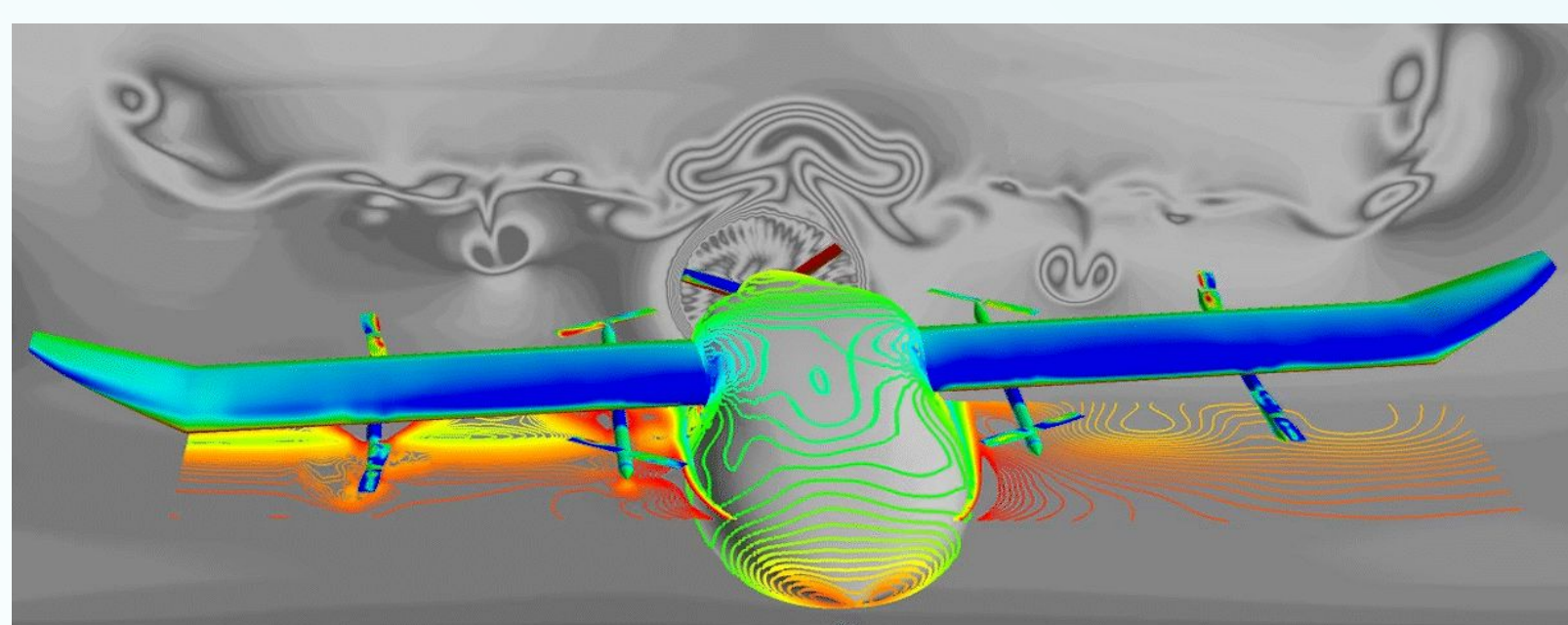
<sup>1</sup>Texas State University, <sup>2</sup>University of Colorado Boulder



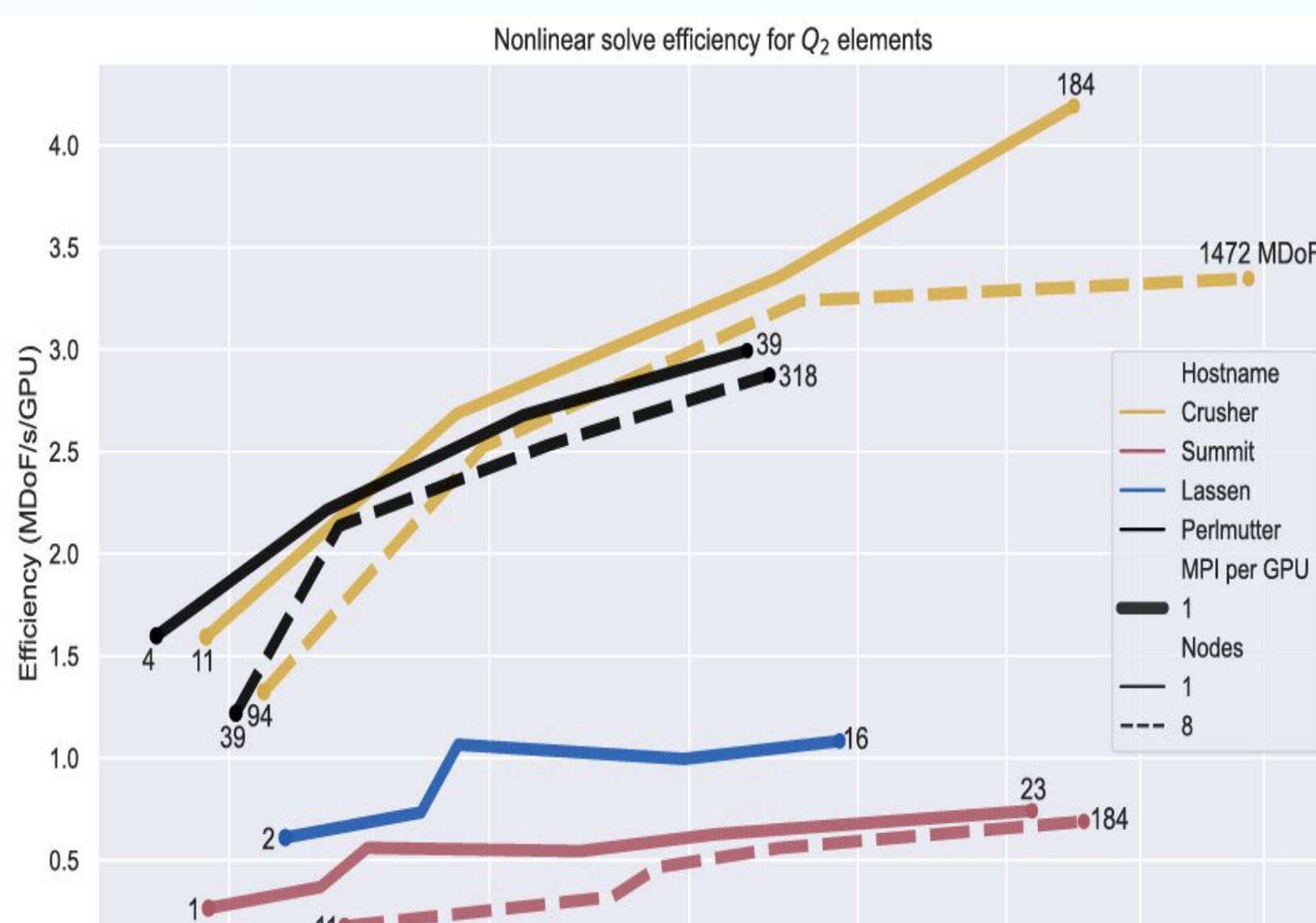
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## Introduction

- ❖ Welcome to the world of structural simulations and the enigmatic "Ratel" application developed by UC Boulder.
- ❖ Our project aims to characterize the Ratel application on NVIDIA V100 GPUs to help scientists optimize it.

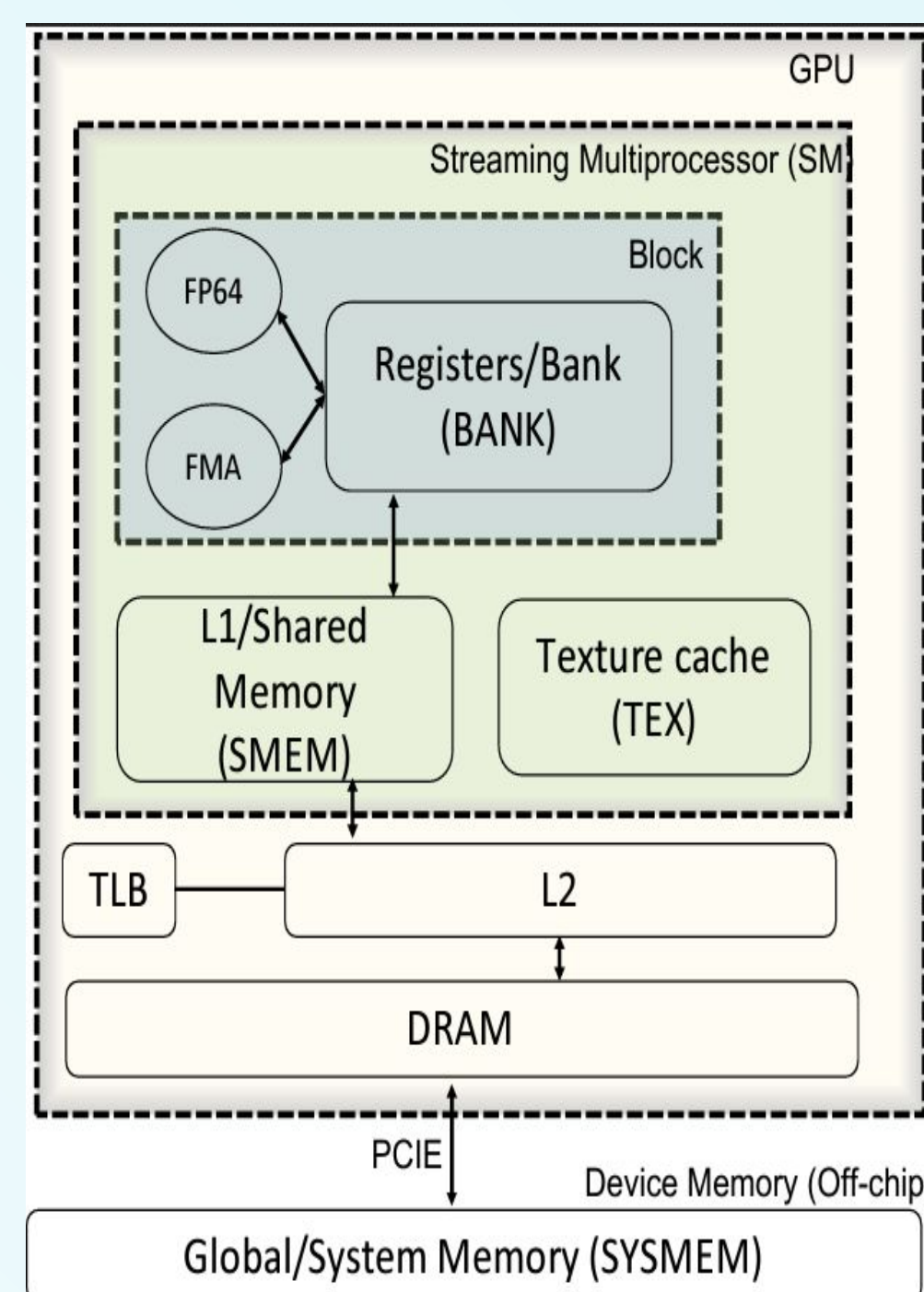


- ❖ We investigate Ratel's efficiency by profiling its interaction with NVIDIA V100 GPUs.
- ❖ Leveraging the "Dashing" framework, we visualize hardware counters data for unique insights.



## Methodology

- ❖ Profiling Ratel's Performance
  - Utilized NVIDIA V100 GPUs for Computational Power.
  - Focused on Interaction with GPU's Main Memory, DRAM.
- ❖ Visualizing Hardware Counters
  - Leveraged the "Dashing" Framework.
  - Presented Data in Various Formats for insights into Efficiency Dynamics.

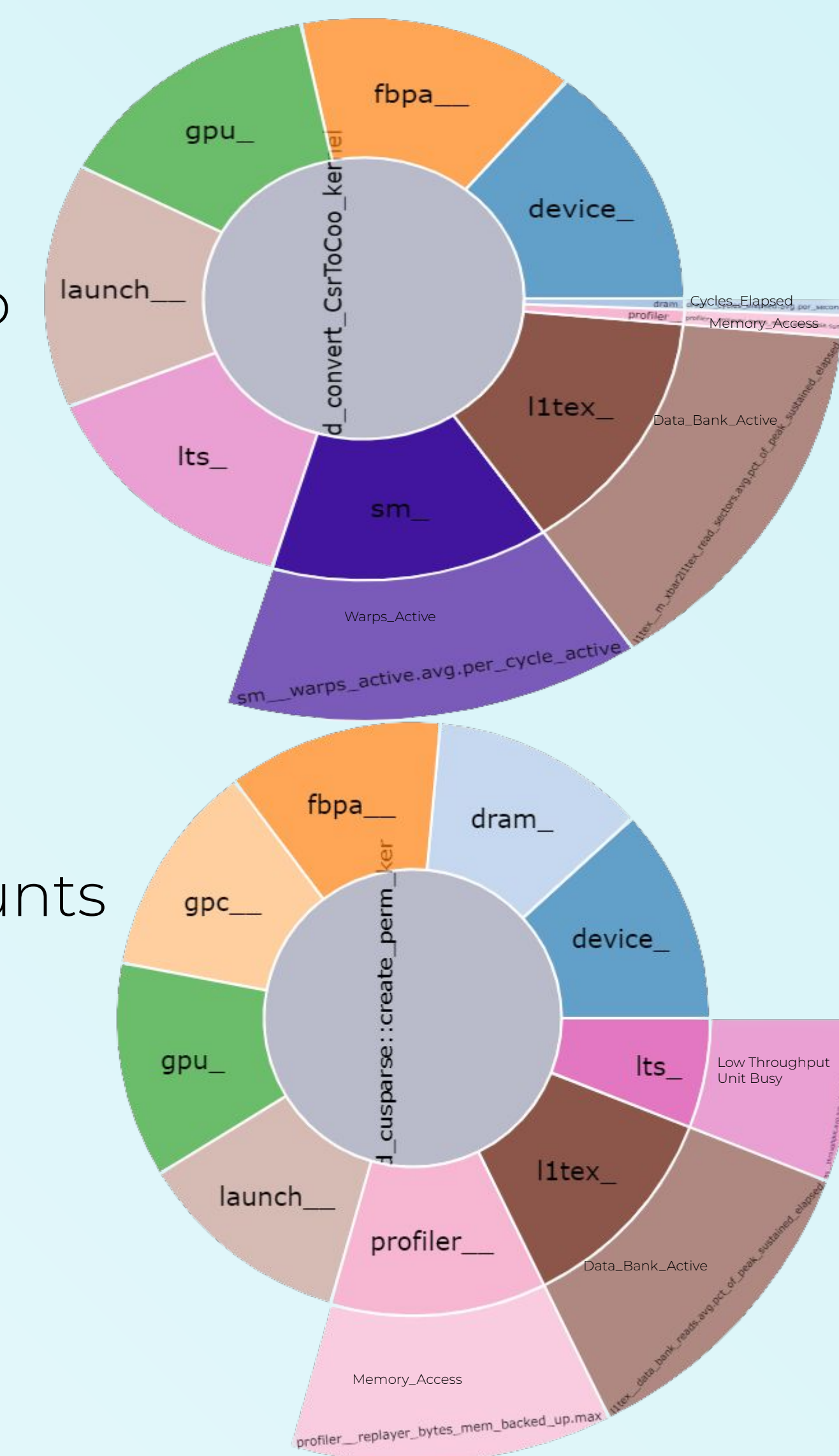


## Conclusion

- ❖ Efficient DRAM Access Crucial for Improved Performance of ratel application
  - Implications Extend to Various Scientific Pursuits.
- ❖ Promising Directions for Future Research
  - Advancements in Simulation Frameworks and Applications.
- ❖ Contribution to Structural Simulations
  - Real-World Relevance Demonstrated.
- ❖ Inspiring Further Exploration in the Captivating Domain.

## Results

- ❖ Successful Execution on NVIDIA V100 GPUs
  - Ratel Application Profiling Completed and vital Data Collected for Analysis.
- ❖ Unveiling the Impact of DRAM Group
  - Heavy Influence on Application's Performance.
  - Significance of Efficient DRAM Access Revealed.
- ❖ Correlation Between DRAM Cycle Counts and Performance
  - Direct Relationship Observed.
  - Emphasizing the Importance of DRAM Access Optimization for Enhanced Efficiency.



## References

- ❑ T. Z. Islam, A. Ayala, Q. Jensen and K. Ibrahim, "Toward a Programmable Analysis and Visualization Framework for Interactive Performance Analytics," 2019 IEEE/ACM International Workshop on Programming and Performance Visualization Tools (ProTools), Denver, CO, USA, 2019.
- ❑ Brown, J., Barra, V., Beams, N., Ghaffari, L., Knepley, M., Moses, W., ... & Zhang, J. (2022). Performance Portable Solid Mechanics via Matrix-Free  $\$ p \$$ -Multigrid. arXiv preprint arXiv:2204.01722.