SORS: Hardware and Software Optimizations for Graph Pattern Mining

Objectives

Abstract: Today's explosive data growth has ushered a new generation of applications that transform massive, unstructured, heterogeneous data into actionable knowledge. Data is increasing exponentially in volume, velocity, variety, and complexity. On the other hand, the performance of memory systems used to store and access this data has remained almost constant throughout the years. Therefore, traditional memory systems cannot keep up with the growing demands and complexities of data-intensive applications.

In this talk, I will present my past and ongoing research efforts in optimizing the performance of Graph Pattern Mining (GPM). The workload of GPM aims to find small subgraph patterns in large real-world graphs, which is extremely challenging to scale with the sizes of input graphs and patterns. First, I will present NDMiner [ISCA 2022] that motivates a Near-Data Processing (NDP) system for GPM in static graphs. Additionally, I will show how to further optimize the performance of this baseline NDP system using domain-specific insights. Second, I will present Mint [MICRO 2022] that optimizes the workload of GPM in temporal graphs (i.e., temporal motif mining). Specifically, I will demonstrate the designs of asynchronous programming model, hardware accelerator architecture, and domain-specific optimization to significantly improve the performance of this workload over commercial hardware platforms (CPU and GPU). Finally, I will end my talk by showcasing the ongoing work in my research group to start a conversation on potential collaboration opportunities.

: Nishil Talati is an Assistant Research Scientist (Research Faculty) at the CSE departmentof University of Michigan. He earned his PhD from University of Michigan. Nishil's research interests span novel hardware and software designs for improving the performance of data-intensive workloads. During PhD, Nishil's work mostly focused on hardware-software co-design to optimize a variety of graph applications. His first PhDwork, Prodigy, was recognized as the Best Paper at HPCA 2021.

Speakers

Speaker: Nishil Talati, Research Faculty at University of Michigan, US
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