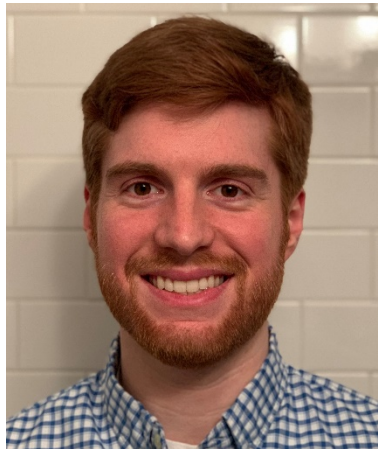


Data Science Seminar Series

Accelerating GPU Betweenness Centrality



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Date: Wednesday, September 16th, 2020
Time: 4:00 PM – 5:00 PM EDT
Location: Zoom Virtual Room
Web Link: <https://njit-institute-for-data-science.eventbrite.com>

Graphs that model social networks, numerical simulations, and the structure of the Internet are enormous and cannot be manually inspected. A popular metric used to analyze these networks is Betweenness Centrality (BC), which has applications in community detection, power grid contingency analysis, and the study of the human brain. However, these analyses come with a high computational cost that prevents the examination of large graphs of interest.

Recently, the use of Graphics Processing Units (GPUs) has been promising for efficient processing of unstructured data sets. Prior GPU implementations of BC suffer from large local data structures and inefficient graph traversals that limit scalability and performance. Here we present a hybrid GPU implementation that provides good performance on graphs of arbitrary structure rather than just scale-free graphs as was done previously. Our methods achieve up to 13x speedup on high-diameter graphs and an average of 2.71x speedup overall compared to the best existing GPU algorithm. We also observe near linear speedup when running BC on 192 GPUs. Finally, we improve upon this approach with a cooperative abstraction that performs 3x-7x faster than existing frameworks.

Adam McLaughlin is a Research Scientist at D. E. Shaw Research. He is currently working on embedded software and hardware verification for Anton, a massively parallel supercomputer used for fast simulations of molecular dynamics for drug discovery projects and fundamental biochemistry research. As a doctoral student, Adam worked on accelerating various graph algorithms using GPUs; one paper produced from that work, “Scalable and High Performance Betweenness Centrality on the GPU”, was a Best Student Paper finalist at the 2014 Supercomputing Conference and was later included as a Research Highlight in *Communications of the ACM*. In his free time, Adam enjoys concerts, comedy shows, and reminiscing about his days as a semi-professional poker player.