

# COMPUTATIONAL RESEARCH in BOSTON and BEYOND SEMINAR

## Migratory Memory-Side Processing: Breakthrough Architecture for Memory-Centric Computing

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### ABSTRACT:

Conventional computer architectures poorly handle cache-unfriendly applications. The problem stems in part from the irregular memory-access patterns exhibited by these applications and in how remote memory accesses are handled. Today's data intensive applications, such as sparse-matrix linear algebra and graph analytics, do not exhibit the same locality traits as compute-intensive applications, resulting in the latency of individual memory accesses overwhelming the advantages of deeply pipelined fast cores.

The "weak-locality" that data-intensive applications do exhibit — where irregular accesses occur within a large memory region of several gigabytes — can be exploited by an innovative architectural approach. The Emu Migratory Memory-Side Processing architecture provides a highly efficient, fine-grained memory system and migrating threads that move the thread state, as new memory locations are accessed, without explicit program directives. The "put-only" communication model dramatically reduces thread latency and total network bandwidth load as return trips and cache coherency are eliminated.

This talk covers: how the architecture delivers orders of magnitude reduction in data movement, inter-process communication and energy requirements; the familiar programming model selected for the architecture which makes it accessible to programmers and data scientists; real-world results of graph analytics and sparse algorithms that validate the architectural vision.

### BIO:

Dr. Peter Kogge is a Chaired Professor in Notre Dame's Department of Computer Science and Engineering. Peter is an IBM Fellow and the 2012 Seymour Cray Award winner among other awards. Prior to academia, he spent 26 yrs. with IBM Federal. Peter's undergraduate degree is from Notre Dame and he has a Ph.D. from Stanford in Electrical Engineering.

**FRIDAY, AUGUST 3, 2018**  
**12:00 PM – 1:00 PM**  
**Building 36, Room 462**

*Pizza and beverages will be provided.*

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