**Nanocourse Series Director:** Gaudenz Danuser, Professor and Chairman, Lyda Hill Department of Bioinformatics

**Course Director:** Brandi Cantarel, Assistant Professor, Bioinformatics Core Facility, Lyda Hill Department of Bioinformatics

**Course Credit:** One credit hour will be available for this course through the UTSW Graduate School for students who participate in all sessions. Attendee roster will be submitted after completion of the course. Please contact Amy Haughey for more information.

**Course Description:**

This course is designed primarily for postdoctoral trainees, advanced graduate students, faculty and other biomedical research scientists. Graphics processing units (GPUs) dramatically increase computing power and performance. C/C++ can be transformed into a parallel programming language by using the CUDA® software environment to optimize programs and drive GPU computing. The two-day course is limited to 40 students. The training experience will include didactic lectures, demonstrations, and mentored hands-on workshops that equip participants to use C/C++ to develop parallel applications and libraries.

**Training Topics:**

- **A. Basics of GPU computing and C/C++ in the CUDA® software environment**
  - Libraries
  - OpenACC directives
  - Programming languages
- **B. Introduction to CUDA® C/C++**
  - Write and launch CUDA C/C++ kernels
  - Manage GPU memory
  - Manage communication & synchronization
- **C. Fundamental CUDA® Optimization**
  - Fermi architecture
  - Kernel optimizations
  - Optimization of CPU-GPU interaction
- **D. Porting the NAS-NPB conjugate gradient benchmark to CUDA**
  - Overview of CG benchmark
  - Overview of CUDA libraries
  - Porting sequence
  - Welch’s two-sample T-test
- **E. Survey of techniques for GPU programming in Matlab**
  - Basics, requirements & capabilities
  - Element-wise acceleration
  - Acceleration using PTX interface
  - Workshop
- **F. Visualizing simulation data using Paraview**
  - Basics of Paraview
  - Batch Python scripting
  - Visualizing large models

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