Dr. Mark Kim

CONTACT INFORMATION

Computer Scientist
Oak Ridge National Laboratory
Scientific Data Group
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RESEARCH INTERESTS

Scientific Visualization, GPGPU, HPC Visualization, in situ visualization, ray tracing, Stream Processing, surface flow visualization, volume rendering

EDUCATION

University of Utah, Salt Lake City, UT.

Ph.D., School of Computing, November 2015

- Thesis Topic: *GPU-Enabled Surface Visualization*
- Adviser: Professor Charles (Chuck) Hansen
- Area of Study: Scientific Visualization

University of Wisconsin, Madison, Madison, WI.

B.S., Computer Science and Philosophy 2002

RESEARCH EXPERIENCE

Computer Scientist, Oak Ridge National Laboratory — April 2018 to Present
Scientific Data Group

- Group Lead: Scott Klasky
- Team Lead: David Pugmire
- Scientific Visualization.

Postdoctoral Researcher, Oak Ridge National Laboratory — Sept 2016 to April 2018
Scientific Data Group

- Group Lead: Scott Klasky
- Team Lead: David Pugmire
- Scientific Visualization.

Postdoctoral Researcher, University of Utah — November 2015 to September 2016
Scientific Computing and Imaging Institute
School of Computing

- Advisor: Charles Hansen
- Current work focuses on compression for volume data using stream processing

Graduate Research Assistant, University of Utah — August 2008 to November 2015
Scientific Computing and Imaging Institute
School of Computing

- Advisor: Charles Hansen
- Accelerated particle mesh extraction using the GPU and the closest point embedding.
- Developed efficient, near real-time unsteady flow visualization techniques using the closest point embedding on the GPU.

PUBLICATIONS

1. Leventhal, S., M. Kim, and D. Pugmire. "PAVE: An In Situ Framework for Scientific Visualization and Machine Learning Coupling". In: *Proceedings of the 4th International Workshop on Data Reduction for Big Scientific Data (DRBSD-5)@SC'18*. Nov. 2019.

2. Kress, J. et al. "Comparing the Efficiency of In Situ Visualization Paradigms at Scale". In: *High Performance Computing*. Ed. by M. Weiland, G. Juckeland, C. Trinitis, and P. Sadayappan. Cham: Springer International Publishing, June 2019, pp. 99–117.

3. Choi, J. Y. et al. "Coupling Exascale Multiphysics Applications: Methods and Lessons Learned". In: *2018 IEEE 14th International Conference on e-Science (e-Science)*. Oct. 2018, pp. 442–452.

4. Klasky, S. et al. "A View from ORNL: Scientific Data Research Opportunities in the Big Data Age". In: *2018 IEEE 38th International Conference on Distributed Computing Systems (ICDCS)*. July 2018, pp. 1357–1368.

5. Kim, M., S. Klasky, and D. Pugmire. "Dense Texture Flow Visualization using Data-Parallel Primitives". In: *Eurographics Symposium on Parallel Graphics and Visualization*. Ed. by H. Childs and F. Cucchietti. The Eurographics Association, June 2018.

6. Pugmire, D., A. Yenpure, M. Kim, J. Kress, R. Maynard, H. Childs, and B. Hentschel. "Performance-Portable Particle Advection with VTK-m". In: *Eurographics Symposium on Parallel Graphics and Visualization*. Ed. by H. Childs and F. Cucchietti. The Eurographics Association, June 2018.

7. Kim, M., T. Evans, S. Klasky, and D. Pugmire. "In Situ Visualization of Radiation Transport Geometry". In: *Proceedings of the In Situ Infrastructures on Enabling Extreme-Scale Analysis and Visualization*. ISAV'17. Denver, CO, USA: ACM, 2017, pp. 7–11.

8. Klasky, S. et al. "Exacution: Enhancing Scientific Data Management for Exascale". In: *2017 IEEE 37th International Conference on Distributed Computing Systems (ICDCS)*. June 2017, pp. 1927–1937.

9. Kim, M. and C. Hansen. "Closest Point Sparse Octree for Surface Flow Visualization". In: *Proceedings of IS&T Visualization and Data Analysis, 2017.* (Feb. 2017).

10. Kress, J., R. M. Churchill, S. Klasky, M. Kim, H. Childs, and D. Pugmire. "Preparing for In Situ Processing on Upcoming Leading-edge Supercomputers". In: *Supercomputing Frontiers and Innovations* 3.4 (Dec. 2016), pp. 49–65.

11. Kim, M. and C. Hansen. "Surface Flow Visualization using the Closest Point Embedding". In: *2015 IEEE Pacific Visualization Symposium* (Apr. 2015).

12. Kim, M. and C. Hansen. "GPU Surface Extraction with the Closest Point Embedding". In: *Proceedings of IS&T/SPIE Visualization and Data Analysis, 2015.* Feb. 2015.

13. Gyulassy, A., N. Kotava, M. Kim, C. Hansen, H. Hagen, and V. Pascucci. "Direct Feature Visualization Using Morse-Smale Complexes". In: *IEEE Transactions on Visualization and Computer Graphics* 18.9 (Sept. 2012), pp. 1549–1562.

14. Kim, M., G. Chen, and C. Hansen. "Dynamic Particle System for Mesh Extraction on the GPU". In: *Proceedings of the 5th Annual Workshop on General Purpose Processing with Graphics Processing Units*. GPGPU-5. London, England: ACM, May 2012, pp. 38–46.

15. UV, K., M. Kim, D. Gerszewski, J. Anderson, and M. Hall. "Assembling Large Mosaics of Electron Microscope Images using GPU". In: *Proceedings of the 2009 Symposium on Application Accelerators in High Performance Computing (SAAHPC'09)*. 2009.

Invited Talks

1. Kim., M. *Data Parallel Primitives and Scientific Visualization.* Oak Ridge, TN.: Oak Ridge National Laboratory., Mar. 2018.

2. Kim, M. *Floating Point Array Compression on the GPU*. San Jose, CA.: GTC 2017., May 2017.

3. Kim, M. *GPU-enabled Particle Systems for Visualization*. Oak Ridge, TN.: Oak Ridge National Laboratory, Mar. 2015.

4. Kim, M. *Dynamic Particle System for Mesh Extraction on the GPU*. Salt Lake City, UT.: IAMCS-KAUST Workshop on Computational Biomedicine and Geophysics., Apr. 2012.

5. Kim, M. *Implicit Surfaces with a Particle System on the GPU*. College Station, TX.: IAMCS Workshop: Visualization in Biomedical Computation., Feb. 2011.

6. Kim, M. *GPGPU with CUDA.* KAUST, Saudia Arabia.: Pervasively Parallel Solutions for Partial Differential Equations Workshop, May 2010.

Teaching Experience

University of Utah, Salt Lake City, UT.

Teaching Assistant **August 2014 to December 2014**

- Teaching Assistant for CS4600: Introduction to Computer Graphics
  - Fall 2014
  - Held office hours to help students with their programming assignments.
  - Javascript and WebGL.

Teaching Assistant **August 2007 to May 2008**

- Teaching Assistant for CS6150: Advanced Algorithms
  - Autumn 2007
  - Responsible for office hours to assist graduate students with homework.
  - Assisted with grading homework assignments.
- Teaching Assistant for CS5530: Database System
  - Autumn 2007
  - Conduct office hours to assist senior-level undergraduate students with homework and projects.
  - Grade homework.

- Teaching Assistant for CS5600: Introduction to Computer Graphics
  - Spring 2008
  - Held office hours to help senior-level undergraduate students with their programming assignments.
  - C/C++ and OpenGL.

Professional Experience

Oak Ridge National Laboratory, Oak Ridge, TN.

Computer Scientist **April 2018 to present**

- Scientific Data Group
- Scientific Visualization.

Oak Ridge National Laboratory, Oak Ridge, TN.

Postdoctoral Researcher **September 2016 to April 2018**

- Scientific Data Group
- Scientific Visualization.

University of Utah, Salt Lake City, UT.

Postdoctoral Researcher **November 2015 to September 2016**

- Supervisor: Charles (Chuck) Hansen
- Current work focuses on compression for volume data using stream processing (GPGPU).

Lawrence Livermore National Laboratory, Livermore, CA.

Graduate Intern **May 2015 to July 2015**

- Advisor: Peter Lindstrom
- As part of the PSAAP project, developed an initial GPU implementation of ZFP, a compression library for volume data.

Los Alamos National Laboratory, Los Alamos, NM.

Graduate Intern **May 2009 to August 2009**

- Advisor: Pat McCormick
- Worked with a computational biologist on Kohonen maps for the GPU.

Graduate Intern **May 2008 to August 2008**

- Advisor: Pat McCormick
- Implemented a CPU volume renderer for Lyman-Alpha visualization for the Scout framework.
- Implemented a particle-particle particle mesh simulation in CUDA.