

Kerry A. Seitz, Jr.

Department of Computer Science
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Davis, CA

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Education

University of California, Davis

Ph.D. Candidate in Computer Science, expected December 2021

M.S. in Computer Science

- Advisor: John D. Owens

Davis, CA

2012 – Present

Trinity University

B.S. in Computer Science, May 2012

- Minors in Biology and Biomathematics

- Graduated Magna Cum Laude with Honors in Computer Science

San Antonio, TX

2008 – 2012

Research Experience

University of California, Davis

Graduate Student Researcher

- Working under Dr. John D. Owens to explore programming models, programming languages, compilers, and optimization techniques for computer graphics applications
- Creating a shader programming system in C++ focused on unifying host code and GPU code into the same language, file, and lexical scope by co-opting existing C++ language features and implementing them with alternate semantics to express shader-specific features and optimizations
- Developed the Selos shader system with staged metaprogramming as the underlying implementation technique and used it to explore the shader specialization design space for performance optimizations
- Implemented a compiler to transform Piko pipeline code into efficient kernels for execution on the GPU and the CPU
- Helped to design and implement Piko—an abstraction for programmable graphics pipelines

Davis, CA

Summer 2012 – Present

Intel Corporation

Advanced Rendering Intern

- Implemented an LLVM-based compiler to translate Microsoft's DirectX Intermediate Language (DXIL) to base LLVM IR with intrinsics, implemented an LLVM-based code generator for a hardware simulator designed for preliminary hardware feature exploration, and developed techniques to improve hardware thread scheduling on GPU hardware

Folsom, CA

Summer 2017 – Fall 2017

Nvidia Corporation

Graduate Research Intern

- Developed a shader metaprogramming system that enables authoring shaders in the Terra programming language, implemented a Terra-to-GLSL backend, and implemented a programming model similar to Spark [Foley and Hanrahan 2011] using the metaprogramming system

Santa Clara, CA

Summer 2015

Apple Inc.

Graduate Intern

- Worked on a compiler frontend for shading languages, including feature development, feature implementation, and IDE integration, implemented optimizations for the Sprite Kit framework, and developed features for LLVM-based tools

Cupertino, CA

Summer 2014

Intel Corporation

San Francisco, CA

Graduate Intern

Summer 2013

- Worked on a Clang- and LLVM-based compiler frontend for a programming model involving task and data parallelism

Trinity University

San Antonio, TX

Computer Science Honors Thesis

Spring 2011, Fall 2011 – Spring 2012

- Developed a bytecode and virtual machine with the goal of optimization in a heterogeneous environment
- Implemented a hybrid interpreter/just-in-time compiler for the bytecode in Scala and OpenCL

DePaul University

Chicago, IL

National Science Foundation Research Experience for Undergraduates

Summer 2011

- Worked under Dr. Daniela Raicu and Dr. Jacob Furst to develop a genetic algorithm approach to reduce the number of image features used in content-based image retrieval of lung computed tomography (CT) scans
- Created a technique to expand a limited set of diagnostically labeled images to include images for which a label could be confidently predicted

Trinity University

San Antonio, TX

National Science Foundation Undergraduate Biology and Biomathematics Fellowship

Summer 2010

- Investigated methods of ortholog detection across multiple taxa using DNA comparison methods as a participant in the Integrated Research in Biomathematics program under Dr. Kevin Livingstone
- Refined Dr. Allen Orr's model of the rate of speciation based on the Bateson-Dobzhansky-Muller model

Honors and Awards

2014 Awarded a National Science Foundation Graduate Research Fellowship Program (NSF GRFP) Fellowship

2011 Awarded Mach Research Fellowship

2008 Eagle Scout – Boy Scouts of America

Publications and Presentations**Peer-Reviewed Publications**

- Kerry A. Seitz, Jr., T. Foley, Serban D. Porumbescu, and John D. Owens. "Staged Metaprogramming for Shader System Development." *ACM Transactions on Graphics*, 38(6):202:1–202:15, November 2019. <https://dx.doi.org/10.1145/3355089.3356554>
- Anjul Patney, Stanley Tzeng, Kerry A. Seitz, Jr., and John D. Owens. "Piko: A Framework for Authoring Programmable Graphics Pipelines." *ACM Transactions on Graphics*, 34(4):147:1–147:13, August 2015. <https://dx.doi.org/10.1145/2766973>
- Anne-Marie Giuca, Kerry A. Seitz, Jr., Jacob Furst, and Daniela Raicu. "Expanding Diagnostically Labeled Datasets Using Content-based Image Retrieval." In *2012 IEEE International Conference on Image Processing, ICIP 2012*, pages 2397–2400. IEEE, September/October 2012. <https://dx.doi.org/10.1109/ICIP.2012.6467380>
- Kevin Livingstone, Peter Olofsson, Garner Cochran, Andrius Dagilis, Karen MacPherson, and Kerry A. Seitz, Jr. "A Stochastic Model for the Development of Bateson–Dobzhansky–Muller Incompatibilities That Incorporates Protein Interaction Networks." *Mathematical Biosciences*, 238(1):49–53, July 2012. <https://dx.doi.org/10.1016/j.mbs.2012.03.006>
- Kerry A. Seitz, Jr. and Mark C. Lewis. "Virtual Machine and Bytecode for Optimization on Heterogeneous Systems." In *Proceedings of the 2012 Ninth International Conference on Information Technology - New Generations, ITNG 2012*, pages 528–533. IEEE, April 2012. <https://dx.doi.org/10.1109/ITNG.2012.116>
- Kerry A. Seitz, Jr., Anne-Marie Giuca, Jacob Furst, and Daniela Raicu. "Learning Lung Nodule Similarity Using a

Genetic Algorithm." In *Medical Imaging 2012: Computer-Aided Diagnosis, Proceedings of SPIE*, volume 8315. SPIE, Bellingham, WA, USA, February 2012. <https://dx.doi.org/10.1117/12.911435>

In Preparation for Future Conference/Journal Submission

- Kerry A. Seitz, Jr., Theresa Foley, Serban D. Porumbescu, and John D. Owens. "Unified Shader Programming in C++." arXiv:2109.14682 [cs.GR], September 2021. <https://arxiv.org/abs/2109.14682>

Conference Presentations

- Kerry A. Seitz, Jr., T. Foley, Serban D. Porumbescu, and John D. Owens. "Staged Metaprogramming for Shader System Development." In *The 12th ACM SIGGRAPH Conference and Exhibition on Computer Graphics and Interactive Techniques in Asia*, SIGGRAPH Asia 2019, November 2019. <https://sa2019.siggraph.org/>
- Kerry A. Seitz, Jr., T. Foley, and John D. Owens. "Selos: Staged Metaprogramming for Shader System Development." In *High-Performance Graphics 2017*, HPG 2017, July 2017. <https://www.highperformancegraphics.org/2017/>
- Kerry A. Seitz, Jr., Anjul Patney, Stanley Tzeng, and John D. Owens. "Realizing High-Performance Pipelines Using Piko." In *GPU Technology Conference 2014*, GTC 2014, March 2014.
- Kerry A. Seitz, Jr., Anjul Patney, Stanley Tzeng, and John D. Owens. "Piko: A Design Framework for Programmable Graphics Pipelines." In *GPU Technology Conference 2013*, GTC 2013, March 2013.
- Kerry A. Seitz, Jr. and Mark C. Lewis. "Implementing a Heterogeneous Bytecode Interpreter in Scala." In *2012 National Conference on Undergraduate Research*, NCUR 2012, March 2012.
- Andrius Dagilis, Karen MacPherson, and Kerry A. Seitz, Jr. "Incorporating Protein Interaction Probability Into the Bateson-Dobzhansky-Muller Model of Speciation." In *2011 Joint Mathematics Meeting*, JMM 2011, January 2011.

Undergraduate Honors Thesis

- Kerry A. Seitz, Jr. *The Design and Implementation of a Bytecode for Optimization on Heterogeneous Systems*. Computer Science Honors Thesis, Trinity University, May 2012. https://digitalcommons.trinity.edu/compsci_honors/28/

Other Publications

- Kerry A. Seitz, Jr., Alex Kennedy, Owen Ransom, Bassam A. Younis, and John D. Owens. "A GPU Implementation for Two-Dimensional Shallow Water Modeling." arXiv:1309.1230 [cs.DC], September 2013. <https://arxiv.org/abs/1309.1230>

Teaching Experience

University of California, Davis Davis, CA
Teaching Assistant – Introduction to Programming; Algorithm Design & Analysis *Summer 2021*
 – Reinforced fundamental course concepts during office hours, instructed students in code debugging techniques, graded exams, and created solutions to exam problems

University of California, Davis Davis, CA
Co-Instructor – Modern Parallel Computing *Winter 2016 and Winter 2020*
 – Wrote and presented course lectures, designed homework assignments, reinforced fundamental course concepts during office hours, and advised students on final projects

University of California, Davis Davis, CA
Instructor *Summer 2018*
 – Instructor for the IT Innovation group's site-visit course for the Kyoto University Interdisciplinary Science and Engineering Research Program
 – Accompanied Kyoto University students to on- and off-campus visits to research and industry labs to help facilitate communication between the students and academic/industry experts
 – Held pre- and post-visit classes to teach key concepts and terminology, review topics learned during the visits, answer student questions, and encourage discussion

University of California, Davis

Davis, CA

*Teaching Assistant – Discrete Mathematics for Computer Science**Winter 2013*

- Taught a discussion section, reinforced fundamental course concepts during office hours, and graded homework and exams

Trinity University

San Antonio, TX

*Teaching Assistant – Introductory Biology Labs**Spring 2010, Fall 2010, and Fall 2011*

- Aided the professor in teaching the weekly lab by answering student questions and explaining concepts used in lab and lecture
- Helped prepare for lab each week

Leadership Experience**Trinity University**

San Antonio, TX

*President of the Association for Computing Machinery (ACM)**Summer 2011 – Spring 2012*

- Planned and ran the weekly ACM meetings, sent updates and reminders to the ACM members, and helped plan events for computer science students and the Trinity University community
- Tutored computer science students and recruited new students into the organization

Trinity University

San Antonio, TX

*Treasurer of the Association for Computing Machinery (ACM)**Fall 2010 – Spring 2011*

- Managed the ACM budget and helped plan events for computer science students and the Trinity University community

Technical Skills**Programming Languages**C/C++, HLSL/GLSL, CUDA, Lua, Terra, Python, \LaTeX **Frameworks**

LLVM, Clang, DirectX, OpenGL, Unreal Engine

Tools

Microsoft Visual Studio, Visual Studio Code, Windows, Linux, CMake, Git