

# Kyle Olszewski

<http://kyleolszewski.com>  
[olszewski.kyle@gmail.com](mailto:olszewski.kyle@gmail.com)  
(832) 407-3468

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## Research interests

Computer graphics, animation, high-performance computing and performance capture: Use of the full power of modern hardware to generate compelling and realistic animations of human movement and facial expressions in real-time for emerging applications such as personal interaction in virtual and augmented reality.

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## Education

University of Southern California 2014 - Present  
**Ph.D. Computer Science**, Expected May 2019.  
Advisor: Hao Li

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Georgia Institute of Technology 2007 - 2009  
**M.S. Computer Science**. GPA 4.0/4.0

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Boston University 2003 - 2007  
**B.A. Computer Science**. Graduated *Summa Cum Laude*.  
**B.S. Film and Television**. Graduated *Summa Cum Laude*.

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## Publications

- **K. Olszewski\***, Z. Li\*, C. Yang\*, Y. Zhou, R. Yu, Z. Huang, S. Xiang, S. Saito, P. Kohli, H. Li. Realistic Dynamic Facial Textures from a Single Image using GANs. *Proceedings of the IEEE International Conference on Computer Vision 2017 (ICCV 2017)*.
- **K. Olszewski**, J. Lim, S. Saito, H. Li. High-Fidelity Facial and Speech Animation for VR HMDs. *Proceedings of the 9th ACM SIGGRAPH Conference and Exhibition in Asia 2016, 12/2016 (SIGGRAPH ASIA 2016)*.
- D. Casas, A. Feng, O. Alexander, G. Fyffe, P. Debevec, R. Ichikari, H. Li, **K. Olszewski**, E. Suma, and A. Shapiro. Rapid Photorealistic Blendshape Modeling from RGB-D Sensors. *Computer Animation and Virtual Worlds 2016, Proceedings of the 29th Conference on Computer Animation and Social Agents, 05/2016 (CASA 2016)*.
- H. Li\*, L. Trutoiu\*, **K. Olszewski\***, L. Wei\*, T. Trutna, P.-L. Hsieh, A. Nicholls, and C. Ma. Facial Performance Sensing Head-Mounted Display. *ACM Transactions on Graphics (Proceedings of SIGGRAPH 2015)*, 34(4):47, 2015.

\* Authors have contributed equally.

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## Academic honors

- Pelican Imaging Fellowship, University of Southern California, 2014 - 2015.
- Boston University Trustee Scholarship (full tuition, four years), 2003 - 2007.
- National Merit Scholarship (BMC Software, \$2,500/year, four years), 2003 - 2007.

- Boston University Dean's List, 2003 - 2007.
- Boston University Computer Science Dept. Academic Achievement Award, May 2007.
- Member, Phi Beta Kappa Society, inducted 2007.
- Member, Sigma Alpha Lambda National Leadership and Honors Org., inducted 2006.

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Positions  
held

**Research Assistant** Aug. 2014 - Present  
Geometric Capture Lab  
University of Southern California, Los Angeles, CA

Developed, implemented and evaluated methods for surface reconstruction from monocular video for the purpose of capturing the appearance of human faces. Developed techniques for using various sensing devices attached to head-mounted displays to track the wearer's facial expressions in real-time for the purpose of controlling a digital avatar.

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**Research Intern** Jun. 2017 - Aug. 2017  
Adobe Research, San Jose, CA

Researched efficient techniques for interactively and realistically editing facial hair in images.

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**Research Intern** May 2016 - Aug. 2016  
Microsoft Research, Redmond, WA

Researched generative modeling techniques for synthesizing accurate images of the occluded regions of an augmented reality head-mounted display wearer's face.

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**Consultant** Jan. 2016 - Present  
Pinscreen, Santa Monica, CA

Researched and implemented real-time facial expression tracking techniques for various applications.

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**Research Intern** Jun. 2015 - Aug. 2015  
Oculus Research, Redmond, WA

Researched supervised learning techniques for performing high-fidelity mouth tracking for the purpose of transferring speech-related motion to a digital avatar.

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**Teaching Assistant** Aug. 2014 - Present  
University of Southern California, Los Angeles, CA  
CSCI 420: Computer Graphics, Fall 2014, Fall 2015  
CSCI 599: Geometry Processing, Spring 2015

Assisted students in understanding concepts from class and resolving issues with

assignments. Delivered guest lectures.

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**Research Consultant**

Jun. 2014 - Aug. 2014

Pelican Imaging, Santa Clara, CA

Experimented with and evaluated techniques for denoising and aligning depth maps from Pelican Imaging's mobile stereo camera into a cohesive model. Assisted with integration of these techniques into surface reconstruction pipeline. Prepared for demonstration of this pipeline to potential clients. Performed interviews with job applicants.

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**Senior Software Engineer**

Mar. 2013 - May 2014

NVIDIA Corporation, Santa Clara, CA

Contributed to design and development of SDK used to create cloud gaming clients for NVIDIA GRID. Implemented and optimized GRID clients on multiple platforms. Interviewed job applicants. Mentored new team members.

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**Software Engineer**

Jun. 2009 - Mar. 2013

NVIDIA Corporation, Santa Clara, CA

Developed remote desktop software for collaborative development with CAD applications. Researched methods to improve performance and image quality of low-latency video encoding and decoding. Assisted with preparation of demos.

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**Master's Student**

Aug. 2007 - May 2009

College of Computing, Georgia Institute of Technology, Atlanta, GA

Took classes on advanced topics in computer graphics and high-performance computing. Conducted research projects related to GPGPU computing and parallelized rendering (see "Miscellaneous research experience" below).

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**Software Engineering Intern**

Summer 2008

NVIDIA Corporation, Santa Clara, CA

Added instrumentation code to OpenGL driver to track resource usage and other aspects of driver state. Created remote monitor program that receives and displays this data. Found and resolved OpenGL driver bugs.

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**Computer Science Tutor**

Spring 2006 - Spring 2007

Boston University Computer Science Lab, Boston, MA

Assisted students in understanding and applying concepts taught in introductory computer science courses. Helped with creation and maintenance of accounts on BU Computer Science network.

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**Undergraduate Research Assistant**  
Boston University Computer Graphics Lab, Boston, MA

Summer 2006

Annotated video files for ground truthing and performance analysis of computer vision algorithms. Developed programs for automated modification of annotation files. Provided SQL queries for searching databases of annotated video frames.

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**Film Production Intern**  
Canal Vivir, Madrid, Spain

Summer 2005

Aided in capturing and editing digital video footage.

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Selected  
press

- **Wired** (2015): "Oculus can map your real-life expressions onto your VR avatar." Katie Collins, May 21.
  - **Engadget** (2015): "Oculus VR figures out how avatars can mimic your facial expressions." Mariella Moon, May 21.
  - **MIT Technology Review** (2015): "Oculus Rift Hack Transfers Your Facial Expressions onto Your Avatar." Tom Simonite, May 20.
  - **USC News** (2016): "Who wants to show up as Gandalf at their next meeting?" Daniel Druhora, Oct. 11.
  - **Radiolab** (2017): "Breaking News." Simon Adler, Jul. 27.
  - **Daily Trojan** (2017): "Professor's research contributed to iPhone X." William Nguyen, Sept. 27.
  - **Wired** (2017): "How Digital Avatars Could Be the Future of Fake News." Oct. 24.
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Exhibitions

- S. Saito, L. Wei, J. Fursund, L. Hu, C. Yang, R. Yu, **K. Olszewski**, S. Chen, I. Benavente, Y. Chen, H. Li. Pinscreen: 3D Avatar from a Single Image. *ACM SIGGRAPH Asia 2016 Emerging Technologies*, 12/2016.
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Research  
talks

- **Facial Performance Sensing Head-Mounted Display**. Qualcomm, San Diego (October 2015).
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Service

- Peer reviewer for: SIGGRAPH Asia, SCA, CAD/Graphics, Computer Graphics Forum, UIST, Pacific Graphics, IEEE VR, VRST, EuroVR, Siggraph VR Village, Siggraph Asia Emerging Technologies.
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Miscellaneous  
research  
experience

### **CUDA Conjugate Gradient Method**

Class Research Project, Georgia Institute of Technology

Implemented CUDA kernels used to perform sparse matrix-vector multiplications and scalar product calculations. Used these kernels to solve sparse systems of linear equations. Experimented with data structures and workload distribution techniques appropriate for NVIDIA GPU architecture. Evaluated performance compared to sequential CPU implementation.

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### **CUDA Medical Image Filters**

Class Research Project, Georgia Institute of Technology

Implemented CUDA kernels used to apply common image filtering techniques to medical image volumes. Developed techniques for using shared memory region to increase performance on Geforce 8 Series GPUs.

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### **Parallel Distribution Ray Tracer**

Class Research Project, Georgia Institute of Technology

Parallelized intersection tests for ray tracer using MPI. Implemented spatial subdivision using k-d trees to reduce number of intersection tests required per ray. Incorporated sampling from multiple rays to produce "soft" effects such as depth-of-field, soft shadows, glossy reflections/refractions, motion blur and anti-aliasing. Experimented with load balancing techniques/heuristics for k-d tree construction.

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Programming  
experience

- Languages: C, C++, C#, Java, Processing, CUDA, Cg, GLSL, Matlab, Perl, Python, Lua, HTML, PHP, SQL, MIPS, Scheme, ML
- Tools/IDEs: gdb, Visual Studio, Xcode, Eclipse, CMake
- APIs/Misc: OpenGL, OpenCV, Qt, MPI, OpenMP, Torch, Caffe