

<b>OVERVIEW</b>	Strong background in research, algorithm development, and software engineering. Core areas include Surface Reconstruction, Computer Graphics, Computational Geometry, SLAM, Multiview Stereo, Signal Processing, and Computer Vision.	
<b>EDUCATION</b>	<b>University of California - Berkeley</b>	
	Ph.D. in Electrical Engineering and Computer Sciences	May 2015
	M.S. in Electrical Engineering and Computer Sciences	May 2013
	GPA: 4.00/4.00	
	<b>Carnegie Mellon University</b>	
	B.S. in Electrical and Computer Engineering	May 2011
	QPA: 3.91/4.00 - Dean's List	
	<i>Minors in Physics, Computer Science</i>	
<b>WORK EXPERIENCE</b>	<b>Google</b>	03/2016 - Present
	Staff Software Engineer - AR Team	
	- Tech lead on ARCore Depth API, developing novel depth algorithms and use-cases across Google product areas.	
	- Developed real-time passive depth sensing on mobile hardware.	
	- Tech lead on real-time 3D reconstruction techniques with noisy depth on smartphones.	
	- Daydream AR/VR - Tech lead on foveated rendering techniques for mobile VR headsets.	
	- Developed custom hardware-foveation displays for VR.	
	- <i>7 patents filed.</i>	
	<b>Indoor Reality, Inc.</b>	06/2015 - 03/2016
	Chief Technology Officer (CTO) and cofounder	
	- Principal Investigator (PI) on multiple federal grants totalling \$2 Million.	
	- Tech lead in developing hardware, software, and algorithms used for automatic and rapid indoor building 3D modeling via backpack-mounted scanning system.	
	- Developed software for data collection, algorithmic processing, and visualization.	
	- Supervisor for visualization and deployment development team.	
	- <i>3 patents filed.</i>	
	<b>Signetron, Inc.</b>	07/2015 - 03/2016
	Software Architect	
	- Algorithm and software development for rapid indoor modeling, automatic building energy audits, and virtual tours from handheld scanning system.	
	- Principal engineer on software and hardware development, including localization and 3D modeling algorithms.	
	- Supervisor for team of software engineers.	
	<b>EECS Department - UC Berkeley</b>	01/2015 - 05/2015
	Graduate Student Instructor	
	- Course EE 122: Introduction to Communication Networks	
	- Taught discussion sections, held office hours, graded homeworks/exams.	
	<b>@Maps</b>	08/2014 - 12/2014
	Principal Engineer	

- Developed hardware systems and surface reconstruction software algorithms for indoor building 3D modeling.
- Research and development of camera calibration procedures.

**Speir Technologies** 01/2013 - 01/2014

Software Development Consultant

- Developed prototype demo application and 3D modeling algorithms for remote viewing medical ultrasound scanning.
- Developed client-server model for remote medical scanning, sensor drivers interface, and 3D meshing techniques for live streaming of patient geometry.

**MIT Lincoln Laboratory** 05/2011 - 08/2011

Summer Intern - Group 104: Intelligence and Decision Theory

Developed algorithms for creation of synthetic test data for Synthetic Aperture Radar (SAR) Coherent Change Detection (CCD) track-finding.

**ECE Department - Carnegie Mellon** 01/2011 - 05/2011

Teaching Assistant

Course 18-391: Noisy Signal Processing

Wrote homework reference solutions, taught weekly office hours.

**Qualcomm** 05/2010 - 08/2010

Software Summer Intern - QCT Modem Integration Team

Developed/automated methodology for optimizing and removing redundancies in client specs of processor builds.

**Flatirons Solutions** 05/2008 - 08/2008

Summer Intern

Developed flight path modeling application for FAA. Wrote application to estimate cost/efficiency analysis for air traffic routes, interfaced with Google Earth.

**RESEARCH  
EXPERIENCE**

**Video and Image Processing Lab - U.C. Berkeley** 08/2011 - 05/2015

Ph.D. Graduate Student

3D and 2D surface reconstruction algorithms for architectural modeling. Automatic reconstruction of indoor building environments from LiDAR and imagery data on an ambulatory backpack-mounted scanning system. System hardware design and assembly, including developing sensor drivers and processing architecture. Analysis of building geometry for room-layout and energy efficiency modeling.

**Spiral Project - Carnegie Mellon** 08/2010 - 05/2011

Honors Research Undergraduate

Analysis of efficiency and error for Synthetic Aperture Radar (SAR) algorithm for logic-in-memory implementation.

**Spiral Project - Carnegie Mellon** 05/2009 - 08/2009

Summer Research Undergraduate

Implementation and analysis of search techniques for Spiral's code optimization engine. Developed genetic search algorithm for optimization of hardware-dependent software implementations of DCT, FFT, and Matrix Multiplication.

**Robotics Institute - Carnegie Mellon** 09/2008 - 12/2008

Research Assistant

Design of user interface for LiDAR scans exported from variety of autonomous robotic systems.

## TECHNICAL SKILLS

**Programming Languages:** C/C++, Java, Python, Matlab, BASH, x86  
**Markup Languages:** HTML, LaTeX, Markdown  
**Software:** Unity, Autodesk Revit, Recap, Navisworks, AutoCAD, SolidWorks, Visual Studio, Git, SVN  
**Frameworks:** Eigen, Boost, OpenCV, PCL, OpenGL, GLSL, Halide, Qt, Android, Google Tango, Doxygen

## AWARDS

**Awarded Best Student Paper - GRAPP 2014** 01/2014  
9th International Joint Conference on Computer Vision, Imaging, and Computer Graphics Theory and Applications

**Awarded NSDEF Fellowship** 09/2013 - 05/2016  
Funded by Office of Naval Research (ONR)

**CMU Meeting of the Minds** 05/2011  
- Won First Place Lockheed Martin ECE Undergraduate Project  
- Won Third Place CIT Honors Research Poster Competition

## PUBLICATIONS

**Depth from Motion for Smartphone AR**, SIGGRAPH Asia 2018

**Limits of Peripheral Acuity and Implications for VR System Design**, Journal of Society for Information Display 2018

**Sensitivity to Peripheral Artifacts in VR Display Systems**, Society for Information Display 2018

**Phase-Aligned Foveated Rendering for Virtual Reality Headsets**, 25th IEEE Conference on Virtual Reality and 3D User Interfaces 03/2018

**Foveated Pipeline for AR/VR Head-Mounted Displays**, Information Display 11/2017

**Identification of Energy Conservation Measures Towards Zero Carbon Building Energy Performance with the Rapid Building Energy Modeler and the Energy Analysis Engine**, ZCB 2016 09/2016

**Automatic Indoor 3D Surface Reconstruction with Segmented Building and Object Elements**, Fifth Joint 3DV Conference 10/2015

**3D Modeling of Interior Building Environments and Objects from Noisy Sensor Suites**, Ph.D. Thesis, Department of Electrical Engineering and Computer Sciences, University of California Berkeley 05/2015

**Multistory Floor Plan Generation and Room Labeling of Building Interiors from Laser Range Data**, Communications in Computer and Information Science 2014

**Fast, Automated, Scalable Generation of Textured 3D Models of Indoor Environments**, Journal of Selected Topics in Signal Processing 08/2014

**Image-Based Position of Mobile Devices in Indoor Environments**, Multi-modal Location Estimation of Video and Images 2014

**Floor Plan Generation and Room Labeling of Indoor Environments from Laser Range Data**, GRAPP 2014 01/2014

**Reduced-Complexity Data Acquisition System for Image Based Localization in Indoor Environments**, IPIN 2013 10/2013

**Image Based Localization in Indoor Environments**, International Conference on Computing for Geospatial Research and Applications 07/2013

**Watertight Planar Surface Meshing of Indoor Point-Clouds with Voxel Carving**, Third Joint 3DV Conference 06/2013

**Watertight Floor Plans Generated From Laser Range Data**, Master's Thesis 05/2013

**Inserted Simulated Tracks into SAR CCD Imagery**, Society for Modeling & Simulation International (SCS) 2013 Autumn Simulation Multi-Conference (Autumn-Sim'12) 10/2012

**Watertight As-Built Architectural Floor Plans Generated from Laser Range Data**, 3DIMPVT 10/2012

**Sharp Geometry Reconstruction of Building Facades Using Range Data**, ICIP 2012 09/2012

**Local Interpolation-based Polar Format SAR: Algorithm, Hardware Implementation and Design Automation**, Japan Society for the Promotion of Science 06/2012

**Polar Format Synthetic Aperture Radar in Energy Efficient Application-Specific Logic-in-Memory**, ICASSP 2012 05/2012

**Energy Efficient Application-Specific Logic-in-Memory for Interpolation in Synthetic Aperture Radar**, High Performance Embedded Computing (HPEC) 09/2011

**AWARDED  
PATENTS**

**PHASE ALIGNED FOVEATED RENDERING**, Patent 17801804.0 - 1216 July 17, 2019.

**DUAL-PATH FOVEATED GRAPHICS PIPELINE**, Patent 17783618.6 - 1209 06/19/2019

**EARLY SUB-PIXEL RENDERING**, Patent 17778139.0 - 1210 06/19/2019

**METHODS FOR INDOOR 3D SURFACE RECONSTRUCTION AND 2D FLOOR PLAN RECOVERY UTILIZING SEGMENTATION OF BUILDING AND OBJECT ELEMENTS**, Patent 10,127,718 11/13/2018

**PATENTS  
UNDER FILE**

**GP-203795-00-PR, "DEPTH FROM MOTION FOR SMARTPHONE AR"**  
Filed February 2019

**GP-202593-00-US, "5DOF PHASE-ALIGNED FOVEATED RENDERING"**  
Filed November 2017

**GP-201053-02-US, "LOW RESOLUTION RGB RENDERING FOR EFFICIENT TRANSMISSION,"**  
Filed November 2016