

Matthew Thomas Hielsberg

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Citizenship: USA

Education:

M.Eng. Computer Engineering, Texas A&M University 2016
B.S. Computer Science, University of South Carolina 2003

Professional Experience:

- Department of Mathematics
Texas A&M University
College Station, TX
 - Research Specialist V June 2021 - current
- Institute of Data Science (TAMIDS)
Texas A&M University
College Station, TX
 - Research Specialist V 2019 - 2021 (20% FTE)
- Institute for Scientific Computation
Texas A&M University
College Station, TX
 - Research Specialist V February 2018 - May 2021
 - Research Specialist III December 2016 - January 2018
 - Research Specialist April 2016 - November 2016
 - Associate Research Specialist January 2010 - April 2016
- Interdisciplinary Mathematics Institute
University of South Carolina
Columbia, SC
 - Senior Applications Analyst January 2007 - December 2009
 - Graphics Specialist May 2003 - December 2006

- Student Software Developer January 2002 - May 2003
- Department of Defense Polygraph Institute
Fort Jackson, SC
- Co-op Network Administrator December 2000 - May 2001

Consulting Experience:

- SIAM TX-LA Section / Texas A&M University
College Station, TX
 - Web and Software Consultant Sep 2020 - October 2020
- Embry-Riddle Aeronautical University
Daytona Beach, FL
 - Software Consultant July 2016 - December 2016

Workshops Co-Organized:

- Uncertainty Quantification: Theory Meets Practice
College Station, TX November 5, 2021

Selected Projects:

- *Optimal Algorithms for Computing Average Temperature*, Implemented optimal algorithms for the computation of global average temperatures given incomplete data.
- *Wavelet Surface Reconstruction*, Worked with a small team to design and develop software for reconstructing surfaces from scattered point cloud data using wavelets.
- *Algorithms for Threat Detection*, Developed tools for analyzing and simulating hyper-spectral LiDAR for detecting and identifying chemical and biological aerosols.
- *Autonomous Vehicle Navigation and Coordination*, Provided technical support and aided in the design and implementation of terrain-learning systems for navigation and multi-vehicle coordination.
- *Simulator*, Developed virtual environment for sensor simulation and HILS development.
- *LiDAR Point Cloud Assimilation: Hybrid Surface Approximation*, Used adaptive tetrahedral meshes and implicit level set methods for surface approximation of large LiDAR point clouds.
- *Software for Generating Geometrically and Topologically Accurate Urban Terrain Models Using Implicit Methods*, Developed fast structures for distance field evaluation and vertex access.

- *Active Vision Control of Agile Autonomous Flight (AVCAAF)*, Worked with a team to combine Mathematical Learning Theory, Receding Horizon Control, and Structure from Motion to enable autonomous Micro-Arial Vehicle flight via vision.
- *Feature Identification and Tracking in Video*, Explored several feature tracking methods for use in SFM and autonomous navigation.
- *Structure from Motion (SFM)*, Explored methods for surface reconstruction from video.
- *Mathematical Learning Theory*, Developed several software packages for real-time integration of point cloud data for 2.5D surface reconstruction.

Publications:

- S. Foucart, M. Hielsberg, G. Mullendore, G. Petrova, P. Wojtaszczyk, Optimal Algorithms for Computing Average Temperatures, *Mathematics of Climate and Weather Forecasting*, *Mathematics of Climate and Weather Forecasting*, 5:34-44, 2019.
- R. Prazenica, M. Hielsberg, R. Sharpley and A. Kurdila, *3-D Implicit Terrain Mapping and Path Planning for Autonomous MAV Flight in Urban Environments*, AIAA Guidance, Navigation, and Control Conference (GNC), Aug 2013 (AIAA-2013-4792).
- M. Hielsberg, R. Tsai, P. Guo and C. Chen, *Visibility-Based Urban Exploration and Learning Using Point Clouds*, ICES REPORT 13-06, The Institute for Computational Engineering and Sciences, The University of Texas at Austin, March 2013.
- R. DeVore, G. Petrova, M. Hielsberg, L. Owens, B. Clack and A. Sood, *Processing Terrain Point Cloud Data*, *SIAM J. Imaging Sci.*, 6(1):1-31, 2013.
- R. Prazenica, A. Kurdila, R. Sharpley, P. Binev, M. Hielsberg, J. Lane, and J. Evers, *Vision-based receding horizon control for micro air vehicles in urban environments*, (preprint).
- P. Binev, R. DeVore, M. Hielsberg, L.S. Johnson, B. Karaivanov, B. Lane and R. Sharpley, *Geometric Encoding of Natural and Urban Terrains*, (preprint).
- A. Thies, B. Philips, P. Binev, R. DeVore, M. Hielsberg, L.S. Johnson, B. Karaivanov, B. Lane and R. Sharpley, *Smooth, Piecewise-Polynomial Terrain Representation Using Nontraditional Metrics*, STTR Final Report, Schafer Corporation Contract No. W911NF-04-C-0060, U.S. Army Research Office, March 2005.

Selected Talks:

- *Data Analyses in Python*, Open Source Open Science Workshop 2020, Texas A&M University, September 13, 2020

- *Processing and Compressing Terrain Data*, ARO MURI: Dynamic Modeling of 3D Urban Terrain, Year 5 Review, University of South Carolina - November 5, 2012
- *Processing Terrain Point Cloud Data*, ARO MURI: Dynamic Modeling of 3D Urban Terrain, Year 4 Review, University of California, Irvine - January 10, 2012
- *LiDAR Simulation*, DTRA/NSF Algorithms for Threat Detection, University of South Carolina - December 19, 2010
- *Overview of ATD Hyperspectral Data*, DTRA/NSF Algorithms for Threat Detection, University of South Carolina - December 19, 2010
- *LiDAR Overview*, DTRA/NSF Seminar Series, Texas A&M University - November 30, 2010
- *Simulation and Experimentation*, ARO MURI: Dynamic Modeling of 3D Urban Terrain, Year 3 Review, University of Texas at Austin - September 28, 2010
- *Simulation, Data Acquisition and Dynamic Data Sets*, ARO MURI: Dynamic Modeling of 3D Urban Terrain, Year 1 Review, University of South Carolina - November 20, 2008
- *IMI Simulation Capabilities*, Model Classes, Approximation, and Metrics for Dynamic Processing of Urban Terrain Data, Rice University - Sept 10, 2007

External Training and Certificates:

- Apple Certified Associate
Mac Integration 10.11 - July 2016
- DIRSIG Synthetic LiDAR Training
Herndon, VA - November 2010
- Subdivision Schemes for Geometric Modeling Class, European Mathematical Society
Summer School
Pontignano, Italy - June-July 2005

Professional Service:

- **Reviewer:**
 - CASE 2013
 - ICRA 2015, 2016
 - IEEE Trans. Aerospace and Electronic Systems 2015
 - WAFR 2014

- Algorithmic Foundations of Robotics XI: Selected Contributions of the Eleventh International Workshop on the Algorithmic Foundations of Robotics, Springer, 2015

- **Miscellany:**

- Texas A&M Immersive Visualization Center Competition Judge, 2011 - 2013
- Maintained webpage for available community software and data repositories for the PCL community, 2013 - 2017. <http://pointclouds.org/media/>

Collegiate Honors, Organizations and Activities:

- **Graduate:**

- AAAS Student Member (2013 - 2016)
- ACM SIGGRAPH Member (2010 - 2014)
- ACM Student Member (2012 - 2016)
- IEEE Student Member (2013 - 2016)
- IEEE Robotics and Automation Society Student Member (2013 - 2016)
- IEEE Cloud Computing Community Student Member (2013 - 2016)
- IEEE Communications Society Student Member (2013 - 2016)
- SIAM Student Member (2013 - 2016)

- **Undergraduate:**

- Ford Motor Company/Golden Key Outstanding Senior Award
- South Carolina LIFE Scholarship
- University Scholars Scholarship
- Dr. Dean's Academic Scholarship
- Association for Computing Machinery
- Golden Key International Honour Society
- Phi Beta Kappa Undergraduate Honors Organization
- National Society of Collegiate Scholars
- Gamma Beta Phi Honorary Society
- Alpha Lambda Delta Freshman Honor Society