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:

- Technology Services, Arts & Sciences
  Texas A&M University
  College Station, TX
    - System Administrator IV (HPC)   February 2023 - current

- Department of Statistics
  Texas A&M University
  College Station, TX
    - Research Specialist V (HPC)   May 2022 - January 2023 (20% FTE)

- Department of Mathematics
  Texas A&M University
  College Station, TX
    - Research Specialist V   June 2021 - February 2023

- Institute of Data Science (TAMIDS)
  Texas A&M University
  College Station, TX
    - Research Specialist V   January 2019 - December 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   September 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 hyperspectral 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