

# Jacob D. Hauenstein

COMPUTER SCIENTIST · ASSISTANT PROFESSOR

✉ hauensj1@uah.edu | 📺 jhauenstein

## Education

---

### The University of Alabama in Huntsville

Huntsville, Alabama, USA

PH.D. IN COMPUTER SCIENCE

May 2020

- Dissertation: “On Determination of Curvature in Range Images and Volumes”
- Advisor: Dr. Timothy S. Newman
- Areas of Focus: visualization, graphics, range image and volumetric data processing, curvature determination, derivative reconstruction, GPGPU, high performance computing

### The University of Alabama in Huntsville

Huntsville, Alabama, USA

M.S. IN COMPUTER SCIENCE

May 15, 2010

### The University of Alabama in Huntsville

Huntsville, Alabama, USA

B.S. IN COMPUTER SCIENCE

December 13, 2008

- Minor: Mathematics
- Honors and Affiliations: Dean's List, Scholar's List

## Peer-Reviewed Publications

---

### JOURNAL ARTICLES

- [1] J. D. Hauenstein and T. S. Newman, “Descriptions and evaluations of methods for determining surface curvature in volumetric data,” *Computers & Graphics*, vol. 86, pp. 52–70, Feb. 2020. doi: 10.1016/j.cag.2019.11.003.
- [2] —, “Exhibition and evaluation of two schemes for determining hypersurface curvature in volumetric data,” *Journal of WSCG*, vol. 27, no. 2, pp. 121–129, May 2019. doi: 10.24132/JWSCG.2019.27.2.5.
- [3] —, “Curvature determination in range images: New methods and comparison study,” *Multimedia Tools and Applications*, vol. 78, no. 7, pp. 9247–9273, Apr. 2019. doi: 10.1007/s11042-018-6363-0.
- [4] J. D. Hauenstein, R. Tinaztepe, and R. S. Aygun, “‘you can run, but you cannot hide’: Tracking objects that leave the field-of-view,” *International Journal of Information Technology & Decision Making*, vol. 11, no. 1, pp. 11–31, 2012. doi: 10.1142/S0219622012500010.

### CONFERENCE PROCEEDINGS

- [1] J. D. Hauenstein and T. S. Newman, “Assessing potential educational use of two 3D scanners: Microsoft Kinect v2 and NextEngine 3D Scanner Ultra HD,” in *Proc., 2019 International Conference on Computational Science and Computational Intelligence (CSCI 2019)*, Las Vegas, Nevada, USA, Dec. 2019, pp. 853–858. doi: 10.1109/CSCI49370.2019.00162, (Acceptance rate: 17%).
- [2] —, “An examination of the effects of noise level on methods to determine curvature in range images,” in *Electronic Imaging: Image Quality and System Performance XVI (IQSP XVI)*, Burlingame, California, USA, Jan. 2019, pp. 325-1–325-7. doi: 10.2352/ISSN.2470-1173.2019.10.IQSP-325.
- [3] —, “Fast and accurate volume data curvature determination using GPGPU computation,” in *Proc., ACMSE 2018 Conference*, Richmond, Kentucky, USA, Mar. 2018, 19:1–19:8. doi: 10.1145/3190645.3190681.
- [4] —, “On reliable estimation of curvatures of implicit surfaces,” in *Proc., 2nd International Conference on 3D Vision (3DV 2014)*, vol. 1, Tokyo, Japan, Dec. 2014, pp. 697–704. doi: 10.1109/3DV.2014.30.

# Experience

---

## The University of Alabama in Huntsville

Huntsville, Alabama, USA

### ASSISTANT PROFESSOR

August 2020 - Present

- Instructor for multiple levels of undergraduate and graduate computer science courses, including:
  - CS 221: Computer Science II (FA20)
  - CS 307: Object Oriented Programming Using C++ (SP21)
  - CS 321: Introduction to Object-Oriented Program Design Using Java (SP21)
  - CS 445: Introduction to Computer Graphics (FA20)
  - CS 545: Introduction to Computer Graphics (FA20)
- Instructor Responsibilities:
  - Developed syllabus
  - Prepared and delivered all lectures
  - Developed all coursework (programming assignments, homeworks, tests, etc.)
  - Graded coursework
  - Produced course portfolio
  - Maintained office hours
- Research Responsibilities:
  - Sought outside funding for research
  - Advised students on research
  - Published research findings in peer-reviewed conference proceedings and journals
- Other Responsibilities:
  - Academic advisor for graduate computer science students

## The University of Alabama in Huntsville

Huntsville, Alabama, USA

### LECTURER

August 2019 - Present

- Instructor for multiple levels of undergraduate computer science courses, including:
  - CS 102: Introduction to Programming Using C (FA19, SP20)
  - CS 121: Computer Science I (FA19)
  - CS 221: Computer Science II (SP20 (2 sections))
  - CS 307: Object Oriented Programming Using C++ (SP20, SU20)
  - CS 317: Introduction to Design and Analysis of Algorithms (SU20)
  - CS 445: Introduction to Computer Graphics (FA19)
- Responsibilities:
  - Developed syllabus
  - Prepared and delivered all lectures
  - Developed all coursework (programming assignments, homeworks, tests, etc.)
  - Graded coursework
  - Produced course portfolio
  - Maintained office hours

## The University of Alabama in Huntsville

Huntsville, Alabama, USA

### INSTRUCTING GRADUATE TEACHING ASSISTANT

January 2016 - July 2019

- Instructor for multiple levels of undergraduate computer science courses, including:
  - CS 102: Introduction to Programming Using C (SP16, SU16, FA16, SP17, FA17, SP19)
  - CS 103: Introduction to Programming Using Java (SU17)
  - CS 317: Introduction to Design and Analysis of Algorithms (SU19)
  - CS 321: Introduction to Object-Oriented Program Design Using Java (SP18 (2 sections))
- Responsibilities:
  - Developed syllabus
  - Prepared and delivered all lectures
  - Developed all coursework (programming assignments, homeworks, tests, etc.)
  - Graded coursework
  - Produced course portfolio
  - Maintained office hours

(continued on next page)

(continued from previous page)

## ESI North America

Huntsville, Alabama, USA

### SOFTWARE DEVELOPER

August 2010 - December 2015

- Developed numerous new features for CFD-VIEW (cross-platform software for visualization and processing of computational fluid dynamics results) including:
  - Integration with FreeType for improved headless font rendering
  - Enhanced logarithmic scales for improved colormap-based visualization
  - Automated Python journaling of commands performed in GUI
  - Expanded support for cell-centered data
- Primary developer of CFD-VIEW from August 2011 to December 2015
- Maintained CFD-VIEW build system
- Worked primarily in C, C++, and Python

## The University of Alabama in Huntsville

Huntsville, Alabama, USA

### GRADING GRADUATE TEACHING ASSISTANT

January 2009 - May 2010

- Maintained hours in student computer lab
- Answered student questions about course material and equipment
- Developed answer keys for various assignments
- Grader for various undergraduate computer science courses, including:
  - CS 214: Introduction to Discrete Structures
  - CS 490: Introduction to Operating Systems

## Proposals, Whitepapers, and Funding

---

### PENDING PROPOSALS

- [1] J. D. Hauenstein and M. Petty, “Active response of digital displays to adverse environmental conditions and damage,” The University of Alabama in Huntsville, Computer Science Department, Tech. Rep., Feb. 2021, Invited proposal pending submission for FY20 Defense Established Program to Stimulate Competitive Research (DEPSCoR). Funding opportunity number: FOA-AFRL-AFOSR-2020-0004. Estimated budget: \$224,000.
- [2] J. D. Hauenstein, “Detecting digital display failures,” The University of Alabama in Huntsville, Computer Science Department, Tech. Rep., Jan. 2021, Proposal pending submission for UAH New Faculty Research. Estimated budget: Under \$10,000.

### WHITEPAPERS

- [1] J. D. Hauenstein and M. Petty, “Active response of digital displays to adverse environmental conditions and damage,” The University of Alabama in Huntsville, Computer Science Department, Tech. Rep., Sep. 2020, Submitted for FY20 Defense Established Program to Stimulate Competitive Research (DEPSCoR). Funding opportunity number: FOA-AFRL-AFOSR-2020-0004. Estimated budget: \$224,000. **Resulted in invited proposal.**

## Research Interests

---

### Data Science

- Machine Learning
- Pattern Recognition

### High Performance Computing

- Parallel Processing
- GPGPU

### Computer Graphics

- Information Visualization
- Scientific Visualization
- Rendering

### Reconstruction

- Curvature Determination
- Derivative Reconstruction

### Digital Image Processing

- Volumetric Data Processing
- Range Image Processing

<b>“Assessing Potential Educational Use of Two 3D Scanners: Microsoft Kinect v2 and NextEngine 3D Scanner Ultra HD”</b>	<i>2019 International Conference on Computational Science and Computational Intelligence (CSCI)</i> December 2019
<b>“Individual Tree Species Classification Based on Terrestrial Laser Scanning Using Curvature Estimation and Convolutional Neural Network”</b>	<i>Visualization and Graphics Interest Group (VISGIG)</i> September 2019
<b>“Exhibition and Evaluation of Two Schemes for Determining Hypersurface Curvature in Volumetric Data”</b>	<i>WSCG International Conf. on Computer Graphics, Visualization, and Computer Vision 2019</i> May 2019
<b>“A Comparison of the Kinect v2 and NextEngine 3D Scanner Ultra HD 3D Scanners”</b>	<i>Visualization and Graphics Interest Group (VISGIG)</i> February 2019
<b>“An Examination of the Effects of Noise Level on Methods to Determine Curvature in Range Images”</b>	<i>Electronic Imaging 2019: Image Quality and System Performance XVI</i> January 2019
<b>“An Examination of the Effects of Noise Level on Methods to Determine Curvature in Range Images”</b>	<i>Visualization and Graphics Interest Group (VISGIG)</i> October 2018
<b>“Fast and Accurate Volume Data Curvature Determination Using GPGPU Computation”</b>	<i>ACM Southeast 2018</i> March 2018
<b>“Fast and Accurate Volume Data Curvature Determination”</b>	<i>Visualization and Graphics Interest Group (VISGIG)</i> March 2018
<b>“Error in Curvature Determination in Range Images”</b>	<i>Visualization and Graphics Interest Group (VISGIG)</i> October 2017
<b>“Curvature Determination in Range Data”</b>	<i>Visualization and Graphics Interest Group (VISGIG)</i> July 2017
<b>“On Reliable Determination of Curvature in Volumetric Data”</b>	<i>Visualization and Graphics Interest Group (VISGIG)</i> February 2017
<b>“A New Method for Determining Curvature in Volume Data”</b>	<i>Booz Allen Hamilton Ideas Festival 2017</i> January 2017
<b>“Surface Curvature in Volume and Range Data”</b>	<i>Visualization and Graphics Interest Group (VISGIG)</i> October 2016
<b>“Shape Descriptors for Visualization and Imaging Applications”</b>	<i>Visualization and Graphics Interest Group (VISGIG)</i> July 2016
<b>“Curvature Estimation on Range Images”</b>	<i>Visualization and Graphics Interest Group (VISGIG)</i> April 2016

(continued on next page)

(continued from previous page)

**“Curvature Estimation in Volume Data”**

*Visualization and Graphics Interest  
Group (VISGIG)  
October 2015*

**“Curvature Estimation in Volume Data”**

*Visualization and Graphics Interest  
Group (VISGIG)  
April 2015*

**“On Reliable Estimation of Curvatures of Implicit Surfaces”**

*2nd International Conf. on 3D Vision  
(3DV 2014)  
December 2014*

**“Curvature Estimation in Volume Data”**

*Visualization and Graphics Interest  
Group (VISGIG)  
October 2014*

**“Accuracy and Runtime Comparison of Implicit Surface Curvature Methods (II)”**

*Visualization and Graphics Interest  
Group (VISGIG)  
April 2014*

**“Accuracy and Runtime Comparison of Implicit Surface Curvature Methods”**

*Visualization and Graphics Interest  
Group (VISGIG)  
January 2014*

## Other Projects

---

**Research Experiences for Undergraduates (REU)**

*Huntsville, Alabama, USA  
Summer 2008*

UNDERGRADUATE RESEARCHER

- Researched methods to enable a small robot to locate an object after it disappears from view
- Developed software to test and verify methods
- Built on an existing C# code base
- Sponsored by Alabama Space Grant Consortium
- Resulted in a journal publication

**UAH GameDev Project**

*Huntsville, Alabama, USA  
2006*

PROJECT MEMBER

- Assisted in planning a game development project consisting of undergraduate computer science students
- Experiments with Ogre3D and other game engines

## Professional Service

---

**2019 International Conference on Computational Science and Computational Intelligence (CSCI)**

*Las Vegas, Nevada, USA  
December 2019*

SESSION CHAIR

**International Conf. on Computer Graphics, Visualization, and Computer Vision 2019 (WSCG)**

*Plzeň, Czech Republic  
May 2019*

SESSION CHAIR

**Conference on Computer and Robot Vision 2016 (CRV 2016)**

*Victoria, British Columbia, Canada  
March 2016*

CO-REVIEWER