

# Mark Simpson

Geography Ph.D. Candidate, The Pennsylvania State University

107 Walker Building University Park, PA 16802. 575-491-5512. [marksimpson@psu.edu](mailto:marksimpson@psu.edu)

---

## Education

---

### **Doctor of Philosophy in Geography, May 2020** (anticipated graduation)

*The Pennsylvania State University, State College, Pennsylvania*

PhD minor in Social Data Analytics.

Dissertation: *Scale and Space: Representations in Immersive Virtual Reality*

Defended January 21, 2020

Advisor: Alexander Klippel

Committee: Alan MacEachren, Roger Downs, Klaus Keller

### **Master of Science in Geography, August 2016**

*The Pennsylvania State University, State College, Pennsylvania*

Thesis: *Quantifying Space, Understanding Minds: A Visual Summary Approach*

Advisor: Alexander Klippel

Committee: Jan Oliver Wallgrün, Guido Cervone

### **Bachelor of Science in Geography, May 2012**

*New Mexico State University, Las Cruces, New Mexico*

Concentration in Geographic Information Systems and Technology. Minor in History.

Crimson Scholar Graduate with Distinction in University Honors.

---

## Research and Professional Experience

---

### Academic Research

- 2019**      **Research Assistant, Department of Geography**  
Create and evaluate virtual reality experiences for visualizing natural hazards, including designing and running human participants experiments. Assist in stand-up of Penn State Center for Immersive Experiences.
- 2016 – 2018**    **NSF Integrative Graduate Education and Research Traineeship Fellow-Trainee**  
Participated in interdisciplinary research projects, developed virtual reality tool for visualizing climate model data, advised and assisted in evaluation of visual interface for decision making under uncertainty.
- 2015 – 2016**    **Research Assistant, Department of Geography**  
Implemented externally funded experimental research study (design, data collection, writing), evaluated immersive technology, and created immersive teleconferencing system.
- 2014 – 2015**    **Research Assistant, Department of Geography**  
Conducted research on spatial cognition and space syntax analysis, investigated and tested tools and methods, reviewed and summarized literature.

## Research Internships

2018, Summer **ORAU Summer Journeyman Fellowship Program**

*U.S. Army Research Laboratory, Aberdeen Proving Ground, Maryland, USA.*

Contributed to design and stimulus creation, and collected data for, a virtual reality data visualization experiment. Designed immersive 3D map demonstrator.

2017, Summer **ORISE Higher Education Research Experiences PhD Intern**

*Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA.*

Led execution of an experimental evaluation of a 3D virtual environment tool for population estimation.

2010, **United States Geological Survey (USGS) Student Volunteer**

Summer & Fall *United States Geological Survey, Lakewood, Colorado, USA.*

Processed remote sensing data of arctic ice melt pods, wrote standard operating procedures for creation of analysis products.

## Professional Experience

2012 – 2014 **Geospatial Analyst**

*Bohannon Huston Incorporated, Albuquerque, New Mexico, USA.*

Collected spatial data using satellite imagery, performed data QA/QC, refined GIS workflows, created imagery request system, and trained new employees.

2011 – 2012 **GPS Field and GIS Technician**

*Spatial Applications Research Center, Las Cruces, New Mexico, USA.*

Designed mapping products and created, repaired, and maintained geospatial data for local government and university customers.

---

## Publications

---

### Peer-Reviewed Journal Articles

2020 Zhao, J., **Simpson, M.**, Wallgrün, J. O., & Klippel, A. (in press) *Exploring the Effects of Geographic Scale on Spatial Learning*. *Cognitive Research: Principles and Implications*.

2017 **Simpson, M.**, Richter, K., Wallgrün, J.O., Klippel, A., (2017). *Quantifying Space, Understanding Minds: A Visual Summary Approach*. *Journal of Spatial Information Science*, 14, 95–136, DOI:10.5311/JOSIS.2017.14.292

Oprean, D., **Simpson, M.**, & Klippel, A., (2017). *Collaborating Remotely: An Evaluation of Immersive Capabilities on Spatial Experiences and Team Membership*. *International*

Journal of Digital Earth, 1, 1–17. DOI:/10.1080/17538947.2017.1381191

## Peer-Reviewed Conference Proceedings

- 2020 Zhao, J., **Simpson, M.**, Wallgrün, J. O., Sajjadi, P., & Klippel, A. (2020). *Extended realities - How changing scale affects spatial learning*. In 2020 IEEE Conference on Virtual Reality and 3D User Interfaces (VR), March 22-26, Atlanta, GA, USA. IEEE.
- 2018 Oprean, D., Spence, C., **Simpson, M.**, Miller, R., Bansal, S., Keller, K., & Klippel, A. (2018). *Human Interpretation of Trade-Off Diagrams in Multi-Objective Problems: Implications for Developing Interactive Decision Support Systems*. In Proceedings of the 52nd Hawaii International Conference on System Sciences | 2019 (pp. 1560–1569). Honolulu, HI: University of Hawai'i at Manoa, Hamilton Library.
- 2016 Oprean, D., **Simpson, M.**, Klippel, A. *Role of Space in Remote Collaborations: An Exploration of Immersive Technology Attributes on Co-presence and Team Membership*. In Proceedings of GIScience 2016 (p. 240 - 243).

## Peer-Reviewed Workshop Proceedings

- 2019 Huang, J., Lucash, M., **Simpson, M.**, Helgeson, C., Klippel, A. (2019). *Visualizing Natural Environments from Data in Virtual Reality: Combining Realism and Uncertainty*. In Proceedings of Ethics in VR Workshop at IEEE VR 2019.
- 2017 **Simpson, M.**, Zhao, J., & Klippel, A. (2017). *Take a walk: Evaluating Movement Types for Data Visualization in Immersive Virtual Reality*. In Proceedings of 2nd Workshop on Immersive Analytics (IA), at IEEE VIS 2017.
- 2016 **Simpson, M.**, Wallgrün, J.O., Klippel, A., Yang, L., Garner, G., Keller, K., Oprean, D., and Bansal, S. *Immersive Analytics for Multi-objective Dynamic Integrated Climate-Economy (DICE) Models*. In Proceedings of the 2016 ACM Companion on Interactive Surfaces and Spaces (ACM-ISS 2016). DOI: 10.1145/3009939.3009955
- Simpson, M.**, Garner, G., Wallgrün, J.O., Keller, K., Oprean, D., Bansal, S., and Klippel, A. *Immersive Analytics for Integrated Assessment Models of Climate Change*. In Proceedings of the Spatial Visual Analytics 2016 Workshop at GIScience 2016.
- Xin, Y., **Simpson, M.**, Xu, Y., Sun, F. Linder, F., Liu, X., Savelyev, A., and MacEachren, A. *Movers: Exploring Refugee Movement with Social Media Data*. In Proceedings of the SpatialVA 2016 Workshop at GIScience 2016.

## Book Chapters (non-peer reviewed)

- 2009 **Simpson, M.** Chapters “Drawing Pixel Art for Games” and “Pushing the Horizon: Advanced Pixel Art for Games”. Sikora, D., and J. Hattan, ed. 2009. *Design and content creation. A GameDev.net collection*. Boston MA: Course Technology Cengage Learning. ISBN-13: 978-1598638080

---

## In-preparation

---

- 2020 Zhao, J., **Simpson, M.**, Wallgrün, J. O., & Klippel, A. (in press) *David and Goliath— Exploring the effects of isovist scale on spatial learning*. Cognitive Research: Principles and Implications.
- Spence, C., Oprean, D., Miller, R., **Simpson, M.**, Klippel, A., Bansal, S., & Keller, K. (in revision). *Lessons from risk management experiments with a multi-objective decision support system*. Risk Analysis.
- Simpson, M.** (in preparation, draft available). *Immersive Technologies: New Opportunities for 3D Visualization*. Target: Journal of Cartography and Geographic Information Science.
- Simpson, M.** (in preparation, draft available). *Immersive Storm Surge Flooding: Scale and Risk Perception in Virtual Reality*. Target: Environment and Behavior.
- Simpson, M.** (in preparation, draft available). *Walk Around the Plot: Evaluating Navigation Methods for Immersive Analytics*. Target: International Journal of Digital Earth.

---

## Presentations

---

### Conference Presentations

- 2020 **Simpson, M.**, Zhao, J., Klippel, A. (upcoming). *Evaluating Viewpoint Transition Types for Immersive Data Visualization*. Thinking Within Symposium. University Park, PA. March 2020.
- 2019 **Simpson, M.**, Keller, K., Klippel, A. *Immersive Virtual Reality Storm Surge Experience*. Interactive demonstration at the Research to Action: The Science of Drawdown Conference, State College, PA. September 2019.

**Simpson, M.**, *Immersive Storm Surge and Risk Perception*. American Association of

Geographers (AAG) 2019 Annual Meeting. Washington, D.C. April 2019.

Zhao, J., **Simpson, M.**, *Isovist Scale - An Unexplored Opportunity for Spatial Learning in Virtual Environments*. American Association of Geographers (AAG) 2019 Annual Meeting. Washington, D.C. April 2019.

2018 **Simpson, M.**, *Spaces for Interfaces: Virtual Reality for Data Exploration*. American Association of Geographers (AAG) 2018 Annual Meeting. New Orleans, Louisiana. April 2018.

Held, E., **Simpson, M.**, Holcomb, B., Urban, M., Stewart, R. Can Virtual Reality Help Improve Recollection and Estimation of Crowd Size? Experimental Results in Building Occupancy Estimation. American Association of Geographers (AAG) 2018 Annual Meeting. New Orleans, Louisiana. April 2018.

2017 **Simpson, M.** *Spaces for Interfaces: Virtual Reality, Spatial Cognition, and Data Visualization*. Thinking Within 2017: Immersive Technologies for Education. State College, Pennsylvania. December 2017.

**Simpson, M.**, Zhao, J., & Klippel, A. *Take A Walk: Evaluating Movement Types for Data Visualization in Immersive Virtual Reality*. Immersive Analytics: Exploring Future Visualization and Interaction Technologies for Data Analytics workshop at IEEE VIS, Phoenix, Arizona. October 2017.

**Simpson, M.**, Zhao, J., Garner, G., Wallgrün, J.O., Keller, K., Oprean, S., and Klippel, A. *Immersive Virtual Reality for Multi-Dimensional Data Visualization*. American Association of Geographers (AAG) 2017 Annual Meeting. Boston, Massachusetts. April 2017.

2016 **Simpson, M.**, Garner, G., Wallgrün, J.O., Keller, K., Oprean, D., Bansal, S., and Klippel, A. *Immersive Virtual Reality for Decision Making with Environmental Models*. Annual Meeting of the Middle Atlantic Division of the American Association of Geographers. Fairfax, Virginia. November 2016.

**Simpson, M.**, Wallgrün, J.O., Klippel, A., Yang, L., Garner, G., Keller, K., Oprean, D., and Bansal, S. *Immersive Analytics for Multi-objective Dynamic Integrated Climate-Economy (DICE) Models*. Immersive Analytics workshop at ACM-Interactive Surfaces and Spaces. Niagara Falls, Ontario. November 2016.

**Simpson, M.**, Garner, G., Wallgrün, J.O., Keller, K., Oprean, D., Bansal, S., and Klippel, A. *Immersive Analytics for Integrated Assessment Models of Climate Change*. SpatialVA 2016 Workshop at GIScience 2016. Montreal, Quebec. September 2016.

**Simpson, M.**, Garner, G., Wallgrün, J.O., Keller, K., Oprean, D., Bansal, S., and Klippel, A. *Immersive Virtual Reality Interfaces for Environmental Decision Making*. The 3rd Pennsylvania & Friends Spatial Cognition Symposium. State College, Pennsylvania.

May 2016.

Bower, C., **Simpson, M.** and Bagher, M. *Topographic Map Understanding and the Role of Immersion*. The 3rd Pennsylvania & Friends Spatial Cognition Symposium. State College, Pennsylvania. May 2016.

Oprean, D., **Simpson, M.** and Klippel, A. *Virtual Reality for Distributed Workforces*. The 3rd Pennsylvania & Friends Spatial Cognition Symposium. State College, Pennsylvania. May 2016.

**Simpson, M.** *Evaluating Immersive Virtual Reality Applications: A Geovisualization Perspective*. The 1st Symposium on Research Methodologies in the Big Data Era. State College, Pennsylvania. May 2016.

**Simpson, M.** *Immersive Virtual Reality and the Future of Geovisualization*. no)Boundaries Interdisciplinary Student Conference. State College, Pennsylvania. February 2016.

2015 **Simpson, M.**, *New Immersive Virtual Reality Technologies and Spatial Cognition*, Doctoral Colloquium at Conference On Spatial Information Theory (COSIT). Santa Fe, New Mexico. October 2015.

**Simpson, M.**, Klippel, A., Richter, K. and Wallgrün, J. O. *Quantifying Spaces, Understanding Minds: Spatial Measures and Human Behavior*, Association of American Geographers (AAG) 2015 Annual Meeting. Chicago, Illinois. April 2015.

**Simpson, M.**, Klippel, A., Richter, K. and Wallgrün, J. O. *Visualizing Spatial Measures and Human Behavior Research*. no)Boundaries Interdisciplinary Student Conference. State College, Pennsylvania. March 2015.

Hultquist, C., **Simpson, M.** *Real-time Detection and Tracking of Power Outages via Social Media*, Natural Hazards Center Annual Workshop. Boulder, Colorado. July 2015.

Hultquist, C., **Simpson, M.**, Cervone, G., Huang, Q. *Using Nightlight Remote Sensing Imagery and Twitter Data to Study Power Outages*, ACM SIGSPATIAL International Workshop on the Use of GIS in Emergency Management (EM-GIS), Seattle, Washington. November 2015.

2014 **Simpson, M.**, Klippel, A., Richter, K. and Wallgrün, J. O. *Quantifying Spaces, Understanding Minds*, Pennsylvania Geographical Society 2014 Annual Meeting. State College, Pennsylvania. November 2014.

2012 **Simpson, M.** *The Modern Silk Road: Transcontinental Trade in Eurasia*. NMSU Undergraduate Research and Creative Arts Symposium. Las Cruces, New Mexico. April 201

## Poster Presentations

- 2018 **Simpson, M.**, Campanelli, J., Geuss, M. *Visualizing Geospatial Data in 3D*. Army Research Laboratory- Oak Ridge Associated Universities Summer Journeyman Fellowship Program Final Project Presentation. Aberdeen, Maryland. July 2018.
- 2016 **Simpson, M.** *Measuring Space and Behavior: A Visual Summary Approach*, Conference On Spatial Information Theory (COSIT). Santa Fe, New Mexico. October 2015.
- 2015 Hultquist, C., **Simpson, M.** *Real-time Detection and Tracking of Power Outages via Social Media*, Penn State Graduate Exhibition. March 2015.
- 2012 **Simpson, M.** *Why Melt Ponds Matter*, Rio Grande Chapter Annual Spring Conference of American Society for Photogrammetry and Remote Sensing. April 2012.

### Invited Talks

- 2020 **Simpson, M.** *Immersive Technologies and Data Visualization*, Technology Committee Roundtable, College of Education, Pennsylvania State University, January 16, 2020.
- 2019 **Simpson, M.** *Immersive Technologies and Space Perception: New Opportunities for 3D Visualization*, US Army Research Laboratory, Human Research and Engineering Directorate, Aberdeen Proving Ground, MD, November 20, 2019.

### Departmental Talks

- 2018 **Simpson, M.** *GIS to Immersive Analytics*, Penn State GIS Coalition. Pennsylvania State University, April 18, 2018.
- 2016 **Simpson, M.** *New Immersive Virtual Reality Technology and Geographic Visualization*, Geography Coffee Hour Graduate Student Lightning Talks. Pennsylvania State University, March 4, 2016.

---

## Teaching and Mentorship

---

### Department of Geography, Penn State University

- 2018, Fall **Instructor of Record**, Spatial Analysis (GEOG 364)
- 2015, Spring **Teaching Assistant**, Advanced Spatial Analysis (GEOG 464)
- 2015, Spring **Undergraduate Research Assistant Supervisor**, 3 students in Undergraduate Research Opportunities Connection (UROC) program
- 2014, Fall **Teaching Assistant**, Spatial Analysis (GEOG 364)

### Upward Bound Math and Science Program, Penn State University

- 2015, Summer **Graduate Research Mentor**, Digital Mapping (Summer Experience in Earth and

Mineral Sciences)

### Guest Lessons

- 2019 *Beginning Modelling in Sketchup*, Immersive Technologies (GEOG 197)  
*GIS to Virtual Reality*, Thinking Geographically (GEOG 301)
- 2016 *Immersive Mapping*, Spatial Intelligence (GEOG 497)
- 2015 *3D Modelling in Sketchup & CityEngine*, Advanced Cartography (GEOG 467)

---

## Fellowships and Awards

---

- 2016 – 2018 National Science Foundation Big Data Social Science (BDSS) Integrative Graduate Education and Research Traineeship (IGERT).
- 2014 – 2016 & 2018 – 2019 Penn State Department of Geography Teaching/Research Assistantship.
- 2007 – 2012 New Mexico State University Leadership Scholarship.
- 2015 **2nd Place Student Project**, Upward Bound Math and Science Program- Summer Experience in Earth and Mineral Sciences, August 2015.
- 2011 **2nd Place Student Poster Presentation**, Rio Grande Chapter Annual Spring Conference of American Society for Photogrammetry and Remote Sensing, April 2011.

---

## Service

---

### University Service

- 2016 – 2019 **Secretary**, College of Earth and Mineral Sciences Graduate Student Council
- 2018 – 2019 **Graduate Representative**, Department of Geography
- 2017 **Member**, GeoVISTA Center Brown Bag Speaker Committee
- 2015, 2016 **New Graduate Student Mentor**
- 2017 **Co-chair**, Geospatial Data Science Workshop 2017, State College, PA, February 3-5, 2017.

### Professional Service

- 2019 **Session chair**, *Immersive II: Immersive Technologies for Natural Hazards and Climate Change Communication*. American Association of Geographers (AAG) 2019 Annual Meeting. Washington, DC. April 4, 2019.

### Reviewer

- 2018 Alfred P. Sloan Foundation



## Professional Affiliations

- 2014 – 2019 Associate of American Geographers
- 2014 – 2019 Pennsylvania Geographic Society
- 2015 – 2019 Human Factors and Ergonomics Society
- 2011 – 2014 American Society for Photogrammetry and Remote Sensing

## Public Outreach - Volunteer Work

- 2019 Center for Immersive Experiences Penn State Parent's Weekend Open House  
Art of Discovery Booth at the Central Pennsylvania Festival of the Arts  
Supporting Young Women in Geography (SYWIG) Day  
Earth and Mineral Sciences EXposition (EMEX 2019)  
Maker Monday at the Discovery Space
- 2018 Immersive Technologies Open House
- 2017 Earth and Mineral Sciences EXposition (EMEX 2017)  
Immersive Technologies Open House
- 2016 Virtual Reality and Geospatial Sciences Parent's Weekend Open House

---

## Professional Development

---

- 2018 **Invited Participant**, *Shaping the Future of the Human-Technology Systems Frontier: A Workshop in Strategic Foresight, Deep Uncertainty, and Leadership* at The Atlantic Council. Washington, D.C., May 15-17, 2018.
- 2017 **Participant**, *2<sup>nd</sup> Workshop on Immersive Analytics* at IEEE VIS. Phoenix, Arizona. October 1, 2017.
- 2016 **Participant**, *Workshop on Immersive Analytics* at ACM-Interactive Surfaces and Spaces. Niagara Falls, Ontario, Canada. November 6, 2016.  
**Invited Participant**, *5<sup>th</sup> Annual Sustainable Climate Risk Management Summer School*. State College, Pennsylvania. August 15-19, 2016.

---

## Skills

---

Programming/Scripting Languages	R, C#, Python
Geographic Information Systems	ESRI ArcGIS, Intergraph Geomedia, ERDAS Imagine
Virtual Reality/3D	Unity, ESRI CityEngine, SketchUp, Blender
Art/Graphic Design	Adobe Photoshop, Adobe Illustrator, Inkscape, GIMP
Video Editing	Adobe Premiere, Adobe Rush

---

## References

---

**Dr. Alexander Klippel**

Department of Geography  
The Pennsylvania State University  
Email: [klippel@psu.edu](mailto:klippel@psu.edu)  
Phone: 1-814-865-2324  
204 Walker Building  
University Park, PA 16802

**Dr. Alan MacEachren**

Department of Geography  
The Pennsylvania State University  
Email: [maceachren@psu.edu](mailto:maceachren@psu.edu)  
Phone: 1-814-865-7491  
310 Walker Building  
University Park, PA 16802

**Dr. Danielle Oprean**

School of Information Science and Learning Technologies  
University of Missouri  
Email: [opreand@missouri.edu](mailto:opreand@missouri.edu)  
Phone: 1-573-882-5088  
303 Townsend Hall  
Columbia, MO 16802