

# Jonathan Thielen

2140 Hawthorn Ct Dr #2333 · Ames, IA 50010 · (612)-437-1604 · jthielen@iastate.edu

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## Education

### **Iowa State University**

Bachelor of Science

Majors: Meteorology and Mathematics

Research Advisor: Dr. William Gallus

Senior Thesis: “Comparison of Machine Learning Techniques for Convective Morphology Classification from Radar Imagery”

Honors Capstone: “Development of an Intermediate Computational Meteorology Course”

*Ames, IA*

Graduation: May 2019

GPA: 4.0

## Research Experience

### **Department of Geological and Atmospheric Sciences**

Senior Thesis

- Compared performance of ensembles of decision trees and convolutional neural networks in classifying convective morphology from radar imagery according to a nine-category scheme
- Developed morphology parameter analysis scripts using scikit-image and machine learning classifiers using scikit-learn and keras.
- Worked in collaboration with Dr. Alex Haberlie (Louisiana State University), whose work on MCS segmentation and classification this work built upon

Undergraduate Research Assistant

- Investigated WRF forecasts of convective morphology evolution, with focuses on microphysical and horizontal grid spacing sensitivities and stratiform rain region errors
- Ran WRF model in high-resolution (1 km) configurations and analyzed terabyte-scale datasets of model output and observed 3D radar data (GridRad) with a framework of Python scripts and Jupyter notebooks
- Wrote manuscript on grid spacing sensitivity work (submitted to *Weather and Forecasting* in December 2018) and prepared several conference presentations
- Assisted in revisions to a now-published article in *Weather and Forecasting* (Stelten and Gallus 2017) on pristine nocturnal convective initiation (PNCI) in the PECAN project by analyzing temperature advection

### **Freshman Honors Mentor Program**

Program Participant

- Studied the sensitivity of the WRF model to physics scheme changes for two PECAN derecho cases under the mentorship of Dr. William Gallus
- Ran WRF model at convection-allowing resolutions and visually analyzed output with NCL-produced graphics
- Presented results at the Honors Program poster session

## Academic/Technical Work Experience

### **University Corporation for Atmospheric Research**

Unidata Summer Programming Intern

- Implemented cross-section functionality and furthered xarray integration within the MetPy general meteorology Python package
- Improved web documentation for MetPy and siphon packages
- Created instructional Python videos as a part of the MetPy Mondays series
- Assisted in teaching the Unidata Python Workshop at Colorado State University
- Provided online support to users of MetPy from the global atmospheric sciences community

*Ames, IA*

Fall 2018

Spring 2017–Present

*Ames, IA*

Spring 2016

*Boulder, CO*

Summer 2018

**Iowa State University Earth, Wind, and Fire Learning Community** Ames, IA

Math Tutor/Mentor

Fall 2016–Present

- Tutor students weekly in courses in preparatory, calculus-sequence, and upper-level mathematics courses ranging from college algebra to partial differential equations
- Provide assistance for Learning Community events and activities

**Bid Partner**

Buffalo, MN

Web Developer/Event Technical Support

Spring 2013–Spring 2018

- Built auction and event management web applications through the entire development process
- Administered Linux web and database servers
- Managed network setup and maintenance at events and assisted guests in use of our system

**Presentations and Publications**

*Submitted Articles*

Thielen, J. E., and W. A. Gallus, 2018: Horizontal Grid Spacing Influences on WRF Forecasts of Convective Morphology Evolution for Nocturnal MCSs in Weakly-Forced Environments. *Wea. Forecasting*, Submitted.

*Submitted Conference Abstracts*

Thielen, J. E., W. A. Gallus, and A. M. Haberland, 2019: A Comparison of Machine Learning Techniques for Convective Morphology Classification from Radar Imagery. *18th Student Conference*, Phoenix, AZ, Amer. Meteor. Soc, <https://ams.confex.com/ams/2019Annual/meetingapp.cgi/Paper/356182>.

Thielen, J. E., R. M. May, and J. R. Leeman, 2019: Cross Section Analysis in MetPy. *Ninth Symposium on Advances in Modeling and Analysis Using Python*, Phoenix, AZ, Amer. Meteor. Soc, <https://ams.confex.com/ams/2019Annual/meetingapp.cgi/Paper/352367>.

*Past Conference Presentations*

Gallus, W. A., J. E. Thielen, and B. J. Squitieri, 2018: The Impact of Horizontal Grid Spacing on Convective Morphology and Propagation in Convection-Allowing Simulations of Severe Weather-Producing Convective Systems. *29th Conference on Severe Local Storms*, Stowe, VT, Amer. Meteor. Soc., 119, <https://ams.confex.com/ams/29SLS/webprogram/Paper348547.html>.

Thielen, J. E., W.A. Gallus, and B.J. Squitieri, 2018: Microphysical and Horizontal Grid Spacing Influences on WRF Forecasts of Stratiform Rain Regions and General Convective Morphology Evolution in Nocturnal MCSs. *25th Conference on Numerical Weather Prediction*, Denver, CO, Amer. Meteor. Soc., 10B.6, <https://ams.confex.com/ams/29WAF25NWP/webprogram/Paper344877.html>.

Gallus, W. A., J. E. Thielen, and B. J. Squitieri, 2018: Sensitivity of WRF forecasts of nocturnal convective system morphology evolution in weakly-forced environments to microphysical schemes and horizontal resolution. *EGU General Assembly 2018*, Vienna, Austria, European Geophysical Union, AS1.2, <https://meetingorganizer.copernicus.org/EGU2018/EGU2018-4985.pdf>.

Thielen, J. E., and W. A. Gallus, 2018: Microphysical and Horizontal Grid Spacing Influences on WRF Forecasts of Convective Morphology Evolution for Nocturnal MCSs in Weakly Forced Environments. *22nd Annual Severe Storms and Doppler Radar Conference*, Ankeny, IA, Central Iowa Chapter of the National Weather Association. [http://www.iowa-nwa.com/conference/files/2018\\_NWA\\_Agenda.pdf](http://www.iowa-nwa.com/conference/files/2018_NWA_Agenda.pdf).

Thielen, J. E., W. A. Gallus, and B. J. Squitieri, 2018: Microphysical and Resolution Influences on WRF Forecasts of Convective Morphology Evolution for Nocturnal MCSs in Weakly Forced Environments. *A Special Symposium on Plains Elevated Convection at Night (PECAN)*, Austin, TX, Amer. Meteor. Soc., 3.4, <https://ams.confex.com/ams/98Annual/webprogram/Paper325179.html>.

## Leadership and Service

### **Iowa State University Student Chapter of the American Meteorological Society**

- Academic Chair Fall 2017–Present
- Lead review sessions and provide individual assistance for sophomore- through senior-level core meteorology courses, including synoptic, dynamic, and mesoscale meteorology
  - Promote academic, scholarship, and internship opportunities at Iowa State and in the meteorological community
  - Connect undergraduates with graduate students and faculty members
  - Mentor students in applications for scholarships and internships

Webmaster Fall 2016–Spring 2017

- Maintained the chapter's website, mailing list, and online event listing
- Developed a new website for greater outreach ability and better resources for members

### **Come Awake Outreach Event at St. Thomas Aquinas Church**

Audiovisual Team Lead Spring 2016–Present

- Manage team that runs the audiovisual systems of our monthly campus outreach event
- Coordinate production of monthly promotional video content

### **Together Our Mission is Service Event at St. Thomas Aquinas Church**

Information and Technology Manager Fall 2015–Spring 2018

- Coordinate ticket and donation management for this annual 150+ person charity event
- Manage website, digital publicity, auction software system, and night-of technology

### **Skywarn Storm Spotter and Amateur Radio Operator**

Summer 2007–Present

- Report severe weather conditions when observed to the National Weather Service via amateur radio nets or SpotterNetwork
- Have assisted in logistical and communication support for local triathlon events

## Professional Memberships

- American Meteorological Society (National and Local Chapter) Fall 2015–Present
- Central Iowa Chapter of the National Weather Association Fall 2015–Present

## Technical Skills

- Programming Languages: Skilled in Python; Experienced in JavaScript, PHP, Java, and Fortran
- Applications: Experienced in MetPy, xarray, CartoPy, NumPy, matplotlib, scikit-image, scikit-learn, GEMPAK, WRF model, Git, JMP, LAMP/LEMP Application Stacks
- Operating Systems: Debian-Family Linux, Red Hat Enterprise Linux, and Windows

## Honors and Awards

- Outstanding Senior Thesis Award Fall 2018
- Best Student Oral Presentation for the 25<sup>th</sup> Conference on Numerical Weather Prediction Summer 2018
- AMS Jay Fein Scholarship Summer 2018
- Φ B K Edward Allen Award in the Mathematical Disciplines Spring 2018
- St. Thomas Aquinas Church Hemann Scholarship Spring 2017, 2018
- Quarter Century Wireless Association Scholarship Spring 2015, 2017, 2018
- NWA Dr. Roderick A. Scofield Scholarship in Meteorology Summer 2017
- Central IA NWA Tim Samaras Scholarship in Research Meteorology Spring 2017
- Amateur Radio Relay League Dan Huettl Memorial Scholarship Spring 2016, 2017
- Freshman Honors Program Outstanding Member Award Spring 2016
- Iowa State University Honors Program Member Fall 2015–Present
- AMS Freshman Undergraduate Scholarship Spring 2015
- National Merit Scholar Spring 2015