

Kelly Kochanski

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23rd August 2021

EDUCATION

- 2020 **University of Colorado Boulder**
Ph.D. in Geological Sciences
- 2015 **Massachusetts Institute of Technology**
B.Sc. in Physics and in Earth, Atmospheric and Planetary Sciences

EMPLOYMENT



- 2020–present **McKinsey & Company**
Senior Data Scientist, Climate Analytics
- 2015–2020 **University of Colorado Boulder**
Graduate Researcher
- 2019
Jun.–Aug. **Lawrence Livermore National Laboratory**
Data Science Scholar
- 2018
May–Aug. **Lawrence Livermore National Laboratory**
Computing Scholar
- 2017
May–Aug. **Los Alamos National Laboratory**
Visiting Researcher, Theoretical Division
- 2015
Feb.–Jun. **Massachusetts Institute of Technology**
Undergraduate Researcher, Geophysics
- 2014
Jun.–Aug. **Royal Dutch Shell**
Intern, Upstream Computational Challenges
- 2013
Jul.–Aug. **Massachusetts Institute of Technology**
Field Assistant
- 2013
Feb.–Jul. **Massachusetts Institute of Technology**
Undergraduate Researcher, Geophysics
- 2012
Jan.–Aug. **Massachusetts Institute of Technology**
Undergraduate Researcher, Astrophysics

GRANTS & FELLOWSHIPS

- 2019 USGS Mendenhall Fellowship (2 years' funding, declined)
- 2018–2019 Conference travel grants ×3 (CU, CU Geology, NeurIPS)
- 2017 GSA Research Grant
- 2016 **DOE Computational Science Graduate Fellowship** (4 years' funding)
NSF Graduate Research Fellowship (3 years' funding, offer declined)
NDSEG Fellowship (3 years' funding, offer declined)
Colorado Scientific Society Memorial Fund Award
University of Colorado Dept. Geology Patterson Award
American Alpine Club Research Grant

- 2015 **University of Colorado Chancellor’s Fellowship** (2 years’ funding)
MIT Physics Outreach Grant
- 2013 MIT-India Travel Grant

HONORS


- 2018 DOE Howes Scholar Award
AGU Cryosphere Innovation Award
Best student presentation, Colorado Scientific Society
Quora Top Writer (5k+ followers, 3m+ views, 2017 & 2018) 
- 2016 MIT Suzanne Berger Award for Future Global Leaders 
- 2014 MIT Burchard Scholar for distinguished students in the humanities
MIT Arts Scholar for students with an outstanding interest in the arts
- 2012 Hertog Program Political Science Summer Fellowship
- 2011 International Baccalaureate, 45/45 points (top 0.2% of candidates worldwide)

PEER-REVIEWED ARTICLES







Including selective conferences and workshops, the preferred venues for peer-reviewed CS research.

Italics = undergraduate/intern author



Under review

3. **Kochanski**, I Cvijanovic, D Lucas (in review). [The advantages of separate Arctic and Antarctic sea ice parameterizations in an ESM.](#)
2. **Kochanski**, G Tucker, R S Anderson (in review). [Snow dune growth increases polar heat fluxes.](#)
1. Rolnick, D, P Donti, L Kaack, **Kochanski**, et al. (2019 preprint, now accepted). [Tackling Climate Change with Machine Learning.](#) arXiv:1906.05433 

Published

6. **Kochanski**, I Cvijanovic, D Lucas (2020). [Surrogate sea ice model enables efficient tuning.](#) *AI for Earth Sciences workshop at ICLR.*  .
5. **Kochanski**, D Mohan, J Horrall, B Rountree, G Abdulla (2019). [Deep learning predictions of dune migration.](#) *NeurIPS Climate Change workshop.*  .
4. **Kochanski**, E Green, G Defazio, R Barnes, C Downie, A Rubin, B Rountree (2019). [Rescal-snow: A model of dunes and snow waves.](#) *Journal of Open Source Software*, 4(42), 1699. doi: 10.21105/joss.01699 
3. **Kochanski**, G Tucker, R S Anderson (2019). [The evolution of snow bedforms in the Colorado Front Range and the processes that form them.](#) *The Cryosphere*, 13, 1267–1281. doi: 10.5194/tc-13-1267-2019 
2. **Kochanski**, R S Anderson, G Tucker (2018). [Statistical classification of self-organized snow surfaces.](#) *Geophysical Research Letters*, 45, 6532–6541. doi: 10.1029/2018GL077616 
1. IJzermans et al., including **Kochanski** (2015). [Simulating the impact of extreme sea waves on offshore structures with SPH.](#) *SPHERIC International Workshop 8-1.* 

REPORTS & THESES

4. **Kochanski** (2020). [The growth of snow bedforms](#). *Ph.D. Thesis, University of Colorado Boulder Department of Geological Sciences*.
3. **Kochanski** (2016). [A review of process-based and statistical models of gully erosion](#). *Report for EnviroCompliance, Inc.*
2. **Kochanski** and T Herring (2015). [Ice accumulation and the apparent seasonal variation of GPS stations in Alaska](#). *B.Sc. Thesis, MIT Department of Earth, Atmospheric and Planetary Sciences*. doi: 10.13140/RG.2.1.1003.5927 
1. **Kochanski**, J Pershken, K Brent (2014). [Deformation in the Paleozoic Stratigraphy of the Piute Mountains in the Mojave Desert Region](#). *Field report, MIT Geology*. doi: 10.13140/RG.2.1.1527.8806 

INVITED TALKS

6. 2020. [Removing barriers to machine learning in the geosciences](#). Seminar. US CLIVAR Data Science Webinar Series.
5. 2019. [Accelerating Earth System Models with machine learning](#). **Keynote** & panelist. NCAR Multicore 9 workshop.
4. 2019. [Building a scalable model of self-organized snow](#). Seminar. Exascale Earth System Modeling Group, Los Alamos National Laboratory.
3. 2019. [Building a scalable model of self-organized snow](#). Seminar. Computational Earth Science Group, Oak Ridge National Laboratory.
2. 2019. [Snow bedforms in the Colorado Front Range](#). Seminar. Ice Sheets and Climate Group, University of Colorado Boulder.
1. 2019. [Snow heterogeneity and sea ice modeling](#). Seminar. Climate, Ocean and Sea Ice Modeling Group, Los Alamos National Laboratory.

CONFERENCE ACTIVITY

Workshops organized

2. 2020. [AI for Earth Sciences Workshop](#). Mukkavilli S K., **Kochanski**, Hansen J. Neural Information Processing Systems.
1. 2020. [AI for Earth Sciences Workshop](#). Mukkavilli S K., **Kochanski**, Hansen J. Workshop, ICLR.


Sessions convened

2. 2020. [Climate Change AI: Climate Science and Adaptation Virtual Booth](#). **Kochanski**, P. Mitra. All-day program, ICLR
1. 2019. [The machine learning landscape](#). Jenkins, C, J Obelcz, **Kochanski**, E Goldstein. Panel, CSDMS Annual Meeting.



Abstracts presented (selected)

Italics = undergraduate/intern author





15. 2020. [The future of AI in environmental science](#). **Kochanski**. Panelist, AMS AI Conference.
14. 2019. [Climate change + AI: Tackling climate change with machine learning](#). **Kochanski**. Talk, AGU Fall Meeting.
13. 2019. [Building a GAN model of sand dunes](#). *Horrall J, D Mohan, **Kochanski**, B Rountree*. Poster, LLNL student symposium.

12. 2019. [Using a cellular automaton CNN to model sand dunes.](#)
Mohan, D, J Horrall, Kochanski, B Rountree. Poster, LLNL student symposium.
11. 2019. [Simulating dunes and ripples made of wind-blown snow.](#)
Rubin A, Kochanski. Poster, CU Hydrologic Sciences Symposium.
10. 2018. [Investigating dune simulations with Fourier analysis.](#)
Downie C, Kochanski, A Robeson, B. Rountree. Poster, LLNL student symposium.
9. 2018. [Analyzing snow dunes with cross- correlation..](#)
Robeson A, Kochanski, C Downie, B Rountree. Poster, LLNL student symposium.
8. 2018. [Parallelizing cellular automata with OpenMP.](#)
Defazio G, J Victorino, N Armour, Kochanski. Poster, LLNL student symposium.
7. 2018. [Understanding Earth with Data Science.](#)
Kochanski. Seminar, LLNL Data Science Summer Institute.
6. 2018. [When is snow flat?.](#)
Kochanski, R Anderson, G Tucker. Poster, CSMDS Annual Meeting, Boulder, CO. 
5. 2018. [Scaling laws for snow bedforms.](#)
Herbertson C, M Yoder, Kochanski. Poster, CU Hydrologic Sciences Symposium. 
4. 2018. [The growth of snow bedforms.](#)
Kochanski. Colorado Scientific Society 🏆 Best student presentation.
3. 2017. [Snow bedforms on Niwot Ridge, CO.](#)
Bertholet C, Kochanski, R Anderson. Poster, Hydrologic Sciences Symposium.
2. 2015. [Ice accumulation and the apparent seasonal variation of GPS stations in Alaska.](#)
Kochanski, T Herring. AGU Fall Meeting, San Francisco, CA. 
1. 2015. [IYPT problems teach high school students about teamwork and the scientific method.](#)
Kochanski, A Klishin. AGU Fall Meeting, San Francisco, CA.

OPEN SOFTWARE & DATA

2. **Kochanski** (2019). [Rescal-snow: A model of dunes and snow-waves](#) 
1. **Kochanski** (2018). [Time-lapse observations of snow bedforms in the Colorado Front Range, 2016-2017.](#) *Zenodo.* doi: 10.5281/zenodo.1253725 

SELECTED PRESS COVERAGE

4. Berkowitz, J (2020). [Fellow Reflections: Kelly Kochanski.](#) *DEIXIS magazine.* 
3. Conn, A (2019). [Not Cool: Tackling climate change with machine learning, pt 1.](#) *Future of Life podcast (interview).* 
2. Appel, T (2019). [Tackling climate change with machine learning.](#) *Towards Data Science.* 
1. Hao, K (2019). [Here are 10 ways AI could help fight climate change.](#) *MIT Technology Review.* 

TEACHING EXPERIENCE

- | | |
|-----------|-------------------------------------------------------------------------------|
| 2016–2019 | University of Colorado Boulder
Mentor for undergraduate researchers |
| 2017–2018 | Lawrence Livermore National Laboratory
Mentor for summer interns |
| 2018 | University of Colorado Boulder |

Jan.–May	Teaching assistant (Computational Modeling for Environmental Science)
2018	University of Colorado Boulder
Jan.–May	Tutor (Geology)
2017	University of Colorado Boulder
Jan.–Sep.	Hiking leader (CU Hiking Club)
2015	Chilean Young Physicists' Tournament
May–Aug.	Founder and teacher
2013–2015	MIT
	Winter Hiking Leader (MIT Outing Club)
2012–2014	MIT
	Teaching Assistant (Introductory Philosophy)
2012–2013	International School of Boston
	Tutor (Math & Physics)

STUDENTS SUPERVISED

Undergraduate and † recent-graduate interns

2019	Divya Mohan	Convolutional neural network models of cellular automata
	Jenna Horrall	Predicting dune motion with deep learning
	Adam Rubin	Simulations of dune growth during snowfall
2018	Carlos Downie†	Fourier analysis of sand and snow waves
	Aaron Robeson	Analyzing dune simulations with cross-correlation
	Chelsea Herbertson	Scaling laws for snow dunes
	Madonna Yoder†	Field measurements of the bedload flux of snow dunes
2017	Clea Bertholet	Snow bedforms on Niwot Ridge, CO (honors thesis)
2016	Gage Hamel	Survey of snow bedforms in the Colorado Front Range
	Jonn van Oosten	Photographing wind-blown snow grains
	Alexandra Orrego	Tree mortality in the Rocky Mountain Eco Region

PROFESSIONAL ACTIVITIES

Leadership	Climate Change AI, Climate Science Community Lead ↗
	Community Surface Dynamics Modeling Systems, Machine Learning Initiative Co-Chair ↗
Reviews	NSF Geomorphology and Land-Use Dynamics Program, CAREER proposal (2020)
	Neural Information Processing Systems, Climate Change Workshop (2020)
	International Conference on Learning Representations (2020)
	Poland National Science Center, grant proposal (2020)
	Journal of Geophysical Research: Oceans (2020)
	Journal of Open Source Software (2020)
	Journal of Geodesy (2020)
	Climate Dynamics (2020)
	IPCC AR6, Ch.7 (2019)
	Neural Information Processing Systems, Climate Change Workshop (2019)
	International Conference for Machine Learning, AI for Climate Change workshop (2019)
IPCC Special Report on Ocean and Cryosphere in a Changing Climate, Ch.2 (2018)	
Outreach	Quora writer. ↗ 3 million+ views on 200+ essays (2016–2019) e.g.

[What made the Rocky Mountains if they're not on a plate boundary?](#)
 3 Minute Thesis, CU Graduate School. [↗](#)
[How wind-blown snow makes the Arctic warm faster](#)
 Question writer, US National Science Bowl (2019)
 Workshops for middle-schoolers (2017), e.g.
[Optimizing the flight of a Magnus glider](#)
 Science fair judge, Bryant Webster Dual Language School (2016)
 Public lectures for MIT India program (2013–2015), e.g.
[Marine fossils in the high Himalaya](#)
 Public lectures for MIT Outing Club (2014), e.g.
[Camping on the mid-Atlantic rift](#)
 Workshops for high-schoolers (2013–2014), e.g.
[Mountains, glaciers and the landscape](#)

FIELD EXPERIENCE

2016–2018 Nov.–Mar.	University of Colorado Boulder Graduate Researcher
2018 Nov.	DOE Next-Generation Ecosystem Experiments Field assistant
2014 Jan.	Massachusetts Institute of Technology Field camp
2013 Aug.	Massachusetts Institute of Technology Field assistant

SKILLS

Computing	<i>Data science</i>	Python (scikit-learn, pandas)
	<i>Modeling</i>	Python (scipy, numpy), Matlab, QGIS
	<i>High performance</i>	OpenMP, MPI, C, Fortran90, bash, dask
	<i>Visualization</i>	Paraview, ViSIT, Python (matplotlib, plotnine)

ADDITIONAL QUALIFICATIONS

Languages	Native English, have taught in Spanish, proficient French, basic Hindi.
Erdős #	3