D. Hudson Smith — curriculum vitae

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Research Interests

Currently, I am researching sample-efficient deep learning techniques for scientific applications in medicine and social science. Working closely with clinicians and other domain experts, I build inductive priors into model architectures and training procedures. These priors offset the need for large, labeled datasets, enabling deep learning applications in data-constrained settings.

Positions

Director of Applied Machine Learning	**Clemson, SC**
Research Computing and Data, CCIT	*1/2023 – present*
Co-Lead	**Clemson, SC**
Clemson/MUSC Artificial Intelligence Hub	*7/2022 – present*
Research Assistant Professor	**Clemson, SC**
Holcombe Dept. of ECE	*10/2019 – present*
Machine Learning Research Associate	**Clemson, SC**
Watt Family Innovation Center	*3/2018 – 12/2022*
Data Scientist	**Columbus, OH**
Dynamit Technologies	*12/2016 – 3/2018*

Education

Ohio State University	**Columbus, OH**
Ph.D. in Theoretical Atomic Physics, GPA: 3.9/4.0	*2011-2016*

Research: theoretical atomic physics, quantum field theory, computer simulation of quantum systems
Thesis: Inducing Resonant Interactions in Ultracold Atoms with an Oscillating Magnetic Field
Advisor: Dr. Eric Braaten, `braaten.1@osu.edu`

Erskine College	**Due West, SC**
B. S. in Physics, B. A. in Mathematics, GPA: 3.9/4.0	*2007-2011*

Publications

Machine learning and Artificial Intelligence

Smith, D. Hudson, John Paul Lineberger, and George H Baker (2023). "On the Relevance of Temporal Features for Medical Ultrasound Video Recognition." In: *International Conference on Medical Image Computing and Computer-Assisted Intervention*. Springer, pp. 744–753.

Erno, Jason, Thomas Gomes, Christopher Baltimore, John P Lineberger, D. Hudson Smith, and G Hamilton Baker (2023). "Automated Identification of Patent Ductus Arteriosus Using a Computer Vision Model." In: *Journal of Ultrasound in Medicine*.

Smith, D Hudson, Carl Ehrett, Katherine Weisensee, and Cristina Tica (2023). "Commentary on: Megyesi MS, Nawrocki SP, Haskell NH. Using accumulated degree-days to estimate the postmortem interval from decomposed human remains." In: *Journal of Forensic Sciences* 68.1, pp. 355–358.

Taye, Mesfin, Dustin Morrow, John Cull, Dane Hudson Smith, and Martin Hagan (2022). "Deep Learning for FAST Quality Assessment." In: *Journal of Ultrasound in Medicine*.

Woo, MinJae, Prabodh Mishra, Ju Lin, Snigdhaswin Kar, Nicholas Deas, Caleb Linduff, Sufeng Niu, Yuzhe Yang, Jerome McClendon, D Hudson Smith, et al. (2021). "Complete and Resilient Documentation for Operational Medical Environments Leveraging Mobile Hands-free Technology in a Systems Approach: Experimental Study." In: *JMIR mHealth and uHealth* 9.10, e32301.

Ehrett, Carl, Darren L. Linvill, Hudson Smith, Patrick L. Warren, Leya Bellamy, Marianna Moawad, Olivia Moran, and Monica Moody (June 2021). "Inauthentic Newsfeeds and Agenda Setting in a Coordinated Inauthentic Information Operation." In: *Social Science Computer Review*. DOI: 10.1177/08944393211019951.

Mayes, Emma, John Paul Lineberger, Michelle Mayer, Andrew Sanborn, Hudson Smith, and Erica Walker (2021). "Automated Brand Color Accuracy for Realtime Video." In: *SMPTE Motion Imaging Journal* 130.3, pp. 45–49. DOI: 10.5594/JMI.2021.3058397.

Freeman, Daniel, Shaurya Gupta, D. Hudson Smith, Joe Mari Maja, James Robbins, James S. Owen, Jose M. Peña, and Ana I. de Castro (Nov. 2019). "Watson on the Farm: Using Cloud-Based Artificial Intelligence to Identify Early Indicators of Water Stress." In: *Remote Sensing* 11.22, p. 2645. DOI: 10.3390/rs11222645.

Atomic Physics

Smith, D. Hudson and Artem G. Volosniev (2019). "Engineering momentum profiles of cold-atom beams." In: *Physical Review A* 100.3, p. 033604.

Smith, D Hudson (2015). "Inducing Resonant Interactions in Ultracold Atoms with a Modulated Magnetic Field." In: *Physical review letters* 115.19, p. 193002.

Volosniev, A. and D. H. Smith (2018). "Impenetrability in Floquet Scattering in One Dimension." In: *Few-Body Systems* 59, pp. 1–9.

Langmack, Christian, D Hudson Smith, and Eric Braaten (2015). "Association of atoms into universal dimers using an oscillating magnetic field." In: *Physical review letters* 114.10, p. 103002.

Braaten, Eric, Christian Langmack, and D Hudson Smith (2014a). "Born-Oppenheimer approximation for the X Y Z mesons." In: *Physical Review D* 90.1, p. 014044.

– (2014b). "Selection Rules for Hadronic Transitions of X Y Z Mesons." In: *Physical review letters* 112.22, p. 222001.

Smith, D Hudson, Eric Braaten, Daekyoung Kang, and Lucas Platter (2014). "Two-body and three-body contacts for identical bosons near unitarity." In: *Physical review letters* 112.11, p. 110402.

Langmack, Christian, D Hudson Smith, and Eric Braaten (2013a). "Atom Loss Resonances in a Bose-Einstein Condensate." In: *Physical review letters* 111.2, p. 023003.

– (2013b). "Avalanche mechanism for the enhanced loss of ultracold atoms." In: *Physical Review A* 87.2, p. 023620.

Langmack, Christian, D Hudson Smith, and Eric Braaten (2012). "Avalanche mechanism for atom loss near an atom-dimer Efimov resonance." In: *Physical Review A* 86.2, p. 022718.

Research awards

1/2024: NIH COBRE Renewal Award   *$346k*

(Co-PI) Team Science Supplement: SC COBRE for Translational Research Improving Musculoskeletal Health (SC TRIMH)

9/2023: CDC Center for Forecasting and Outbreak Analytics   *$7MM*

(Senior Personnel) Disease Modeling and Analytics to inform Outbreak Preparedness, Response, Intervention, Mitigation, and Elimination in South Carolina (DMA-PRIME)

7/2023: Clemson/MUSC AI Hub Augmentation Award   *$25k*

(Co-PI) Automated Identification of Patent Ductus Arteriosus using a Computer Vision Model

4/2023: Clemson University Research Foundation Technology Maturation Award   *$20k*

(Senior Personnel) Integration of Smart Needle Measurements and Functional Ultrasonography by Machine Learning for Quantitative Monitoring and Assessment of Acupuncture Myofascial Pain Management

1/2022: Clemson-MUSC Artificial Intelligence Hub   *$5k*

(Fellow) Artificial Intelligence Advocate

7/2021: RHBSSI Seed Grant (Clemson University)   *$45k*

(Co-PI) ColorNet: Developing AI-based color correction tools for sports media applications

6/2021: ACRE Competitive Grants Program (SCDA)   *$120k*

(PI) AI Master Gardener for Greenhouse Supervision

4/2021: Prisma Health Seed Grant   *$20k*

(Senior Personnel) Automated Quality Assessment of FAST Exams

2/2021: ACRE Competitive Grants Program (SCDA)   *$20k*

(Co-PI) AI for Fruit and Vegetable Harvesting in South Carolina

2/2021: CU Seed Grant, Tier 1 (Clemson University)   *$5k*

(Co-PI) ColorNet: An AI-based color management system for live video

11/2019: CURF Tech Maturation Fund (Clemson)   *$29k*

(Co-PI) ColorNet: Consistent display of Clemson brand colors using artificial intelligence

8/2019: Erwin Center for Brand Communications (Clemson University)   *$8k*

(Co-PI) AI for on the fly color correction of sports footage

7/2018: ACRE Competitive Grants Program (SCDA)   *$105k*

(Co-PI) Rapid Chicken Sex Determination with Multiple Mechanisms and AI

Teaching Experience

Clemson University

Spring 2023–present: Instructor for Data Science, Machine Learning, and Deep Learning Workshops for Research Computing and Data. Selected topics include "Data Visualization in Python",

"Introduction to Deep Learning with Pytorch", and "A"ttention, Transformers, and LLMs: a hands-on introduction in Pytorch"

Spring 2018–Fall 2022: Instructor for Watt AI Creative Inquiry course for 9 consecutive semesters

Spring 2020–Fall 2021: Designed intro to artificial intelligence curriculum for undergraduates from diverse majors

Fall 2021–Fall 2022: Led weekly journal club with advanced students

Fall 2018–Spring 2019: Instructor for Ulbrich CI focused on manufacturing analytics

Ohio State University

Fall 2015: Tutor for graduate level classical mechanics course

Fall 2012–Spring 2013: Recitation and lab instructor for Physics: Vibrations, Fluids, Thermodynamics, and Special Relativity

Erskine College

Spring 2010: Lab instructor for Modern Physics

Fall 2009: Teaching assistant for Calculus

Fall 2008–Fall 2009: Teaching assistant for Introductory Physics

Fall 2008–Fall 2010: Writing assistant for various subjects

Presentations

Machine learning

Smith, D. Hudson and John Paul Lineberger (2023, October). "On the Relevance of Temporal Features for Medical Ultrasound Video Recognition." International Conference on Medical Image Computing and Computer Assisted Intervention.

Gemmill, Jill and D. Hudson Smith (2023, October). "Member Panel on AI: Supporting AI in an HPC Environment." Coalition for Academic Scientific Computation Fall Meeting.

Smith, D. Hudson (2023, May). "Artificial Intelligence: from Duck Digestion to Conversational Companions." Clemson University Data Science Conference.

Weisensee, Katherine, Irina Tica, D. Hudson Smith, Carl Ehrett, and Patricia Carbajales-Dale (2023, February). "Postmortem Interval Estimation Using a Novel Data set and Methods." Annual Meeting of the American Academy of Forensic Sciences.

Smith, D. Hudson (2021, November). "Quality Assessment of FAST Exams using Deep Learning." Clemson/MUSC AI Hub Seminar.

– (2021, April). "SMRF: a Cloud-Based Social Media Research Framework." In: *Research Running on Cloud Compute & Emerging Technologies*. Vol. 2021, pp. 11–12.

Walker, Erica Black, Dane Hudson Smith, John Paul Lineberger, Michelle Leigh Mayer, Emma Elizabeth Mayes, and Andrew Thomas Sanborn (2020). "67-3: ColorNet: A Neural Network-Based System for Consistent Display of Brand Colors for Video." In: *SID Symposium Digest of Technical Papers*. Vol. 51. 1. Wiley Online Library, pp. 1001–1004.

Fine, Jeffrey, Nicholas Deas, Jacob Shellnut Spencer Sargent, and D. Hudson Smith (2019). "Content Analyzing Political Tweets using Natural Language Processing: Opportunities and Challenges." In: *Southern Political Science Association Conference*.

Zhang, Tianyi, Monica Moody, Julia P Nelon, D Matthew Boyer, D Hudson Smith, and Ryan D Visser (2019). "Using Natural Language Processing to Accelerate Deep Analysis of Open-Ended Survey Data." In: *2019 SoutheastCon*. IEEE, pp. 1–3.

Physics

Mohapatra, Abhishek, D Hudson Smith, and Eric Braaten (2016). "Dissociation of Cooper pairs in the BCS Limit using an Oscillating Magnetic Field." In: *APS Division of Atomic, Molecular and Optical Physics Meeting Abstracts*.

Smith, D Hudson (2016). "Induced two-body scattering resonances from a square-well potential with oscillating depth." In: *EPJ Web of Conferences*. Vol. 113. EDP Sciences, p. 02005.

Braaten, Eric, Abhishek Mohaptra, and D Hudson Smith (2016). "Initial Atom Loss Rate after the Sudden Ramp of a BEC to Unitarity." In: *APS Division of Atomic, Molecular and Optical Physics Meeting Abstracts*.

Smith, D Hudson (2015). "Inducing Resonant Interactions in Ultracold Atoms with an Oscillating Magnetic Field." In: *APS Division of Atomic, Molecular and Optical Physics Meeting Abstracts*. Vol. 1, p. 3010.

Smith, D, Christian Langmack, Eric Braaten, et al. (2013). "Avalanche Mechanism for the Enhanced Loss of Ultracold Atoms." In: *APS Division of Atomic, Molecular and Optical Physics Meeting Abstracts*. Vol. 1, 5007P.

Braaten, Eric and Dane Smith (2012). "Avalanche Mechanism for Multiple Atom Loss near an Efimov Atom-Dimer Resonance." In: *APS Division of Atomic, Molecular and Optical Physics Meeting Abstracts*.

Computational tools

- Python, R, SQL, bash, C++, C#, Java, LaTeX
- Deep Learning and Probabilistic Programming: Pytorch, Pyro, NumPyro, Jax
- Experience with Cloud and cluster computing environments
- Hardware-accelerated array programming for scientific computing

Honors and Awards

2016: Presidential Fellow, OSU

2013: Winner of Physics Dept. Poster Competition, OSU

2011: Fowler Fellow, OSU

2011: University Fellow, OSU

2010: T. Kincannon Mathematics Award, Erskine College

2010: Junkin Physics Award, Erskine College

2008: Garnet Circle Award, Erskine College

2007: Roy M. Smith Mathematics Scholarship, Erskine College