

Jeremiah Johnson, Ph.D

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Research Interests

Machine learning applications in magnetospheric physics, self-supervised representation learning for computer vision and time series, algebraic representation learning, computer science and data science education.

Current Position

Associate Professor

Department of Applied Engineering and Sciences

University of New Hampshire

July 2022 - Present

Academic Background

Assistant Professor

Department of Applied Engineering and Sciences

University of New Hampshire

September 2015 - June 2022

Senior Lecturer

Division of Applied Sciences

University of New Hampshire

May 2012 - August 2015

Senior Lecturer

Department of Computer Sciences and Mathematics

The Pennsylvania State University

Aug. 2010 - June 2012

Ph.D, Mathematics

Department of Mathematics and Statistics

University of New Hampshire

2010

○ **Supervisor:** Edward K. Hinson

○ **Thesis:** Admissible Orders on Quotients of the Free Associative Algebra

○ **GPA:** 3.9

Instructor of Mathematics

Department of Mathematics

Pima Community College

July 2007 – July 2010

M.S., Mathematics

Department of Mathematics and Statistics

University of New Hampshire

2002

○ **GPA:** 3.9

B.S., Mathematics

Department of Mathematics and Statistics

University of New Hampshire

2000

○ Graduated *Magna Cum Laude*

Refereed Publications

Advances in the Modelling of Meso-scale Phenomena in the Coupled Magnetosphere-Ionosphere System, Ozturk, D., Verkhoglyadova, O.P., Johnson, J.W., Meng, X., Kunduri, B., Thomas, E., Connor, H.K.,

accepted, Triennial Earth-Sun Summit (TESS) 2022.

Revisiting the Ground Magnetic Fields Perturbation Challenge: A Machine Learning Perspective, Pinto, V.A., Keesee, A.M., Coughlan, M., Mukundan, R., Johnson, J.W., Ngwira, C.M., Connor, H.K., *Frontiers in Astronomy and Space Sciences* vol. 9, 2022, doi: 10.3389/fspas.2022.869740.

Establishing a Benchmark for Ground Magnetic Field Perturbations Predictions Using Machine Learning Models, Pinto, V.A., Keesee, A.M., Coughlan, M., Mukundan, R., Ferdousi, B., Ozturk, D., Johnson, J.W., Connor, H.K., AGU Fall Meeting 2021. AGU, 2021.

Using Convolutional Neural Networks and Long-Short Term Machine Learning Models to Provide Insights into GIC Drivers and Risk of Occurrence, Coughlan, M., Keesee, A.M., Pinto, V.A., Mukundan, R., Connor, H.K., Johnson, J.W., AGU Fall Meeting 2021. AGU, 2021.

A Contrastive Learning Approach to Auroral Image Identification and Classification, Johnson, J.W., Hari, S., Connor, H.K., Hampton, D., in press, the 20th IEEE International Conference on Machine Learning and Applications (ICMLA), 2021, pp. 772-777, doi: 10.1109/ICMLA52953.2021.00128.

A Diophantine Equation with an Elementary Solution, Johnson, J.W., in press, *The College Mathematics Journal*, March 2021.

Benefits and Challenges of Oral Assessments in Computing and Mathematics, Johnson, J.W., Jin, K., Sabin, M., in press, *Frontiers in Education* 2021, Oct. 2021.

Students from a Large Australian University Use Twitter to Identify Difficult Course Concepts to Review During Face-to-Face Lectorial Sessions, Halpin, P., Johnson, J.W., Badoer, E., *Advances in Physiology Education* vol. 45 no. 1 (2021) pp. 10–17.

Using Machine Learning and Geomagnetic Storm Data to Determine the Risk of GIC Occurrence, Coughlan, M., Keesee, A.M., Pinto, V.A., Johnson, J.W., Connor, H.K., AGU Fall Meeting 2020. AGU, 2020.

A Deep Learning Approach to the Forecasting of Ground Magnetic Field Perturbations at High and Mid-Latitudes (Conference Presentation), Pinto, V.A., Keesee, A.M., Coughlan, M., Gadbois, M.A., Johnson, J.W., Connor, H.K., AGU Fall Meeting 2020. AGU, 2020.

Predicting Ground Magnetic Field Fluctuations from Geomagnetic Storm Data Using a Novel Transformer-Based Model, Hari, S., Johnson, J.W., Coughlan, M., Pinto, V.A., Keesee, A.M., Connor, H.K., AGU Fall Meeting 2020., AGU, 2020.

Improved Diagnosis of Invasive Ductal Carcinoma with Semi-Supervised cGANs, Johnson, J.W., *Proceedings of the Future Technologies Conference*, Springer, November 2020.

Benefits and Pitfalls of Jupyter Notebooks in the Classroom, Johnson, J.W., *Proceedings of the 21st annual Conference on Information Technology Education (SIGITE '20)*, October 2020, pp. 32–37.

Generative Adversarial Networks in Medical Imaging, Johnson, J., *State of the Art in Neural Networks and Their Applications*, Elsevier, 2021.

Training a Neural Network Using Geomagnetic Storm Data to Predict Ground Magnetic Field Fluctuations, Coughlan, M., Keesee, A., Pinto, V., Johnson, J.W., Connor, H., *Geospace Environment Modeling (GEM) Workshop*, July 2020.

Jupyter Notebooks in Education, Johnson, J.W., Jin, K., *Journal of Computing Sciences in Colleges*, vol. 35 no. 8, April 2020.

Structured Prediction using cGANs with Fusion Discriminator, Johnson, J.W., Mahmood, F., Xu, W., Yuille, A., *Workshop on Deep Generative Models for Highly Structured Data at the 2019 International Conference on Learning Representations*, May 2019.

Fusing Attributes Predicted via Conditional GANs for Improved Skin Lesion Classification (Conference Presentation), Mahmood, F., Johnson, J. W., Yang, Z., Durr, N. J., *Proc. SPIE 10950, Medical Imaging 2019*:

Computer–Aided Diagnosis, 109501T (14 March 2019).

[Automatic Nucleus Segmentation with Mask-RCNN](#), Johnson, J.W., *Advances in Computer Vision*, Springer Intl., pp. 399–407, 2020. Available online April 2019.

[Towards the Algorithmic Detection of Artistic Style](#), Johnson, J.W., *International Journal of Advanced Computer Science & Applications*, vol. 10 no. 1, Jan. 2019.

Teaching Neural Networks in the Deep Learning Era, Johnson, J.W., *Journal of Computing Sciences in Colleges*, vol. 34 no. 6, April 2019.

Scaling Up: Introducing Undergraduates to Data Science Early In Their College Careers, Johnson, J.W., *Journal of Computing Sciences in Colleges*, vol. 33 no. 6, June 2018.

[Neural Style Representations and the Large-Scale Classification of Artistic Style](#), Johnson, J., *Proceedings of the 2017 Future Technologies Conference*, pp. 283–285, November 2017.

Data Science as a Vehicle for Computing Across the Curriculum, Johnson, J., *Journal of Computing Sciences in Colleges*, vol. 32 no. 6, June 2017.

[Weight Ideals Associated to Regular and Log–Linear Arrays](#), Johnson, J.W., *Journal of Symbolic Computation*, vol. 67, pp. 1–15, March–April 2015.

[The Number of Group Homomorphisms from \$D_m\$ into \$D_n\$](#) , Johnson, J.W., *The College Mathematics Journal*, vol. 43 no. 3, May 2013.

Admissible Orders on Quotients of the Free Associative Algebra, Johnson, J.W., *Doctoral Dissertation*, University of New Hampshire, May 2010.

Preprints, Unpublished, and Working Papers

[Subspace Match Probably Does Not Accurately Assess the Similarity of Learned Representations](#), Johnson, J.W., Jan. 2019.

Evaluation of UV Dose Response Quality Control Bounds for Bacteriophage T1 and T1UV, Collins, J., Cotton, C., and Johnson, J.W., 2016.

Exhibited Artworks

Abstract 0, 2022 Joint Mathematics Meetings Mathematical Art Galleries Jan. 2022
Untitled Abstracts (2), Open Source, Los Angeles Center for Digital Art March–April 2019

Selected Talks and Presentations

Geospace Environment Modeling Workshop 2022	June 2022 (upcoming)
20 th IEEE International Conference on Machine Learning and Applications	Dec. 2021
Frontiers in Education (FIE 2021)	October 2021
Machine Learning Algorithms for Geomagnetically Induced Currents in Alaska and New Hampshire Annual Meeting (MAGICIAN) (invited)	May 2021
Consortium for Computing Sciences in Colleges Northeast (CCSCNE)	April 2021
Wex Corp. Data Science Summit Keynote (invited)	January 2021
Future Technologies Conference 2020	November 2020
21 st Annual Conference on Information Technology Education	October 2020
International Conference on Learning Representations (ICLR)	May 2019
Computer Vision Conference	April 2019

CCSCNE	April 2019
CCSCNE	April 2018
Saint Anselm College (invited)	May 2017
CCSCNE	April 2017
The Open Data Science Conference (ODSC) (slides)	May 2016
ODSC	May 2015

Selected Conferences/Trainings/Workshops

MSRI: Foundations of Stable, Generalizable and Transferable Statistical Learning	March 2022
ICLR	May 2021
CCSCNE	April 2021
NASA/JPL Second AI and Data Science Workshop for Earth and Space Sciences	February 2021
AGU Fall Meeting	December 2020
GEM Workshop	August 2020
Neural Information Processing Systems (NeurIPS)	December 2018
PyTorch Developer's Conference (invited)	October 2018
ODSC CxO Summit (invited)	May 2017
NeurIPS	December 2016
Re.Work Deep Learning Summit	May 2016
Maurice Auslander Distinguished Lectures and International Conference	April 2012
Joint Mathematics Meetings	January 2012
Mathematical Sciences Research Community - Computational and Applied Topology	June–July 2011
Maurice Auslander Distinguished Lectures and International Conference	April 2011
Fall Southeastern Section Meeting of the American Mathematical Society	November 2010
AMS–MAA Joint Mathematics Meetings	January 2009
Southwestern Group Theory Day	2007

Recent Grants

NASA Citizen Science Seed Funding Program	\$124,208
<i>Role: Co-Investigator</i>	February 2022
<ul style="list-style-type: none"> ○ Title: <i>AuroraClick: A Citizen Science and Education Project for Machine Learning Applications for Aurora Classification</i> ○ Status: <i>Pending</i> 	
NASA Living With a Star: Tools and Methods	\$169,257
<i>Role: Principal Investigator</i>	August 2021
<ul style="list-style-type: none"> ○ Title: <i>Producing Homogeneous, Machine Learning–Ready Auroral Image Databases Using Unsupervised Learning</i> ○ NASA Award # 80NSSC22K0642 	
NH-INBRE Seed Grant	\$27,090
<i>Role: Principal Investigator</i>	February 2020
<ul style="list-style-type: none"> ○ Title: <i>Using Artificial Intelligence to Understand the Neurological Basis of Autism Spectrum Disorder</i> ○ Federal award #2P20GM103506-11, subaward #R1410 	
NSF EPSCoR RII FEC	\$1,941,867
<i>Role: Senior Personnel</i>	January 2019
<ul style="list-style-type: none"> ○ Title: <i>Harnessing Big Data to Improve Understanding and Predictions of Geomagnetically Induced Currents</i> ○ NSF Award #1920965 ○ Principal Investigators Hyunju Connor, Amy Keese, Hui Zhang, Donald Hampton, Md Shaad Mahmud 	

Awards

Faculty Standards Teaching Award

Pima Community College
2007 and 2008

Research Students (Primary Advisor)

Swathi Hari (M.S. in Information Technology), expected graduation December 2021

William Rivera (M.S. in Information Technology), expected graduation December 2021

Sharmila Chandrakatha (M.S. in Information Technology), graduated May 2019

Research Students (Committee Member)

Michael Coughlan (Ph.D in Physics), expected graduation May 2022

Andrea Murphy (M.S. in Information Technology), graduated May 2020

Eric Hutchins (M.S. in Information Technology), graduated May 2016

Ramon Whitman (M.S. in Information Technology), graduated May 2016

Curriculum Development

B.S. in Analytics & Data Science Program

2015–2016

- Led development and implementation of novel Bachelor-level program in Analytics & Data Science
- Developed curriculum for four new courses in Analytics & Data Science:
 - DATA 557: Introduction to Analytics & Data Science
 - DATA 674: Predictive and Prescriptive Modeling I
 - DATA 675: Predictive and Prescriptive Modeling II
 - DATA 757: Mining Massive Datasets

Other Curriculum Development

2015–Present

- Developed curriculum for new upper-level undergraduate/graduate course COMP 750/850: Neural Networks
- Developed curriculum needed to offer the B.S. in Analytics & Data Science on multiple campuses of UNH System (2018)
- Developed two new options in the B.S. in Analytics & Data Science Curriculum (2018)
- Developed two minors in Analytics & Data Science (2018)
- Developed curriculum for new course COMP 570: Statistics in Computing & Engineering (2016)

Teaching

- Three four-credit courses taught per semester in mathematics and data science (at UNH) 2012–Present
- Four four-credit courses taught per semester in mathematics (at the Pennsylvania State University) 2010–2012
- Four four-credit courses taught per semester in mathematics (at Pima Community College) 2007–2010
- Selected courses taught (at UNH except where otherwise indicated):
 - COMP 750/850: Neural Networks (annually/semi-annually)
 - DATA 674: Predictive and Prescriptive Modeling I (annually)
 - DATA 675: Predictive and Prescriptive Modeling II (annually)

- DATA 557: Introduction to Analytics and Data Science (every semester)
- MATH 645: Linear Algebra for Applications (annually)
- MATH 425: Calculus I (annually/semi-annually)
- MATH 426: Calculus II (annually/semi-annually)
- MATH 527: Differential Equations with Linear Algebra
- COMP 570: Statistics for Computing and Engineering
- MATH 435: Abstract Algebra (at the Pennsylvania State University)
- MATH 230: Calculus and Vector Analysis (at the Pennsylvania State University)

Reviewing and Service to the Profession

Reviewer for Frontiers in Education	2021
Reviewer for the Journal of Symbolic Computation	2021–Present
Reviwer for Medical Image Analysis	2021–Present
CCSCNE Regional Editor	2020–Present
Reviewer for zbMATH	2019–Present
Reviewer for MathSciNet	2014–Present
Reviewer for SIGCSE	2018–Present
Reviewer for CCSCNE	2018–Present
Poster & Paper Reviewer for SciPy	2017–2019
Reviewer for Decision Sciences	2017
MathCounts Volunteer	2010–2013

Committees Work and University Service

Program Coordinator for Undergraduate and Graduate programs in Analytics & Data Science	2021–Present
Member, Machine Learning Cluster Hire Committee	2021
Codirector, Undergraduate Analytics & Data Science Curriculum Committee	2017–Present
Member, Research Computing Center Faculty Advisory Committee	2016–Present
Member, Fall Education Reopening Committee	2020
Member, Tenure–Track Assistant Professor of Mathematics Hiring Committee	2020
Member, Analytics Curriculum Committee	2014–2020
Member, Ph.D in Data Science Study Group	2016–2019
Program Coordinator, B.S. in Analytics & Data Science	2014–2018
Member, Analytics & Data Science Lecturer Hiring Committee	2017
Member, UNH Analytics Steering Committee	2014–2016
Member, UNH Lecturer Council	2013–2015
Member, Career Services Coordinator Hiring Committee	2013
Member, Senior Lecturer Hiring Committee (The Pennsylvania State University)	2010
Faculty Mentor (Pima Community College)	2009–2010
Faculty Senator (Pima Community College)	2008–2009
Member, College Curriculum Committee (Pima Community College)	2008–2009
Member, Mathematics Faculty Hiring Committee (Pima Community College)	2008–2009
Member, Cycle 4 Mathematics Program Review (Pima Community College)	2007–2008

Other Employment

Instructor

The UNH Summer Analytics Institute

University of New Hampshire

May 2014 - June 2014

- Responsible for curriculum design and instruction in statistics, machine learning, predictive analytics, programming, and data mining.
- Mentored multiple teams of students working on practicum projects for external partners.

Founder & Principal

Gorilla Data Science LLC

June 2014 - Present

- Provide consulting services in data science, machine learning, and artificial intelligence to regional enterprises.

Technical Skills

Programming Languages: Python, R, C/C++, CUDA, SQL, Bash/Shell

Operating Systems: Unix/Linux, Mac OS X

Frameworks and Tools: TensorFlow, PyTorch, Caffe, Vowpal Wabbit, Matlab (Octave), Mathematica, Maple, GAP, \LaTeX , Git/GitHub, Tableau, Amazon Web Services

Languages

English: Native

French: A2/B1

Certifications

ACUE Credential in Effective College Teaching

2021

Professional Memberships

American Mathematical Society

Mathematical Association of America

Association for Computing Machinery

ACM SIGKDD

American Geophysical Union

Other Interests

Rock climbing, surfing, espresso.

References

Available upon request.