

McKell Woodland

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Education

Rice University, Houston, TX

Aug 2024

Ph.D. Computer Science

Brigham Young University, Provo, UT

Apr 2018

B.S. Applied and Computational Mathematics

Research Experience

Morfeus Lab, MD Anderson Cancer Center, Houston, TX

Jan 2020 - Present

- Researching out-of-distribution detection and generative modeling evaluation in medical imaging
- Papers published in MICCAI 2024, UNSURE 2023, Diagnostics, SASHIMI 2022, & Eur. J. Radiol
- Awarded Best Spotlight Paper, Graduate Student Travel Grant, Young Investigator Award – Significance, and Worldwide Innovations in Medical Physics
- Oral presentations at UNSURE 2023, AAPM 2021-2023, & SWAAPM 2022 (MedPhys Slam)
- Posters at PBDW 2021-2023, Med-NeurIPS 2022, SASHIMI 2022, SWAAPM 2022, & WIMP 2021
- Participated in a public debate at PBDW 2023
- Moderated session at 2nd Annual Research Retreat in Oncological Data and Computational Sciences

Texas Children's Hospital; Medical Informatics Corp, Houston, TX

Aug 2019 – Dec 2019

- Created a novel classification algorithm to detect the onset of a heart rhythm disorder with 90% AUROC
- Engineered a novel waveform visualization tool (using t-SNE) for use in a development pipeline
- Team took first place in Rice's Data2Knowledge Showcase; poster presentation in WFPICCS 2020

Perception Control, and Cognition Lab, BYU, Provo, UT

Jan 2018 – May 2019

- Trained a Rainbow DQN on game states embedded by a CVLAE to reduce sample complexity in RL
- Outperformed Deep Mind's Rainbow DQN for both Space Invaders and Atlantis
- Awarded Session Winner at the 2019 BYU Student Research Conference

Mathematics Department, BYU, Provo, UT

Apr 2017– Dec 2017

- Utilized Markov chains to find optimal facility locations in terms of four metrics
- Applied research to determine a location for a new religious center
- Oral presentations at NERCCS 2019 and 2018 BYU Student Research Conference

Computer Science Department, BYU, Provo, UT

Aug 2017– Dec 2017

- Extracted 23 features from web-scraped BYU speeches and used a wrapper algorithm for feature selection
- Ran 4 machine learning models on the features and achieved 79% accuracy on the speeches' popularity
- Oral presentation at NCUR 2018, along with a presentation to the BYU speeches team

Mechanical Engineering Department, BYU, Provo UT

June 2016 – Dec 2016

- Used Mathematica to find paths of rigid motion of a four-bar mechanism on a cone and to do 3D modeling
- Published peer-reviewed article in J. Mechanisms Robotics
- Oral presentation at IDETC/CIE 2020 and 2018 BYU Student Research Conference

Instructional Psychology & Technology Department, BYU, Provo, UT

Jan 2016 – Dec 2016

- Evaluated over 1 million tweets from 50,000 users using SQL servers
- Published peer-reviewed articles in JSSR (2017) and IRRODL (2019)
- Oral presentation at Instructional Design and Learning Community Conference

Professional Experience

Microsoft, Redmond, WA (remote)

May 2020 - Aug 2020

Data Science Intern

- Devised a similarity score in Python to analyze overlap between suspicious behavior detectors
- Produced, using Kusto, a tool for Microsoft Threat Experts to use the score to detect malicious behavior
- Moderated a Q&A session with the TF and CTO of Microsoft's AI Cognitive Services

Lawrence Livermore National Laboratory, Livermore, CA

May 2019 - Aug 2019

Data Science R&D Intern

- Developed an event detection model for videos by embedding a R2U-Net into a ConvLSTM using PyTorch

- Crafted 100,000 colorful moving MNIST with obscurations videos with OpenCV (VRAM)
- Gave final model (99% acc on VRAM) to client to apply to classified data with obscured and moving objects

3M Health Information Systems, Murray, UT

May 2018 – Aug 2018

Data Science Intern

- Made a RNN on a EC2-instance to predict over 50,000 PdXs from 1.7 million documents using Keras
- Built the basis of a deep learning framework in Keras to predict DRG codes
- Assembled a framework to analyze the text behind any amount of medical notes

National Security Agency, Laurel, MD

May 2017 – Aug 2017

Director's Summer Program Intern

- Implemented custom convolutional neural nets using Python and received TS//SCI clearance
- Analyzed an inertial navigation problem with noisy data and submitted internally referenced technical paper
- Prepared a briefing for the Deputy Director and presented findings to the IDA at Princeton

Teaching Experience

The Coding School, Remote

Aug 2019 – Present

Lead Instructor; Developer; Young Professional Advisory Board Member

- Taught introductory Python and AI courses to over 400 elementary, middle, and high school students
- Instructed 300+ HBCU and community college professors on how to introduce AI into their classrooms
- Tutored 5 students one-on-one in data structures, OOP, algorithms, and AI in both Java and Python
- Authored the deep learning and SQL curriculum and edited the machine learning curriculum

Computer Science, Brigham Young University - Idaho, Remote

Apr 2022 – July 2022

Online Adjunct Instructor

- Taught the online pilot course CSE 450: Machine Learning and Data Mining
- Served as the Online Course Representative for CSE 450
- Received 12% higher reviews than all other online instructors in terms of: concern, timeliness, & enthusiasm

Computer Science, Rice University, Houston, TX

Teaching Assistant

Oct 2020 – Dec 2021

- Statistics for Computing and Data Science (Fall 2021): graded assignments and held office hours
- Introduction to Computer Security (Spring 2021): held office hours, edited labs, and graded assignments
- Programming for Data Science (Fall 2020): held 10 hrs/week of office hours to help struggling students

Instructional Coach

Aug 2021 – Apr 2022

- Help students prepare to give a research presentation in the department's Graduate Research Seminar

Mathematics, Brigham Young University, Provo, UT

Jan 2017 – Dec 2017

Curriculum Developer

- Wrote 7 Python labs for the Applied & Computational Mathematics curriculum: iterative solvers, profiling, SymPy, SQL 1&2, one-dimensional optimization, & gradient descent
- Worked with collaborators to edit over 15 different labs

Peer-Reviewed Articles

- **Woodland, M.**, Patel, N., Castelo, A., Al Taie, M., Yung, J.P., Netherton, T.J., Calderone, T.L., Sanchez, J.I., Cleere, D.W., Elsaiey, A., Gupta, H., Victor, D., Beretta, L., Patel, A.B., & Brock, K.K. (2024). Dimensionality Reduction and Nearest Neighbors for Improving Out-of-Distribution Detection in Medical Image Segmentation. *MELBA*.
- Baroudi, H. Brock, K.K., Cao, W., Chen, X., Chung, C., Court, L.E., El Basha, M.D., Farhat, M., Gay, S., Gronberg, M.P., Gupta, A.C., Hernandez, S., Huang, K., Jaffray, D.A., Lim, R., Marquez, B., Nealon, K., Netherton, T.J., Nguyen, C.M., Reber, B., Rhee, D.J., Salazar, R.M., Shanker, M.D., Sjogreen, C., **Woodland, M.**, Yang, J., Yu, C., & Zhao, Y. (2023). Automated Contouring and Planning in Radiation Therapy: What Is 'Clinically Acceptable'? *Diagnostics*, 13, 667. doi.org/10.3390/diagnostics13040667
- Sen, A., Troncoso, P., Venkatesan, A., Pagel, M.D., Nijkamp, J.A., He, Y., Lesage, A., **Woodland, M.**, & Brock, K.K. (2021). Correlation of In-Vivo Imaging with Histopathology: A Review. *Eur. J. Radiol.*, 144, 109964. doi.org/10.1016/j.ejrad.2021.109964
- **Woodland, M.**, Hsiung, M., Matheson, E., Safsten, A., Greenwood, J., Halverson, D.M., & Howell, L.L. (2021). Analysis of the Rigid Motion of a Developable Conical Mechanism. *J. Mech. Robot.*, 13, 031106-1 to 031106-8. doi.org/10.1115/1.4050294

- Kimmons, R., Hunsaker, E., Jones, E.J., & **Stauffer, M.** (2019). The nationwide landscape of K-12 school websites in the United States: Systems, services, intended audiences, and adoption patterns. *IRRODL*, 20(3). doi.org/10.19173/irrodl.v20i4.3794
- Kimmons, R., McGuire, K., **Stauffer, M.**, Jones, E.J., Gregson, M., & Austin, M. (2017). Religious identity, expression, and civility in social media: Results of data mining Latter-day Saint Twitter accounts. *J. Sci. Study Relig.*, 56(3), 180-210. doi.org/10.1111/jssr.12358

Conference Proceedings

- **Woodland, M.**, Castelo, A., Al Taie, M., Albuquerque Marques Silva, J., Eltaher, M., Mohn, F., Kundu, S., Yung, J.P., Patel, A.B., & Brock, K.K. (2024) Feature Extraction for Generative Medical Imaging Evaluation: New Evidence Against an Evolving Trend. *MICCAI 2024*.
- **Woodland, M.**, Patel, N., Al Taie, M., Yung, J.P., Netherton, T.J., Patel, A.B., & Brock, K.K. (2023). Dimensionality Reduction for Improving Out-of-Distribution Detection in Medical Image Segmentation. In: Sudre, C.H., Baumgartner, C.F., Dalca, A., Mehta, R., Qin, C., Wells, W.M. (eds) *UNSURE 2023*. LNCS, vol 14291. Springer, Cham. doi.org/10.1007/978-3-031-44336-7_15
- **Woodland, M.**, Wood, J., Anderson, B.M., Kundu, S., Lin, E., Koay, E., Odisio, B., Chung, C., Kang, H.C., Venkatesan, A.M., Yedururi, S., De, B., Lin, Y.-M., Patel, A.B., & Brock, K.K. (2022). Evaluating the Performance of StyleGAN2-ADA on Medical Images. In: Zhao, C., Svoboda, D., Wolterink, J.M., Escobar, M. (eds) *SASHIMI 2022*. LNCS, vol 13570. Springer, Cham. doi.org/10.1007/978-3-031-16980-9_14
- **Woodland, M.**, Hsiung, M., Matheson, E.L., Safsten, C.A., Greenwood, J., Halverson, D.M., & Howell, L.L. (2020). Analysis of the Rigid Motion of a Developable Conical Mechanism. *IDETC-CIE 2020*. doi.org/10.1115/DETC2020-22643
- Henrichsen, A., Jafek, B., O'Bryant, J., & **Stauffer, M.** (2018). Brigham Young University Speeches Popularity Predictor. *NCUR 2018*. libjournals.unca.edu/ncur

Abstracts

- **Woodland, M.**, O'Connor, C., Wood, J., Patel, A.B., & Brock, K.K. (2023). Interpretable Out-of-Distribution Detection with Generative Adversarial Networks. *Med. Phys.*, 50(6), e154-155. doi.org/10.1002/mp.16525
- **Woodland, M.**, Wood, J., O'Connor, C., Patel, A.B., & Brock, K.K. (2022). StyleGAN2-based Out-of-Distribution Detection for Medical Imaging. In: *Med-NeurIPS 2022*. sites.google.com/view/med-neurips-2022/abstracts
- Reber, B., van Dijk, L.V., Anderson, B.M., Mohamed, A.S., Rigaud, B., He, Y., **Woodland, M.**, Fuller, C.D., Lai, S.Y., and Brock, K.K. (2022) Comparison of Machine Learning and Deep Learning Methods for the Prediction of Osteoradionecrosis Resulting from Head and Neck Cancer Radiation Therapy. *Int. J. Radiat. Oncol. Biol. Phys.*, 114(3), e124. doi.org/10.1016/j.ijrobp.2022.07.946
- **Woodland, M.**, Wood, J., Anderson, B.M., Kundu, S., Lin, E., Koay, E., Odisio, B., Chung, C., Kang, H.C., Venkatesan, A., Yedururi, S., De, B., Lin, Y., Patel, A.B., & Brock, K.K. (2022). Comparing Transfer Learning, Data Augmentation, and Data Expansion in the Improvement of Medical Image Generation. *Med. Phys.*, 49(6), 134. doi.org/10.1002/mp.15769
- **Woodland, M.**, Patel, A.B., Anderson, B.M., Lin, E., Koay, E., Odisio, B., & Brock, K.K. (2021). GAN-Driven Anomaly Detection for Active Learning in Medical Imaging Segmentation. *Med. Phys.*, 48(6). doi.org/10.1002/mp.15041
- Reber, B., Anderson, B.M., Mohamed, A., Van Dijk, L., Rigaud, B., McCulloch, M., He, Y., **Woodland, M.**, Fuller, C. Lai, S., & Brock, K.K. (2021). Predicting Osteoradionecrosis from Head and Neck Radiotherapy Using a Residual Convolutional Neural Network. *Med. Phys.*, 48(6). doi.org/10.1002/mp.15041
- Sailsbery, M., Heiner, J., Robertson, C., **Stauffer, M.**, & Jarvis, T. (2019). Facility Location Using Markov Chains on Spatial Networks. In: *NERCCS 2019*. coco.binghamton.edu/nerccs

Oral Presentations

- **Woodland, M.**, Patel, N., Al Taie, M., Yung, J.P., Netherton, T.J., Patel, A.B., & Brock, K.K. (2023). Dimensionality Reduction for Improving Out-of-Distribution Detection in Medical Image Segmentation. *UNSURE 2023*.
- **Woodland, M.**, O'Connor, C., Wood, J., Patel, A.B., & Brock, K.K. (2023). Interpretable Out-of-Distribution Detection with Generative Adversarial Networks. *AAPM 2023*.
- **Woodland, M.**, Wood, J., Anderson, B.M., Kundu, S., Lin, E., Koay, E., Odisio, B., Chung, C., Kang, H.C., Venkatesan, A., Yedururi, S., De, B., Lin, Y., Patel, A.B., & Brock, K.K. (2022). Comparing Transfer

Learning, Data Augmentation, and Data Expansion in the Improvement of Medical Image Generation. *AAPM 2022*.

- **Woodland, M.**, Anderson, B. M., Wood, J., Lin, E., Koay, E., Odisio, B., Patel, A. B., & Brock, K. K. (2022). Houston, Our AI Models Have a Problem! *SWAAPM 2022*.
- **Woodland, M.**, Patel, A. B., Anderson, B. M., Lin, E., Koay, E., Odisio, B., & Brock, K. K. (2021). GAN-Driven Anomaly Detection for Active Learning in Medical Imaging Segmentation. *AAPM 2021*.
- Kimmons, R., McGuire, K., **Stauffer, M.**, Jones, E. J., Gregson, M., & Austin, M. (2016). Understanding LDS Twitter use. *Instructional Design and Learning Community Conference 2016*.

Posters

- **Woodland, M.**, Al Taie, M., Lebimoyo, O., Patel, A.B., & Brock, K.K. (2023). Interpretable OOD Detection using GANs: An Application to the MIDRC Data Repository. *PBDW 2022*.
- **Woodland, M.**, Wood, J., O'Connor, C., Patel, A.B., & Brock, K.K. (2022). StyleGAN2-based Out-of-Distribution Detection for Medical Imaging. *Med-NeurIPs 2022*.
- **Woodland, M.**, Wood, J., Anderson, B. M., Kundu, S., Lin, E., Koay, E., Odisio, B., Chung, C., Kang, H. C., Venkatesan, A. M., Yedururi, S., De, B., Lin, Y.-M., Patel, A. B., & Brock, K. K. (2022). Evaluating the Performance of StyleGAN2-ADA on Medical Images. *SASHIMI 2022*.
- **Woodland, M.**, Patel, A.B., & Brock, K.K. (2022). StyleGAN2-based Out-of-Distribution Detection in Computed Tomography. *PBDW 2022*.
- **Woodland, M.**, Anderson, B.M., Wood, J., Lin, E., Koay, E., Odisio, B., Patel, A.B., & Brock, K.K. (2022). Improving the Generation of Synthetic Medical Images using Data Augmentation and Transfer Learning. *SWAAPM 2022*.
- **Woodland, M.**, Patel, A. B., Rigaud, B., Reber, B., Anderson, B. M., Wood, J., Lin, E., Koay, E., Odisio, B., & Brock, K. K. (2021). Detecting Out-of-Distribution Images for Active Learning using a Generative Adversarial Network (StyleGAN2). *PBDW 2021*.
- Reber, B., Duk, L.V., Anderson, B. M., Mohammad, A., Rigaud, B., He, Y., **Woodland, M.**, Fuller, C., Lai, S., Brock, & K. K. (2021). Comparison of Machine Learning Methods for the Prediction of Osteoradionecrosis (ORN) from Head and Neck Cancer (HNC) Radiation Therapy. *PBDW 2021*.
- **Stauffer, M.**, Patel, A.B., Anderson, B.M., Rigaud, B., Reber, B., Nie, W., Koay, E., & Brock, K.K. (2021). GAN-Driven Anomaly Detection for Active Learning in Medical Imaging Segmentation. *WIMP 2021*.
- Barua, S., Babei, H., Tan, X., Chen, H., Humayun, A.I., Dai, Y., **Stauffer, M.**, Paciuc, M., Patel, R., Rusin, C., & Jain, P. (2020). A Novel Algorithm for Early Detection of Junctional Ectopic Tachycardia in Patients with Congenital Heart Disease. *WFPICCS 2020*.

Awards

(2023) Best Spotlight Paper - UNSURE 2023
(2023) Graduate Student Travel Grant – Rice Engineering Alumni
(2021) Early Career Investigator Significance Award - PBDW 2021
(2021) Worldwide Innovations in Medical Physics Finalist - WIMP 2021
(2019) Showcase Winner – Rice Data2Knowledge Showcase
(2019) Session Winner – BYU Student Research Conference
(2019) Y-Serve Exceptional Leader – BYU Y-Serve
(2018) Outstanding Mathematician – BYU Math
(2017) Outstanding Mathematician – BYU Math

Technical Skills

Languages: Python, C++, Java, HTML, and C

Platforms: Docker, Kubernetes, Amazon Web Services, Linux, Spark, SQL, Kusto, LaTeX, and Mathematica

Python Packages: PyTorch, TensorFlow, PySpark, Scikit-Learn, Keras, OpenCV, Autograd, and Pandas

Academic Services

Reviewer, Uncertainty for Safe Utilization of Machine Learning in Medical Imaging (UNSURE), 2024

Reviewer, Medical Image Computing & Computer Assisted Intervention (MICCAI), 2024

Reviewer, Workshop on Deep Generative Models for Health held in conjunction with NeurIPS, 2023

Community Involvement

Summer STEM Institute, Remote

Jun 2021 – Aug 2021

Research Mentor

- Advised a high-school student who built a glioblastoma detector on MRI scans using a pre-trained CNN
- Guided another student who built an arrhythmia detector on ECG signals using a pre-trained ResNet
- Delivered a talk on deep learning in medical imaging to ~300 high school students

Rice University, Houston, TX

Aug 2019 – Present

Panelist, Mentor, Teaching Assistant

- Spoke on a graduate student panel for the Rice CS/IO club
- Mentored undergraduate students in the 2022 Rice Datathon
- Tutored international online master's students who were struggling with the data science curriculum

BYU Y-Serve: Kids Who Code, Provo, UT

Aug 2018 - Apr 2019

Executive Director

- Established a program that facilitates university students teaching kids in the local community coding skills
- Facilitated a Girls Who Code club (20+ girls) at an elementary school (taught Scratch)
- Received a top leadership award from the Y-Serve organization

Utah STEM Action Center, Salt Lake City, UT

Apr 2018 – May 2019

Ambassador

- Promoted STEM at 10+ events and called 100+ schools to teach them about STEM opportunities
- Spoke on a panel at a "Girls Who Code" event at Adobe to 200+ middle school girls
- Accepted certificate from Utah Governor Gary Herbert for service

BYU Women in Computer Science, Provo, UT

Jan 2018 – Dec 2018

Public Outreach Officer

- Planned a "lazy" hackathon event to help women at BYU have projects for interviews
- Interacted with companies to promote opportunities among the female computer science students
- Increased the number of social media followers by 500%