

# McKell Woodland

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## Education

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**Rice University**, Houston, TX Aug 2024  
Ph.D. Computer Science

**Brigham Young University**, Provo, UT Apr 2018  
B.S. Applied and Computational Mathematics

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## Research Experience

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**Morfeus Lab, MD Anderson Cancer Center**, Houston, TX Jan 2020 - Present

- Researching out-of-distribution detection and generative modeling evaluation in medical imaging
- Utilized PCA & the Mahalanobis distance to detect model failure; evaluated StyleGAN2 on medical imaging
- Papers published in UNSURE 2023, Diagnostics, SASHIMI 2022, & Eur. J. Radiol
- Won “Best Spotlight Paper”, “Graduate Student Travel Grant”, “Young Investigator Award – Significance”, and “Worldwide Innovations in Medical Physics” awards
- 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 2<sup>nd</sup> 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 (2021)
- 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

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## Professional Experience

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**Microsoft**, Redmond, WA (remote) May 2020 - Aug 2020  
*Data Science Intern*

- Fabricated 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 obscuration 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

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## Teaching Experience

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**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

Oct 2020 – Dec 2021

*Teaching Assistant*

- 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

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## Peer-Reviewed Articles

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- 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](https://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](https://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](https://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](https://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](https://doi.org/10.1111/jssr.12358)

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## Conference Proceedings

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- **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](https://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](https://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](https://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](http://libjournals.unca.edu/ncur)

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## Manuscripts Under Review

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- **Woodland, M.**, Castelo, A., Al Taie, M., Albuquerque Marques Silva, J., Eltaher, M., Mohn, F., Shieh, A., Kundu, S., Yung, J.P., Patel, A.B., & Brock, K.K. (2023). Feature Extraction for Generative Medical Imaging Evaluation: New Evidence Against an Evolving Trend. [arxiv:2311.13717](https://arxiv.org/abs/2311.13717)

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## Abstracts

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- **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](https://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](https://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](https://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](https://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](https://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](https://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](http://coco.binghamton.edu/nerccs)

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## Posters

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- **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*.

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## Oral Presentations

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- **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*.

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## Awards

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(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

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## Technical Skills

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**Languages:** Python, C++, Java, 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

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## Academic Services

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

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

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## Community Involvement

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**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

**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%