Joshua V. Stough
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Curriculum Vitae

Employment

9/2023–present	Associate Professor, Bucknell University Department of Computer Science
9/2016–8/2023	Assistant Professor, Bucknell University Department of Computer Science
8/2014–8/2016	Software Engineer, Technica Corporation Internal Research and Development
1/2015–5/2016	Adjunct Professor, George Mason University Department of Computer Science
6/2012–12/2012	Visiting Assistant Professor, The Johns Hopkins University Dept. of Electrical and Computer Engineering (untenured leave)
7/2009–8/2014	Assistant Professor, Washington and Lee University Department of Computer Science
7/2008–6/2009	Visiting Assistant Professor, Claremont McKenna College Department of Mathematics

Education

2001–2008	The University of North Carolina at Chapel Hill Ph.D. Computer Science Degree Conferred 12/2008; M.S. 6/2006 Advisor: Stephen M. Pizer
1997–2001	Carleton College, Northfield, MN B.A. Computer Science, B.A. Mathematics Degrees Conferred with Distinction, *Magna Cum Laude*

Research Interests

Medical image analysis: My principal research experience focuses on the segmentation and annotation of medical images for diagnostic, disease modeling, and precision medicine applications. In frequent collaboration with Geisinger Health, my students and I are using machine learning, and specifically neural network learning, for medical targets including segmentation of echocardiography (2D ultrasound of the heart), classification of dermatopathic histology (skin samples in microscopy), and severity determination of facial palsy (cell phone imagery and video).

Honors and Awards

2023-2024	Ciffolillo Healthcare Technology Inventors Program (HTIP) Project on Bell's palsy severity determination by facial recognition software and machine learning
2017-2024	Supported students in earning internal research grants through Bucknell Program for Undergraduate Research (4) and Ciffolillo Healthcare Technology Inventors Program (6)
2018-2019	Bucknell Geisinger Research Initiative (BGRI) Stage 2 grant to support collaborative research with Geisinger in cardiac magnetic resonance and cardiovascular image analysis.
2017	Bucknell Geisinger Research Initiative Stage 1 on deep learning cardiac magnetic resonance
2016	Adjunct Faculty Teaching Award - George Mason University Computer Science.
2010–2014	Five Lenfest summer research grants, five RE Lee student research grants–Washington and Lee institutional funding for summer research.
2011, 2014	NSF-TCPP Early Adopter, Parallel and Distributed Computing Education curriculum grants, plus conference expenses and Nvidia hardware grant.
2010–2013	SuperComputing (SC) – HPC Educators Program: provided conference attendance and gave workshops on teaching parallel computing in the Python programming language.
2006	Future Faculty Fellowship, Center for Teaching and Learning, The University of North Carolina at Chapel Hill.
2001	Phi Beta Kappa

Peer-Reviewed Journal Articles and Book Chapter (* - undergraduate coauthor)

9. A.E. Ulloa Cerna, D.P. vanMaanen, L. Jing, **J.V. Stough**, A.A. Patel, C.M. Haggerty, B.K. Fornwalt, M. Pattichis, "Multimodal Neural Networks for Predicting Mortality Risk: A large-scale study using Interpretable Models." In preparation. preprint https://arxiv.org/abs/1901.08125

8. X. Zhang, A.E. Ulloa Cerna, **J.V. Stough**, Y. Chen*, B.J. Carry, A. Alsaid, S. Raghunath, D.P. vanMaanen, B.K. Fornwalt, C.M. Haggerty, "Generalizability and Quality Control of Deep Learning-Based 2D Echocardiography Segmentation Models in a Large Clinical Dataset." *International Journal of Cardiovascular Imaging* (2022). https://doi.org/10.1007/s10554-022-02554-7

7. S. Raghunath, A.E. Ulloa Cerna, L. Jing, D.P. vanMaanen, **J.V. Stough**, A. Hafez, A. Nemani, T. Carbonati, K. Johnson, K. Young, D.N. Hartzel, J.B. Leader, H.L. Kirchner,

C.W. Good, J.M. Pfeifer, A.A. Patel, B.P. Delisle, A. Alsaid, D. Beer, C.M. Haggerty, B.K. Fornwalt, "Prediction of mortality from 12-lead electrocardiogram voltage data using a deep neural network." *Nature Medicine* (2020). https://doi.org/10.1038/s41591-020-0870-z

6. L. Jing, A.E. Ulloa Cerna, C.W. Good, N.M. Sauers, G. Schneider, D.N. Hartzel, J.B. Leader, H.L. Kirchner, Y. Hu, D.M. Riviello, **J.V. Stough**, S. Gazes, A. Haggerty, S. Raghunath, B.J. Carry, C.M. Haggerty, B.K. Fornwalt. "A Machine Learning Approach to Management of Heart Failure Populations." *JACC Heart Failure*, Volume 8, issue 7, 2020. https://doi.org/10.1016/j.jchf.2020.01.012

5. J. Glaister, A. Carass, T. NessAiver, **J.V. Stough**, S. Saidha, P. Calabresi, J. Prince. "Thalamus Segmentation using Multi-Modal Feature Classification: Validation and Pilot Study of an Age-Matched Cohort." *NeuroImage*, Volume 158, pp. 430-440, 2017. https://doi.org/10.1016/j.neuroimage.2017.06.047

4. S. Bogaerts, **J.V. Stough**. Parallelism in Python for Novices. Chapter in "Topics in Parallel and Distributed Computing: Introducing Concurrency in Undergraduate Courses." Morgan Kaufmann/Elsevier, 2015. http://store.elsevier.com/product.jsp?isbn=9780128038994

3. **J.V. Stough**. Clustering and shifting of regional appearance for deformable model segmentation. Dissertation, The University of North Carolina at Chapel Hill, 2008. http://midag.cs.unc.edu/pubs/phd-thesis/stough_thesis.pdf

2. S.M. Pizer, P.T. Fletcher, S. Joshi, A.G. Gash, **J.V. Stough**, A. Thall, G. Tracton, E.L. Chaney. "A Method & Software for Segmentation of Anatomic Object Ensembles by Deformable M-Reps." *Medical Physics*, Volume 32, number 5, pp. 1335-1345, 2005. https://doi.org/10.1118/1.1869872

1. M. Rao, **J.V. Stough**, Y. Chi, K. Muller, G.S. Tracton, S.M. Pizer, E.L. Chaney. "Comparison of human and automatic segmentations of kidneys from CT images." *International Journal of Radiation Oncology, Biology, Physics*, Volume 61, number 3, pp.954-960, 2005. https://doi.org/10.1016/j.ijrobp.2004.11.014

Peer-Reviewed Conference Proceedings (* - undergraduate coauthor)

20. J. Cai*, C.M. Haggerty, **J.V. Stough**. "Co-Unet-GAN: a Co-Learning Domain Adaptation Model on Echocardiography Segmentation." In Proceedings: *SPIE Medical Imaging*, 2023. http://eg.bucknell.edu/~jvs008/research/cardiac/SPIE23/SPIE23.html https://doi.org/10.1117/12.2652621

19. D. Zhang*, A. Marchiori, and **J.V. Stough**, "Smartphone-Based Turbidity Estimation with Inherent Calibration." In Proceedings: *2022 International Conference on Computational Science and Computational Intelligence*, Research Track on Signal & Image Processing, Computer Vision & Pattern Recognition (CSCI-RTPC)

18. A. Vaidya*, **J.V. Stough**, and A.A. Patel. "Perceptually Improved T1-T2 MRI Translations Using Conditional Generative Adversarial Networks." In Proceedings: *SPIE Medical Imaging*, 2022. http://eg.bucknell.edu/~jvs008/research/brain/SPIE22/SPIE22.html https://doi.org/10.1117/12.2608428

17. Y. Chen*, X. Zhang, C.M. Haggerty, **J.V. Stough**. "Fully Automated Multi-heartbeat Echocardiography Video Segmentation and Motion Tracking." In Proceedings: *SPIE Medical Imaging*, 2022.
http://eg.bucknell.edu/~jvs008/research/cardiac/SPIE22/SPIE22.html
https://doi.org/10.1117/12.2607871

16. T. Tran*, **J.V. Stough**, X. Zhang, C.M. Haggerty. "Bayesian Optimization of 2D Echocardiography Segmentation." In Proceedings: *IEEE International Symposium on Biomedical Imaging* (ISBI), 2021.
http://eg.bucknell.edu/~jvs008/research/cardiac/ISBI21/ISBI21.html
https://doi.org/10.1109/ISBI48211.2021.9433868

15. Y. Chen*, X. Zhang, C.M. Haggerty, **J.V. Stough**. "Assessing the Generalizability of Temporally-Coherent Echocardiography Video Segmentation." In Proceedings: *SPIE Medical Imaging*, 2021.
http://eg.bucknell.edu/~jvs008/research/cardiac/SPIE21/SPIE21.html
https://doi.org/10.1117/12.2580874

14. **J.V. Stough**, S. Raghunath, X. Zhang, J.M. Pfeifer, B.K. Fornwalt, C.M. Haggerty. "Left ventricular and atrial segmentation of 2D echocardiography with convolutional neural networks." In Proceedings: *SPIE Medical Imaging*, 2020.
http://eg.bucknell.edu/~jvs008/research/cardiac/SPIE20/SPIE20.html
https://doi.org/10.1117/12.2547375

13. **J.V. Stough**, J. DiPalma*, Z. Ma*, B.K. Fornwalt, C.M. Haggerty. "Ventricular segmentation and quantitative assessment in cardiac MR using convolutional neural networks." In Proceedings: *SPIE Medical Imaging*, 2018.
http://eg.bucknell.edu/~jvs008/research/cardiac/SPIE18/SPIE18.html
https://doi.org/10.1117/12.2291534

12. J. Glaister, A. Carass, **J.V. Stough**, P. Calabresi, J. Prince. "Thalamus parcellation using multi-modal feature classification and thalamic nuclei priors." In Proceedings: *SPIE Medical Imaging*, 2016. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5003298/

11. **J.V. Stough**, J. Glaister, C. Ye, S. Ying, J. Prince, A. Carass. "Automatic method for thalamus parcellation using multi-modal feature classification." In Proceedings: *Medical Image Computing and Computer-Assisted Intervention (MICCAI)*, Springer LNCS 8675, pp. 169-176, 2014. http://link.springer.com/chapter/10.1007/978-3-319-10443-0_22

10. **J.V. Stough**, C. Ye, S. Ying, J. Prince. "Thalamic parcellation from multi-modal data using random forest learning." In Proceedings: *International Symposium on Biomedical Imaging (ISBI)*, 2013. http://dx.doi.org/10.1109/ISBI.2013.6556609

9. **J.V. Stough**, L. Greer, M. Benson*. "Texture and Color Distribution-Based Classification for Live Coral Detection." In Proceedings: *International Coral Reef Symposium (ICRS)* Theme 5D, 2012.
http://www.icrs2012.com/proceedings/manuscripts/ICRS2012_5D_2.pdf

8. J.Y. Jeong, **J.V. Stough**, J.S Marron, S.M. Pizer. "Conditional-Mean initialization using neighboring objects in deformable model segmentation." In Proceedings: *SPIE Medical Imaging*, 2008. http://dx.doi.org/10.1117/12.770712

7. **J.V. Stough**, R.E. Broadhurst, S.M. Pizer, E.L. Chaney. "Regional appearance in deformable model segmentation." In: *Information Processing in Medical Imaging (IPMI)*, Springer LNCS 4584, pp. 532-543, 2007. http://dx.doi.org/10.1007/978-3-540-73273-0_44

6. **J.V. Stough**, R.E. Broadhurst, S.M. Pizer, E.L. Chaney."Clustering on local appearance for deformable model segmentation." In: *International Symposium on Biomedical Imaging*, 2007. http://dx.doi.org/10.1109/ISBI.2007.357013

5. S.M. Pizer, R.E. Broadhurst, J.Y. Jeong, Q. Han, R. Saboo, **J. Stough**, G. Tracton, E.L. Chaney. "Intra-Patient Anatomic Statistical Models for Adaptive Radiotherapy." In Proceedings: *MICCAI Workshop: From Statistical Atlases to Personalized Models*, 2006. http://www2.imm.dtu.dk/sa2pm/

4. R.E. Broadhurst, **J. Stough**, S.M. Pizer, E.L. Chaney. "A Statistical Appearance Model Based on Intensity Quantiles." In: *International Symposium on Biomedical Imaging*, 2006. http://dx.doi.org/10.1109/ISBI.2006.1624943

3. R.E. Broadhurst, **J. Stough**, S.M. Pizer, E.L. Chaney. "Histogram statistics of local model-relative image regions." In: *International Workshop on Deep Structure, Singularities and Computer Vision (DSSCV)*, Springer LNCS 3753, pp. 72-83, 2005. https://doi.org/10.1007/11577812_7

2. S.M. Pizer, J. Jeong, R.E. Broadhurst, S. Ho, **J. Stough**. "Deep Structure of Images in Populations via Geometric Models in Populations." In: *DSSCV*, Springer LNCS 3753, pp. 49-59, 2005. https://link.springer.com/chapter/10.1007/11577812_5

1. **J. Stough**, S.M. Pizer, E.L. Chaney, M. Rao. "Clustering on image boundary regions for deformable model segmentation." In: *International Symposium on Biomedical Imaging*, 2004. https://doi.org/10.1109/ISBI.2004.1398568

Other Oral, Workshop, and Poster Presentations (* - undergraduate coauthor)

Student Poster: N. Johnston*, K. Buffinton, A. Gadre, **J.V. Stough**. "Mobile App Development to Support Bell's Palsy Diagnosis" Susquehanna Valley Undergraduate Research Symposium, 2023. (Best Poster Award)
http://eg.bucknell.edu/~jvs008/2023_Johnston_SVURS.html

Student Poster: M. Cao*, **J.V. Stough**. "Domain adaptation of Convolutional Neural Networks for 2D Echocardiography Segmentation." Susquehanna Valley Undergraduate Research Symposium, 2023.
http://eg.bucknell.edu/~jvs008/2023_Cao_SVURS.html

Student Poster: K. Wrynn*, **J.V. Stough**. "Domain Adaptation in 2D Echocardiography Videos." Susquehanna Valley Undergraduate Research Symposium, 2023.
http://eg.bucknell.edu/~jvs008/2023_Wrynn_SVURS.html

Student Poster: N. Huo*, K. Buffinton, A. Gadre, **J.V. Stough**. "Facial Nerve Paralysis Severity Grading by Computer Vision and Machine Learning." Susquehanna Valley Undergraduate Research Symposium, 2022. (Best Poster Award)
http://eg.bucknell.edu/~jvs008/2022_Huo_SVURS.html
https://youtu.be/XmrpCGHMlbU

Student Poster: W. Wang*, C.M. Haggerty, **J.V. Stough**. "Applications of Motion Tracking in Temporally Coherent Echocardiography Video Segmentation." Susquehanna Valley Undergraduate Research Symposium, 2022.
http://eg.bucknell.edu/~jvs008/2022_Wang_SVURS.html
https://youtu.be/T9Xt8fyiGNA

Abstract: X. Zhang, **J.V. Stough**, S.M. Raghunath, A.E. Ulloa Cerna, D.P. vanMaanen, B.K. Fornwalt, C.M. Haggerty. "Automatic Multi-structural Cardiac Segmentation of 2D Echocardiography with Convolutional Neural Networks." American Heart Association (AHA) Conference (Dallas, TX – virtual), 2020. https://doi.org/10.1161/circ.142.suppl_3.15393

Abstract: A. Vaidya*, **J.V. Stough**. "Deep Learning for Early Detection of Diabetic Retinopathy." Biomedical Engineering Society (BMES) Annual Meeting (San Diego, CA – virtual), 2020. https://doi.org/10.31219/osf.io/rz6k3

Invited Talk: **J.V. Stough**. "Machine Learning in Cardiac Medical Imaging," Susquehanna University (Selinsgrove, PA), 2020. https://bit.ly/2G0R2xY

Abstract: S.M. Raghunath, A. Ulloa Cerna, L. Jing, D. vanMaanen, **J.V. Stough**, D. Hartzel, J. Leader, C. Good, B.K. Fornwalt, C.M. Haggerty. "A Deep Neural Network for Predicting Incident Atrial Fibrillation Directly From 12-Lead Electrocardiogram Traces." In: American Heart Association (AHA) Conference (Philadelphia, PA), 2019.
https://www.ahajournals.org/doi/abs/10.1161/circ.140.suppl_1.14407

Abstract: S.M. Raghunath, A. Ulloa Cerna, L. Jing, D. vanMaanen, **J.V. Stough**, D. Hartzel, J. Leader, H.L. Kirchner, C. Good, A. Patel, B.P. Delisle, A. Alsaid, D. Beer, C.M. Haggerty, B.K. Fornwalt. "Deep Neural Networks Can Predict 1-Year Mortality Directly From ECG Signal, Even When Clinically Interpreted as Normal." In: American Heart Association (AHA) Conference (Philadelphia, PA), 2019.
https://www.ahajournals.org/doi/abs/10.1161/circ.140.suppl_1.14425

Abstract: L. Jing, A. Ulloa Cerna, C. Good, N.M. Sauers, D.N. Hartzel, J.B. Leader, H.L Kirchner, Y. Hu, D.M. Riviello, **J.V. Stough**, S. Gazes, A. Haggerty, S. Raghunath, B.J. Carry, C.M. Haggerty, B.K. Fornwalt. "A Novel Approach to Managing Heart Failure Populations Using Actionable Machine Learning Models." In: American Heart Association (AHA) Conference (Philadelphia, PA), 2019.
https://www.ahajournals.org/doi/abs/10.1161/circ.140.suppl_1.12086

Student Poster: T. Kim*, M. Qureshi*, **J.V. Stough**, C.M. Haggerty. "Neural Network-Based Mortality Prediction Using Echocardiography and Electronic Health Records." Susquehanna Valley Undergraduate Research Symposium, 2018.
http://eg.bucknell.edu/~jvs008/research/cardiac/Summer18/Kim_Summer18.pdf

Student Poster: J. DiPalma*, **J.V. Stough**, C.M. Haggerty. "Automatic Segmentation of Cardiac MR Data Using Convolutional Neural Networks." Susquehanna Valley Undergraduate Research Symposium, 2018.
http://eg.bucknell.edu/~jvs008/research/cardiac/Summer18/DiPalma_Summer18.pdf

Student Poster: M. Qureshi*, **J.V. Stough**, T. Kim*, C.M. Haggerty. "Large-scale Cardiac MR Assessment in the Clinic Using Neural Networks." Susquehanna Valley Undergraduate Research Symposium, 2018.
http://eg.bucknell.edu/~jvs008/research/cardiac/Summer18/Qureshi_Summer18.pdf

Invited Talk: **J.V. Stough**. "Machine Learning for the Toolsmith." James Madison University (Harrisonburg, VA), 2015.
http://eg.bucknell.edu/~jvs008/research/talks/JMU_MachineLearning.pdf

Intramural Workshop Session: **J.V. Stough**. "Introductory Python Programming for Data Visualization." Technica Corporation (Sterling, VA), 2015.

Abstract: C.L. Walker*, **J.V. Stough**, L. Greer, E.M. Elium*, A.F. Stier*. "Coral Vision: Software for improving efficiency in coral monitoring." In: *Geological Society of America Annual Conference (GSA), Abstracts with Posters* (Denver, CO), volume 45, number 7, 2013.
https://gsa.confex.com/gsa/2013AM/webprogram/Paper224917.html
http://eg.bucknell.edu/~jvs008/research/coral/GSA13/CoralVisionPP.pdf

Workshop Session: S. Bogaerts, **J.V. Stough**. "Strategies for Introducing Parallelism with Python." *SuperComputing – HPC Educators* (Denver, CO), 2013.
http://eg.bucknell.edu/~jvs008/SC13

Workshop Session: S. Bogaerts, **J.V. Stough**. "Python for Parallelism in Introductory Computer Science Education." *SuperComputing – HPC Educators* (Salt Lake City, UT), 2012.
http://eg.bucknell.edu/~jvs008/SC12

Invited Talk: **J.V. Stough**. "Texture and Color Distribution-Based Classification for Live Coral Detection." The Johns Hopkins University, (Baltimore, MD), 2012.

Abstract: **J.V. Stough**. "Python Parallelism in CS2/DS." *SuperComputing – Education Program* (Seattle, WA), 2011.

Intramural Abstract: P. Nguyen*, L. Davis*, **J.V. Stough**. "Exploiting Parallelism in Computer Vision." *R.E. Lee Research Symposium*, Washington and Lee University (Lexington, VA), 2011.
http://eg.bucknell.edu/~jvs008/research/posters/LeeNguyen_Parallel.pdf

Intramural Abstract: G. Koller*, **J.V. Stough**. "Condor at W&L: Exploiting Excess Resources for the Computational Sciences." *R.E. Lee Research Symposium*, Washington and Lee University (Lexington, VA), 2011.
http://eg.bucknell.edu/~jvs008/research/posters/Condor_Poster.pdf

Abstract: **J.V. Stough**. "Python Parallelism in CS2/DS." *International Parallel & Distributed Processing Symposium (IPDPS) – EduPar* (Anchorage, AK), 2011.

Intramural Abstract: C. Zhong*, W. Richardson*, **J.V. Stough**. "Object Recognition in Natural Images." *Science, Society, and the Arts*, Washington and Lee University (Lexington, VA), 2010. http://eg.bucknell.edu/~jvs008/research/posters/ZhongRichardson2010.pdf

Invited Talk: **J.V. Stough**. "Object-relative Appearance for Medical Image Analysis." Pomona College (Claremont, CA), 2009.

University Activities and Service

2023	Organizer, Susquehanna Valley Undergraduate Research Symposium, https://svurs.scholar.bucknell.edu/
2022 - present	Advisor to National Society for Black Engineers (NSBE)
2022	Engineering Camp for middle and high schoolers (lead: Dr. Jablonski, Chemical Engineering)
2022	Jury for direct assessment of student writing in engineering W2 courses (lead: Dr. Malusis, Civil and Environmental Engineering)
2022	Project Report Reader (Jiawen Zhao'22, Mathematics; Dr. Ken Field, Biology)
2021	College of Engineering Dean Search Committee
2021	Honors Thesis Advisor (A. Vaidya'21, Biomedical Engineering, Perceptually Improved Medical Image Medical Image Translations Using Generative Adversarial Networks)
2020–present	Undergraduate Research Advisory Committee (URAC)
2018, 2020–present	Advisor to ACM-Student chapter
2017–present	A&S majors advisor, classes of '21, '25 (∼50 to date)
2020	Honors Thesis Reader (T. Kim CSE'20; Dr. Brian King, Computer Science)
2018, 2020	Department Hiring Committee: four tenure track positions
2019	M.S. Thesis Reader (R. Jennings; Dr. Brahma, Mechanical Engineering)
2018-2019	High Performance Computer Lab: Garman and Captial fund request organizing
2018–present	University Admitted Students Open House Talks, B2B: Bison to Bison
2017–present	Bucknell Engineering Accepted Students Day: talk on image and video compression, sorting with playing cards, met with students
2016–2022	Engineering Facilities Committee (EFC, previously IFC)
2016–present	Coached programming teams during travel and helped organize and judge the Bucknell programming competition (lead: Dr. Wittie)
2016–2017	Faculty development through the Teaching and Learning Center: Course Design and Pedagogy Workshop, New Faculty Pedagogy Series throughout the year

2016	Bucknell Move In Day: assisted upper classes move in to Roberts, Trax, Kress halls
2010–2014	Coach, ACM programming team (Washington and Lee University)
2010–2014	student academic advisor (30+)

Professional Activities

- Member, Association for Computing Machinery (ACM)
- Member, Institute of Electrical and Electronics Engineers (IEEE)
- Member, Society of Photographic Instrumentation Engineers (SPIE)
- Programming Committee, Society of Photographic Instrumentation Engineers (SPIE) Medical Imaging (Image Processing)
- Reviewer (journal): Computer Vision and Image Understanding, Transactions on Medical Imaging, Image and Vision Computing Journal, Neuroimage
- Reviewer (conference): International Symposium on Biomedical Imaging, Information Processing in Medical Imaging, Medical Image Computing and Computer Assisted Interventions, SPIE: Medical Imaging