Danielle F. Pace, Ph.D.

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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA, USA 2013-2020
Ph.D., Computer Science (4.9/5.0)
- Thesis: "Image segmentation for highly variable anatomy: Applications to congenital heart disease"
- Selected Coursework: Machine Learning, Inference and Information, Advances in Computer Vision, Shape Analysis

The University of Western Ontario, London, ON, Canada 2007-2010
M.E.Sc., Biomedical Engineering (92/100)

Queen's University, Kingston, ON, Canada 2003-2007
B.Cmp.H., Biomedical Computing (91/100: full computer science curriculum, plus extensive biomedical coursework)

SKILLS

Technical: Python, C++, TensorFlow, Keras, NumPy, ITK, VTK, MATLAB, SQL, Git/GitHub, Bash, DICOM
Languages: English (native), German (limited working proficiency)

EXPERIENCE

The Broad Institute of MIT and Harvard, Cambridge, MA, USA 2023-now
Senior Machine Learning Scientist II, Machine Learning for Health (ML4H) team
- Machine learning methods development using large clinical datasets, including imaging, electronic health record data, electrocardiogram (ECG) waveforms and genetic information, in collaboration with clinician scientists
- On-going projects encompass dataset curation and characterization, development of novel imaging phenotypes, disease risk prediction, representation learning, and discovering associations between genetics and clinical outcomes

A. A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Boston, MA, USA 2020-2023
Research Fellow
- Developed new deep learning and anatomical modelling algorithms for neuroimaging data, by combining deep Bayesian image segmentation with image synthesis for robust segmentation of contrast-agnostic MR scans

Computer Science and Artificial Intelligence Laboratory, MIT, Cambridge, MA, USA 2013-2020
Graduate Student Researcher
- Conceived and implemented new machine learning algorithms for image segmentation, from data collection and annotation through model development and experimental validation
- Demonstrated improved accuracy in cardiac MR datasets with extreme variability caused by severe congenital heart defects that alter the size, shape, number, location and connectivity of cardiac structures (link)
- Mentored 6 MIT undergraduates for projects in machine learning and medical image annotation
- Served as a teaching assistant for 85 students in "Introduction to Inference", with an excellent student rating (6.5/7)

Kitware Inc., Carrboro, NC, USA 2010-2013
Research and Development Engineer
- Conducted research formulating, implementing and validating a new deformable image registration method to better model the sliding motion of the lungs and abdominal organs (link)
- Wrote custom C++ software in a multi-developer team for a major orthopedic device manufacturer, including bone morphological population analyses and implant design. Progressed to co-lead responsible for defining software requirements, conducting code reviews, supervising personnel, and leading customer presentations
- Led and co-wrote two successful NIH grants on medical image analysis, in collaboration with academic partners

LEADERSHIP AND SERVICE

- **MedNeurIPS Workshop Organizer (2022):** Planned the program, solicited participants, and managed peer review
- **MICCAI HVSMR Challenge Organizer (2016):** Ran a technical challenge on segmentation for congenital heart disease, including data preparation, managing the leaderboard, and co-chairing the peer review process
- **MICCAI Student Board (2015-2020):** Organized professional activities, social events and an educational challenge
- **Technical Reviewer** for 6 journals and 8 conferences in computer vision, machine learning and medical imaging

AWARDS

Outstanding Reviewer Award (MICCAI 2021 conference, top 10/1220 reviewers), **Best Presentation** (New England Computer Vision Workshop, 2018), **Master's and Doctoral Canada Graduate Scholarships** (National Sciences and Engineering Research Council of Canada, 2007-2009 and 2013-2016), **Best Student Poster** (CARS 2010 conference)

PEER-REVIEWED JOURNAL PUBLICATIONS

1. ***D.F. Pace***, H.T.M Contreras, J. Romanowicz, S. Ghelani, I. Rahaman, Y. Zhang, P. Gao, M.I. Jubair, T. Yeh, P. Golland, T. Geva, S. Ghelani, A.J. Powell, M.H. Moghari. HVSMR-2.0: A 3D cardiovascular MR dataset for whole-heart segmentation in congenital heart disease. Nature Scientific Data 11:721, 2024.
2. V. Nauffal, M.D.R. Klarqvist, M.C. Hill, ***D.F. Pace***, P. Di Achille, S.H. Choi, J.T. Rämö, J.P. Pirruccello, P. Singh, S. Kany, C. Hou, K. Ng, A.A. Philippakis, P. Batra, S.A. Lubitz, P.T. Ellinor. Non-invasive assessment of organ-specific and shared pathways in multi-organ fibrosis using T1 mapping. Nature Medicine 30:1749-1760, 2024.
3. S.T. Arasteh, J. Romanowicz, ***D.F. Pace***, P. Golland, A.J. Powell, A.K. Maier, D. Truhn, T. Brosch, J. Weese, M. Lotfinia, R.J. van der Geest, M.H. Moghari. Automated segmentation of 3D cine cardiovascular magnetic resonance imaging, Frontiers in Cardiovascular Medicine 10, 2023.
4. ***D.F. Pace***, A.V. Dalca, T. Brosch, T. Geva, A.J. Powell, J. Weese, M.H. Moghari, P. Golland. Learned iterative segmentation of highly variable anatomy from limited data: Applications to whole heart segmentation for congenital heart disease, Medical Image Analysis 80:102469, 2022.
5. A. Bayat, ***D.F. Pace***, A. Sekuboyina, C. Payer, D. Stern, M. Urschler, J.S. Kirschke, Bjoern H. Menze, Anatomy-aware inference of the 3D standing spine posture from 2D radiographs, Tomography 8(1):479-496, 2022.
6. C. Herz, ***D.F. Pace***, N.H. Nam, A. Lasso, P. Dinh, P. Golland, M.A. Jolley, Segmentation of tricuspid valve leaflets from transthoracic 3D echocardiograms of children with hypoplastic left heart syndrome using deep learning, Frontiers in Cardiovascular Medicine, 2021.
7. ***D.F. Pace***, S.R. Aylward, M. Niethammer, A locally adaptive regularization based on anisotropic diffusion for deformable image registration, IEEE Transactions on Medical Imaging; 32(11): 2114-2126, 2013.
8. A. Irimia, B. Wang, S. Aylward, M. Prastawa, ***D.F. Pace***, M. Niethammer, G. Gerig, D.A. Hovda, R. Kikinis, P.M. Vespa, J.D. Van Horn, Neuroimaging of structural pathology and neuroconnectivity in traumatic brain injury: towards personalized outcome prediction, NeuroImage: Clinical; 1:1-17, 2012.

PEER-REVIEWED CONFERENCE PROCEEDINGS

9. ***D.F. Pace***, A.V. Dalca, T. Brosch, T. Geva, A.J. Powell, J. Weese, M.H. Moghari, P. Golland, Iterative segmentation from limited training data: Applications to congenital heart disease, MICCAI Workshop on Deep Learning in Medical Image Analysis, LNCS 11045:334-342, 2018.
10. ***D.F. Pace***, A.V. Dalca, T. Geva, A.J. Powell, M.H. Moghari, P. Golland, Interactive whole-heart segmentation in congenital heart disease, Medical Image Computing and Computer Assisted Interventions (MICCAI), LNCS 9351:80-88, 2015.
11. R. Kwitt, ***D.F. Pace***, M. Niethammer, S.R. Aylward, Studying cerebral vasculature using structure proximity and graph kernels, Medical Image Computing and Computer Assisted Interventions (MICCAI), LNCS 8150:534-541, 2013.
12. ***D.F. Pace***, M. Niethammer, S.R. Aylward, Sliding geometries in deformable image registration, MICCAI Workshop on Computational and Clinical Applications in Abdominal Imaging, LNCS 7029:141-148, 2011.
13. M. Niethammer, G.L. Hart, ***D.F. Pace***, P.M. Vespa, A. Irimia, J.D. Van Horn, S.R. Aylward, Geometric Metamorphosis, Medical Image Computing and Computer Assisted Interventions (MICCAI), LNCS 6892:639-646, 2011.
14. ***D.F. Pace***, A. Enquobahrie, H. Yang, S.R. Aylward, M. Niethammer, Deformable image registration of sliding organs using anisotropic diffusive regularization, International Symposium on Biomedical Imaging (ISBI), 30:407-413, 2011.
15. T. Peters, ***D.F. Pace***, P. Lang, G. Guiraudon, D. Jones, C. Linte, Ultrasound image guidance of cardiac interventions, Proceedings of SPIE Medical Imaging; 7968:79680T, 2011.
16. C.A. Linte, M. Carias, S.D. Cho, ***D.F. Pace***, J. Moore, C. Wedlake, D. Bainbridge, B. Kiaii, T.M. Peters, Estimating heart shift and morphological changes during minimally invasive cardiac interventions, Proceedings of SPIE Medical Imaging; 7625:762509, 2010.
17. ***D.F. Pace***, D.G. Gobbi, C. Wedlake, J. Gumprecht, J. Boivert, J. Tokuda, N. Hata, T.M. Peters, An open-source real-time ultrasound reconstruction system for four-dimensional imaging of moving organs, MICCAI Workshop on Systems and Architectures for Computer Assisted Intervention, 2009.
18. J. Moore, C. Clarke, D. Bainbridge, C. Wedlake, A.D. Wiles, ***D.F. Pace***, T.M. Peters, Image guidance for spinal facet injections using tracked ultrasound, Medical Image Computing and Computer Assisted Interventions (MICCAI), LNCS 5761:516-523, 2009.
19. T.M. Peters, C.A. Linte, J. Moore, A. Wiles, J. Lo, ***D.F. Pace***, C. Wedlake, D. Bainbridge, D.L. Jones, G.M. Guiraudon, Cardiac imaging and modeling for guidance of minimally invasive beating heart interventions, Functional Imaging and Modeling of the Heart, LNCS 5528:466-475, 2009.
20. ***D.F. Pace***, A.D. Wiles, J. Moore, C. Wedlake, D.G. Gobbi, T.M. Peters, Validation of four-dimensional ultrasound for targeting in minimally-invasive beating-heart surgery, Proceedings of SPIE Medical Imaging; 7261:726115, 2009.
21. J. Jomier, L. Ibanez, A. Enquobahrie, ***D.F. Pace***, K. Cleary, An open-source testing framework for tracking devices using Lego Mindstorms™, Proceedings of SPIE Medical Imaging; 7261:72612S, 2009.
22. ***D.F. Pace***, R. Kikinis, N. Hata, An accessible, hands-on tutorial system for image-guided therapy and medical robotics using a robot and open source software, MICCAI Workshop on Open Source and Open Data, 2007.

PEER-REVIEWED CONFERENCE ABSTRACTS

23. ***D.F. Pace***, Polina Golland, David Annese, Tal Geva, Andrew J. Powell, M.H. Moghari, Creating 3D heart models of children with congenital heart disease using magnetic resonance imaging, International Society for Magnetic Resonance in Medicine (ISMRM), 2015.
24. Y. Dai, ***D.F. Pace***, J. Bischoff, Anthropometric differences in natural posterior tibial slope, Orthopaedic Research Society (ORS), 2014.
25. ***D.F. Pace***, A. Enquobahrie, P. Reynolds, J. Jomier, E. Bullitt, S.R. Aylward, TubeTK: An open-source toolkit of algorithms operating on images of tubes, 26th International Congress and Exhibition on Computer Assisted Radiology and Surgery (CARS), International Journal of CARS; 7 (S1):S79-S80, 2012.
26. ***D.F. Pace***, D. Bainbridge, J. Moore, C. Wedlake, G. Guiraudon, D.L. Jones, T.M. Peters, Real-time 4D ultrasound reconstruction for improved intraoperative imaging during image-guided beating-heart interventions, 24th International Congress and Exhibition on Computer Assisted Radiology and Surgery (CARS), International Journal of CARS; 5(S1):S271-S273, 2010.
    Won International Society for Computer Aided Surgery (ISCAS) Best Student Poster award.
27. C.A. Linte, D.S. Cho, M. Carias, ***D.F. Pace***, J. Moore, C. Wedlake, D. Bainbridge, B. Kiaii, T.M. Peters, Estimating heart movement and morphological changes during robot-assisted coronary artery bypass graft interventions, 24th International Congress and Exhibition on Computer Assisted Radiology and Surgery (CARS), 2010.
28. ***D.F. Pace***, T. Bui, P.K. Rose, Computational estimates of the effect of asynchronous synaptic activity on fluctuations in the membrane potential of motoneurons, Society for Neuroscience (SfN), 2006.

BOOKS AND PROCEEDINGS

29. M.A. Zuluaga, K. Bhatia, B. Kainz, M.H. Moghari, ***D.F. Pace*** (eds). Reconstruction, segmentation and analysis of medical images, First International Workshops, RAMBO 2016 and HVSMR 2016. LNCS 10129, 2016.

THESES

30. ***D.F. Pace***, Image segmentation for highly variable anatomy: Applications to congenital heart disease, Ph.D. Thesis, Cambridge, MA, USA: Massachusetts Institute of Technology, June 2020.
31. ***D.F. Pace***, Real-time 4D ultrasound reconstruction for image-guided intracardiac interventions, M.E.Sc. Thesis. London, ON, Canada: The University of Western Ontario, March 2010.