

Danielle F. Pace

Ph.D. Student, Massachusetts Institute of Technology
dfpace@mit.edu

EDUCATION:

Ph.D. Student, Computer Science

Sept 2013–Present

Massachusetts Institute of Technology, Cambridge, MA, USA

GPA: 4.8/5.0

Advisors: Dr. Polina Golland (MIT) and Dr. Mehdi Hedjazi Moghari (Boston Children's Hospital)

- Developing new image segmentation algorithms for whole-heart cardiac MRI in severe congenital heart defect cases.
- Goal is to enable clinically practical 3D printing of patient-specific heart models for surgical planning.
- Coursework: Inference and information, Machine Learning, Advances in computer vision, Shape analysis, Algorithms for inference (listener). Attended Medical Imaging Summer School (MISS 2014).

Part-Time Classroom Studies, Mathematics (non-degree)

May 2012–May 2013

University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

- Calculus of functions of several variables, Advanced calculus (real analysis), Scientific computation I and II.

M.E.Sc., Biomedical Engineering

Sept 2007–Mar 2010

University of Western Ontario & Robarts Research Institute, London, ON, Canada

GPA: 3.98/4.0

Advisor: Dr. Terry Peters

- Thesis: "Real-time 4D ultrasound reconstruction for image-guided intracardiac interventions".
- Developed a system to image the beating heart during surgery, by reconstructing 4D ultrasound datasets (3D+time) from multiple images from a tracked 2D ultrasound probe with cardiac gating. The system was integrated into a virtual reality system for guiding minimally-invasive heart surgery, and was tested in animal models and two patients.
- Coursework: Medical imaging, Introduction to computer vision techniques, Learning and computer vision (listener).

B.Cmp.H., Biomedical Computing

Sept 2003–Apr 2007

Queen's University, Kingston, ON, Canada

GPA: 4.15/4.3

Advisor: Dr. Randy Ellis

- Final project: "Visualization for computer-assisted image-free total hip replacement".

RESEARCH AND PROFESSIONAL EXPERIENCE:

Visiting Ph.D. Student

June 2017–Aug 2017

Philips Research., Hamburg, Germany

Advisor: Dr. Jürgen Weese

- Implemented and tested deep learning algorithms to segment 2D and 3D cardiac MR images for patients with congenital heart disease.
- Relationship with Philips continues, as they are now funding my Ph.D. research.

Research and Development Engineer

July 2010–June 2013

Kitware Inc., Carrboro, NC, USA

Advisor: Dr. Stephen Aylward

- Developed a method for deformable image registration in lung and abdominal CT images that uses anisotropic smoothing to more accurately model the sliding motion of the lungs and abdominal organs as the subject breathes.
- Developed software for a major orthopedic device manufacturer, focusing on implant design evaluation and bone morphological population analysis. Collaborated directly with the customer's research team to design and implement analyses in the application, which is used by dozens of scientists in their work every day. Progressed to co-lead, including project management, requirements generation and budgeting.
- Led and wrote two successful NIH STTR research grants with collaborators at RIT and UCLA, as well as successful commercial consulting proposals.

Research Assistant

May 2007–Aug 2007

Surgical Planning Laboratory, Brigham & Women's Hospital / Harvard Medical School, Boston, MA, USA

Advisor: Dr. Nobuhiko Hata

- Developed a tutorial module for hands-on training in image-guided therapy and medical robotics using 3D Slicer and a LEGO Mindstorms NXT robot to simulate a needle biopsy.
- Tutorial software covered all stages of a typical image-guided therapy procedure, including preoperative imaging, surgical planning, targeting and tracking, navigation, and image-to-patient registration.

Research Assistant

May 2005–Aug 2006

Department of Physiology, Queen's University, Kingston, ON, Canada

Advisor: Dr. Ken Rose

- Used compartmental models of single motoneurons to investigate how asynchronous background synaptic activity affects noise in the cell's membrane potential, and when this in turn affects its firing rate. This work involved using electrical circuit models of the neuron and computer simulations to analyze the cell's input-output properties.

TEACHING EXPERIENCE:**"Introduction to Inference"**

Sept 2016–Dec 2016

Teaching Assistant, Massachusetts Institute of Technology

- Taught recitations, ran office hours, developed material for problem sets, labs and exams, and grading.

"Algorithms and Data Structures for Object-Oriented Design"

Jan 2009–Apr 2009

Teaching Assistant, The University of Western Ontario

- Designed and graded major assignments and weekly labs, and ran laboratory hours.

Training Specialist

Mar 2008–Dec 2008

Consulting to National Center for Image-Guided Therapy (NCIGT)

Advisor: Dr. Nobuhiko Hata

- Developed tutorial presentations about using 3D Slicer for image analysis and image-guided therapy.
- Taught groups of new users and software developers in interactive training workshops in Germany and Canada.

"Programming Fundamentals for Engineers"

Sept 2007–Dec 2007

Teaching Assistant, The University of Western Ontario

- Taught core principles and debugging strategies to novice programmers, individually and in small groups.

AWARDS:

- **NSERC Canada Graduate Scholarship (Doctoral)**, Sept. 2013–Aug. 2016 (\$63,000)
- **Best Poster**, International Society for Computer Aided Surgery, Computer Assisted Radiology and Surgery, 2010.
- **1st Poster in Imaging for Cardiovascular Therapeutics**, 7th Imaging Symposium of Imaging Network Ontario, 2008.
- **NSERC Canada Graduate Scholarship (Master's)**, Sept. 2007–Aug. 2009 (\$35,000).
- **Ontario Graduate Scholarship**, Government of Ontario, 2007 (\$15,000, declined for NSERC).
- **Advanced Undergraduate Project Award**, School of Computing, Queen's University, 2007.
- **Best Undergraduate Contribution**, Canadian Student Conference on Biomedical Computing, 2006.
- **HSBC Bank Malta Undergraduate Scholarship (Canadian Branch)**, 2003–2007 (\$10,000)
- **Principal's Scholarship in Computing**, Queen's University, 2003–2005 (\$8,000)

SERVICE:

Organizing Committee:

- MICCAI Workshop on Whole-Heart and Great Vessel Segmentation from 3D Cardiovascular Magnetic Resonance Images in Congenital Heart Disease, MICCAI 2016

Reviewer:

- IEEE Transactions on Medical Imaging (TMI)
- Medical Image Computing and Computer Assisted Intervention (MICCAI)
- International Journal of Medical Robotics and Computer Assisted Surgery
- MICCAI Workshop on Computational and Clinical Applications in Abdominal Imaging
- MICCAI Workshop on Clinical Image-Based Procedures: From Planning to Intervention

Volunteer:

- MICCAI Student Board (Educational Officer '18/'17, Professional Students Event Officer '16, Executive Member '15)
- MIT Canadians Club (Deputy Prime Minister 2014-2015, 2016-2017, Minister of Finance 2015-2016)

PEER-REVIEWED JOURNAL PUBLICATIONS:

1. **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.
2. 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, "Multimodal neuroimaging of structural pathology and neuroconnectivity in traumatic brain injury: towards personalized outcome prediction", NeuroImage: Clinical; 1:1-17, 2012.

PEER-REVIEWED CONFERENCE PROCEEDINGS:

Note: MICCAI is a top conference in medical image analysis, and has an acceptance rate of ~30%.

3. 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", Workshop on Deep Learning in Medical Image Analysis, in conjunction with Medical Image Computing and Computer Assisted Intervention (MICCAI), 2018 (accepted).
4. **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), Lecture Notes in Computer Science; 9351:80-88, 2015.
5. 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), Lecture Notes in Computer Science; 8150:534-541, 2013.
6. **D.F. Pace**, M. Niethammer, S.R. Aylward, "Sliding geometries in deformable image registration", Workshop on Computational and Clinical Applications in Abdominal Imaging, in conjunction with Medical Image Computing and Computer Assisted Intervention (MICCAI), Lecture Notes in Computer Science; 7029:141-148, 2011.
7. 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), Lecture Notes in Computer Science; 6892:639-646, 2011.
8. **D.F. Pace**, A. Enquobahrie, H. Yang, S.R. Aylward, M. Niethammer, "Deformable image registration of sliding organs using anisotropic diffusive regularization", IEEE International Symposium on Biomedical Imaging (ISBI), 30:407-413, 2011.
9. 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.
10. 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.
11. **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", Workshop on Systems and Architectures for Computer Assisted Intervention, in conjunction with Medical Image Computing and Computer Assisted Intervention (MICCAI), 2009.
12. 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), Lecture Notes in Computer Science; 5761:516-523, 2009.

13. 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, Lecture Notes in Computer Science*; 5528:466-475, 2009.
14. **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.
15. 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.
16. **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", *Workshop on Open Source and Open Data, in conjunction with Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2007.

PEER-REVIEWED CONFERENCE ABSTRACTS:

17. **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.
18. Y. Dai, **D.F. Pace**, J. Bischoff, "Anthropometric differences in natural posterior tibial slope", *Orthopaedic Research Society (ORS)*, 2014.
19. **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.
20. **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 Poster award*).
21. 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.
22. **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.