Adrian Vasile Dalca

Curriculum Vitae

Massachusetts General Hospital,
Harvard Medical School, and
Computer Science and Artificial Intelligence Lab,
Massachusetts Institute of Technology

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Education

Ph.D. Massachusetts Institute of Technology 2016

Electrical Engineering and Computer Science
Thesis: Genetic, Clinical and Population Priors for Brain Images
Minor: Healthcare Ventures
Advisor: Prof. Polina Golland
Thesis Readers: John Guttag (MIT), Mert Sabuncu (HMS/MGH), Natalia Rost (HMS/MGH)
GPA: 5.00/5.00

S.M. Massachusetts Institute of Technology 2012

Electrical Engineering and Computer Science
Thesis: Segmentation of Nerve Bundles and Ganglia in Spine MRI using Particle Filters
Advisor: Prof. Polina Golland
GPA: 5.00/5.00

M.Sc. University of Toronto 2010

Department of Computer Science
Thesis: VARiD: A Variation Detection Framework for Color-Space and Letter-Space Platforms
Advisor: Prof. Michael Brudno
GPA: 4.00/4.00

Hon. B.Sc. University of Toronto, with High Distinction 2008

Department of Computer Science
Advisor: Prof. Michael Brudno
GPA: 3.97/4.00

Research Experience

Postdoctoral Fellow, Massachusetts General Hospital, Harvard Medical School, Charlestown, MA

Biomedical Data Analysis Group. Advisor: Prof. Mert Sabuncu 2017 – Present
Holding appointments at Massachusetts Institute of Technology and Cornell University

Research Assistant, Massachusetts Institute of Technology, Cambridge, MA

Medical Vision Group. Advisor: Prof. Polina Golland 2010 – 2017
Computational Biology Lab. Advisor: Prof. Manolis Kellis Fall 2009

Research Assistant, University of Toronto, Toronto, ON, Canada

Computational Biology Lab. Advisor: Prof. Michael Brudno 2006 – 2009
Geophysics Lab. Advisor: Prof. Jerry Mitrovica 2007 – 2008

Teaching and Mentorship

Mentorship, Massachusetts Institute of Technology, Cambridge, MA 2014-Current

Mentored two MIT graduate students 2017
Resulting in several papers, including a paper for which I am senior author

Mentored five MIT undergraduate students 2014-2017
Students successfully contributed to code and publications, including a best-paper award

Teaching Assistant, Massachusetts Institute of Technology, Cambridge, MA

6.815/865: Computational Photography. Prof. Fredo Durand 2015

Teaching Assistant, University of Toronto, Toronto, ON, Canada

CSC120: Computer Science for the Sciences 2009
CSC207: Software Design 2008

Papers Under Review

Adrian V. Dalca, Katherine L. Bouman, William T. Freeman, Natalia S. Rost, Mert R. Sabuncu, and Polina Golland. "Medical Image Imputation from Image Collections". *Under Review at IEEE: Transactions on Medical Imaging.*

Adrian V. Dalca, John Guttag, and Mert R. Sabuncu. "Unsupervised Data Imputation via Variational Inference of Deep Subspaces". *Under Review at NIPS: Neural Information Processing Systems 2018.*

Amy Zhao, Guha Balakrishnan, Fredo Durand, John Guttag, and **Adrian V. Dalca**. "Learning Class-Independent Transforms for Image Data Augmentation". *Under Review at NIPS: Neural Information Processing Systems 2018.*

Francesco P. Casale, **Adrian V. Dalca**, Luca Saglietti, Nicolo Fusi, Jennifer Listgarten. "Gaussian Process Prior Variational Autoencoders". *Under Review at NIPS: Neural Information Processing Systems 2018.*

Publications

Adrian V. Dalca, Guha Balakrishnan, John Guttag, and Sabuncu Mert. "Unsupervised Learning for Fast Probabilistic Diffeomorphic Registration". In: *Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS* (2018), **Early acceptance.**

Adrian V. Dalca, John Guttag, and Sabuncu Mert. "Anatomical Priors in Convolutional Networks for Unsupervised Biomedical Segmentation". In: *Proc. CVPR: Conference on Computer Vision and Pattern Recognition* (2018).

Guha Balakrishnan, Amy Zhao, Mert Sabuncu, John Guttag, and **Adrian V. Dalca**. "An Unsupervised Learning Model for Deformable Medical Image Registration". In: *Proc. CVPR: Conference on Computer Vision and Pattern Recognition* (2018).

Guha Balakrishnan, Amy Zhao, **Adrian V. Dalca**, Fredo Durand, and John Guttag. "Synthesizing Images of Humans in Unseen Poses". In: *Proc. CVPR: Conference on Computer Vision and Pattern Recognition* (2018).

Katherine L. Bouman, Michael D. Johnson, **Adrian V. Dalca**, Andrew A. Chael, Freek Roelofs, Sheperd S. Doeleman, and William T. Freeman. "Reconstructing Video from Interferometric Measurements of Time-Varying Sources". In: *IEEE: Transactions on Computational Imaging* (2018), In Press.

Adrian V. Dalca, John Guttag, and Mert Sabuncu. "Spatial Anatomical Priors in Convolutional Networks for Unsupervised Biomedical Segmentation". In: *NIPS ML4H: Machine Learning for Health* (2017), **Spotlight**.

Adrian V. Dalca, Katherine L. Bouman, William T. Freeman, Mert Sabuncu, Natalia S Rost, and Polina Golland. "Population Based Image Imputation". In: *Proc. IPMI: International Conference on Information Processing in Medical Imaging* 10265 (2017), 659–671. **Best poster award.**

Miaomiao Zhang, Ruizhi Liao, **Adrian V. Dalca**, Ellen Grant, and Polina Golland. "Frequency Diffeomorphisms for Efficient Image Registration". In: *Proc. IPMI: International Conference on Information Processing and Medical Imaging* 10265 (2017), pp. 559–570.

Anne-Katrin Giese et al. "Design and Rationale for Examining Neuroimaging Genetics in Ischemic Stroke: the MRI-GENIE Study". In: *Neurology Genetics* 3.5 (2017), e180.

Adrian V. Dalca, Andreea Bobu, Natalia S Rost, and Polina Golland. "Patch-Based Discrete Registration of Clinical Brain Images". In: *Proc. MICCAI-PATCHMI: Patch-based Techniques in Medical Imaging, LNCS* 9993 (2016), 60–67. **Best paper award.**

Adrian V. Dalca. "Genetic, Clinical and Population Priors for Brain Images". Ph.D. Thesis. Cambridge, MA: Massachusetts Institute of Technology, Sept. 2016.

Nematollah K. Batmanghelich, **Adrian V. Dalca**, Gerald Quon, Mert R. Sabuncu, and Polina Golland. "Probabilistic Modeling of Imaging, Genetics and Diagnosis". In: *IEEE Transactions on Medical Imaging* 35.7 (2016), pp. 1765–79.

Adrian V. Dalca, Ramesh Sridharan, Mert Sabuncu, and Polina Golland. "Predictive Modeling of Anatomy with Genetic and Clinical Data". In: *Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS* 9351 (2015), pp. 519–526.

Danielle Pace, **Adrian V. Dalca**, Tal Geva, Andrew J. Powell, Mehdi H. Moghari, and Polina Golland. "Interactive Whole-Heart Segmentation in Congenital Heart Disease". In: *Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS* 9351 (2015), pp. 80–88.

Adrian V. Dalca, Ramesh Sridharan, Lisa Cloonan, Kaitlin M. Fitzpatrick, Allison Kanakis, Karen L. Furie, Jonathan Rosand, Ona Wu, Mert Sabuncu, Natalia S. Rost, and Polina Golland. "Segmentation of Cerebrovascular Pathologies in Stroke Patients with Spatial and Shape Priors". In: *Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS* 8674 (2014), pp. 773–780.

Adrian V. Dalca, Ramesh Sridharan, Natalia S. Rost, and Polina Golland. "tipiX: Rapid Visualization of Large Image Collections". In: *MICCAI-IMIC Interactive Medical Image Computing Workshop* (2014), **Best paper award for impact and usability.**

Ramesh Sridharan, **Adrian V. Dalca**, and Polina Golland. "An interactive visualization tool for Nipype medical imaging pipelines". In: *MICCAI-IMIC Interactive Medical Image Computing Workshop* (2014).

Ramesh Sridharan‡, **Adrian V. Dalca**‡, Kaitlin M. Fitzpatrick, Lisa Cloonan, Allison Kanakis, Ona Wu, Karen L. Furie, Jonathan Rosand, Natalia S. Rost, and Polina Golland. "Quantification and Analysis of Large Multimodal Clinical Image Studies: Application to Stroke". In: *Proc. MICCAI International Workshop on Multimodal Brain Image Analysis (MBIA), LNCS* 8159 (2013), 18–30. **(‡) equal contribution**.

Kayhan N. Batmanghelich, **Adrian V. Dalca**, Mert R. Sabuncu, and Polina Golland. "Joint generative modeling of imaging and genetics". In: *Proc. IPMI: International Conference on Information Processing and Medical Imaging, LNCS* 7917 (2013), pp. 766–777.

Adrian V. Dalca, Ken L. Ferrier, Jerry X. Mitrovica, J. Taylor Perron, Glen A. Milne, and Jessica R. Creveling. "On post-glacial sea-level - III: incorporating sediment redistribution". In: *Geophysical Journal International* (2013), pp. 45–60.

Adrian V. Dalca. "Segmentation of nerve bundles and ganglia in spine MRI using particle filters". S.M. Thesis. Cambridge, MA: Massachusetts Institute of Technology, June 2012, **Morris Joseph Levin Award**.

Adrian V. Dalca, Giovanna Danagoulian, Ron Kikinis, Ehud Schmidt, and Polina Golland. "Segmentation of nerve bundles and ganglia in spine MRI using particle filters". In: *Proc. MICCAI: Medical Image Computing and Computer-Assisted Intervention, LNCS* (2011), pp. 537–545.

Adrian V. Dalca, Stephen M. Rumble, Samuel Levy, and Michael Brudno. "VARiD: A variation detection framework for color-space and letter-space platforms". In: *Bioinformatics* 26.12 (2010), pp. i343–i349.

Adrian V. Dalca and Michael Brudno. "Genome variation discovery with high-throughput sequencing data". In: *Briefings in Bioinformatics* 11.1 (2010), pp. 3–14.

Stephen M. Rumble, Phil Lacroute, **Adrian V. Dalca**, Marc Fiume, Arend Sidow, and Michael Brudno. "SHRiMP: Accurate mapping of short color-space reads". In: *PLoS computational biology* 5.5 (2009).

Adrian V. Dalca and Michael Brudno. "FRESCO: Flexible alignment with rectangle scoring schemes". In: *Pacific Symposium on Biocomputing* 13 (2008), pp. 3–14.

Books and Proceedings

Adrian V. Dalca, Nematollah K. Batmanghelich, Mert Sabuncu, Li Shen (Editors). Imaging Genetics. *Elsevier*. 2017.

Jorge Cardoso, Tal Arbel, Enzo Ferrante, Xavier Pennec, **Adrian V. Dalca**, et al (Editors). Graphs in Biomedical Image Analysis, Computational Anatomy and Imaging Genetics. *Springer*. 2017.

Jorge Cardoso, Tal Arbel, Fei Gao, Bernhard Kainz, Theo van Walsum, Kuangyu Shi, Kanwal K. Bhatia, Roman Peter, Tom Vercauteren, Mauricio Reyes, **Adrian V. Dalca**, et al (Editors) Molecular Imaging, Reconstruction and Analysis of Moving Body Organs, and Stroke Imaging and Treatment. *Springer*. 2017.

Selected Presentations

An Unsupervised Learning Model for Fast Deformable Medical Image Registration. *Biomedical Imaging and Analysis*. Invited Talk, Cambridge, MA, USA. 2018.

Spatial Anatomical Priors in Convolutional Networks for Unsupervised Biomedical Segmentation. *NIPS ML4H: Machine Learning for Health*. Poster Presentation, Long Beach, CA, USA. 2017.

Population Based Medical Image Imputation, *Information Processing in Medical Imaging*. Poster Presentation, Boone, NC, USA. 2017. **Best Poster Award**.

Population Based Medical Image Imputation, *Computer Vision Research Seminar, Computer Science and Artificial Intelligence Lab, MIT*. Oral Presentation. Cambridge, MA, USA. 2017.

Population Based Image Imputation, *Institute for Medical Engineering and Science Research Social, MIT*. Oral Presentation. Cambridge, MA, USA. 2017.

Patch-Based Discrete Registration of Clinical Brain Images, *International Workshop on Patch-based Techniques in Medical Imaging*. Oral Presentation. Athens, Greece. 2016.

Population, Clinical, and Genetic Priors for Medical Images, *Laboratory of Neuro Imaging*. Visiting Talk. Los Angeles, CA, USA. 2016.

Genetic, Clinical, and Population Priors for Medical Images, *Computer Science and Artificial Intelligence Lab*. Ph.D. Defense. Cambridge, MA, USA. 2016.

Characterization of Cerebrovascular Pathologies from Brain Images, *WHISR Talk Series*. Invited Talk. Cambridge, MA, USA. 2016

Predictive Modeling of Anatomy with Genetic and Clinical Data, *Medical Image Computing and Computer Assisted Intervention*. Poster. Munich, Germany. 2015.

Segmentation of Cerebrovascular Pathologies in Stroke Patients with Spatial and Shape Priors, *Medical Image Computing and Computer Assisted Intervention*. Poster. Cambridge, MA, USA. 2014.

tipiX: Rapid Visualization of Large Image Collections, *MICCAI-IMIC Interactive Medical Image Computing Workshop*. Oral Presentation. Cambridge, MA, USA. 2014.

Quantification and Analysis of Large Multimodal Clinical Image Studies: Application to Stroke, *MICCAI International Workshop on Multimodal Brain Image Analysis*. Oral Presentation. Nagoya, Japan. 2013.

A Bayesian Framework for Imaging Genetics, *International Imaging Genetics Conference*. Poster. Irvine, CA, USA. 2013.

Segmentation of Nerve Bundles and Ganglia in Spine MRI Using Particle Filter, *EECS Masterworks*. Poster. Cambridge, MA, USA. 2012. **Morris Joseph Levin Award**

Segmentation of Nerve Bundles and Ganglia in Spine MRI Using Particle Filter, *Medical Image Computing and Computer Assisted Intervention*. Poster. Toronto, Canada. 2011.

VARiD: A Variation Detection Framework for Color-Space and Letter-Space Platforms, *Intelligent Systems for Molecular Biology*. Oral Presentation. Stockholm, Sweden. 2010.

FRESCO: Flexible Alignment with Rectangle Scoring Schemes, *Pacific Symposium on Bioinformatics*. Oral Presentation. The Big Island, HI, USA. 2008.

Awards

Whitaker Health Sciences Fund Fellowship (MIT)	2015 – 2016
MICCAI-PATCHMI Best paper award	2016
MICCAI-IMIC Best paper award for impact and usability	2014
Advanced Multimodal Neuroimaging Training Program (NIH)	2014 – 2015
Hewlett Packard Full Fellowship (EECS)	2013 – 2014
Morris Joseph Levin Thesis Presentation Award	2012
NSERC (Alexander Graham Bell) Canada Graduate Scholarship (CGS-D)	2012 – 2014
Barbara J. Weedon Full Fellowship	2012 – 2013
Harvard EPS Pierce Scholarship Admission Scholarship, (Declined in favor of MIT)	2009
NSERC (Alexander Graham Bell) Canada Graduate Scholarship (CGS-M)	2008 – 2010
Ontario Graduate Scholarship, (Declined in favour of NSERC CGS-M)	2008
Halen Sawyer Hogg Graduate Admission Award	2008

Academic Service

Organizing Committee

MICGen: MICCAI Workshop on Imaging Genetics — 2014 (Founding), 2015, 2017
Founded and led the organization of the first Imaging Genetics workshop in the MICCAI community

SWITCH: Stroke Workshop on Imaging and Treatment CHallenges — 2017 (Founding)
Active participant of founding and organizing committee

MICCAI Educational Initiative — 2014 (Founding), 2015
Founded and led initiative to facilitate online availability of educational material, leading to creation of 20 educational videos and two professional courses made available online

Technical Reviewer or Scientific Committee

Transactions on Medical Imaging (IEEE)	2018
NeuroImage (Elsevier)	2017-2018
Workshop on Biomedical Image Registration	2016, 2018
MICCAI: Medical Image Computing and Computer Assisted Intervention	2014-2018
ISBI: International Symposium on Biomedical Imaging	2017
Medical Image Analysis (Elsevier)	2017
NIPS ML4H: Machine Learning for Health	2017
SWITCH: Stroke Workshop on Imaging and Treatment CHallenges	2017
MICGen: MICCAI Workshop on Imaging Genetics	2014, 2017

ICASSP: International Conference on Acoustics, Speech and Signal Processing 2017
Nature Scientific Reports 2016
RECOMB: Research in Computational Molecular Biology 2009

Leadership and Entrepreneurship

Entrepreneurship

First Prize, EECS Start6 Entrepreneurship Competition, $10,000 2015
Created business plan to commercialize software for spinal nerve segmentation in clinical trial MRIs.

First Prize, Hacking Medicine Ultrasound Grand Prize $1,500 2015
Developed method to guide sonographers towards ideal positioning of ultrasound probe.

MICCAI Student Board (MSB)

President 2014, 2015
Led student group in organizing social and professional activities, and growing student network.

MIT SciEx Initiative

Co-Founded video competition to showcase excited science to broad audience. 2014 (Founding), 2015

MIT - Massachusetts General Hospital SITECOR Program

Paticipated in inaugural MGH Surgeon Shadowing Program for MIT Engineers. 2014

MICCAI 2014

Student Liaison 2014
Interfaced with MICCAI 2014 organizing committee to advocate for student interests.

MIT Eastgate Executive Committee

Information Officer 2010-2012
Developed web interface and organized community events.

University of Toronto

Peer Mentor - First Year Learning Communities 2007-2008
Department of Computer Science Ambassador 2007-2009
Romanian Students' Club President, Webmaster 2004-2007