

CURRICULUM VITAE
Nicha C. Dvornek, Ph.D.
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EDUCATION

Ph.D., Engineering & Applied Science	Yale University, New Haven, CT	December 2012
M.Phil., Engineering & Applied Science	Yale University, New Haven, CT	May 2009
M.S., Engineering & Applied Science	Yale University, New Haven, CT	December 2007
B.S., Biomedical Engineering	Johns Hopkins University, Baltimore, MD	May 2006

PROFESSIONAL HONORS & RECOGNITION

IPMI Scholarship for Junior Scientists from Underrepresented Populations	2017
James Hudson Brown – Alexander Brown Coxe Postdoctoral Fellowship	2014-2015
Yale School of Medicine Diagnostic Radiology Grand Rounds Poster Award	2013
International Symposium on Biomedical Imaging 2011 NIH-funded Travel Award	2011
International Symposium on Biomedical Imaging 2010 Travel Award	2010
Yale University Graduate Student Association Conference Travel Fund Award	2010
Co-authored paper winning the Honorable Mention Poster Award, SPIE Medical Imaging	2007
Yale University Faculty of Engineering Fellowship	2006-2007
Yale University - Pierre W. Hoge Fellowship	2006-2007
Graduated Rank 1 in The Johns Hopkins Whiting School of Engineering	2006
Richard J. Johns Award (from Johns Hopkins University Department of Biomedical Engineering)	2006
Tau Beta Pi (Johns Hopkins University Chapter) Appreciation Award	2006
Johns Hopkins University Women's Club Scholarship	2005-2006
Johns Hopkins University - Engineering Emeriti Professors' Student Aid Fund Scholarship	2004-2006
Inducted into Tau Beta Pi, Engineering Honor Society	2005
Inducted into Alpha Eta Mu Beta, Biomedical Engineering Honor Society	2005
National Merit Scholarship	2002

PROFESSIONAL SERVICE AND AFFILIATIONS

Journal Service:

Frontiers in Human Neuroscience	2019-Present
PLOS One	2018-Present
Medical Image Analysis	2016-Present
Frontiers in Computational Neuroscience	2016-Present
Journal of Magnetic Resonance Imaging	2016-Present
IEEE Transactions on Medical Imaging	2013-Present
Journal of Mathematical Imaging and Vision	2010-2011

Service for Professional Meetings:

Area Chair, International Conference on Medical Imaging with Deep Learning	2018-2019
Reviewer, Medical Image Computing and Computer Assisted Intervention Conference	2013-Present
Reviewer, IEEE International Symposium on Biomedical Imaging: From Nano to Macro	2011-Present

Professional Organizations:

IEEE Signal Processing Society, Member	2018-Present
Medical Image Computing and Computer Assisted Intervention Society, Member	2016-Present
Medical Image Computing and Computer Assisted Intervention Society, Student Member	2010,2012
IEEE Engineering in Medicine and Biology Society, Student Member	2011
IEEE, Student Member	2010-2011
IEEE Signal Processing Society, Student Member	2010-2011
Biomedical Engineering Society, Student Member	2011
Tau Beta Pi, Engineering Honor Society	2005-Present
• Johns Hopkins University Chapter Executive Board – Cataloguer	2005-2006
Alpha Eta Mu Beta, Biomedical Engineering Honor Society	2005-Present

RESEARCH EXPERIENCE

Assistant Professor July 2018 – Present

Radiology & Biomedical Imaging, Yale School of Medicine, New Haven, CT

- Developing deep learning models for modeling and learning from fMRI time-series data using recurrent neural networks.
- Applying developed deep learning models to investigate autism spectrum disorder, Parkinson's disease, and other brain disorders/diseases.

Associate Research Scientist July 2017 – June 2018

Radiology & Biomedical Imaging, Yale School of Medicine, New Haven, CT

- Developed a deep learning approach for predicting clinical outcomes from fMRI time-series data using recurrent neural networks.
- Incorporated phenotypic information with fMRI time-series data in recurrent neural network models to classify autistic vs. healthy subjects from resting-state fMRI.
- Developed strategies for learning more generalizable models from small datasets, with applications in treatment outcome prediction using baseline task-based fMRI.

Postdoctoral Fellow with Dr. James S. Duncan July 2015 – June 2017

Research Training Program in Translational Developmental Neuroscience (T32 MH18268)

Child Study Center, Yale School of Medicine, New Haven, CT

- Developed a decision tree ensemble-based learning pipeline to improve predictions when dealing with a large number of uninformative predictors and small training samples.
- Applied the learning pipeline to predict autism behavioral treatment outcome from baseline task-based fMRI data.
- Investigated biomarkers derived from fMRI acquired during a biological motion viewing task to be used as informative predictors for autism treatment response.

Postdoctoral Associate with Dr. Hemant D. Tagare

September 2012 – June 2015

Diagnostic Radiology, Yale School of Medicine, New Haven, CT

- Developed a fast, statistical estimation algorithm for single particle reconstruction from cryo-electron microscopy images.
- Implemented the fast reconstruction algorithm in MATLAB and made the code publicly available on the MATLAB File Exchange.
- Achieved speedups of over two orders of magnitude over traditional statistical estimation methods.

Doctoral Researcher with Dr. James S. Duncan

June 2007 - August 2012

Biomedical Engineering, Yale University, New Haven, CT

- Developed a nonrigid image registration method to accommodate missing correspondences between images.
- Derived a maximum *a posteriori* estimation framework to simultaneously estimate the registration parameters and correspondence regions.
- Implemented the algorithm using C++ with VTK libraries.
- Applied the method to align preoperative and postresection brain MRI of epilepsy patients and longitudinal brain tumor treatment MRI.

Graduate Researcher with Dr. R. Todd Constable

January 2007 - May 2007

Biomedical Engineering, Yale University, New Haven, CT

- Created analysis tools in MATLAB to extract semiquantitative and quantitative measures from dynamic contrast-enhanced MRI to examine properties of microvasculature.
- Estimated physiologically relevant parameters using pharmacokinetic modeling.
- Analyzed data to measure changes in tumor perfusion after experimental antiangiogenic drug treatment.

Graduate Researcher with Dr. James S. Duncan

September 2006 - December 2006

Biomedical Engineering, Yale University, New Haven, CT

- Implemented shape-based non-rigid motion tracking method in MATLAB for 2-D cardiac image analysis. Method used bending energy as a shape-similarity measure.

Undergraduate Researcher with Dr. Gabor Fichtinger

January 2006 - May 2006

Computer Science, Johns Hopkins University, Baltimore, MD

- Created an in-house virtual fluoroscopy system, integrating individual hardware and software components.
- Developed MATLAB software to register optically tracked tools to the C-arm and image coordinate systems.
- Designed and performed experiments to evaluate sensitivity of the system to C-arm mis-calibration.

Undergraduate Intern with Dr. Yiannis Kaznessis

June 2005 - August 2005

Bioinformatics Summer Institute, University of Minnesota, Minneapolis, MN

- Engineered new artificial gene networks exhibiting oscillatory behavior using stochastic simulations.

- Gathered gene component data for use in other synthetic system designs.

Undergraduate Intern with Dr. Victor Barocas

June 2004 - August 2004

University of Minnesota Supercomputing Institute, Minneapolis, MN

- Designed and implemented an image processing routine for ImageJ software to calculate volume of the posterior chamber from a 2D image of the eye.
- Modeled accommodation microfluctuations of the eye with a computer simulation to study iris profile during microfluctuations.

TEACHING EXPERIENCE

Teaching Fellow for *Biomedical Engineering Laboratory*

Spring 2008 - Fall 2010, Fall 2011

Biomedical Engineering, Yale University, New Haven, CT

- Supervised biomedical engineering upperclassman in a laboratory course which explored techniques to measure, analyze, and model biological signals and physiological systems.
- Graded laboratory reports and gave pre-laboratory lectures.
- Assisted in creating assignments and writing exams.
- Managed laboratory equipment and helped troubleshoot problems with experiments.

Tutor for *Biomedical Image Processing and Analysis*

Fall 2011

Biomedical Engineering, Yale University, New Haven, CT

- Tutored a senior biomedical engineering student in image processing and analysis.
- Taught basic coding and MATLAB skills.

Teaching Assistant for *Models for Life*

Fall 2005

Biomedical Engineering, Johns Hopkins University, Baltimore, MD

- Led team of students in an introductory biomedical engineering laboratory course.

Tutor for *Introductory Chemistry I and II*

Fall 2003 - Spring 2006

Chemistry, Johns Hopkins University, Baltimore, MD

- Provided one-on-one and group tutoring to undergraduate students.
- Taught basic concepts in chemistry, assisted with homework assignments, and helped prepare students for exams.

PRESENTATIONS

Invited:

“Predicting Autism Behavioral Treatment Response from Baseline Functional MRI,” Rising Stars in Biomedical, November 2016, Massachusetts Institute of Technology, Cambridge, MA (Oral).

Contributed:

“Learning Generalizable Recurrent Neural Networks from Small Task-fMRI Datasets,” 21st International Conference on Medical Image Computing and Computer Assisted Intervention, September 2018, Granada, Spain (Poster).

“Combining Phenotypic and Resting-State fMRI Data for Autism Classification with Recurrent Neural Networks,” IEEE International Symposium on Biomedical Imaging, April 2018, Washington, DC (Poster).

“Identifying Autism from Resting-State fMRI Using Long Short-Term Memory Networks,” Eighth International Workshop on Machine Learning in Medical Imaging, September 2017, Quebec City, Canada (Oral).

“Prediction of Autism Treatment Response from Baseline fMRI using Random Forests and Tree Bagging,” Sixth International Workshop on Multimodal Learning for Clinical Decision Support, October 2016, Athens, Greece (Oral).

“A Fast EM Algorithm for Single Particle Reconstruction,” National Resource for Automated Molecular Microscopy Workshop on Advanced Topics in EM Structure Determination, November 2014, La Jolla, CA (Poster).

“Tracking Metastatic Brain Tumors In Longitudinal Scans via Joint Image Registration and Labeling,” 2nd International MICCAI Workshop on Spatiotemporal Image Analysis for Longitudinal and Time-Series Image Data, October 2012, Nice, France (Poster).

“Robust Registration of Brain MRI with Missing Correspondences,” Biomedical Engineering Society Annual Meeting, October 2011, Hartford, CT (Poster).

“Non-rigid Registration of Longitudinal Brain Tumor Treatment MRI,” 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, September 2011, Boston, MA (Oral).

“Registration of Brain Resection MRI with Intensity and Location Priors,” 8th IEEE International Symposium on Biomedical Imaging: From Nano to Macro, April 2011, Chicago, IL (Oral).

“Non-rigid Registration with Missing Correspondences in Preoperative and Postresection Brain Images,” 13th International Conference on Medical Image Computing and Computer Assisted Intervention, September 2010, Beijing, China (Oral).

“Pairwise Registration of Images With Missing Correspondences Due to Resection,” 7th IEEE International Symposium on Biomedical Imaging: From Nano to Macro, April 2010, Rotterdam, The Netherlands (Oral).

“Design and Optimization of Gene Oscillatory Networks through Stochastic Simulations,” Biomedical Engineering Society Annual Fall Meeting, Section on Highlights of Undergraduate Bioengineering Research, September 2005, Baltimore, MD (Oral).

University:

“Applications of Deep Learning in fMRI and Autism,” Yale Translational Research Imaging Center Seminar, April 2019, New Haven, CT (Oral).

“Learning from fMRI using Recurrent Neural Networks with Applications in Autism,” Yale School of Medicine fMRI Seminar Series, May 2018, New Haven, CT (Oral).

“Identifying Autism from Resting-State fMRI Using Deep Learning,” Yale School of Medicine Child Study Center Grand Rounds, June 2017, New Haven, CT (Poster).

“Fast Computation of High-Resolution Protein Structure from Cryo-EM,” Yale School of Medicine Diagnostic Radiology Grand Rounds, May 2013, New Haven, CT (Poster).

“Registration of Intra-patient Brain Images with Missing Correspondences,” Yale University Biomedical Engineering Graduate Student Seminar, October 2011, New Haven, CT (Oral).

“Nonrigid Image Registration with Missing Correspondences Due to Surgical Resection,” Yale University Bioimaging Sciences Conference, November 2008, Southbury, CT (Poster).

BIBLIOGRAPHY

Peer-Reviewed Papers:

Li, X., **Dvornek, N.C.**, Zhou, Y., Zhuang, J., Ventola, P. and Duncan, J.S., “Efficient Interpretation of Deep Learning Models Using Graph Structure and Cooperative Game Theory: Application to ASD Biomarker Discovery,” To appear in: *Information Processing in Medical Imaging (IPMI)*, June 2019.

Zhuang, J., **Dvornek, N.C.**, Zhao, Q., Li, X., Ventola, P. and Duncan, J.S., “Prediction of treatment outcome for autism from structure of the brain based on sure independence screening,” In: *IEEE International Symposium on Biomedical Imaging (ISBI)*, April 2019.

Dvornek, N.C., Yang, D., Ventola, P., Duncan, J.S., “Learning Generalizable Recurrent Neural Networks from Small Task-fMRI Datasets,” In: *Med Image Computing and Computer Assist Intervention 2018*, LNCS 11072, pp. 329–337, 2018.

Li, X., **Dvornek, N.**, Zhuang, L.H., Ventola, P., Duncan, J., “Brain Biomarker Interpretation in ASD Using Deep Learning and fMRI,” In: *Med Image Computing and Computer Assist Intervention 2018*, LNCS 11072, pp. 206-214, 2018.

Zhuang, J., **Dvornek, N.**, Li, X., Ventola, P., Duncan, J., “Prediction of Severity and Treatment Outcome for ASD from fMRI,” In: *International Workshop on Predictive Intelligence In Medicine*, LNCS 11121, pp. 9-17, 2018.

Dvornek, N.C., Ventola, P., Duncan, J.S., “Combining Phenotypic and Resting-State fMRI Data for Autism Classification with Recurrent Neural Networks,” In: *IEEE 15th International Symposium on Biomedical Imaging (ISBI)*, pp. 725-728, April 2018.

Li, X., **Dvornek, N.**, Papademetris, X., Zhuang, J., Staib, L.H., Ventola, P., Duncan, J., “2-Channel Convolutional 3D Deep Neural Network (2CC3D) for fMRI Analysis: ASD Classification and Feature Learning,” In: *IEEE 15th International Symposium on Biomedical Imaging (ISBI)*, pp. 1252-1255, April 2018.

Zhuang, J., **Dvornek, N.**, Li, X., Yang, D., Ventola, P., Duncan, J., “Prediction of pivotal response treatment outcome with task fMRI using random forest and variable selection,” In: *IEEE 15th International Symposium on Biomedical Imaging (ISBI)*, pp. 97-100, April 2018.

Dvornek, N.C., Ventola, P., Pelphrey, K.A., Duncan, J.S., “Identifying Autism from Resting-State fMRI Using Long Short-Term Memory Networks,” In: *8th International Workshop on Machine Learning in Medical Imaging*, Lecture Notes in Computer Science vol. 10541, pp. 362-370, 2017.

Yang, D., Pelphrey, K.A., Sukholdolsky, D., Crowley, M., Dayan, E., **Dvornek, N.C.**, Venkataraman, A., Duncan, J.S., Staib, L.H., Ventola, P., “Brain Responses to Biological Motion Predict Treatment Outcome in Young Children with Autism,” *Translational Psychiatry*, vol. 6, no. 11, e948, Nov 2016.

Dvornek, N.C., Yang, D., Venkataraman, A., Ventola, P., Staib, L.H., Pelphrey, K.A., Duncan, J.S., “Prediction of Autism Treatment Response from Baseline fMRI using Random Forests and Tree Bagging,” In: *Sixth International Workshop on Multimodal Learning for Clinical Decision Support*, 2016.

Venkataraman, A., Yang, D.Y.J., **Dvornek, N.**, Staib, L.H., Duncan, J.S., Pelphrey, K.A., Ventola, P., “Pivotal response treatment prompts a functional rewiring of the brain among individuals with autism spectrum disorder,” *Neuroreport*, vol. 27, no. 14, pp. 1081-1085, Sep 2016.

Dvornek, N.C., Sigworth, F.J., and Tagare, H.D., “SubspaceEM: A Fast Maximum-a-posteriori Algorithm for Cryo-EM Single Particle Reconstruction,” *Journal of Structural Biology*, vol. 190, no. 2, pp. 200-214, May 2015.

Chitphakdithai, N., Chiang, V.L., and Duncan, J.S., “Tracking Metastatic Brain Tumors in Longitudinal Scans via Joint Image Registration and Labeling,” In: *2nd International Workshop on Spatiotemporal Image Analysis for Longitudinal and Time-Series Image Data*, Lecture Notes in Computer Science vol. 7570, pp. 124-136, 2012.

Chitphakdithai, N., Chiang, V.L., and Duncan, J.S., “Non-rigid Registration of Longitudinal Brain Tumor Treatment MRI,” In: *33rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, pp. 4893-4896, 2011.

Chitphakdithai, N., Vives, K.P., and Duncan, J.S., “Registration of Brain Resection MRI with Intensity and Location Priors,” In: *8th IEEE International Symposium on Biomedical Imaging: From Nano to Macro, 2011*, pp. 1520-1523, 2011.

Chitphakdithai, N. and Duncan, J.S., “Non-rigid Registration with Missing Correspondences in Preoperative and Postresection Brain Images,” In: *Med Image Computing and Computer Assist Intervention 2010*, Lecture Notes in Computer Science vol. 6361, pp. 367-374, 2010.

Chitphakdithai, N. and Duncan, J.S., "Pairwise Registration of Images With Missing Correspondences Due to Resection," In: *7th IEEE International Symposium on Biomedical Imaging: From Nano to Macro, 2010*, pp. 1025-1028, 2010.

Other Published Papers:

Jain, A.K., An, M., **Chitphakdithai, N.**, Chitalapani, G., Fichtinger, G., "C-arm Calibration: Is It Really Necessary?" In: Cleary, K.R, and Miga, M.I. (eds.) *Medical Imaging 2007*. SPIE, vol. 6509, pp. 65092U, 2007 (Honorable mention poster award).