

# Nick Tustison

## Curriculum Vitae

4173 Cardamon Circle  
Home office  
Corona, CA U.S.A.  
☎ +1 (540) 383 2719  
✉ ntustison@virginia.edu  
🌐 ntustison

### Education

- 2004 **D.Sc. Biomedical Engineering**, Washington University in St. Louis, St. Louis, MO.  
Thesis: *Biventricular Myocardial Strains With Anatomical NURBS Models From Tagged MRI*
- 2000 **M.S. Biomedical Engineering**, University of Virginia, Charlottesville, VA.  
Thesis: *Quantification Methods for Assessing Asthma in Hyperpolarized  $^3\text{He}$  Lung MRI Studies*
- 1998 **B.S. Applied Physics: Computer Science**, Brigham Young University, Provo, UT.

### Professional Appointments

- 2010– **Assistant Professor**, Department of Radiology and Medical Imaging, University of Virginia, Charlottesville, VA.
- 2016– **Visiting Assistant Researcher**, Department of Neurobiology and Behavior, University of California, Irvine, Irvine, CA.
- 2005–2010 **Senior Research Investigator**, Department of Radiology, University of Pennsylvania, Philadelphia, PA.
- 2004–2005 **Research Fellow**, Department of Radiology, University of Pennsylvania, Philadelphia, PA.

### Academic Service

#### Program committees

- 2012–present **SPIE Medical Imaging**.

#### Editorships

- 2012–present **Frontiers Review Editorial Board**.
- May 2013– **Frontiers in Neuroinformatics: Guest Editor**, *Neuroinformatics with the Insight ToolKit*.

## Reviewer Duties

Academic Radiology  
American Journal of Neuroradiology  
Annals of Biomedical Engineering  
Artificial Intelligence in Medicine  
Biomedical Signal Processing and Control  
Computers in Biology and Medicine  
Computerized Medical Imaging and Graphics  
Focused Ultrasound Foundation ad hoc grant reviewer  
Image and Vision Computing  
International Journal of Pattern Recognition and Artificial Intelligence  
IEEE Transactions on Medical Imaging  
IEEE Transactions on Pattern Analysis and Machine Intelligence  
IEEE Transactions on Biomedical Engineering  
Insight Journal  
International Conf. on Medical Image Computing and Computer Assisted Intervention  
International Journal of Biomedical Imaging  
International Journal of Computer Vision  
International Workshop on Medical Imaging and Augmented Reality  
IEEE International Symposium on Biomedical Imaging: From Nano to Macro  
Journal of Computed Tomography  
Journal of Electronic Imaging  
Journal of Magnetic Resonance Imaging  
Journal of Neurotrauma  
Journal of the Optical Society of America A  
Magnetic Resonance in Medicine  
Medical Physics  
Medical Image Analysis  
Neurobiology of Aging  
NeuroImage  
NeuroImage: Clinical  
Neuroradiology  
PLOS ONE  
Respirology  
SIAM Journal on Imaging Sciences

## Invited Talks/Participation

- Feb 2012 **SPIE conference**, *Open source tools for medical image analysis.*  
Sept 2012 **MICCAI**, *provided canonical registrations for Grand Challenge and Workshop on Multi-Atlas Labeling.*  
Sept 2013 **MICCAI**, *provided canonical registrations for SATA challenge workshop.*  
Oct 2014 **Laboratory of Neuroimaging**, *ANTs and the perils of circularity.*

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## Computer Skills

Languages C++, perl, bash, L<sup>A</sup>T<sub>E</sub>X, R  
Tools and Libraries Advanced Normalization Tools (ANTs), Insight Toolkit (ITK), Visualization Toolkit (VTK), Paraview, git, Matlab, PBS/SGE qsub

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## Awards

- 2010 **1st place**, *EMPIRE10 lung registration competition*, MICCAI Conference 2010.
- 2013 **1st place**, *BRATS2013 multimodal brain tumor segmentation competition*, MICCAI Conference 2013.
- 2014 **Best paper award**, *STACOM2014 cardiac motion estimation challenge*, MICCAI Conference 2014.

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## Publications

### Articles

Dorian Pustina, H Branch Coslett, Peter E Turkeltaub, Nicholas Tustison, Myrna F Schwartz, and Brian Avants. Automated segmentation of chronic stroke lesions using linda: Lesion identification with neighborhood data analysis. *Hum Brain Mapp*, Jan 2016.

Talissa A Altes, John P Mugler, 3rd, Kai Ruppert, Nicholas J Tustison, Joanne Gersbach, Sylvia Szentpetery, Craig H Meyer, Eduard E de Lange, and W Gerald Teague. Clinical correlates of lung ventilation defects in asthmatic children. *J Allergy Clin Immunol*, Oct 2015.

Khader M Hasan, Benson Mwangi, Bo Cao, Zafer Keser, Nicholas J Tustison, Peter Kochunov, Richard E Frye, Mirjana Savatic, and Jair Soares. Entorhinal cortex thickness across the human lifespan. *J Neuroimaging*, Oct 2015.

Bjoern H Menze, Andras Jakab, Stefan Bauer, Jayashree Kalpathy-Cramer, Keyvan Farahani, Justin Kirby, Yuliya Burren, Nicole Porz, Johannes Slotboom, Roland Wiest, Levente Lenczi, Elizabeth Gerstner, Marc-Andre Weber, Tal Arbel, Brian B Avants, Nicholas Ayache, Patricia Buendia, D Louis Collins, Nicolas Cordier, Jason J Corso, Antonio Criminisi, Tilak Das, Herve Delingette, Cagatay Demiralp, Christopher R Durst, Michel Dojat, Senan Doyle, Joana Festa, Florence Forbes, Ezequiel Geremia, Ben Glocker, Polina Golland, Xiaotao Guo, Andac Hamamci, Khan M Iftekharuddin, Raj Jena, Nigel M John, Ender Konukoglu, Danial Lashkari, Jose Antonio Mariz, Raphael Meier, Sergio Pereira, Doina Precup, Stephen J Price, Tammy Riklin Raviv, Syed M S Reza, Michael Ryan, Duygu Sarikaya, Lawrence Schwartz, Hoo-Chang Shin, Jamie Shotton, Carlos A Silva, Nuno Sousa, Nagesh K Subbanna, Gabor Szekely, Thomas J Taylor, Owen M Thomas, Nicholas J Tustison, Gozde Unal, Flor Vasseur, Max Wintermark, Dong Hye Ye, Liang Zhao, Binsheng Zhao, Darko Zikic, Marcel Prastawa, Mauricio Reyes, and Koen Van Leemput. The multimodal brain tumor image segmentation benchmark (brats). *IEEE Trans Med Imaging*, 34(10):1993–2024, Oct 2015.

Kun Qing, Talissa A Altes, Nicholas J Tustison, Xue Feng, Xiao Chen, Jaime F Mata, G Wilson Miller, Eduard E de Lange, William A Tobias, Gordon D Cates, Jr, James R Brookeman, and John P Mugler, 3rd. Rapid acquisition of helium-3 and proton three-dimensional image sets of the human lung in a single breath-hold using compressed sensing. *Magn Reson Med*, 74(4):1110–5, Oct 2015.

Nicholas J Tustison, Kun Qing, Chengbo Wang, Talissa A Altes, and John P Mugler, 3rd. Atlas-based estimation of lung and lobar anatomy in proton MRI. *Magn Reson Med*, Jul 2015.

Christopher R Durst, Navin Michael, Nicholas J Tustison, James T Patrie, Prashant Raghavan, Max Wintermark, and S Sendhil Velan. Noninvasive evaluation of the regional

variations of gaba using magnetic resonance spectroscopy at 3 tesla. *Magn Reson Imaging*, 33(5):611–7, Jun 2015.

Nicholas J Tustison, K L Shrinidhi, Max Wintermark, Christopher R Durst, Benjamin M Kandel, James C Gee, Murray C Grossman, and Brian B Avants. Optimal symmetric multimodal templates and concatenated random forests for supervised brain tumor segmentation (simplified) with *ANTsR*. *Neuroinformatics*, 13(2):209–25, Apr 2015.

Yi Xin, Gang Song, Maurizio Cereda, Stephen Kadlecsek, Hooman Hamedani, Yunqing Jiang, Jennia Rajaei, Justin Clapp, Harrilla Profka, Natalie Meeder, Jue Wu, Nicholas J Tustison, James C Gee, and Rahim R Rizi. Semiautomatic segmentation of longitudinal computed tomography images in a rat model of lung injury by surfactant depletion. *J Appl Physiol (1985)*, 118(3):377–85, Feb 2015.

Brian B Avants, Jeffrey T Duda, Emily Kilroy, Kate Krasileva, Kay Jann, Benjamin T Kandel, Nicholas J Tustison, Lirong Yan, Mayank Jog, Robert Smith, Yi Wang, Mirella Dapretto, and Danny J J Wang. The pediatric template of brain perfusion. *Sci Data*, 2:150003, 2015.

Brian B Avants, Hans J Johnson, and Nicholas J Tustison. Neuroinformatics and the Insight ToolKit. *Front Neuroinform*, 9:5, 2015.

Jonathon H Yoder, John M Peloquin, Gang Song, Nick J Tustison, Sung M Moon, Alexander C Wright, Edward J Vresilovic, James C Gee, and Dawn M Elliott. Internal three-dimensional strains in human intervertebral discs under axial compression quantified noninvasively by magnetic resonance imaging and image registration. *J Biomech Eng*, 136(11), Nov 2014.

Nicholas Said, W Jeff Elias, Prashant Raghavan, Alan Cupino, Nicholas Tustison, Robert Frysinger, James Patrie, Wenjun Xin, and Max Wintermark. Correlation of diffusion tensor tractography and intraoperative macrostimulation during deep brain stimulation for Parkinson disease. *J Neurosurg*, 121(4):929–35, Oct 2014.

Nicholas J Tustison, Philip A Cook, Arno Klein, Gang Song, Sandhitsu R Das, Jeffrey T Duda, Benjamin M Kandel, Niels van Strien, James R Stone, James C Gee, and Brian B Avants. Large-scale evaluation of ANTs and FreeSurfer cortical thickness measurements. *Neuroimage*, 99:166–79, Oct 2014.

W Gerald Teague, Nicholas J Tustison, and Talissa A Altes. Ventilation heterogeneity in asthma. *J Asthma*, 51(7):677–84, Sep 2014.

Max Wintermark, Diane S Huss, Binit B Shah, Nicholas Tustison, T Jason Druzgal, Neal Kassell, and W Jeff Elias. Thalamic connectivity in patients with essential tremor treated with MR imaging-guided focused ultrasound: in vivo fiber tracking by using diffusion-tensor MR imaging. *Radiology*, 272(1):202–9, Jul 2014.

Max Wintermark, Nicholas J Tustison, William J Elias, James T Patrie, Wenjun Xin, Nicholas Demartini, Matt Eames, Suna Sumer, Benison Lau, Alan Cupino, John Snell, Arik Hananel, Neal Kassell, and Jean-Francois Aubry. T1-weighted MRI as a substitute to CT for refocusing planning in MR-guided focused ultrasound. *Phys Med Biol*, 59(13):3599–614, Jul 2014.

Nicholas J Tustison, Brian B Avants, Philip A Cook, Junghoon Kim, John Whyte, James C Gee, and James R Stone. Logical circularity in voxel-based analysis: normalization strategy may induce statistical bias. *Hum Brain Mapp*, 35(3):745–59, Mar 2014.

Christopher R Durst, Prashant Raghavan, Mark E Shaffrey, David Schiff, M Beatriz Lopes, Jason P Sheehan, Nicholas J Tustison, James T Patrie, Wenjun Xin, W Jeff Elias, Kenneth C Liu, Greg A Helm, A Cupino, and Max Wintermark. Multimodal MR imaging model to predict tumor infiltration in patients with gliomas. *Neuroradiology*, 56(2):107–15, Feb 2014.

Brian B Avants, Nicholas J Tustison, Michael Stauffer, Gang Song, Baohua Wu, and James C Gee. The Insight ToolKit image registration framework. *Front Neuroinform*, 8:44, 2014.

Nicholas J Tustison and Brian B Avants. Explicit B-spline regularization in diffeomorphic image registration. *Front Neuroinform*, 7:39, 2013.

Nicholas J Tustison, Hans J Johnson, Torsten Rohlfing, Arno Klein, Satrajit S Ghosh, Luis Ibanez, and Brian B Avants. Instrumentation bias in the use and evaluation of scientific software: recommendations for reproducible practices in the computational sciences. *Front Neurosci*, 7:162, 2013.

Gang Song, Eduardo Mortani Barbosa, Jr, Nicholas Tustison, Warren B Geftter, Maryl Kreider, James C Gee, and Drew A Torigian. A comparative study of HRCT image metrics and PFT values for characterization of ILD and COPD. *Acad Radiol*, 19(7):857–64, Jul 2012.

Brian B Avants, Nicholas J Tustison, Jue Wu, Philip A Cook, and James C Gee. An open source multivariate framework for  $n$ -tissue segmentation with evaluation on public data. *Neuroinformatics*, 9(4):381–400, Dec 2011.

Keelin Murphy, Bram van Ginneken, Joseph M Reinhardt, Sven Kabus, Kai Ding, Xiang Deng, Kunlin Cao, Kaifang Du, Gary E Christensen, Vincent Garcia, Tom Vercauteren, Nicholas Ayache, Olivier Commowick, Grégoire Malandain, Ben Glocker, Nikos Paragios, Nassir Navab, Vladlena Gorbunova, Jon Sporring, Marleen de Bruijne, Xiao Han, Matthias P Heinrich, Julia A Schnabel, Mark Jenkinson, Cristian Lorenz, Marc Modat, Jamie R McClelland, Sébastien Ourselin, Sascha E A Muenzing, Max A Viergever, Dante De Nigris, D Louis Collins, Tal Arbel, Marta Peroni, Rui Li, Gregory C Sharp, Alexander Schmidt-Richberg, Jan Ehrhardt, René Werner, Dirk Smeets, Dirk Loeckx, Gang Song, Nicholas Tustison, Brian Avants, James C Gee, Marius Staring, Stefan Klein, Berend C Stoel, Martin Urschler, Manuel Werlberger, Jef Vandemeulebroucke, Simon Rit, David Sarrut, and Josien P W Pluim. Evaluation of registration methods on thoracic CT: the EMPIRE10 challenge. *IEEE Trans Med Imaging*, 30(11):1901–20, Nov 2011.

Eduardo Mortani Barbosa, Jr, Gang Song, Nicholas Tustison, Maryl Kreider, James C Gee, Warren B Geftter, and Drew A Torigian. Computational analysis of thoracic multidetector row HRCT for segmentation and quantification of small airway air trapping and emphysema in obstructive pulmonary disease. *Acad Radiol*, 18(10):1258–69, Oct 2011.

Nicholas J Tustison, Brian B Avants, Lucia Flors, Talissa A Altes, Eduard E de Lange, John P Mugler, 3rd, and James C Gee. Ventilation-based segmentation of the lungs using hyperpolarized  $(3)\text{He}$  MRI. *J Magn Reson Imaging*, 34(4):831–41, Oct 2011.

Cuneyt Yilmaz, Nicholas J Tustison, D Merrill Dane, Priya Ravikumar, Masaya Takahashi, James C Gee, and Connie C W Hsia. Progressive adaptation in regional parenchyma mechanics following extensive lung resection assessed by functional computed tomography. *J Appl Physiol (1985)*, 111(4):1150–8, Oct 2011.

Nicholas J Tustison, Brian B Avants, Marcelo Siqueira, and James C Gee. Topological well-composedness and glamorous glue: a digital gluing algorithm for topologically constrained front propagation. *IEEE Trans Image Process*, 20(6):1756–61, Jun 2011.

Nicholas J Tustison, Tessa S Cook, Gang Song, and James C Gee. Pulmonary kinematics from image data: a review. *Acad Radiol*, 18(4):402–17, Apr 2011.

Brian B Avants, Nicholas J Tustison, Gang Song, Philip A Cook, Arno Klein, and James C Gee. A reproducible evaluation of ANTs similarity metric performance in brain image registration. *Neuroimage*, 54(3):2033–44, Feb 2011.

Nicholas J Tustison, Suyash P Awate, Gang Song, Tessa S Cook, and James C Gee. Point set registration using Havrda-Charvat-Tsallis entropy measures. *IEEE Trans Med Imaging*, 30(2):451–60, Feb 2011.

Nicholas J Tustison, Talissa A Altes, Gang Song, Eduard E de Lange, John P Mugler, 3rd, and James C Gee. Feature analysis of hyperpolarized helium-3 pulmonary MRI: a study of asthmatics versus nonasthmatics. *Magn Reson Med*, 63(6):1448–55, Jun 2010.

Nicholas J Tustison, Brian B Avants, Philip A Cook, Yuanjie Zheng, Alexander Egan, Paul A Yushkevich, and James C Gee. N4ITK: improved N3 bias correction. *IEEE Trans Med Imaging*, 29(6):1310–20, Jun 2010.

Nicholas J Tustison, Suyash P Awate, Jing Cai, Talissa A Altes, G Wilson Miller, Eduard E de Lange, John P Mugler, 3rd, and James C Gee. Pulmonary kinematics from tagged hyperpolarized helium-3 MRI. *J Magn Reson Imaging*, 31(5):1236–41, May 2010.

Nicholas J Tustison, Brian B Avants, and James C Gee. Directly manipulated free-form deformation image registration. *IEEE Trans Image Process*, 18(3):624–35, Mar 2009.

Marcelo Siqueira, Longin J. Latecki, Nicholas J. Tustison, J. Gallier, and James C. Gee. Topological repairing of 3D digital images. *Journal of Mathematical Imaging and Vision*, 30(3):249–274, March 2008.

Nicholas J Tustison and Amir A Amini. Biventricular myocardial strains via nonrigid registration of anatomical NURBS model [corrected]. *IEEE Trans Med Imaging*, 25(1):94–112, Jan 2006.

Nicholas J Tustison, Victor G Dávila-Román, and Amir A Amini. Myocardial kinematics from tagged MRI based on a 4-D B-spline model. *IEEE Trans Biomed Eng*, 50(8):1038–40, Aug 2003.

K D Hagspiel, T A Altes, J P Mugler, 3rd, M J Spellman, Jr, J F Mata, N J Tustison, and J R Brookeman. MR virtual colonography using hyperpolarized (3)He as an endoluminal contrast agent: demonstration of feasibility. *Magn Reson Med*, 44(5):813–6, Nov 2000.