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Brian Avants

Brain mapping: theory & methods

Current Position

Biogen

2017 Lead of Imaging Analytics, Biomarkers Group

Research Interests

Brain mapping: brain structure, function, cognition and its interaction with environment and disease; visualization, modality integration, reproducibility, machine learning, longitudinal analysis, open data and science.

Education

2005 **Ph.D.**, *The University of Pennsylvania*, Philadelphia, PA, *Bioengineering*.

2002 **M.S.**, *The University of Pennsylvania*, Philadelphia, PA, *Computer Science*.

1998 **B.A.**, *New College of Florida*, Sarasota, FL, *Physics*.

Professional Appointments

2016 Associate Director, Global Biomarker Discovery & Development, Biogen

2012–2016 Assistant Professor of Radiology, University of Pennsylvania

2008–2012 Research Associate, Radiology, University of Pennsylvania

2006–2008 Research Fellow, Radiology, University of Pennsylvania

Awards and Honors

2014 Best paper award with Nicholas Tustison at STACOM 2014 challenge.

2013 Advanced Normalization Tools with R (ANTsR) wins BRATS 2013 Tumor Segmentation Challenge at MICCAI, Nagoya, Japan (with Nick Tustison).

2013 Advanced Normalization Tools (ANTs) finishes first in segmentation categories at SATA challenge, MICCAI, Nagoya, Japan (with Nick Tustison).

2012 Advanced Normalization Tools (ANTs) Software Selected to provide "Standard Setting" image registration results for MICCAI 2013 Multi-Atlas Segmentation Challenge: 4D cardiac, brain and multimodality canine leg MR images

2012 All top finishers in 2012 MICCAI multi-atlas segmentation used ANTs

2010 ANTs finished *1st overall* in an unbiased EMPIRE10 international lung mapping competition

2009 ANTs finished in *1st rank* in an unbiased Klein 2009 international brain mapping competition

2007 Young Investigator Award, General Medical Computing, MICCAI

2003 Best Poster Award SPIE Medical Imaging

1995 Future Healthcare Researcher Scholarship, Humana Health Care

1994 National Merit Scholarship, New College of Florida, Sarasota, FL

Editorial Positions

2017 Topic Editor - Neuroimage special issue on Brain Parcellation

2015 Topic Editor - Frontiers in Neuroinformatics: ITK topic

current Ad hoc Reviewer - Nature Neuroscience

— Ad hoc Reviewer - Neuroimage

— Ad hoc Reviewer - IEEE Transaction on Medical Imaging

— Ad hoc Reviewer - Pediatrics

— Ad hoc Reviewer - Medical Physics

— Ad hoc Reviewer - Human Brain Mapping

— Ad hoc Reviewer - IEEE Pattern Analysis Machine Intelligence

— Ad hoc Reviewer - Medical Image Analysis

Academic and Institutional Committees

2013–present Grant Reviewer - Alzheimer's Association

2013–present Consultant, American College of Radiology Head Injury Institute Information Technology Committee

2010–present Insight ToolKit Version 4 Development Leader and regular contributor to this large-scale industry-academic collaborative effort sponsored by NLM

2011–present International Neuroinformatics Coordinating Facility Registration and Atlasing Task Force Member (youtube video)

2006–present Spatial Transformations Informatics Technology Initiative (SIFTI) member

2006–present Neuroimaging Informatics Tools and Resources Clearinghouse member

Major Academic Collaborations

2016–present Collaboration with Dr. Howie Rosen, UCSF Neurology, in multiple modality and longitudinal analysis.

2013–present Collaboration with Dr. Yvette Sheline, UPenn Center for Neuromodulation in Depression and Stress (CNDS), in multiple modality and longitudinal analysis.

2006–present Collaboration with Dr. Martha Farah (UPenn) and Dr. Hallam Hurt (CHOP), understanding the effects of stress and poverty on brain development.

2006–present Collaboration with Dr. Murray Grossman (UPenn), multiple modality biomarkers for frontotemporal lobar degeneration and related disorders.

2013–2016 Collaboration with Dr. Ruben Gur (UPenn), Brain-Behavior Laboratory (BBL), in big data analysis of normal adolescent development and early signs of neuropsychiatric disorders.

2013–2016 Collaboration with Dr. Lyle Ungar (UPenn), analyzing the eigenspaces relating words, sentences and brain activity.

Major Academic Teaching Responsibilities

Summer 2017 Summer advisor to Nicholas Cullen (B.S. in computer science) for Biogen Biomarkers internship on deep learning and multivariate analysis in neuroimaging of Alzheimer's Disease

2014–2016 Faculty technical advisor, with clinical advisor Branch Coslett, to Dorian Pustina, postdoctoral scientist studying machine learning applied to stroke; *Dr. Pustina is currently Director of Experimental Neuroimaging at the CHDI foundation for Huntington's disease research.*

2012–2017 Ph.D. Co-Advisor of Stathis Gennatas, UPenn Doctoral student, Neuroscience; *currently data scientist at UCSF working with Lyle Ungar.*

2010–2015 Ph.D. Advisor of Ben Kandel, UPenn Doctoral student, Bioengineering; Ben's work was awarded an oral presentation at IPMI-2013; *currently a data scientist at Picwell.*

2010–2015 Ph.D. Co-Advisor of Paramveer Dhillon, Doctoral student, UPenn Computer Science with Professor Lyle Ungar; Paramveer's work was an awarded an oral presentation at PRNI-2013; *currently MIT post-doc studying large-scale networks.*

2012–2013 Organizer of Provost-sponsored UPenn Interdisciplinary Seminar Series on multi-modality brain mapping: See brainomics link for full list of activities

Media Coverage

2016 Performed confirmatory analyses of the amyloid PET findings in the PRIME dataset and created Figure 1 and cover image associated with this publication.

2013 CNN article on collaboration with Martha Farah.

2012 Daily Mail UK article on SFN 2012 presentation

2012 Washington post article on SFN 2012 presentation

2012 PENN medicine press publicity for our MICCAI 2012 segmentation competition win: article

Professional Skills & Primary Software Contributions

Programming Languages	Software Engineering & Programming - C++, CMake, R, Julia, Python, Bash, Rst, LaTeX, Git, Gerrit, others as needed
ANTs since 2008	Advanced Normalization Tools: C++ software used broadly in both academia & industry for medical image analytics; **lead developer/designer.**
ANTsR since 2012	R statistical programming language extension of ANTs with novel imaging-specific extensions; ideal for teaching; **lead developer/designer.**
ANTsPy 2017	Python statistical programming language extension of ANTs with novel imaging-specific extensions; ideal for teaching; **new* with Nicholas Cullen.*
Neuro conductor since 2016	The neuroconductor platform provides new data science support that bridges novel medical imaging methods with the world's leading statistical platform; *founder and contributor.*
ITK since 2002	The Insight ToolKit - **lead designer** for registration framework for this seminal medical imaging analysis library.

Professional Memberships

2011–present	The Organization for Human Brain Mapping (OHBM)
2011–present	The International Society for Magnetic Resonance in Medicine (ISMRM)

Languages

English	Mothertongue
Spanish	Intermediate/Conversational

Brain mapping & data science tutorials

Aug 2017	"ANTs and ANTsR for clinical applications", two day tutorial, Seattle Children's/University of Washington, Seattle, WA, Aug 2017, *organized by Murat Maga.*
Aug 2016	"ANTs and ANTsR in biostatistics", two day tutorial at MD Anderson, Houston, TX, Aug 2016, *organized by Hongtu Zhu.*
Jul 2016	Park City Mathematics Institute, Data science domain expert invitee, Park City, Utah, *organized by Rafe Mazzeo, Stanford University.*
Jul 2015	"ANTs and ANTsR", one day tutorial at USC Center for Imaging Genetics, Los Angeles, June 2015, *organized by Neda Jahanshad.*
May 2015	"ANTs and ANTsR in machine learning", two day tutorial with Nick Tustison, McGill University and Montreal Neurological Institute, Montreal, CN, *organized by Tal Arbel.*
Sep 2013	"Multivariate Medical Imaging Analysis with R", MICCAI 2013, Nagoya, Japan.

Jul 2013 "ANTs & Eigenanatomy", Neuroimaging Training Program, UCLA, Los Angeles, CA.

Sep 2011 "ITKv4 Image Registration Tutorial", MICCAI 2011, Toronto, Canada.

Oct 2006 "Tutorial on Neuromorphometry", MICCAI 2006, Copenhagen, Denmark.

Lectures by Invitation

Jun 2017 Invited lecture on translational brain mapping in neurodegenerative disease, Yale University, New Haven CT

Mar 2017 Lecture of multiple modality analysis of Alzheimer's disease, Duke University, Durham, NC

Apr 2017 Platform presentation at ADPD 2017, Vienna, Austria

Jun 2015 "Large-scale, predictive analytics for M^3 pediatric neuroimaging", International Society for Magnetic Resonance in Medicine Meeting, Toronto, CN

May 2015 Invited to deliver ANTs introduction talk at University of California, San Diego. San Diego, CA

Nov 2014 "Functional Imaging Analysis with R", University of South Carolina

Aug 2014 "Big Image Registration", Frontiers in Human Brain Mapping Workshop, Princeton University

Apr 2014 "Eigenwords & Eigenanatomy for Decoding Neural Representations of Semantics", HRL, Malibu, CA

Feb 2014 "ANTs & Eigenanatomy for Integrative Brain Mapping ", University of Calgary, Calgary, Alberta

Mar 2013 "Multi-Modality Analysis", CMROI Workshop, University of Pennsylvania, Philadelphia, PA

May 2012 "Early Home Environment Impacts Cortical Thickness in Young Adulthood", Chinese Academy of Sciences, Beijing, China

Oct 2012 "A Unified Image Registration Framework for ITKv4", National Library of Medicine, Bethesda, MD

Jul 2012 "A Unified Registration Framework for ITKv4," WBIR 2012, Nashville, TN

Oct 2012 "Early Home Environment Impacts Cortical Thickness in Young Adulthood," Society for Neuroscience Press Conference, New Orleans, LA

May 2012 "Multivariate Methods for Integrating Multiple Modalities in Brain Mapping", Incheon National University, Incheon, South Korea

Jun 2012 "Eigenanatomy Methods for Multivariate Brain Mapping", University of California, San Francisco

Jan 2011 "Open Source Neonatal Brain Mapping," Washington University at St. Louis, St. Louis, MO

Nov 2011 "Multivariate analyses improve detection power for cortical longitudinal change in dementia", Society for Neuroscience Meeting, Washington D.C.

Dec 2011 "Modern analytics for neuroimaging," University of California, Los Angeles

Feb 2011	"Multivariate methods in neuroimaging", Washington Univ. at St. Louis
Sep 2010	"Open Source in Medical Imaging" Inst. of Automation, Chinese Academy of Sciences, Beijing, China
Jun 2010	“Open Source Image Registration”, National Library of Medicine, Bethesda, MD
Sep 2010	"Multivariate Longitudinal Correlation of Atrophy in White Matter and Gray Matter" MICCAI, Beijing, China
Jul 2010	"Advanced ITK-Based Image Registration,” NLM, Bethesda, MD
Sep 2010	“Sparse Unbiased Analysis of Anatomical Variance in Longitudinal Neuroimaging,” MICCAI 2010, Beijing China. (45 of 786 submissions accepted for oral presentation)
Jun 2009	“Grammatical comprehension and longitudinal adolescent brain development: a multivariate DTI and T1 analysis,” Human Brain Mapping 2009, San Francisco, CA
Jul 2009	“Democratizing Hippocampus Labeling,” Columbia University, NY, NY
Jul 2009	“Multivariate Analysis of the Adolescent Brain and its Association with Language Development,” Columbia University, NY, NY
Mar 2009	“Follow-Up on Effects of Prenatal Cocaine Exposure on the Young Adult Brain,” Eastern SPR, Philadelphia, PA
Jul 2009	“Multivariate Methods and Applications for Neuroimaging,” SRI, Menlo Park, CA
Jun 2008	“The Longitudinal Effect of Neurodegeneration of Language Network Neuroanatomy and Cognition,” Pendergrass Symposium, Univ. of Penn. Philadelphia, PA
Sep 2008	“Template-based Brain Mapping with Diffeomorphisms,” Janelia Farm, Ashburn, Virginia
Oct 2008	“Multivariate Template-based Retinotopic Mapping,” Stanford Vision Science Group, Stanford University, Palo Alto, CA
Apr 2007	“Symmetric Shape Averaging in the Diffeomorphic Space", International Symposium Biomedical Imaging, Washington DC
Oct 2007	“Spatiotemporal Normalization for Longitudinal Analysis of Gray Matter Atrophy in Frontotemporal Dementia,” MICCAI 2007, Brisbane, Australia
Apr 2006	“Geodesic shape averaging,” IEEE International Symposium on Biomedical Imaging 2006, Alexandria, VA
Nov 2007	“Mapping Statistical Patterns in Medical Images via Diffeomorphisms,” Univ. of Pennsylvania, CIS 520 lecture, Philadelphia, PA
Jul 2005	“Shape Optimizing Diffeomorphisms in Medical Imaging,” ISI, Utrecht, NL

Grants

10/2014-9/2019	The Imaging Genomics of Pediatric Executive Function, NIH, K01ES025432-01, (Avants, Brian, PI), $275,000/annual direct costs, 80% effort (Big data to knowledge (BD2K) research grant.)

08/01/15-05/31/18 Multimodal brain maturation indices modulating psychopathology and neurocognition, NIH, R01MH107235-01, (Avants, Brian, collaborator, Gur, Ruben, PI), $275,000/annual direct costs, 5% effort (via cost sharing with K01.)

9/2013-8/2018 Neuroscience Neuroimaging Center, NIH, P30-NS045839-07, (Detre, John, M.D., PI), $499,727/annual direct costs, 10% effort (Role in grant: Collaborator, To provide support for technical aspects of neuroimaging using MRI.)

2014 IARPA-sponsored Knowledge Representation in Neural Systems (KRNS), IARPA-BAA-12-05, 50% effort (Role in grant: Image Analysis Lead)

9/2012-7/2013 Age, Hearing Loss, And Sentence Comprehension: Neural Correlates, National Institute On Aging/Nih/Dhhs, 5-R01-AG-038490-05, (Murray Grossman, PI), $291,978/annual direct costs (Role in grant: Co-PI)

9/2011-8/2015 Continued Development and Maintenance of ITK-SNAP 3D Image Segmentation Software, NIH, R01-EB014346-01, (Yushkevich, Paul A., Ph.D., PI), $350,824/annual direct costs (Role in grant: Collaborator)

9/2010-8/2015 TDP-43 Proteinopathies in ALS-Dementia, NIH, P01-AG032953-02, (Lee, Virginia/Grossman, Murray, PI), $729,272/annual direct costs (Role in grant: Collaborator)

6/2010-6/2013 Fundamental Refactoring Of Deformable Image Registration In Itk With Distributed Computing And Gpu Acceleration, National Library Of Medicine, HHSN276201000492P, (JAMES C GEE, PI), $472,861/annual direct costs (Role in grant: Co-PI)

8/2007-4/2013 In Utero Cocaine Exposure: Adolescent & Young Adult Neurocognitive Outcome, Children's Hospital of Philadelphia, R01-DA14129-08, (Gee, James C., Ph.D., PI), $102,515/annual direct costs (Role in grant: Collaborator, To explore the effects of gestational cocaine exposure on neurocognitive outcome of adolescents and young adults)

2/2011-1/2012 Longitudinal Multi-model Neuroimaging of Natural Recovery after Traumatic Brain Injury: A Pilot Study, Moss Rehab Research Institute/NIH, (**Avants**, Brian Ph.D., PI), $7,764/annual direct costs (Role in grant: PI)

6/2010-5/2012 Parkinsons Disease & Dementia, NIH, P50-NS053488-04S1, (Trojanowski/Grossman, PI), $132,641/annual direct costs (Role in grant: Collaborator)

9/2009-5/2010 Pediatric Template Of Brain Perfusion, National Institute Of Mental Health/Nih/Dhhs, 3-R01-MH-080892-01A2S1, (JiongJiong Wang, PI) $0/annual direct costs, (Role in grant: Co-PI)

9/2009-8/2012 Tract-Specific Analysis of Brain White Matter, NIH, R01-NS065347-02, (Gee, James C., Ph.D., PI), $370,667/annual direct costs, (Role in grant: Collaborator)

9/2008-9/2011 Advanced Neuroimages Registration Methods: Effects of Prenatal Cocaine Exposure, NIH, (James C. Gee, PI: Brian **Avants**, Co-Investigator), $354,375/annual direct costs, (Role in grant: Co-PI)

6/2008-1/2011 The Longitudinal Effect of Neurodegeneration onLanguage-Network Neuroanatomy and Cognition, University of Pennsylvania, Institute of Aging, (James C. Gee, PI: Brian **Avants**, Co-Investigator), (Role in grant: Co-PI)

4/2007-1/2011	Long Term Effects of Prenatal Cocaine Exposure, NIH, (Hallam Hurt, PI), (Role in grant: Research Scientist)
4/2006-3/2010	Shape Optimizing Diffeomorphisms for Computational Biology, NIH - UCLA Center for Computational Biology, R01-EB006266, (James C. Gee, PI) (Role in grant: Research Scientist)
8/2004-6/2009	Surface-based Cortical Analysis in ITK: Segmentation, Conformal Flattening and Statistics, NLM-NIH ITK Development Grant, (James C. Gee, PI, Role in grant: Co-PI, Open source development)
9/2002-6/2010	Bioengineering Training in Cardiovascular Pathophysiology, Institute for Medicine and Engineering Training Grant, University of Pennsylvania, Philadelphia, PA, (Peter Davies, PI), (Role in grant: Trainee)

Articles Under Review/Development

1. *Amyloid-β positive subjects exhibit network-specific longitudinal reductions in spontaneous brain activity*, first author, (submitted)
2. *A reproducible analysis pipeline for population studies of ASL-based cerebral blood flow*, last author, (in process)
3. *Environmental influences on early childhood hippocampal growth*, with Martha Farah and Hallam Hurt, (in process)
4. *Joint Fusion for optimal template creation*, with Nicholas J Tustison, (in process)
5. *The ANTs longitudinal cortical thickness pipeline*, with Nicholas J Tustison, (submitted)

Journal Publications

1. See these links for latest papers: Google scholar search and Pubmed search
2. Muschelli, J.; Fortin, J. P.; Gherman, A; **Avants** B. B.; Whitcher, B.; Caffo B. & Crainiceanu C. (2017), *Neuroconductor: An R platform for Neuroimaging*, Biostatistics (under review)
3. Pustina, D.; Coslett, H. B.; Ungar, L.; Faseyitan, O. K.; Medaglia, J. D.; **Avants**, B. B.; Schwartz, M. F., (2017), *Enhanced estimations of post-stroke aphasia severity using stacked multimodal predictions*, Human Brain Mapping.
4. Tustison, N. J.; Holbrook, A. J.; **Avants**, B. B.; Roberts, J. M.; Cook, P. A.; Reagh, Z. M.; Stone, J. R.; Gillen, D. L.; Yassa, M. A., (2017), *The ANTs Longitudinal Cortical Thickness Pipeline*, bioRxiv.
5. Pustina, D.; **Avants**, B. B.; Faseyitan, O.; Medaglia, J.; Coslett, H. B., (2017), *Improved accuracy of lesion to symptom mapping with multivariate sparse canonical correlations*, Neuropsychologia. (in press)
6. Maga, M. A.; Tustison, N. J.; **Avants**, B. B. (2017), *A population level atlas of Mus musculus craniofacial skeleton and automated image-based shape analysis*, Journal of Anatomy.
7. Gennatas, E. D.; **Avants**, B. B.; Wolf, D. H.; Satterthwaite, T. D.; Ruparel, K.; Ciric, R.; Hakonarson, H.; Gur, R. E.; Gur, R. C., (2017), *Age-related effects and sex differences in gray matter density, volume, mass, and cortical thickness from childhood to young adulthood*, Journal of Neuroscience.
8. Xie, L.; Pluta, J. B.; Das, S. R.; Wisse, L. E. M.; Wang, H.; Mancuso, L.; Kliot, D.; **Avants**, B. B.; Ding, S.; Manjón, J. V.; Yushkevich, P., (2017), *Multi-template analysis of human perirhinal cortex in brain MRI: Explicitly accounting for anatomical variability*, Neuroimage.

9. Olm, C. A.; Kandel, B. M.; **Avants**, B. B.; Detre, J. A.; Gee, J. C.; Grossman, M.; McMillan, C. T., (2016), *Arterial spin labeling perfusion predicts longitudinal decline in semantic variant primary progressive aphasia*, Journal of Neurology.
10. Kandel, B. M.; **Avants**, B. B.; Gee, J. C.; McMillan, C. T.; Erus, G.; Doshi, J.; Davatzikos, C.; Wolk, D. A., (2016), *White matter hyperintensities are more highly associated with preclinical Alzheimer's disease than imaging and cognitive markers of neurodegeneration*, Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring.
11. Legant, W. R.; Shao, L.; Grimm, J. B.; Brown, T. A.; Milkie, D. E.; **Avants**, B. B.; Lavis, L. D.; Betzig, E., (2016), *High-density three-dimensional localization microscopy across large volumes*, Nature methods.
12. Pustina, D.; Coslett, H; Turkeltaub, P. E.; Tustison, N. J.; Schwartz, M. F.; Avants, B. B., (2016), *Automated segmentation of chronic stroke lesions using LINDA: lesion identification with neighborhood data analysis*, Human Brain Mapping.
13. Betancourt, L.; **Avants**, B. B.; Farah, M. J.; Brodsky, N. L.; Wu, Jue; Ashtari, M.; & Hurt, H., (2016), *Effect of socioeconomic status (SES) disparity on neural development in female African-American infants at age 1 month*, Developmental Science.
14. **Avants**, B. B.; Hackman, D.; Betancourt, L.; Lawson, G. M.; Hurt, H.; Farah, M.J (2016), *Relation of Childhood Home Environment to Cortical Thickness in Late Adolescence: Specificity of Experience and Timing*, PLOS One.
15. **Avants**, B. B.; Johnson, H. J.; Tustison, N. J., (2015), *Neuroinformatics and the The Insight ToolKit*, Frontiers in neuroinformatics 9.
16. Pustina, D.; **Avants**, B. B.; Sperling, M.; Gorniak, R.; He, X.; Doucet, G.; Barnett, P.; Mintzer, S.; Sharan, A. & Tracy, J. (2015), *Predicting the laterality of temporal lobe epilepsy from PET, MRI, and DTI: A multimodal study*, Neuroimage Clin, 9, 20–31.
17. **Avants**, B. B.; Duda, J. T.; Kilroy, E.; Krasileva, K.; Jann, K.; Kandel, B. T.; Tustison, N. J.; Yan, L.; Jog, M.; Smith, R.; Wang, Y.; Dapretto, M. & Wang, D. J. J. (2015), *The pediatric template of brain perfusion*, Sci Data 2, 150003.
18. Wu, J.; Awate, S. P.; Licht, D. J.; Clouchoux, C.; du Plessis, A. J.; **Avants**, B. B.; Vossough, A.; Gee, J. C. & Limperopoulos, C. (2015), *Assessment of MRI-Based Automated Fetal Cerebral Cortical Folding Measures in Prediction of Gestational Age in the Third Trimester*, AJNR Am J Neuroradiol 36(7), 1369–1374.
19. Isgum, I.; Benders, M. J. N. L.; **Avants**, B.; Cardoso, M. J.; Counsell, S. J.; Gomez, E. F.; Gui, L.; HÅšppi, P. S.; Kersbergen, K. J.; Makropoulos, A.; Melbourne, A.; Moeskops, P.; Mol, C. P.; Kuklisova-Murgasova, M.; Rueckert, D.; Schnabel, J. A.; Srhoj-Egekher, V.; Wu, J.; Wang, S.; de Vries, L. S. & Viergever, M. A. (2015), *Evaluation of automatic neonatal brain segmentation algorithms: The NeoBrainS12 challenge*, Med Image Anal 20(1), 135–151.
20. Kandel, B. M.; Wang, D. J. J.; Detre, J. A.; Gee, J. C. & **Avants**, B. B. (2015), *Decomposing cerebral blood flow MRI into functional and structural components: a non-local approach based on prediction*, Neuroimage 105, 156–170.
21. Kandel, B. M.; **Avants**, B. B.; Gee, J. C.; Arnold, S. E. & Wolk, D. A. (2015), *Neuropsychological Testing Predicts Cerebrospinal Fluid Amyloid-β in Mild Cognitive Impairment*, J Alzheimers Dis 46(4), 901–912.
22. Kandel, B. M.; Wang, D. J. J.; Gee, J. C. & **Avants**, B. B. (2015), *Eigenanatomy: sparse dimensionality reduction for multi-modal medical image analysis*, Methods 73, 43–53.
23. Adler, D. H.; Pluta, J.; Kadivar, S.; Craige, C.; Gee, J. C.; **Avants**, B. B. & Yushkevich, P. A. (2014), *Histology-derived volumetric annotation of the human hippocampal subfields in*

postmortem MRI, Neuroimage 84, 505–523.
24. **Avants**, B. B.; Tustison, N. J.; Stauffer, M.; Song, G.; Wu, B. & Gee, J. C. (2014), *The Insight ToolKit image registration framework*, Front Neuroinform 8, 44.
25. **Avants**, B. B.; Libon, D. J.; Rascovsky, K.; Boller, A.; McMillan, C. T.; Massimo, L.; Coslett, H. B.; Chatterjee, A.; Gross, R. G. & Grossman, M. (2014), *Sparse canonical correlation analysis relates network-level atrophy to multivariate cognitive measures in a neurodegenerative population*, Neuroimage 84, 698–711.
26. Cook, P. A.; McMillan, C. T.; **Avants**, B. B.; Peelle, J. E.; Gee, J. C. & Grossman, M. (2014), *Relating brain anatomy and cognitive ability using a multivariate multimodal framework*, Neuroimage 99, 477–486.
27. Dhillon, P. S.; Wolk, D. A.; Das, S. R.; Ungar, L. H.; Gee, J. C. & **Avants**, B. B. (2014), *Subject-specific functional parcellation via Prior Based Eigenanatomy*, Neuroimage 99, 14–27.
28. McMillan, C. T.; **Avants**, B. B.; Cook, P.; Ungar, L.; Trojanowski, J. Q. & Grossman, M. (2014), *The power of neuroimaging biomarkers for screening frontotemporal dementia*, Hum. Brain Mapp. 35(9), 4827–4840.
29. McMillan, C. T.; Toledo, J. B.; **Avants**, B. B.; Cook, P. A.; Wood, E. M.; Suh, E.; Irwin, D. J.; Powers, J.; Olm, C.; Elman, L.; McCluskey, L.; Schellenberg, G. D.; Lee, V. M.-Y.; Trojanowski, J. Q.; Van Deerlin, V. M. & Grossman, M. (2014), *Genetic and neuroanatomic associations in sporadic frontotemporal lobar degeneration*, Neurobiol. Aging 35(6), 1473–1482.
30. Tustison, N. J.; Cook, P. A.; Klein, A.; Song, G.; Das, S. R.; Duda, J. T.; Kandel, B. M.; van Strien, N.; Stone, J. R.; Gee, J. C. & **Avants**, B. B. (2014), *Large-scale evaluation of ANTs and FreeSurfer cortical thickness measurements*, Neuroimage 99, 166–179.
31. Hopkins, W. D. & **Avants**, B. B. (2013), *Regional and Hemispheric Variation in Cortical Thickness in Chimpanzees (Pan troglodytes)*, J. Neurosci. 33(12), 5241–5248.
32. Kim, J.; **Avants**, B.; Whyte, J. & Gee, J. C. (2013), *Methodological considerations in longitudinal morphometry of traumatic brain injury*, Front Hum Neurosci 7, 52.
33. Lawson, G. M.; Duda, J. T.; **Avants**, B. B.; Wu, J. & Farah, M. J. (2013), *Associations between children's socioeconomic status and prefrontal cortical thickness*, Dev Sci 16(5), 641–652.
34. McMillan, C. T.; **Avants**, B.; Irwin, D. J.; Toledo, J. B.; Wolk, D. A.; Van Deerlin, V. M.; Shaw, L. M.; Trojanoswki, J. Q. & Grossman, M. (2013), *Can MRI screen for CSF biomarkers in neurodegenerative disease?*, Neurology 80(2), 132–138.
35. McMillan, C. T.; Irwin, D. J.; **Avants**, B. B.; Powers, J.; Cook, P. A.; Toledo, J. B.; McCarty Wood, E.; Van Deerlin, V. M.; Lee, V. M.-Y.; Trojanowski, J. Q. & Grossman, M. (2013), *White matter imaging helps dissociate tau from TDP-43 in frontotemporal lobar degeneration*, J. Neurol. Neurosurg. Psychiatry.
36. Tustison, N. J. & **Avants**, B. B. (2013), *Explicit B-spline regularization in diffeomorphic image registration*, Front Neuroinform 7, 39.
37. Tustison, N. J.; Johnson, H. J.; Rohlfing, T.; Klein, A.; Ghosh, S. S.; Ibanez, L. & **Avants**, B. B. (2013), *Instrumentation bias in the use and evaluation of scientific software: recommendations for reproducible practices in the computational sciences*, Front Neurosci 7, 162.
38. Weber, M. J.; Detre, J. A.; Thompson-Schill, S. L. & **Avants**, B. B. (2013), *Reproducibility of functional network metrics and network structure: a comparison of task-related BOLD, resting ASL with BOLD contrast, and resting cerebral blood flow*, Cogn. Affect. Behav. Neurosci. 13(3), 627–640.

39. Badea, A.; Gewalt, S.; **Avants**, B. B.; Cook, J. J. & Johnson, G. A. (2012), *Quantitative mouse brain phenotyping based on single and multispectral MR protocols*, Neuroimage 63(3), 1633–1645.
40. Cook, P. A.; **Avants**, B. B.; McMillan, C. T.; Powers, J.; Gee, J. C. & Grossman, M. (2012), *Multimodal neuroimaging reveals gray and white matter associations with verbal fluency in frontotemporal degeneration*, Dement. Geriatr. Cogn. Disord. 33(1), 154–155.
41. Das, S. R.; **Avants**, B. B.; Pluta, J.; Wang, H.; Suh, J. W.; Weiner, M. W.; Mueller, S. G. & Yushkevich, P. A. (2012), *Measuring longitudinal change in the hippocampal formation from in vivo high-resolution T2-weighted MRI*, Neuroimage 60(2), 1266–1279.
42. Datta, R.; Lee, J.; Duda, J.; **Avants**, B. B.; Vite, C. H.; Tseng, B.; Gee, J. C.; Aguirre, G. D. & Aguirre, G. K. (2012), *A Digital Atlas of the Dog Brain*, PLOS ONE 7(12).
43. Ghosh, S. S.; Klein, A.; **Avants**, B. & Millman, K. J. (2012), *Learning from open source software projects to improve scientific review*, Front Comput Neurosci 6, 18.
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Selected Conference Publications

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