

# Brian Avants

*Brain mapping: theory & methods*

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## Current Position

- 2018–present Visiting Associate Professor of Radiology and Medical Imaging, University of Virginia, Charlottesville, VA
- 2018–present Founder and Director, Cingulate, LLC, Hampton, NH
- 2018–present Senior Director of Machine Learning, Invicro, Boston, MA

## 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

- 2016–2018 Associate Director, Imaging Analytics, Biomarkers Group, 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

- 2016–2017 Collaboration with Dr. Howie Rosen, UCSF Neurology, in multiple modality and longitudinal analysis.

- 2013–2017 Collaboration with Dr. Yvette Sheline, UPenn Center for Neuromodulation in Depression and Stress (CNDS), in multiple modality and longitudinal analysis.
- 2006–2018 Collaboration with Dr. Martha Farah (UPenn) and Dr. Hallam Hurt (CHOP), understanding the effects of stress and poverty on brain development.
- 2006–2018 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 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 amyloid PET analysis in the PRIME dataset and created Figure 1 and cover image associated with [this Nature 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; <b>lead developer/designer</b> .
ANTsR since 2012	R statistical programming language extension of ANTs with novel imaging-specific extensions; ideal for teaching; <b>lead developer/designer</b> .
ANTsPy 2017	Python statistical programming language extension of ANTs with novel imaging-specific extensions; ideal for teaching; <i>*new* with Nicholas Cullen</i> .
Neuroconductor since 2016	The neuroconductor platform provides new data science support that bridges novel medical imaging methods with the world's leading statistical platform; <i>founder and contributor</i> .
ITK since 2002	The Insight ToolKit - <b>lead designer</b> 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

Jun 2018	"ANTsX for decoding and resting state fMRI studies", talk and tutorial, Dartmouth College, Hanover, NH <i>at Haxby Lab</i> .
Aug 2017	"ANTs and ANTsR for clinical applications", two day tutorial, Seattle Children's/University of Washington, Seattle, WA, Aug 2017, <i>organized by Murat Maga</i> .
Aug 2016	"ANTs and ANTsR in biostatistics", two day tutorial at MD Anderson, Houston, TX, Aug 2016, <i>organized by Hongtu Zhu</i> .
Jul 2016	Park City Mathematics Institute, Data science domain expert invitee, Park City, Utah, <i>organized by Rafe Mazzeo, Stanford University</i> .
Jul 2015	"ANTs and ANTsR", one day tutorial at USC Center for Imaging Genetics, Los Angeles, June 2015, <i>organized by Neda Jahanshad</i> .
May 2015	"ANTs and ANTsR in machine learning", two day tutorial with Nick Tustison, McGill University and Montreal Neurological Institute, Montreal, CN, <i>organized by Tal Arbel</i> .

- 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<sup>3</sup> 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- The Imaging Genomics of Pediatric Executive Function, NIH, K01ES025432-
- 9/2019 01, (Avants, Brian, PI), \$275,000/annual direct costs, 80% effort (Big data to knowledge (BD2K) research grant.)

- 08/01/15- 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.)
- 05/31/18
- 9/2013- 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.)
- 8/2018
- 2014 IARPA-sponsored Knowledge Representation in Neural Systems (KRNS), IARPA-BAA-12-05, 50% effort (Role in grant: Image Analysis Lead)
- 9/2012- 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)
- 7/2013
- 9/2011- 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)
- 8/2015
- 9/2010- TDP-43 Proteinopathies in ALS-Dementia, NIH, P01-AG032953-02, (Lee, Virginia/Grossman, Murray, PI), \$729,272/annual direct costs (Role in grant: Collaborator)
- 8/2015
- 6/2010- 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)
- 6/2013
- 8/2007- 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)
- 4/2013
- 2/2011- 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)
- 1/2012
- 6/2010- Parkinsons Disease & Dementia, NIH, P50-NS053488-04S1, (Trojanowski/Grossman, PI), \$132,641/annual direct costs (Role in grant: Collaborator)
- 5/2012
- 9/2009- 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)
- 5/2010
- 9/2009- 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)
- 8/2012
- 9/2008- 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)
- 9/2011
- 6/2008- 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)
- 1/2011



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

## Articles Under Review/Development

1. **Avants**, B. B.; Tustison, N. J.; Stone, J. R. (2018), *Software for learning multi-view brain embeddings and application to imaging genetics of depression*, Frontiers in Neuroinformatics (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. **Avants**, B.B.; Hutchison, R.M.; Mikulskis, A.; Salinas-Valenzuela, C.; Hargreaves, R.; Beaver, J.; Chiao, P. and Alzheimer's Disease Neuroimaging Initiative, (2018). Amyloid beta-positive subjects exhibit longitudinal network-specific reductions in spontaneous brain activity. *Neurobiology of aging*.
3. Chiao, P.; Bedell, B.J.; **Avants**, B. B.; Zijdenbos, A.P.; Grand'Maison, M.; O'Neill, P.; O'Gorman, J.; Chen, T.; Koeppe, R. (2018), *Impact of Reference/Target Region Selection on Amyloid PET Standard Uptake Value Ratios in the Phase 1b PRIME Study of Aducanumab*, *J Nucl Med*.
4. Muschelli, J.; Fortin, J. P.; Gherman, A.; **Avants** B. B.; Whitcher, B.; Caffo B. & Crainiceanu C. (2018), *Neuroconductor: An R platform for Neuroimaging*, *Biostatistics*.
5. Pustina, D.; **Avants**, B. B.; Faseyitan, O.; Medaglia, J.; Coslett, H. B., (2018), *Improved accuracy of lesion to symptom mapping with multivariate sparse canonical correlations*, *Neuropsychologia*.
6. 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*.
7. 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*.



8. 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.
9. 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.
10. Xie, L.; Pluta, J. B.; Das, S. R.; Wisse, L. E. M.; Wang, H.; Mancuso, L.; Klot, 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.
11. 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.
12. 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.
13. 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.
14. 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.
15. Betancourt, L.; **Avants**, B. B.; Farah, M. J.; Brodsky, N. L.; Wu, J.; 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.
16. **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.
17. **Avants**, B. B.; Johnson, H. J.; Tustison, N. J., (2015), *Neuroinformatics and the The Insight ToolKit*, Frontiers in neuroinformatics 9.
18. 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.
19. **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.
20. 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.
21. Isgum, I.; Benders, M. J. N. L.; **Avants**, B.; Cardoso, M. J.; Counsell, S. J.; Gomez, E. F.; Gui, L.; Håspä, 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.
22. 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.
23. Kandel, B. M.; **Avants**, B. B.; Gee, J. C.; Arnold, S. E. & Wolk, D. A. (2015), *Neuropsychological Testing Predicts Cerebrospinal Fluid Amyloid- $\beta$  in Mild Cognitive Impairment*, *J Alzheimers Dis* 46(4), 901–912.
  24. 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.
  25. 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.
  26. **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.
  27. **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.
  28. 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.
  29. 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.
  30. 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.
  31. 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.
  32. 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.
  33. Hopkins, W. D. & **Avants**, B. B. (2013), *Regional and Hemispheric Variation in Cortical Thickness in Chimpanzees (*Pan troglodytes*)*, *J. Neurosci.* 33(12), 5241–5248.
  34. Kim, J.; **Avants**, B.; Whyte, J. & Gee, J. C. (2013), *Methodological considerations in longitudinal morphometry of traumatic brain injury*, *Front Hum Neurosci* 7, 52.
  35. 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.
  36. McMillan, C. T.; **Avants**, B.; Irwin, D. J.; Toledo, J. B.; Wolk, D. A.; Van Deerlin, V. M.; Shaw, L. M.; Trojanowski, J. Q. & Grossman, M. (2013), *Can MRI screen for CSF biomarkers in neurodegenerative disease?*, *Neurology* 80(2), 132–138.
  37. 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*.

38. Tustison, N. J. & **Avants**, B. B. (2013), *Explicit B-spline regularization in diffeomorphic image registration*, Front Neuroinform 7, 39.
39. 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.
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## Selected Conference Publications

1. Hutchison, R. M.; Chiao, P. & **Avants**, B. B.; 'Decomposing the interdependence of brain anatomy, connectivity, and perfusion' (2017), Annual Meeting of the Organization for Human Brain Mapping, Vancouver, Canada, June 25 - 29.
2. Pustina, D; Coslett, B.; Schwartz, M. F.; & **Avants**, B. B.; 'A supervised framework for lesion segmentation and automated VLSM analyses in left hemispheric stroke' (2015), Academy of Aphasia 53rd Annual Meeting, Tucson, USA, 18 Oct - 20 Oct.
3. Kandel, B. M.; Wang, D. J. J.; Gee, J. C. & **Avants**, B. B. (2014), *Single-subject structural networks with closed-form rotation invariant matching improve power in developmental studies of the cortex*, Med Image Comput Comput Assist Interv 17(Pt 3), 137–144.
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5. Duda, J. T., Detre, J. A., Kim, J., Gee, J. C. and **Avants**, B. B. 'Fusing functional signals by

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6. P. Dhillon, B. M. Kandel, D. Wolk, J. C. Gee & B. **Avants**, "Prior-based Eigenanatomy for Classification of Autism Spectrum Disorder", *PRNI*, (2013)
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