BRIAN BEAUMONT AVANTS, Ph.D.

AI & Machine Learning Executive · Computational Anatomy Pioneer · Founder, Cingulate LLC

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Google Scholar: **57,500+ Citations** · **h-index: 71** · **i10-index: 166** PubMed Author Profile

EXECUTIVE & SCIENTIFIC SUMMARY: Entrepreneurial AI/ML executive, principal data scientist, and computational imaging leader with over two decades of impact spanning academic medicine, pharmaceutical drug development, clinical trial CROs, and open-source software engineering. Co-creator and lead architect of the **ANTsX ecosystem** (`ANTs`, `ANTsPy`, `ANTsR`, `ANTsPyNet`, `ANTsPyMM`), the international standard for diffeomorphic medical image registration (`SyN`), morphometry, and deep learning phenotyping (**57,500+ citations, h-index 71**). Author of four papers each cited more than 6,000 times (`SyN`, `N4ITK`, BRATS, and the ANTs registration evaluation). Proven executive track record founding **Cingulate LLC**, directing global Machine Learning teams at **Invicro**, and leading translational imaging biomarker strategy for the landmark *Aducanumab/Aduhelm* program at **Biogen**.

57,500+ Citations	**h-index: 71 / i10: 166**	**6x #1 Global Benchmarks**	**Pharma & Venture AI Lead**
Foundational imaging & ML methods	180+ peer-reviewed publications	Klein, EMPIRE10, BRATS, SATA	Cingulate, Invicro, Biogen, UVA, UPenn

ENTREPRENEURIAL, EXECUTIVE & ACADEMIC APPOINTMENTS

Founder & Principal Consultant — 2018 – Present
Cingulate LLC — Portsmouth, NH

- Founder and managing principal of an independent AI, machine learning, and computational neuroimaging consultancy serving biotechnology, pharmaceutical, defense (DoD/CDMRP), and academic research organizations.
- Architect of novel interpretable representation learning and matrix optimization tools, including **NSA-Flow** (*Non-Negative Stiefel Approximating Flow*, PyTorch) and **SiMLR** (*Similarity-driven Multi-view Linear Reconstruction*, *Nature Computational Science* 2021).
- Lead multi-modal neuroimaging phenotyping, longitudinal subtyping, and normative database engineering for large-scale studies including the **UK Biobank**, **Parkinson's Progression Markers Initiative (PPMI)**, and **LIMBIC-CENC**.

Visiting Associate Professor of Radiology and Medical Imaging — 2018 – Present
University of Virginia School of Medicine — Charlottesville, VA

- Co-lead multi-view machine learning and quantitative neuroimaging investigations of repetitive low-level blast exposure and traumatic brain injury (TBI) in military Special Operations personnel and breachers (*Journal of Neurotrauma* 2020, 2022, 2024).
- Co-architect of the **Normative Neuroimaging Library** (*J. Neurotrauma* 2024) and **Deep Computational Anatomy via Latent-Aligned Multiview Normalizing Flows** (2026).

Senior Director of Machine Learning — 2018 – 2024
Invicro (a Konica Minolta Company) — Boston, MA

- Directed the enterprise Machine Learning group for a premier global imaging CRO, leading clinical trial software development and integrative AI analytics across neurodegenerative, oncology, cardiopulmonary, and multi-species drug development programs.
- Designed and deployed **ANTsPyMM**, automated deep learning quality control, 3D concurrent super-resolution, and multi-modal patient representation learning pipelines (*ICLR* 2023, *Patterns* 2023, *European Journal of Human Genetics* 2024).

Visiting Scholar, Institute for Computational and Experimental Research in Mathematics (ICERM) — Spring 2020
Brown University — Providence, RI

- Invited visiting scientist for the semester program *"Model and Dimension Reduction in Uncertain and Dynamic Systems"*; developed mathematical foundations for integrative multi-view machine learning (`SiMLR`).

Associate Director, Translational & Advanced Analytics (Imaging Biomarkers) — 2016 – 2018
Biogen — Cambridge, MA

- Lead integrative imaging data scientist for the **Aducanumab (Aduhelm)** clinical trial program (Phase 1b PRIME and Phase 3 ENGAGE/EMERGE); performed confirmatory amyloid PET SUVR analyses and created Figure 1 and the cover visualization for the landmark **2016 *Nature* publication**.
- Led longitudinal network-specific rs-fMRI biomarker discovery in amyloid-positive cohorts (*Neurobiology of Aging* 2018) and initiated **ANTsPy** development for deep learning in neuroimaging.

Assistant Professor of Radiology — 2012 – 2016
University of Pennsylvania Perelman School of Medicine (PICSL) — Philadelphia, PA

- Directed computational neuroimaging, multi-modal MRI/DTI/PET/ASL methodology, and big-data imaging genetics projects; served as Principal Investigator on NIH BD2K K01 Career Development Award and Image Analysis Lead for IARPA KRNS.

Research Associate (2008–2012) · Postdoctoral Research Fellow (2006–2008) — 2006 – 2012
University of Pennsylvania, Department of Radiology — Philadelphia, PA

- Developed foundational methods for **Symmetric Diffeomorphic Image Registration (`SyN`)**, **N4ITK** bias correction, **Atropos** multivariate segmentation, **DiReCT** cortical thickness, and **Sparse Canonical Correlation Analysis (`SCCAN`)**.

Algorithm Developer, Imaging Department — **1999 – 2000**

Siemens Corporate Research — Princeton, NJ

- Developed adaptive minimal-path vessel tracking and 3D segmentation algorithms in CTA/CE-MRA volumetric imaging.

EDUCATION & POSTDOCTORAL TRAINING

2006 – 2008 — **Postdoctoral Fellowship in Radiology**, University of Pennsylvania, Philadelphia, PA.

2005 — **Ph.D. in Bioengineering**, University of Pennsylvania, Philadelphia, PA. Dissertation: *Diffeomorphometry for Computational Anatomy*. NIH Institute for Medicine and Engineering Trainee (2002).

2002 / 2003 — **M.S. in Computer Science**, University of Pennsylvania, Philadelphia, PA.

1998 — **B.A. in Physics and Literature**, New College of Florida, Sarasota, FL (*With High Honors*; National Merit Scholar).

RESEARCH DOMAINS & TECHNICAL EXPERTISE

Deep Learning & AI — High-dimensional multi-output regression, 3D segmentation, concurrent super-resolution, longitudinal manifold embedding (Aligned-UMAP), Stiefel manifold flow (`NSA-Flow`), normalizing flows, multi-modal prediction with missing modalities, and interpretable neural architectures.

Brain Mapping — Brain structure, function, perfusion, neuroinflammation, and cognition across development, aging, neurotrauma, and neurodegeneration; multi-view modality integration (`SiMLR`, `SCCAN`); disease subtyping and staging (`subtyper`); reproducible biobank-scale phenotyping.

Tech Stack — C++, Python, PyTorch, TensorFlow/Keras, R, Julia, CMake, ITK, Bash, Git, LaTeX, Docker/Singularity, AWS/HPC cloud architectures.

FLAGSHIP SOFTWARE CONTRIBUTIONS & OPEN-SOURCE ECOSYSTEM

Ecosystem reach (Nov 2026): ANTsX GitHub organization: 13 repositories, 2,900+ stars, 700+ forks; `ANTsPy` 30,000+ PyPI downloads per month; `ANTs`/`SyN` is a core dependency of fMRIPrep, QSIPrep, Nipype, Clinica, and TemplateFlow.

ANTs (2008–) — Advanced Normalization Tools (github.com/ANTsX/ANTs): C++ library used globally across academia and industry for medical image registration (`SyN`), segmentation (`Atropos`), and cortical thickness; **Creator & Lead Architect**.

ANTsPy & ANTsPyNet — Python interface and deep learning library (ANTsPy, ANTsPyNet) providing pre-trained 2D/3D networks for brain extraction, Deep Atropos, HippMapp3r, brain age, lesion segmentation, and super-resolution; **Co-Creator & Architect**.

ANTsPyMM (2021–) — Multi-modal neuroimaging processing and automated QC framework (ANTsX/ANTsPyMM) converting structural T1w, FLAIR, rs-fMRI, DTI, and neuromelanin MRI into standardized Image Derived Phenotypes (IDPs); **Lead Architect**.

ANTsR (2012–) — R statistical programming extension of ANTs (ANTsX/ANTsR) featuring `Eigenanatomy`, `SCCAN`, and `SiMLR`; **Creator & Lead Designer**.

NSA-Flow (2025–) — PyTorch package (stnava/nsa_flow) implementing Non-Negative Stiefel Approximating Flow for orthogonalish, sparse, interpretable matrix factorization and representation learning; **Creator**.

syntx, pysimlr & curvanato (2025–) — Next-generation ANTsX tooling in Python: `syntx` (symmetric normalization transformations; stnava/syntx), `pysimlr` (similarity-driven linear and nonlinear multi-view reconstruction; stnava/pysimlr), and `curvanato` (local curvature quantification for anatomical data; stnava/curvanato); **Creator**.

subtyper (2023–) — Disease subtyping, staging, and latent space evaluation toolkit (stnava/subtyper); **Creator**.

ITKv4 (2002–) — The Insight ToolKit (itk.org): **Lead Designer** for the v4 deformable image registration framework.

Neuroconductor — R platform for reproducible neuroimaging data science (neuroconductor.org); **Co-Founder & Contributor**.

AWARDS, INTERNATIONAL BENCHMARKS & HONORS

2014 — **Best Paper Award** (with Nicholas J. Tustison) at the STACOM 2014 Challenge, MICCAI.

2013 — **1st Place, BRATS 2013 Brain Tumor Segmentation Challenge**, MICCAI, Nagoya, Japan (`ANTsR`, with N. Tustison).

2013 — **1st Place, SATA Segmentation Challenge**, MICCAI, Nagoya, Japan (`ANTs`, with N. Tustison).

2012–2013 — **"Standard Setting" Image Registration Software** selected for the MICCAI 2013 Multi-Atlas Segmentation Challenge (4D cardiac, brain, and multimodality canine leg MR images); all top finishers in MICCAI 2012 multi-atlas segmentation used `ANTs`.

2010	**1st Overall** in the unbiased **EMPIRE10** International Thoracic CT Lung Registration Challenge (*IEEE TMI* 2011).
2009	**1st Rank** in the unbiased **Klein 2009** International Brain MRI Registration Evaluation of 14 nonlinear algorithms (*NeuroImage* 2009).
2007	**Young Investigator Award**, General Medical Computing, MICCAI, Brisbane, Australia.
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.

GRANTS, SPONSORED RESEARCH & CONSORTIUM LEADERSHIP

2018 – Present	**DoD** / **CDMRP** / **LIMBIC-CENC Neurotrauma & Blast Overpressure Research Programs** (with James R. Stone, M.D., Ph.D. & Nicholas J. Tustison, D.Sc., University of Virginia): Multi-view neuroimaging biomarkers (`SiMLR`, `NSA-Flow`), TSPO PET neuroinflammation, and Normative Neuroimaging Library development in Special Operations personnel and combat breachers (Role: **Co-Investigator** / **Lead ML Consultant**).
2018 – 2024	**Parkinson's Progression Markers Initiative (PPMI) & Multimodal Neurodegeneration Consortia** (Invicro / Michael J. Fox Foundation / NIH CARD Collaborations): Automated multi-modal MRI/PET phenotyping (`ANTsPyMM`), Aligned-UMAP longitudinal subtyping, and missing-modality patient representation learning (Role: **Senior Director of ML** / **Co-Investigator**).
10/2014 – 09/2019	**The Imaging Genomics of Pediatric Executive Function**, NIH Big Data to Knowledge (BD2K), **K01-ES025432-01** (**Avants, Brian, PI**), $275,000/annual direct costs, 80% effort.
08/2015 – 05/2018	**Multimodal Brain Maturation Indices Modulating Psychopathology and Neurocognition**, NIH **R01-MH107235-01** (Gur, Ruben, PI), $275,000/annual direct costs (Role: **Collaborator**).
09/2013 – 08/2018	**Neuroscience Neuroimaging Center**, NIH **P30-NS045839-07** (Detre, John, M.D., PI), $499,727/annual direct costs (Role: **Collaborator** / **Technical Core Lead**).
2014	**Knowledge Representation in Neural Systems (KRNS)**, IARPA-BAA-12-05, 50% effort (Role: **Image Analysis Lead**).
09/2012 – 07/2013	**Age, Hearing Loss, and Sentence Comprehension: Neural Correlates**, NIA/NIH **5-R01-AG038490-05** (Grossman, Murray, PI), $291,978/annual direct costs (Role: **Co-PI**).
09/2011 – 08/2015	**Continued Development and Maintenance of ITK-SNAP 3D Image Segmentation Software**, NIH **R01-EB014346-01** (Yushkevich, Paul A., PI), $350,824/annual direct costs (Role: **Collaborator**).
09/2010 – 08/2015	**TDP-43 Proteinopathies in ALS-Dementia**, NIH **P01-AG032953-02** (Lee, Virginia / Grossman, Murray, PI), $729,272/annual direct costs (Role: **Collaborator**).
06/2010 – 06/2013	**Fundamental Refactoring of Deformable Image Registration in ITK with Distributed Computing and GPU Acceleration**, National Library of Medicine **HHSN276201000492P** (Gee, James C., PI), $472,861/annual direct costs (Role: **Co-PI & Architecture Lead**).
02/2011 – 01/2012	**Longitudinal Multi-Modal Neuroimaging of Natural Recovery after Traumatic Brain Injury: A Pilot Study**, Moss Rehab Research Institute / NIH (**Avants, Brian, PI**), $7,764/annual direct costs.
08/2007 – 04/2013	**In Utero Cocaine Exposure: Adolescent & Young Adult Neurocognitive Outcome**, CHOP / NIH **R01-DA14129-08** (Gee, James C., PI), $102,515/annual direct costs (Role: **Collaborator**).
06/2010 – 05/2012	**Parkinson's Disease & Dementia**, NIH **P50-NS053488-04S1** (Trojanowski / Grossman, PI), $132,641/annual direct costs (Role: **Collaborator**).
09/2009 – 08/2012	**Tract-Specific Analysis of Brain White Matter**, NIH **R01-NS065347-02** (Gee, James C., PI), $370,667/annual direct costs (Role: **Collaborator**).
09/2009 – 05/2010	**Pediatric Template of Brain Perfusion**, NIMH/NIH **3-R01-MH080892-01A2S1** (Wang, Jiongjiong, PI) (Role: **Co-PI**).
09/2008 – 09/2011	**Advanced Neuroimage Registration Methods: Effects of Prenatal Cocaine Exposure**, NIH (Gee, James C., PI; **Avants, Brian, Co-PI**), $354,375/annual direct costs.
06/2008 – 01/2011	**The Longitudinal Effect of Neurodegeneration on Language-Network Neuroanatomy and Cognition**, UPenn Institute on Aging (Gee, James C., PI; **Avants, Brian, Co-PI**).
04/2007 – 01/2011	**Long Term Effects of Prenatal Cocaine Exposure**, NIH (Hurt, Hallam, PI) (Role: **Research Scientist**).
04/2006 – 03/2010	**Shape Optimizing Diffeomorphisms for Computational Biology**, NIH / UCLA Center for Computational Biology **R01-EB006266** (Gee, James C., PI; based on B. Avants' Ph.D. thesis).
08/2004 – 06/2009	**Surface-based Cortical Analysis in ITK: Segmentation, Conformal Flattening and Statistics**, NLM-NIH ITK Development Grant (Gee, James C., PI; **Avants, Brian, Co-PI**).

09/2002 – 06/2005	**Bioengineering Training in Cardiovascular Pathophysiology**, Institute for Medicine and Engineering Training Grant, UPenn (Davies, Peter, PI; **Trainee**).

EDITORIAL POSITIONS, ADVISORY PANELS & PROFESSIONAL SERVICE

2019	**Brain Injury Biomarker Strategy Panel Contributor**, sponsored by Cohen Veterans Bioscience.
2017	**Topic Editor**, *NeuroImage* Special Issue on Brain Parcellation.
2012 – 2015	**Topic Editor**, *Frontiers in Neuroinformatics*: Research Topic on Neuroinformatics with the Insight ToolKit (ITK).
2013 – Present	**Grant Reviewer**, Alzheimer's Association & Ad Hoc Federal/International Study Sections.
2013 – Present	**Consultant**, American College of Radiology (ACR) Head Injury Institute Information Technology Committee.
2010 – Present	**Insight ToolKit (ITKv4) Development Leader**, NLM/NIH-sponsored industry-academic consortium.
2011 – Present	**Task Force Member**, International Neuroinformatics Coordinating Facility (INCF) Registration and Atlasing Task Force.
2006 – Present	**Member**, Neuroimaging Informatics Tools and Resources Clearinghouse (NITRC) & Spatial Transformations Informatics Technology Initiative (SIFTI).
Peer Review	**Ad Hoc Referee:** *Nature Neuroscience*, *Nature Computational Science*, *Nature Methods*, *Medical Image Analysis*, *NeuroImage*, *IEEE Transactions on Medical Imaging*, *IEEE TPAMI*, *Human Brain Mapping*, *Medical Physics*, *Pediatrics*.
Memberships	Organization for Human Brain Mapping (OHBM); International Society for Magnetic Resonance in Medicine (ISMRM).

MENTORSHIP, ADVISING & MAJOR RESEARCH COLLABORATIONS

2018 – Present	**Industry & Consortium Mentorship (Invicro, Cingulate LLC, UVA):** Mentored machine learning scientists, postdoctoral fellows, and Ph.D. interns across deep learning, multimodal representation learning, and longitudinal clinical trial modeling (including collaborations with Anant Dadu, Zhenbang Wu, Brandon Theodorou, and Taylor Gosselin).
Summer 2017	**Industry Internship Advisor to Nicholas Cullen** (Biogen Biomarkers Group): Deep learning and multivariate neuroimaging in Alzheimer's Disease; co-created `ANTsPy` and co-authored Springer Protocols chapter on deep learning brain segmentation.
2014 – 2016	**Faculty Technical Advisor to Dr. Dorian Pustina** (UPenn Postdoctoral Scientist, with Dr. H. Branch Coslett): Automated stroke lesion segmentation (`LINDA`) and multivariate lesion-symptom mapping (`SCCAN`); *subsequently Director of Experimental Neuroimaging at CHDI Foundation*.
2012 – 2017	**Ph.D. Co-Advisor to Dr. Efstathios (Stathis) Gennatas** (UPenn Neuroscience): Developmental brain morphometry across childhood to young adulthood (*J. Neurosci.* 2017); *subsequently faculty/scientist at UCSF*.
2010 – 2015	**Ph.D. Advisor to Dr. Benjamin M. Kandel** (UPenn Bioengineering): Eigenanatomy, sparse linear regression, and ASL perfusion decomposition (Oral presentation at IPMI 2013).
2010 – 2015	**Ph.D. Co-Advisor to Dr. Paramveer S. Dhillon** (UPenn Computer Science, with Prof. Lyle Ungar): Prior-based Eigenanatomy and functional parcellation (Oral presentation at PRNI 2013; *subsequently MIT postdoc and faculty at University of Michigan*).
2012 – 2013	**Organizer, UPenn Provost's Interdisciplinary Seminar Series on Multi-Modality Brain Mapping** (*Brainomics*): Hosted David Van Essen (Human Connectome Project), Mert Sabuncu, and Moriah Thomason.
Key Collaborations	**Dr. James R. Stone & Dr. Nicholas J. Tustison** (UVA/UC Irvine: ANTsX, SiMLR, NSA-Flow, military blast neurotrauma); **Dr. Mike Nalls & Dr. Faraz Faghri** (NIH CARD / Data Tecnica: multimodal AI & Parkinson's subtyping); **Dr. Murat Maga** (Seattle Children's/UW: evolutionary morphometrics & `SlicerMorph`); **Dr. Murray Grossman** (UPenn FTLD Center); **Dr. Martha Farah & Dr. Hallam Hurt** (UPenn/CHOP socioeconomic brain development); **Dr. Ruben Gur** (UPenn Brain-Behavior Lab); **Dr. Howie Rosen** (UCSF Neurology); **Dr. Yvette Sheline** (UPenn CNDS).

HIGHLIGHTED MEDIA & COVER FEATURES

2016	***Nature* Cover Story (Aducanumab PRIME Study):** Performed confirmatory amyloid PET analysis and created Figure 1 and the cover visualization for Sevigny et al., *"The antibody aducanumab reduces Aβ plaques in Alzheimer's disease"* (*Nature* 537, 50–56).
2013	**CNN Health Feature:** Coverage of collaborative neuroimaging research with Dr. Martha Farah on childhood environment and brain development.
2012	***The Washington Post* & *Daily Mail* (UK):** International press coverage of Society for Neuroscience (SfN) press conference presentation on early home environment and adolescent cortical thickness.
2012	**Penn Medicine News:** Feature article (*"Image Wizardry"*) highlighting `ANTs` winning the MICCAI 2012 segmentation competition.

SELECTED BRAIN MAPPING & DATA SCIENCE TUTORIALS

May 2019	"Introduction to the ANTsX Ecosystem," Workshop Tutorial, ICERM, Brown University, Providence, RI.
Jun 2018	"ANTsX for Decoding and Resting-State fMRI Studies," Talk & Tutorial, Haxby Lab, Dartmouth College, Hanover, NH.
Aug 2017	"ANTs and ANTsR for Clinical Applications," Two-Day Tutorial, Seattle Children's / University of Washington, Seattle, WA.
Aug 2016	"ANTs and ANTsR in Biostatistics," Two-Day Tutorial, MD Anderson Cancer Center, Houston, TX.
Jul 2016	Data Science Domain Expert Invitee, Park City Mathematics Institute (PCMI), Park City, UT.
Jun 2015	"ANTs and ANTsR," One-Day Tutorial, USC Center for Imaging Genetics (ENIGMA), Los Angeles, CA.
May 2015	"ANTs and ANTsR in Machine Learning," Two-Day Tutorial (with N. Tustison), McGill University & Montreal Neurological Institute, Montreal, QC.
Sep 2013	"Multivariate Medical Imaging Analysis with R," MICCAI 2013 Tutorial, Nagoya, Japan.
Jul 2013	"ANTs & Eigenanatomy," UCLA Neuroimaging Training Program, Los Angeles, CA.
Sep 2011	"ITKv4 Image Registration Tutorial" (with Kitware, Inc.), MICCAI 2011, Toronto, ON.
Oct 2006	"Tutorial on Neuromorphometry," MICCAI 2006, Copenhagen, Denmark.

SELECTED INVITED LECTURES & KEYNOTES

2018 – 2025	**Invited Industry, Consortium & Academic Presentations:** Michael J. Fox Foundation (MJFF) PPMI Data Science Working Group; LIMBIC-CENC Annual Conferences; ICERM Workshop on Dimension Reduction (Brown University); Invicro Translational Biomarker Symposia.
Jun 2017	"Translational Brain Mapping in Neurodegenerative Disease," Yale University, New Haven, CT.
Apr 2017	Platform Presentation on Quantitative Amyloid PET & Connectivity Biomarkers, AD/PD 2017, Vienna, Austria.
Mar 2017	"Multiple Modality Analysis of Alzheimer's Disease," Duke University, Durham, NC.
Jun 2015	"Large-Scale, Predictive Analytics for M^3 Pediatric Neuroimaging," ISMRM Annual Meeting, Toronto, ON.
May 2015	"Introduction to the ANTs Ecosystem," University of California, San Diego, La Jolla, CA.
Nov 2014	"Functional Imaging Analysis with R," University of South Carolina, Columbia, SC.
Aug 2014	"Big Image Registration," Frontiers in Human Brain Mapping Workshop, Princeton University, Princeton, NJ.
Apr 2014	"Eigenwords & Eigenanatomy for Decoding Neural Representations of Semantics," HRL Laboratories, Malibu, CA.
Feb 2014	"ANTs & Eigenanatomy for Integrative Brain Mapping," University of Calgary, Calgary, AB.
Oct 2012	"A Unified Image Registration Framework for ITKv4," National Library of Medicine (NIH), Bethesda, MD.
Oct 2012	"Early Home Environment Impacts Cortical Thickness in Young Adulthood," SfN Press Conference, New Orleans, LA.
Jun 2012	"Eigenanatomy Methods for Multivariate Brain Mapping," University of California, San Francisco, CA.
May 2012	"Early Home Environment Impacts Cortical Thickness," Chinese Academy of Sciences, Beijing, China; & Incheon National University, South Korea.
2011	Invited Lectures at UCLA (Dec 2011), Society for Neuroscience (Nov 2011), and Washington University in St. Louis (Jan & Feb 2011).
2005 – 2010	Invited Lectures at Chinese Academy of Sciences (2010), National Library of Medicine (2010), Columbia University (2009), SRI International (2009), Stanford University (2008), HHMI Janelia Farm (2008), ISBI (2006, 2007), and ISI Utrecht (2005).

PEER-REVIEWED JOURNAL PUBLICATIONS & RECENT PREPRINTS (1999 – 2026)

Full citation metrics (**57,500+ citations, h-index: 71**): Google Scholar Profile · PubMed Index

1. Tustison, N. J.; **Avants, B. B.**; Cook, P. A.; Gee, J. C.; Stone, J. R. (2026). *Deep Computational Anatomy via Latent-Aligned Multiview Normalizing Flows*. bioRxiv / PubMed (PMID: 42146611).
2. Pustina, D.; Bogale, H.; Das, S.; **Avants, B.**; Sathe, S.; Sampaio, C.; Wood, A. (2026). *Geometric properties of caudate and putamen mark the progression of Huntington's disease*. **Imaging Neuroscience**, 4, IMAG.a.1351.
3. Theodorou, B.; Dadu, A.; **Avants, B.**; Nalls, M.; Sun, J.; Faghri, F. (2026). *Realistic PET image synthesis from MRI for automated inference of brain atrophy and Alzheimer's*. **iScience**, 29(5), 115747.
4. **Avants, B. B.**, et al. (2025). *Non-Negative Stiefel Approximating Flow: Orthogonalish Matrix Optimization for Interpretable Embeddings*. **arXiv**:2511.06425.
5. **Avants, B. B.**; Tustison, N. J.; Stone, J. R. (2025). *Joint representations from multi-view MRI-based learning support cognitive and functional performance domains*. **medRxiv**.
6. Tustison, N. J.; Yassa, M. A.; Rizvi, B.; Cook, P. A.; Holbrook, A. J.; Sathishkumar, M. T.; Tustison, M. G.; Gee, J. C.; Stone, J. R.; **Avants, B. B.** (2024). *ANTsX neuroimaging-derived structural phenotypes of UK Biobank*. **Scientific Reports**, 14(1), 8848.
7. Stone, J. R.; **Avants, B. B.**; Tustison, N. J.; Gill, J.; Wilde, E. A.; Neumann, K. D.; Gladney, L. A.; Kilgore, M. O.; Bowling, F.; Wilson, C. M. (2024). *Neurological effects of repeated blast exposure in Special Operations personnel*. **Journal of Neurotrauma**, 41(7–8), 942–956.
8. Tustison, N.; **Avants, B.**; Whitlow, C. T.; Lancashire, L.; Bhatt, S. D.; Haas, M. (2024). *Normative Neuroimaging Library: Designing a Comprehensive and Demographically Diverse Dataset of Healthy Controls to Support Traumatic Brain Injury Diagnostic and Therapeutic Development*. **Journal of Neurotrauma**, 41(23–24), 2497–2512.
9. Yang, Z.; Wen, J.; Erus, G.; **Avants, B. B.**, et al. (2024). *Brain aging patterns in a large and diverse cohort of 49,482 individuals*. **Nature Medicine**, 30, 3015–3026.
10. **Avants, B. B.**; Fonville, L.; Hampton, O.; Reardon, A.; Stenger, A.; Wang, X.; Tustison, N. J.; Stone, J. R.; Cook, P. A.; Marebwa, B.; Chahine, L. M. (2024). *Magnetic Resonance Imaging Data Phenotypes for the Parkinson's Progression Markers Initiative*. **medRxiv**.
11. Dennis, E. L.; Rowland, J.; Esopenko, C.; Tustison, N.; Newsome, M.; **Avants, B.**; Gill, J.; Hinds, S.; Kenney, K.; Lindsey, H. (2024). *Brain volume changes following blast-related mild TBI in service members and veterans: a LIMBIC-CENC study*. **medRxiv**, 2024.02.27.24303460.
12. Polfus, L.; Shirazi, H. M.; Reardon, A.; Varga, M.; Tchourbanov, A.; Gosselin, T.; Dadu, A.; **Avants, B.**; Faghri, F.; Nalls, M.; Hesterman, J. (2024). *Genetic and brain imaging phenotype joint prediction of longitudinal Parkinson's Disease subtypes*. **European Journal of Human Genetics**, 32, 653.
13. Wu, Z.; Dadu, A.; Tustison, N.; **Avants, B.**; Nalls, M.; Sun, J.; Faghri, F. (2023). *Multimodal Patient Representation Learning with Missing Modalities and Labels*. **The Twelfth International Conference on Learning Representations (ICLR)**.
14. Dadu, A.; Satone, V. K.; Kaur, R.; Koretsky, M. J.; Iwaki, H.; Qi, Y. A.; Ramos, D. M.; **Avants, B.**; Hesterman, J.; Gunn, R.; Nalls, M.; Faghri, F. (2023). *Application of Aligned-UMAP to longitudinal biomedical studies*. **Patterns** (Cell Press), 4(6), 100741.
15. **Avants, B.**; Tustison, N. J.; McMillan, C. T.; Gosselin, T.; Gunn, R.; Hesterman, J. (2023). *Concurrent 3D super resolution on intensity and segmentation maps improves detection of structural effects in neurodegenerative disease*. **medRxiv**, 2023.02.02.23285376.
16. Elhamod, M.; Diamond, K. M.; Maga, A. M.; Bakis, Y.; Bart Jr, H. L.; Mabee, P.; Dahdul, W.; Leipzig, J.; Greenberg, J.; **Avants, B.** (2022). *Hierarchy-guided neural network for species classification*. **Methods in Ecology and Evolution**, 13(3), 642–652.
17. **Avants, B. B.**; Tustison, N. J. (2022). *Mapping the Spatial Distribution of Lesions in Stroke: Effect of Diffeomorphic Registration Strategy in the ATLAS Dataset*. In **Lesion-to-Symptom Mapping: Principles and Tools** (pp. 79–94), Springer.
18. Stone, J.; **Avants, B.**; Tustison, N.; Gill, J.; Wilde, E.; Neumann, K.; Gladney, L.; Kilgore, M.; Modica, L. T.; Bowling, F. (2022). *Increased Neuroinflammation in special operators with a history of blast overpressure exposure*. **Journal of Neurotrauma**, 39(11–12), A27–A28.
19. **Avants, B. B.**; Tustison, N. J.; Stone, J. R. (2021). *Similarity-driven multi-view embeddings from high-dimensional biomedical data*. **Nature Computational Science**, 1(2), 143–152.
20. Tustison, N. J.; Cook, P. A.; Holbrook, A. J.; Johnson, H. J.; Muschelli, J.; Devenyi, G. A.; Duda, J. T.; Das, S. R.; Cullen, N. C.; Gillen, D. L.; Yassa, M. A.; Stone, J. R.; Gee, J. C.; **Avants, B. B.** (2021). *The ANTsX ecosystem for quantitative biological and medical imaging*. **Scientific Reports**, 11(1), 9068.
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BOOK CHAPTERS

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