

BIOGRAPHICAL SKETCH

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NAME: Nagesh Adluru

eRA COMMONS USER NAME (credential, e.g., agency login): adluru

POSITION TITLE: Assistant Scientist

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Jawaharlal Nehru Technological University	B.Tech.	05/2003	Computer Sci. & Eng.
Temple University	M.S.	01/2005	Comp. & Info. Sci.
Temple University	Ph.D.	01/2009	Comp. & Info. Sci.

A. Personal Statement

My research interests are in developing and integrating state-of-the-art image processing, statistical and machine learning methods for transforming diffusion MR imaging (dMRI) data from neuro-scientific studies to interpretable and usable knowledge. My core training is in computer science and in the sub-fields of computer vision and machine learning. At the Waisman brain imaging laboratory I develop, support and maintain diffusion image processing and analysis (DIPA) pipelines including advanced processing of multi-shell diffusion data. On UW-Campus I have been working closely with several principal investigators in computer science, neuroscience, psychiatry, psychology for over seven years in developing novel machine learning and statistical methods to address the needs and challenges in analyzing complex models of diffusion as well as morphometric data obtained from MR images. In addition I also have been training and mentoring undergraduate and graduate students from a variety of backgrounds on imaging and statistics.

B. Positions and Honors**Positions and employment**

2004 – 2004 Research Assistant, Dept. of CIS, Temple University
 2004 – 2006 Teaching Assistant, Dept. of CIS, Temple University
 2006 – 2009 Research Assistant, Dept. of CIS, Temple University
 2009 – 2011 Postdoctoral Research Associate, Dept. of Biostatistics, UW-Madison
 2011 – Present Assistant Scientist, Waisman Lab. for Brain Imaging and Behavior, UW-Madison

Honors

1999 National merit scholarship for academic achievement in intermediate education by Govt. of India.
 2003 Academic excellence award for ranking 1st in B.Tech. by Sree Nidhi Inst. of Sci. & Tech., India.
 2007 Graduate student travel award of \$2000 for presenting our work at ICCV, Temple University.
 2008 Project award \$1500 (jointly with X. Yang and C. Lu), Temple University.
 2009 Two year postdoctoral fellowship by Morgridge Institutes for Research.
 2010 Google travel award for our NIPS 2010 paper.
 2010 Best abstract award by the OHBM for scalable network modeling using tractography data.
 2012 Travel award for 6th International Workshop on Statistical Analysis of Neuronal Data.
 2012 ISMRM Magna Cum Laude award for prob. tractography and tracer studies in rhesus macaques.
 2013 Top poster finalist award, Society of Biological Psychiatry.
 2013 ISMRM Summa Cum Laude Merit award for VIPR-IR.

Other Experience and Professional Service

1. **Program committees:** International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI) workshop on Computational Diffusion MRI, 2011, 2012, 2013, 2014, 2015.
2. **Reviewing journals:** Brain Connectivity, Neuron, Neuroinformatics, NeuroImage (NIMG), Human Brain Mapping (HBM), Magnetic Resonance in Medicine (MRM), IEEE Transactions in Medical Imaging (TMI), Journal of Statistical Software (JSS), Computational Intelligence and Neuroscience, Computational and Mathematical Methods in Medicine, Medical Physics.
3. **Memberships:** Have been a member of IEEE, SPS and ISMRM.

C. Contributions to Imaging Science

1. **Diffusion imaging and computer vision:** Starting with my postdoctoral work I have been working on applying computer vision methods for various processing steps of dMRI data of the brain. We developed efficient parametric representations and visualization software for tractography data. We also developed highly scalable approach for inferring structural brain networks using millions of white matter tracts obtained from tractography data. We also developed image segmentation algorithms that take into account prior training data for extracting specific white matter regions automatically. These techniques can enable neuroscience researchers to perform regions of interest (ROI) analyses in a computationally efficient way. Some of the work I did in brain imaging has also been successfully be adapted by a principle investigator doing research in vocal tract developmental modeling using CT images.
 - a. **Adluru N**, Hinrichs C, Chung MK, Lee JE, Singh V, Bigler ED, Lange N, Lainhart JE, Alexander AL. (2009). Classification in DTI using shapes of white matter tracts. *IEEE Conference on Engineering in Medicine and Biological Society*, 2719–2722. PMID: PMC4437626
 - b. **Adluru N**, Singh V, Alexander AL. (2012). Adaptive cuts for extracting specific white matter tracts. *IEEE International Symposium on Biomedical Imaging*, 1393–1396. PMID: PMC3807817
 - c. Kim WH, **Adluru N**, Chung MK, Charchut S, GadElkarim JJ, Altshuler L, Moody T, Kumar A, Singh V, Leow AD. (2013). Multi-resolutional brain network filtering and analysis via wavelets on non-Euclidean space. *Medical Image Computing and Computer Assisted Intervention*, 16(3):643–51. PMID: PMC3918676
 - d. Kim WH, **Adluru N**, Chung MK, Okonkwo OC, Johnson SC, Bendlin BB, Singh V. (2015). Multi-resolution statistical analysis of brain connectivity graphs in preclinical Alzheimer's disease. *NeuroImage*, 118:103–17. PMID: 26025289
2. **Diffusion imaging and machine learning:** We enhanced the statistical analysis pipelines using modern machine learning methods for multi-voxel pattern analysis (MVPA) in the neuroimaging community. We used penalized likelihood modeling to provide a unified framework for understanding both voxel based morphometry (VBM) and MVPA. We used penalized likelihood modeling to provide a unified framework for understanding both voxel based morphometry (VBM) and MVPA. We proposed statistical learning theory which provides practical methods for interpreting the results of MVPA beyond commonly used performance metrics, such as leave-one-out-cross validation accuracy and the receiver operating characteristic (ROC) curve. I co-developed advanced statistical analysis methods for analyzing connectome data obtained from dMRI using multi-resolutional graph wavelets. In addition I co-developed manifold statistical methods for analyzing diffusion tensor imaging (DTI), higher angular resolution imaging (HARDI) and Cauchy deformation tensors of the brain.
 - a. **Adluru N**, Ennis CM, Davidson RJ, Alexander AL. (2012). Max Margin General Linear Modeling for Neuroimage Analyses. *IEEE Workshop on Mathematical Methods in Biomedical Image Analysis*, 105–110. PMID: PMC3807858
 - b. Kim HJ, **Adluru N**, Collins MD, Chung MK, Bendlin BB, Johnson SC, Davidson RJ, Singh V. (2014). Multivariate general linear models (MGLM) on Riemannian manifolds with applications to statistical analysis of diffusion weighted images. *IEEE Computer Vision and Pattern Recognition*, 2705–2712. PMID: PMC4288036

- c. Kim HJ, **Adluru N**, Bendlin BB, Johnson SC, Vemuri BC, Singh V. (2014). Canonical correlation analysis on Riemannian manifolds and its applications. *European Conference on Computer Vision*, 8690:251-267. PMID: PMC4194269
 - d. **Adluru N**, Hanlon BM, Lutz A, Lainhart JE, Alexander AL, Davidson RJ. (2014). Penalized likelihood phenotyping: Unifying voxelwise analyses and multi-voxel pattern analyses in neuroimaging. *Neuroinformatics*, 11(2):227-247. PMID: PMC3624987
3. Diffusion imaging investigations in mental health: All through my research after graduation I have been working closely with psychologists, psychiatrists and neuroscientists in order to perform best possible processing and analysis of the diffusion imaging data from their studies. I have had successful collaborations with scientists researching on autism, anxiety, Alzheimer's disease and mindfulness.
- a. Travers BG, **Adluru N**, Ennis C, Tromp do PM, Destiche D, Doran S, Bigler ED, Lange N, Lainhart JE, Alexander AL. (2012). Diffusion tensor imaging in autism spectrum disorder: a review. *Autism Research*, 5(5):289-313. PMID: PMC3474893
 - b. Hanson JL, **Adluru N**, Chung MK, Alexander AL, Davidson RJ, Pollak SD. (2013). Early neglect is associated with alterations in white matter integrity and cognitive functioning. *Child Development*, 84(5):1566-1578. PMID: PMC3690164
 - c. Racine AM, **Adluru N**, Alexander AL, Christian BT, Okonkwo OC, Oh J, Cleary CA, Birdsill A, Hillmer AT, Murali D, Barnhart TE, Gallagher CL, Carlsson CM, Rowley HA, Dowling NM, Asthana S, Sager MA, Bendlin BB, Johnson SC. (2014). Associations between white matter microstructure and amyloid burden in preclinical Alzheimer's disease: A multimodal imaging investigation. *NeuroImage: Clinical*. 4:604-614. PMID: PMC4053642
 - d. **Adluru N**, Destiche DJ, Lu SY, Doran ST, Birdsill AC, Melah KE, Okonkwo OC, Alexander AL, Dowling NM, Johnson SC, Sager MA, Bendlin BB. (2014). White matter microstructure in late middle-age: Effects of apolipoprotein E4 and parental family history of Alzheimer's disease, *NeuroImage: Clinical*, 4:730-742. PMID: PMC4053649
4. Imaging tools and resources: We made several of our research tools as open-source on public platforms such as NITRC, Sourceforge and Github. The tractography visualization toolkit (Camino-trackvis downloaded over 4300 times from all over the world) has been particularly helpful in enabling our clinical collaborators to leverage the advanced tracking algorithms in Camino in the user-friendly visual environment afforded by Trackvis. Diffusion Tensor Imaging (DTI) analysis methodologies have been developed for human brain studies but not many digital resources are available for studies of non-human primates (NHP). A prerequisite for most statistical DTI analysis is to spatially normalize the individual scans to a representative template. We developed the first population-specific DTI template for young adolescent Rhesus Macaque (*Macaca mulatta*) monkeys using 271 high-quality scans. Our DTI template was generated using the largest number of animals ever used in generating a computational brain template. In addition we also released detailed digital atlas of the white matter regions in the rhesus. The digital diffusion image resources have been downloaded by researchers over 900 times.
- a. Camino-trackvis: <http://sourceforge.net/projects/camino-trackvis/> (2009). (~4383 downloads)
 - b. **Adluru N**, Zhang H, Fox AS, Shelton SE, Ennis CM, Bartosic AM, Oler JA, Tromp do PM, Zakszewski E, Gee JC, Kalin NH, Alexander AL. (2012). A diffusion tensor brain template for rhesus macaques. *NeuroImage*, 59(1):306-318. PMID: PMC3195880
 - c. Zakszewski E, **Adluru N**, Tromp do PM, Kalin NH, Alexander AL. (2014). A diffusion-tensor-based white matter atlas for rhesus macaques. *PLOS ONE*, 9(9):e107398. PMID: PMC4159318
 - d. <https://www.nitrc.org/projects/rmdtitemplate/> (2012, 2014). (~918 downloads)

Complete list of publications

<http://www.ncbi.nlm.nih.gov/sites/myncbi/nagesh.adluru.1/bibliography/41167759/public/?sort=date&direction=ascending>

Completed Research Support (last 3 years)

UW Institute of Clinical and Translational Research (ICTR); Novel methods development 07/14–06/15
Multi-scale Statistical Analysis of Networks: Applications to Group analysis of Brain Connectivity Networks
 Role: PI (with Singh)
 (07/14–06/15, \$50,000).