

Summary: National Alliance for Medical Image Computing (NA-MIC): A National Center for Biomedical Computing

NA-MIC has championed a modular set of interoperable free open source software (FOSS) packages, managed under a collaborative, high quality software engineering methodology. This common infrastructure allows new concepts, emerging from algorithmic research in computer science, to be directly and efficiently deployed into the hands of clinical researchers trying to solve difficult clinical problems. Once embodied as NA-MIC Kit components, such innovations are available to the community at large for use across a range of compute platforms and datasets. Closing the gap between idea and implementation, supporting rapid iteration, and providing a stable dissemination mechanism lie at the core of the NA-MIC software approach. This brief overview highlights notable contributions that mark NA-MIC's place in the field of biomedical image analysis, discusses important activities and functions that differentiate NA-MIC as a center, and cites NA-MIC's most pre-eminent achievements as illustrations of the quality of its work and productivity.

Statistical Modeling of Genetic and Imaging Data for COPD and Huntington's Disease

Imaging biomarkers are an essential component of modern approaches to understanding heritable diseases because they provide powerful tools to interpret genetic information in the context of their clinical manifestation. NA-MIC has established a pattern of scientific research that integrates genetic testing with large scale, statistically sensitive disease-specific image quantification. The NA-MIC collaboration with the NIH-funded COPDGene effort (www.copdgene.org) has enabled statistical modeling of genetic profiles of the at-risk population by correlating imaging derived airway, parenchymal, and vascular phenotypes with a spectrum of established pulmonology diagnostic metrics. A recent study has revealed new genetic associations at the loci near *CHRNA-3/5* in chromosome 15 and *MMP-12/13* in chromosome 11 based on CT-quantified emphysema patterns using a local histogram classifier, establishing that these genes can determine the genetic predisposition of an individual to develop COPD.

The same statistical approach is being used in collaboration with the PREDICT-HD, a Huntington's disease (HD) consortium led by the University of Iowa. The goal is to provide early detection of HD progression using image, genetic, and clinical data from 786 gene-positive but undiagnosed subjects. People afflicted with HD can be identified well in advance of symptom onset based on a reliable genetic test, but genetics alone cannot predict when they will transition into the acute phase of the disease. The PREDICT-HD consortium is seeking quantitative medical imaging biomarkers for use as surrogate endpoints in their drug treatment trials aimed at delaying the onset and/or progression of disease. These more accurate predictions will ultimately help inform clinical decisions about the timing and use of therapies such as implantable devices that can deliver genetically engineered neurotrophic factors directly to the brain. The NA-MIC Kit is being used to identify early changes in white matter architecture and atrophy of subcortical brain structures including caudate, putamen, and thalamus. These biomarkers correlate with the known genetic test for HD in presymptomatic patients.

Mobilizing an International Open Source Development Community

NA-MIC takes seriously the responsibility of representing US medical imaging software development activities in the national and international community. Through our collaborations and outreach programs, we have mobilized like-minded scientists to contribute to open source software development for biomedical image analysis. Attracted to the concept of sharing software development resources, leading international groups have adopted NA-MIC's engineering framework in lieu of undertaking the costly and redundant option of developing their own. These collaborative efforts have greatly raised awareness of the benefits of open science, and as a result, government-funded efforts that complement NA-MIC are now in place in Canada, Germany, Spain, France, and Italy.

In 2011, Canadian funding was awarded to the Ontario Consortium for Adaptive Interventions in Radiation Oncology (OCAIRO) to develop a shared framework for radiation therapy, called Software Platform and Adaptive Radiotherapy Kit (SPARKit). SPARKit's goal is to enable oncologists to monitor, assess response to, and adapt radiation therapy in individual patients. Recognizing the quality and value of NA-MIC's open source model, software imaging scientists at OCAIRO decided to adopt 3D Slicer as the platform for SPARKit. OCAIRO has contributed substantially to 3D Slicer by adding specific functionality in adaptive radiotherapy data format support and dose visualization and processing

In a similar vein, NA-MIC investigators have been leaders in establishing Common Toolkit (CTK), a multi-institution international collaboration to share software development resources in medical imaging applications. The inspiration for this project grew from informal discussions between NA-MIC scientists and investigators from the German Cancer Research Center (DKFZ) during a NA-MIC hosted outreach event in Munich. CTK's initial focus was on user interfaces and core technology around DICOM networking and related standards to be shared to the mutual benefit of individual investigators and has further adapted and extended the NA-MIC Kit.

NA-MIC's 'center' mandate for outreach, a feature of every National Center for Biomedical Computing, has been a crucial catalyst to international collaborations such as OCAIRO/SPARKit and CTK. Such collaborations attract international funding that benefits not only NA-MIC, but also other NIH initiatives.

2. NA-MIC Top-10 Publications List

NA-MIC has published 456 papers since its inception. A list is provided in Appendix A. Below we highlight ten publications that represent the breadth and depth of recent activity in NA-MIC.

DBP Science

1. Wolff J.J., Gu H., Gerig G., Elison J.T., Styner M., Gouttard S., Botteron K.N., Dager S.R., Dawson G., Estes A.M., Evans A.C., Hazlett H.C., Kostopoulos P., McKinstry R.C., Paterson S.J., Schultz R.T., Zwaigenbaum L., Piven J. *Differences in White Matter Fiber Tract Development Present from 6 to 24 Months in Infants with Autism*. *Am J Psychiatry*. 2012 Jun 1;169(6):589-600. PMID: 22362397. This paper demonstrates the impact of NA-MIC's DTI fiber analysis framework as it applies to autism, where it has been used to measure white matter changes in infants and toddlers. It has been featured on CNN, MSNBC, among other media, e.g. <http://www.sciencedaily.com/releases/2012/02/120217101048.htm>. *Am J Psychiatry Impact Factor: 12.759, Paper citations: 11*

2. Kubicki M., Styner M., Bouix S., Gerig G., Markant D., Smith K., Kikinis R., McCarley R.W., Shenton M.E. *Reduced Interhemispheric Connectivity in Schizophrenia- Tractography Based Segmentation of the Corpus Callosum*. *Schizophr Res*. 2008 Dec;106(2-3):125-31. PMID: 18829262. PMCID: PMC2630535. This paper, published in one of the prime schizophrenia journals, highlights the integration of shape analysis on the corpus callosum and NA-MIC DTI processing with Slicer. It is one of the first publications to report reduced interhemispheric connectivity in schizophrenia via callosal fiber tracts. *Schizophrenia Research Impact Factor: 5.1 Paper citations: 43*

3. Van Horn J.D., Irimia A., Torgerson C.M., Chambers M.C., Kikinis R., Toga A.W. *Mapping Connectivity Damage in the Case of Phineas Gage*. *PLoS ONE* 7(5): e37454. PMID: 22616011. PMCID: PMC3353935. This paper models and examines the extent of white matter damage experienced in the case of Phineas Gage, undoubtedly the most famous case of neurological injury in medical history. Mr. Gage, a railroad construction foreman was severely injured when a large iron crowbar was driven completely through his head, destroying much of his left frontal lobe and markedly altering his personality. This work has been featured on CNN, LA Times, NPR, among other media, and will soon be featured in Discover Magazine. *PLoS ONE Impact Factor: 4.092, Paper citations: 1*

4. Irimia A., Chambers M.C., Alger J.R., Filippou M., Prastawa M., Wang B., Hovda D., Gerig G., Toga A.W., Kikinis R., Vespa P.M., Van Horn J.D. *Comparison of Acute and Chronic Traumatic Brain Injury using Semi-automatic Multimodal Segmentation of MR Volumes*. *J Neurotrauma*. 2011 Nov;28(11):2287-306. PMID: 21787171. This article illustrates the use of Slicer and accompanying tools for modeling and measuring edema, bleeding, and tissue damage in traumatic brain injury (TBI). The method described in this report provides a valuable framework for developing 'personalized' injury profiling for TBI assessment, monitoring, and treatment evaluation. *J Neurotrauma Impact Factor: 3.654, Paper citations: 6*

Computational Science

5. Walter T., Shattuck D.W., Baldock R., Bastin M.E., Carpenter A.E., Duce S., Ellenberg J., Fraser A., Hamilton N., Pieper S., Ragan M.A., Schneider J.E., Tomancak P., Hériché J.-K. *Visualization of Image Data from Cells to Organisms*. *Nature Methods Supplement* 2010 March; 7(3):S27-S41. PMID: 20195255. <http://www.slicer.org/publications/item/view/1818> Working with an international team of visualization experts, Dr. Pieper authored the human clinical image visualization content of a special issue of Nature Methods covering the spectrum of biological visualization. Dr. Shattuck of the Center for Computational Biology at UCLA, a sister NCBC, was a co-author on this work. The Nature Methods special issue offers a unique overview of the role of visual computing in core biological research from microbiology to population analysis. It has become a seminal work in the field and is now being converted to book form under contract with Cambridge University Press. *The 2011 impact factor for Nature Methods is 19.276, Paper citations: 63.*

6. Goodlett C., Fletcher P.T., Gilmore J.H., Gerig G. *Group Analysis of DTI Fiber Tract Statistics with Application to Neurodevelopment*. *Neuroimage*. 2009 Mar;45(1 Suppl):S133-42. PMID: 19059345. PMCID: PMC2727755. This paper describes a NAMIC development of a group-wise processing of large number of DTI data, including mapping to an unbiased atlas and tract-based statistical analysis based on a new concept of functional data analysis. Unlike common averaging of diffusivity along tracts, this methods takes into account the whole profile of diffusion values as a function of arc-length, and performs statistical analysis that not only results in significance values but also locality and type of group difference. *Neuroimage Impact factor: 5.895, Paper citations: 55.*

7. Rathi Y., Vaswani N., Tannenbaum A., Yezzi A. [Tracking deforming objects using particle filtering for geometric active contours](#). *IEEE Trans Pattern Anal Mach Intell.* 2007 Aug;29(8):1470-5. PMID: 17568149. This paper was the first to combine statistical estimation theory with geometric models of active contours for the dynamic segmentation of noisy imagery that may undergo large deformations. By decoupling the affine part from the elastic part of the deformation, one may drastically reduce the number of particles in the particle filter necessary for a given task. The method has been applied already to several of our DBPs including the robotic prostate biopsy and the left atrial fibrillation projects. (2011 Thomas Reuter's Web of Knowledge; **Second Highest Among All Computer Science Journals**). **TPAMI Impact Factor: 4.908, Paper citations: 100**

8. Yeo B.T.T., Sabuncu M.R., Desikan R., Fischl B., Golland P. *Effects of Registration Regularization and Atlas Sharpness on Segmentation Accuracy*. *Med Image Anal.* 2008 Oct;12(5):603-15. PMID: 18667352. PMCID: PMC2615799. This paper investigates the implications of the design choices at the time of the atlas construction on the quality of atlas-based segmentation of new images. The initial version of this work was presented at MICCAI 2007 (10 citations). **Received the Young Investigator award at MICCAI in 2007 and the Young Investigator Publication Impact Award at MICCAI in 2011.** *Medical Image Analysis impact factor: 4.424, Paper citations: 37.*

9. Gerber S., Tasdizen T., Fletcher P.T., Joshi S., Whitaker R.T. *Manifold Modeling for Brain Population Analysis*. *Med Image Anal.* 2010 Oct;14(5):643-53. PMID: 20579930. PMCID: PMC3020141. This paper describes a method for building efficient representations of large sets of brain images. The basic hypothesis is that the space spanned by a set of brain images can be captured to a close approximation by a low-dimension, nonlinear manifold. This paper presents a method to learn such a low-dimensional manifold from a given dataset. The manifold model is generative. Brain images can be constructed from a relatively small set of parameters and new brain images can be projected onto the manifold. **Medical Image Analysis Impact Factor: 4.424, Paper citations: 23.**

10. Lankton S., Tannenbaum A. [Localizing region-based active contours](#). *IEEE Trans Image Process.* 2008 Nov;17(11):2029-39. PMID: 18854247. PMCID: PMC2796112. This paper proposes a framework that allows any region-based segmentation energy to be re-formulated in a local way. Thus, we consider local rather than global image statistics and evolve a contour based on local information. Such localized contours are capable of segmenting objects with heterogeneous feature profiles that would be very challenging to capture using a standard global statistically based method. Such heterogeneity is very typical in much medical imagery. **TIP Impact factor: 3.042, Paper citations: 174**

3. Training

NA-MIC has trained 35 students, of whom 8 are now pursuing academic careers (5 faculty positions 3 research fellows) and 10 are in industry (3 in leadership positions and 7 in engineering roles).

NA-MIC has also trained 20 fellows, of whom 9 are now in faculty positions around the world, and the rest are in leadership positions in industry or research laboratories.

In addition, NA-MIC has employed nearly 60 engineers from academic and industry laboratories, many of whom are thought leaders in the international free and open source software community.

A list of all NA-MIC funded personnel is provided in Appendix B.

4. Milestones of a Successful National Infrastructure Resource

Grant funding mechanisms have a substantive impact on the development efforts a project may undertake. The National Center for Biomedical Computing program was chartered to create infrastructure to enable focused research. In contrast to this, R01s typically support discrete, specified, circumscribed projects. As a result, where investment in cross-cutting and broadly applicable technologies can be difficult or impossible to justify in the context of an R01, NA-MIC investigators routinely identify commonality across a range of use-cases in order to implement general purpose tools and techniques. For example, NA-MIC has undertaken numerous projects in image registration, shape analysis, segmentation, and visualization that are now applied across multiple imaging modalities and used in dozens of clinical domains.

The principled use of software engineering science inside the NA-MIC effort has resulted in a robust, modular, and maintainable software environment embodied in the NA-MIC Kit. The infrastructure created in this open source software allows collaborating R01s to focus on their own core science without having to re-create redundant commodity capabilities. More importantly, the stability of an infrastructure maintained by a dedicated group of engineers facilitates the long-term viability and accessibility of the results of R01 research. Likewise, requirements of the driving biological projects and collaborating R01s shape the extension of NA-MIC functionality. With continued funding, the medical image computing community will benefit from NA-MIC's foundational investment in high quality software engineering methodology and common infrastructure that promote open and reproducible science. As more projects adopt the tools and methodologies provided by the center, maintaining the continuity of this infrastructure will be critical to sustaining its productivity.

Network of External Collaborations. NA-MIC has powered 31 funded collaborations using the NA-MIC Kit; 25 funded by NIH grants (8 active, 17 completed) and 6 by international governments (5 active, 1 completed). A list of these collaborations is provided in Appendix C. Collectively, these collaborations address a broad range of organ systems and pathologies: diagnosis and therapy of schizophrenia, lupus, autism, lung disease, cancer of the liver, colon, and prostate, and musculoskeletal disorders. Recognizing the value of developing new techniques that integrate with the NA-MIC Kit, the collaborating PIs and their respective teams have gained efficiency by bypassing the time-consuming tasks associated with custom software development, including distribution, training, and routine maintenance.

Driving Biological Projects (DBPs). Synergistic with but distinct from our external collaborations, NA-MIC's 11 DBPs have provided the strong push-pull relationship needed to drive the NA-MIC portfolio. These address neurodegenerative disorders including schizophrenia and autism, lupus, Huntington's disease, heart disease (atrial fibrillation), radiotherapy for prostate and head and neck cancer, and traumatic brain injury. The NA-MIC Kit now contains detailed tutorials and test datasets that can be used to solve specific clinical research problems in each of these clinical domains.

NA-MIC Kit. The first FOSS biomedical computation platform of its magnitude, the current configuration of the NA-MIC Kit is the culmination of 6 years of effort. The Kit and its various components have been and continue to be widely disseminated as measured by the center's download statistics. Our flagship end-user application, Slicer, was downloaded 31,717 times in the past 12 months. CMake, along with its associated software process tools (CTest, CDash, CPack), continues to be one of the most popular pieces of the NA-MIC Kit, with more than 2,000 known downloads per day (not counting the various Linux distributions). Used to build, test, and deploy software in a cross-platform manner, CMake has become the industry standard for cross-platform development way beyond the medical image computing community. Finally, NA-MIC's user and developer mailing lists now contain 829 and 483 members, respectively. Membership is distributed globally, and the high level of daily activity is a testament to the ability of open-source software to leverage development efforts across a broad community, at little additional cost to project sponsors.

Training Compendium and Workshops. Using the NA-MIC Kit, we have created an online training compendium, consisting of 88 detailed tutorials with step-by-step instructions and pre-computed datasets that are freely available to the scientific and clinical community. Additionally, we have taught 2,090 investigators worldwide through 63 instructor-led hands-on workshops (ranging from 12-120 participants per event). These workshops are customized to the needs of specific audiences composed of clinical researchers, radiologists, neuroscientists, neurosurgeons, computer scientists, and biomedical engineers. We also provide training to the translational and clinical research communities, through the organization of grand challenge workshops at premier conferences, such as our pioneering initiative on the standardized evaluation of diffusion tensor imaging tractography algorithms for neurosurgical planning offered at MICCAI and RSNA.

Hands-on Project Events. We practice the best principles of collaborative science through our semi-annual Project Week events. To date, we have held 15 consecutive events. Experts and students from inside and outside of NA-MIC gather at these hands-on workshops to address current research problems. The events have grown over the years, now attracting more than 100 participants per workshop and they have been recognized and adopted by several other centers including NCIGT(P41EB015898) and NAC (P41 RR13218; and P41 EB015902).

Appendix A: Publications

	Citation	Impact Factor	Citation Count
1	Tuch D.S., Wisco J.J., Khachaturian M.H., Ekstrom L.B., Kötter R., Vanduffel W. Q-ball Imaging of Macaque White Matter Architecture. Philos Trans R Soc Lond B Biol Sci. 2005 May 29;360(1457):869-79. PMID: 16087432. PMCID: PMC1854934.	6.053	46
2	Ou W. fMRI Detection with Spatial Regularization. Master's Thesis, MIT, 2005.	N/A	N/A
3	Ou W., Golland P. From Spatial Regularization to Anatomical Priors in fMRI Analysis. Inf Process Med Imaging. 2005;19:88-100. PMID: 17354687.	3.643	15
4	Tuch D.S., Salat D.H., Wisco J.J., Zaleta A.K., Hevelone N.D., Rosas H.D. Choice Reaction Time Performance Correlates with Diffusion Anisotropy in White Matter Pathways Supporting Visuospatial Attention. Proc Natl Acad Sci U S A. 2005 Aug 23;102(34):12212-7. PMID: 16103359. PMCID: PMC1189298.	9.681	152
5	Nakamura M., McCarley R.W., Kubicki M., Dickey C.C., Niznikiewicz M.A., Voglmaier M.M., Seidman L.J., Maier S.E., Westin C-F., Kikinis R., Shenton M.E. Fronto–Temporal Disconnectivity in Schizotypal Personality Disorder: A Diffusion Tensor Imaging Study. Biol Psychiatry. 2005 Sep 15;58(6):468-78. PMID: 15978550. PMCID: PMC2768055.	8.283	62
6	Pichon E., Tannenbaum A. Curve Segmentation using Directional Information, Relation to Pattern Detection. Proceedings of the 12th IEEE International Conference on Image Processing 2005; 12(2):794-797.	N/A	5
7	Pichon E., Westin C-F., Tannenbaum A.R. A Hamilton-Jacobi-Bellman Approach to High Angular Resolution Diffusion Tractography. Int Conf Med Image Comput Comput Assist Interv. 2005;8(Pt 1):180-7. PMID: 16685844.	N/A	43
8	Maddah M., Mewes A.U.J., Haker S., Grimson W.E.L., Warfield S.K. Automated Atlas-based Clustering of White Matter Fiber Tracts from DTMRI. Int Conf Med Image Comput Comput Assist Interv. 2005;8(Pt 1):188-95. PMID: 16685845.	N/A	50
9	Zhu L., Haker S., Tannenbaum A. Mass Preserving Registration for Heart MR Images. Int Conf Med Image Comput Comput Assist Interv. 2005;8(Pt 2):147-54. PMID: 16685954.	N/A	5
10	Corouge I., Fletcher P.T., Joshi S., Gilmore J.H., Gerig G. Fiber Tract-Oriented Statistics for Quantitative Diffusion Tensor MRI Analysis. Int Conf Med Image Comput Comput Assist Interv. 2005;8(Pt 1):131-9. PMID: 16685838.	N/A	76
11	Pohl K.M., Fisher III J.W., Wells III W.M., Kikinis R., Grimson W.E.L. Shape Based Segmentation of Anatomical Structures in Magnetic Resonance Images. Proceedings of the Tenth IEEE International Conference on Computer Vision Workshop Computer Vision for Biomedical Image Applications Current Techniques and Future Trend 2005; LNCS 3765.	N/A	21

12	Kim S., Smyth P., Stern H., Turner J.A. Parametric Response Surface Models for Analysis of Multi-site fMRI Data. Int Conf Med Image Comput Comput Assist Interv. 2005;8(Pt 1):352-9. PMID: 16685865.	N/A	4
13	Pohl K.M., Fisher III J.W., Levitt J.J., Shenton M.E., Kikinis R., Grimson W.E.L., Wells III W.M. A Unifying Approach to Registration, Segmentation, and Intensity Correction. Int Conf Med Image Comput Comput Assist Interv. 2005;8(Pt 1):310-8. PMID: 16685860. PMCID: PMC2784666.	N/A	N/A
14	Yang Y., Zhu L., Haker S., Tannenbaum A.R., Giddens D.P. Harmonic Skeleton Guided Evaluation of Stenoses in Human Coronary Arteries. Int Conf Med Image Comput Comput Assist Interv. 2005;8(Pt 1):490-7. PMID: 16685882.	N/A	15
15	O'Donnell L., Westin C-F. White Matter Tract Clustering and Correspondence in Populations. Int Conf Med Image Comput Comput Assist Interv. 2005;8(Pt 1):140-7. PMID: 16685839.	N/A	50
16	Nain D., Haker S., Bobick A., Tannenbaum A.R. Multiscale 3D Shape Analysis Using Spherical Wavelets. Int Conf Med Image Comput Comput Assist Interv. 2005;8(Pt 2):459-67. PMID: 16685992.	N/A	19
17	Zöllei L., Learned-Miller E., Grimson W.E.L., Wells III W.M. Efficient Population Registration of 3D Data. Proceedings of the 10th IEEE International Conference on Computer Vision Workshop 2005; 10(WS):	N/A	93
18	Melonakos J., Al-Hakim R., Fallon J.H. Knowledge-Based Segmentation of Brain MRI Scans Using the Insight Toolkit. Int Conf Med Image Comput Comput Assist Interv. 2005;8(WS). Open-Source Workshop.	N/A	3
19	Goodlett C., Corouge I., Jomier M., Gerig G. A Quantitative DTI Fiber Tract Analysis Suite. Int Conf Med Image Comput Comput Assist Interv. 2005;8(WS). Open-Source Workshop.	N/A	N/A
20	Pohl K.M., Bouix S., Shenton M.E., Grimson W.E.L., Kikinis R. Automatic Segmentation Using Non-Rigid Registration. Short communications, Int Conf Med Image Comput Comput Assist Interv. 2005;8. PMID: 20407623. PMCID: PMC2856350.	N/A	N/A
21	Martin-Fernandez M., Bouix S., Ungar L., McCarley R.W., Shenton M.E. Two Methods for Validating Brain Tissue Classifiers. Int Conf Med Image Comput Comput Assist Interv. 2005;8(Pt 1):515-22. PMID: 16685885. PMCID: PMC2775440.	N/A	14
22	Tasdizen T., Suyash A., Whitaker R.T. A Nonparametric, Entropy-minimizing MRI Tissue Classification Algorithm Implementation Using ITK. Int Conf Med Image Comput Comput Assist Interv. 2005;8(WS). Open-Source Workshop.	N/A	1
23	Hershkovits E., Sapiro G., Tannenbaum A., Williams L.D. Statistical Analysis of RNA Backbone. IEEE/ACM Transactions on Computational Biology and Bioinformatics, 2006; 3(1):33-46. PMID: 17048391. PMCID: PMC2811324.	N/A	21
24	Melonakos J., Krishnan K., Tannenbaum A. An ITK Filter for Bayesian Segmentation: itkBayesianClassifierImageFilter. The Insight Journal - 2006 January - June; #69	N/A	5

25	Yang Y., George S., Martin D.R., Tannenbaum A.R., Giddens D.P. 3D Modeling of Patient-specific Geometries of Portal Veins Using MR Images. Conf Proc IEEE Eng Med Biol Soc. 2006;1:5290-3. PMID: 17946691.	N/A	8
26	Zöllei L., Wells III W.M. Multi-modal Image Registration Using Dirichlet-encoded Prior Information. Proceedings of the 3rd International Workshop on Biomedical Image Registration 2006; 3(WS):34-42.	N/A	7
27	Rathi Y., Olver P., Sapiro G., Tannenbaum A. Affine Invariant Surface Evolutions for 3D Image Segmentation. Proceedings of IS&T/SPIE Electronic Imaging, 2006.	N/A	2
28	Al-Hakim R., Nain D., Melonakos J., Tannenbaum A., Fallon J.H. A Dorsolateral Prefrontal Cortex Semi-Automatic Segmenter. Proceedings of SPIE Medical Imaging 2006; 6144:170-177.	N/A	5
29	Styner M., Jomier M., Gerig G. Closed and Open Source Neuroimage Analysis Tools and Libraries at UNC. Proceedings of the 3rd IEEE International Symposium on Biomedical Imaging: From Nano to Macro 2006; 702-705.	N/A	5
30	Gerig G., Joshi S., Fletcher T., Gorczowski K., Xu S., Pizer S.M., Styner M. Statistics of Populations of Images and its Embedded Objects: Driving Applications in Neuroimaging. Proceedings of the 3rd IEEE International Symposium on Biomedical Imaging: From Nano to Macro 2006; 1120-1123.	N/A	11
31	Maddah M., Grimson W.E.L., Warfield S.K. Statistical Modeling and EM Clustering of White Matter Fiber Tracts. Proceedings of the 3rd IEEE International Symposium on Biomedical Imaging: From Nano to Macro 2006; 53-56.	N/A	13
32	Pieper S., Lorensen W., Schroeder W., Kikinis R. The NA-MIC Kit: ITK, VTK, Pipelines, Grids and 3D Slicer as an Open Platform for the Medical Image Computing Community. Proceedings of the 3rd IEEE International Symposium on Biomedical Imaging: From Nano to Macro 2006; 698-701.	N/A	71
33	O'Donnell L., Kubicki M., Shenton M.E., Dreusicke M.H., Grimson W.E.L., Westin C-F. A Method for Clustering White Matter Fiber Tracts. AJNR Am J Neuroradiol. 2006 May;27(5):1032-6. PMID: 16687538. PMCID: PMC2768142.	2.138	51
34	Rathi Y., Dambreville S., Tannenbaum A. Comparative Analysis of Kernel Methods for Statistical Shape Learning. Proceedings of the 2nd International Workshop on Computer Vision Approaches to Medical Image Analysis 2006; 2:96-107.	N/A	11
35	Heimann T., Oguz I., Wolf I., Styner M., Meinzer H-P. Implementing the Automatic Generation of 3D Statistical Shape Models with ITK. The Insight Journal - 2006 MICCAI Open Science Workshop	N/A	15
36	Salat D.H., Smith E.E., Tuch D.S., Benner T., Pappu V., Schwab K.M., Gurol M.E., Rosas H.D., Rosand J., Greenberg S.M. White Matter Alterations in Cerebral Amyloid Angiopathy Measured by Diffusion Tensor Imaging. Stroke. 2006 Jul;37(7):1759-64. PMID: 16763176.	5.729	30

37	Oguz I., Gerig G., Barre S., Styner M. KWMeshVisu: A Mesh Visualization Tool for Shape Analysis. The Insight Journal - 2006 MICCAI Open Science Workshop	N/A	5
38	Niethammer M., Kalies W.D., Mischaikow K., Tannenbaum A. On the Detection of Simple Points in Higher Dimensions Using Cubical Homology. IEEE Trans Image Process. 2006 Aug;15(8):2462-9. PMID: 16900699.	3.643	12
39	Blood A.J., Tuch D.S., Makris N., Makhlof M.L., Sudarsky L.R., Sharma N. White Matter Abnormalities in Dystonia Normalize after Botulinum Toxin Treatment. Neuroreport. 2006 Aug 21;17(12):1251-5. PMID: 16951564. PMCID: PMC3039124.	N/A	23
40	DiMaio S.P., Archip N., Hata N., Talos I-F., Warfield S.K., Majumdar A., Mcdannold N., Hynynen K., Morrison P.R., Wells III W.M., Kacher D.F., Ellis R.E., Golby A.J., Black P.M., Jolesz F.A., Kikinis R. Image-guided Neurosurgery at Brigham and Women's Hospital. IEEE Eng Med Biol Mag. 2006 Sep-Oct;25(5):67-73. PMID: 17020201.	N/A	16
41	Wishart H.A., Saykin A.J., McAllister T.W., Rabin L.A., McDonald B.C., Flashman L.A., Roth R.M., Mamourian A.C., Tsongalis G.J., Rhodes C.H. Regional Brain Atrophy in Cognitively Intact Adults with a Single APOE Epsilon4 Allele. Neurology. 2006 Oct 10;67(7):1221-4. PMID: 17030756.	1.661	61
42	Basu S., Fletcher T., Whitaker R.T. Rician Noise Removal in Diffusion Tensor MRI. Int Conf Med Image Comput Comput Assist Interv. 2006;9(Pt 1):117-25. PMID: 17354881.	N/A	87
43	Dauguet J., Peled S., Berezovskii V., Delzescaux T., Warfield S.K., Born R., Westin C-F. 3D Histological Reconstruction of Fiber Tracts and Direct Comparison with Diffusion Tensor MRI Tractography. Int Conf Med Image Comput Comput Assist Interv. 2006;9(Pt 1):109-16. PMID: 17354880.	N/A	14
44	Niethammer M., Bouix S., Westin C-F., Shenton M.E. Fiber Bundle Estimation and Parameterization. Int Conf Med Image Comput Comput Assist Interv. 2006;9(Pt 2):252-9. PMID: 17354779. PMCID: PMC2773691.	N/A	6
45	Haidar H., Bouix S., Levitt J.J., McCarley R.W., Shenton M.E., Soul J.S. Characterizing the Shape of Anatomical Structures with Poisson's Equation. IEEE Trans Med Imaging. 2006 Oct;25(10):1249-57. PMID: 17024829. PMCID: PMC2785042.	3.643	2
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442	Gouttard S., Goodlett C., Kubicki M., Gerig G. Measures for Validation of DTI Tractography. <i>Proceedings of SPIE 2012;8314, 83140J</i>	N/A	0
443	Irimia A., Chambers M.C., Torgerson C.M., Filippou M., Hovda D.A., Alger J.R., Gerig G., Toga A.W., Vespa P.M., Kikinis R., Van Horn J.D. Patient-tailored Connectomics Visualization for the Assessment of White Matter Atrophy in Traumatic Brain Injury. <i>Front. Neur</i> . 3:10. doi: 10.3389/fneur.2012.00010	2.339	2
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451	Fedorov A., Tuncali K., Fennessy F.M., Tokuda J., Hata N., Wells III W.M., Kikinis R., Tempany C.M. Image Registration for Targeted MRI-guided Transperineal Prostate Biopsy. <i>J Magn Reson Imaging.</i> 2012 May 29. PMID: 22645031.	2.138	1
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454	Hazlett H.C., Gu H., McKinstry R.C., Shaw D.W.W., Botteron K.N., Dager S.R., Styner M., Vachet C., Gerig G., Paterson S.J., Schultz R.T., Estes A.M., Evans A.C., Piven J. Brain Volume Findings in 6-month-old Infants at High Familial Risk for Autism. <i>Am J Psychiatry.</i> 2012 Jun;169(6):601-8. PMID: 22684595.	2.524	1
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Appendix B: Personnel

	Name	Institutional Affiliation(s)	Year Start	Year End	Role at start	role now (inside or outside namic)
1	Ron Kikinis	BWH	2004	Present	FACULTY	FACULTY
2	Tina Kapur	BWH	2004	Present	FELLOW	FACULTY
3	Stephen Maier	BWH	2004	2006	FACULTY	FACULTY
4	Katie Mastrogiacom	BWH	2004	Present	STAFF	STAFF
5	Stephen Wong	BWH	2004	2007	FACULTY	FACULTY
6	Sanjay Manandhar	BWH	2004	Present	STAFF	STAFF
7	Hartuniuan Robin	BWH	2004	2007	STAFF	STAFF
8	Rachana Manandhar	BWH	2006	Present	STAFF	STAFF
9	Sonia Pujol	BWH	2005	Present	FELLOW	FACULTY
10	Nicole Aucoin	BWH	2007	Present	ENGINEER/ACADEMIC	ENGINEER/ACADEMIC
11	Wendy Plesniak	BWH	2007	Present?	FELLOW	FACULTY
12	Marianna Jakab	BWH	2007	Present	ENGINEER/ACADEMIC	ENGINEER/ACADEMIC
13	Eric Grimson	MIT	2004	Present	FACULTY	FACULTY
14	Polina Golland	MIT	2004	Present	FACULTY	FACULTY
15	Fernando DeOliveira	MIT	2008	2012	STAFF	STAFF
16	Tammy Riklin Raviv	MIT	2010	2011	STUDENT	FACULTY
17	Michal Depa	MIT	2010	2011	STUDENT	STUDENT
18	David Kennedy	MGH	2004	2008	FACULTY	FACULTY
19	David Tuch	MGH, Novartis, GE	2004	2006	FELLOW	INDUSTRY LEADER
20	Dara Manoach	MGH	2004	2006	FACULTY	FACULTY
21	Kevin Teich	MGH	2004	2006	ENGINEER/ACADEMIC	ENGINEER/INDUSTRY
22	Nathan White	MGH	2004	2005	ENGINEER/ACADEMIC	ENGINEER/INDUSTRY
23	Josh Snyder	MGH	2005	2007	ENGINEER/ACADEMIC	ENGINEER/INDUSTRY
24	Dennis Jen	MGH, Broad	2006	2008	ENGINEER/ACADEMIC	ENGINEER/INDUSTRY
25	Bruce Fischl	MGH	2006	2010	FACULTY	FACULTY
26	Nich Schmansky	MGH	2007	2008	ENGINEER/ACADEMIC	INDUSTRY
27	Randy L Gollub	MGH	2004	2011	FACULTY	FACULTY
28	Vijay Choudhary	MGH	2004	2005	ENGINEER/ACADEMIC	ENGINEER/INDUSTRY
29	Gregory Sharp	MGH	2010	Present	FACULTY	FACULTY
30	Rui Li	MGH, GE	2010	2011	ENGINEER/ACADEMIC	ENGINEER/INDUSTRY
31	Nadezhda Shushrina	MGH	2011	2012	ENGINEER	ENGINEER
32	James Shackelford	MGH	2011	2012	ENGINEER	ENGINEER

	Name	Institutional Affiliation(s)	Year Start	Year End	Role at start	role now (inside or outside namic)
33	Daniel Marcus	WUSTL	2008	Present	FACULTY	FACULTY
34	Mikhail Milchenko	WUSTL	2008	2012	FELLOW	FELLOW
35	Kevin Archie	WUSTL	2008	2012	ENGINEER/ACADEMIC	ENGINEER/ACADEMIC
36	Timothy Olsen	WUSTL	2010	2011	ENGINEER/ACADEMIC	ENGINEER/ACADEMIC
37	Lester Schweiss	WUSTL	2011	2012	ENGINEER/ACADEMIC	ENGINEER/ACADEMIC
38	Aditya Siram	WUSTL	2011	2012	ENGINEER/ACADEMIC	ENGINEER/ACADEMIC
39	Allen Tannenbaum	Georgia Tech, BU	2004	Present	FACULTY	FACULTY
40	John Melonakos	Georgia Tech, Founded Acceleryes	2005	2008	STUDENT	ENGINEER/INDUSTRY LEADER
41	Oleg Michailovich	Georgia Tech	2006	2008	STUDENT	STUDENT
42	Vandana Mohan	Georgia Tech	2008	2010	STUDENT	STUDENT
43	Yi Gao	Georgia Tech, BWH	2010	2011	STUDENT	FELLOW
44	Martin Mueller	Georgia Tech	2011	2012	STUDENT	
45	Marc Neithammer	Georgia Tech, BWH, UNC	2006	2012	STUDENT	FACULTY
46	Guido Gerig	UNC, Utah	2004	Present	FACULTY	FACULTY
47	Isabelle Corouge	UNC	2004	2005	FELLOW	SCIENTIST
48	Timothy Terribery	UNC	2004	2005	STUDENT	INDUSTRY
49	Pierre Fillard	UNC	2004	2005	STUDENT	SCIENTIST
50	Martin Styner	UNC	2005	Present	FACULTY	FACULTY
51	Gary Long	UNC	2007	2008	STAFF	STAFF
52	Mathieu Jomier	UNC	2005	2006	ENGINEER	INDUSTRY
53	Ipek Oguz	UNC	2005	2010	STUDENT	FACULTY
54	Casey Goodlett	UNC, Utah, Kitware	2005	2009	STUDENT	INDUSTRY
55	Michael Garret Larson	UNC	2010	2011	STUDENT	
56	Deepika Mahalingam	UNC	2010	2011	STUDENT	
57	Clement Vachet	UNC	2010	2012	ENGINEER	ENGINEER
58	Yinpeng Li	UNC	2011	2012	STUDENT	
59	Beatriz Paniagua	UNC	2011	2012	FELLOW	FELLOW
60	Heather Cody Hazlett	UNC	2007	2010	FACULTY	FACULTY
61	Rachel Gimpel Smith	UNC	2007	2010	STAFF	STAFF
62	Cedric Mathieu	UNC	2009	2010	ENGINEER	ENGINEER
63	James R Scotton	UNC	2009	2010	STUDENT	
64	Marcel Prastawa	U of Utah	2010	2012	FELLOW	FACULTY
65	Stanley Durrleman	U of Utah	2010	2012	FELLOW	FELLOW
66	James Fishbaugh	U of Utah	2010	2012	STUDENT	STUDENT

	Name	Institutional Affiliation(s)	Year Start	Year End	Role at start	role now (inside or outside namic)
67	Emmanuel Bitaud	U of Utah	2010	2012	STUDENT	STUDENT
68	Ross Whitaker	U of Utah	2004	Present	FACULTY	FACULTY
69	Tolga Tasdizen	U of Utah	2004	2007	FELLOW	FACULTY
70	Sarah Geneser	U of Utah	2004	2007	STUDENT	FELLOW
71	Greg Jones	U of Utah	2005	2006	FACULTY	FACULTY
72	Preston T. Fletcher	U of Utah	2005	2010	FELLOW	FACULTY
73	Steve Corbato	U of Utah	2006	2007	FACULTY	FACULTY
74	Suarav Basu	U of Utah	2006	2007	STUDENT	INDUSTRY
75	Ran Tao	U of Utah	2007	2009	STUDENT	INDUSTRY
76	Yongshen Pan	U of Utah	2010	2011	FELLOW	FELLOW
77	Manasi Datar	U of Utah	2010	2012	STUDENT	STUDENT
78	Samuel Gerber	U of Utah	2010	2011	STUDENT	FACULTY
79	Jonathan Bronson	U of Utah	2011	2012	STUDENT	STUDENT
80	MiaoMiao Zhang	U of Utah	2011	2012	STUDENT	STUDENT
81	Rob MacLeod	U of Utah	2010	Present	FACULTY	FACULTY
82	Josh Cates	U of Utah	2010	2012	STUDENT	FELLOW
83	Josh Blauer	U of Utah	2010	2011	STUDENT	STUDENT
84	William E Lorensen	GE	2004	2007	ENGINEER	INDUSTRY LEADER/RETIRED
85	Daniel J Blezek	GE, Mayo Clinic Rochester MN	2004	2008	ENGINEER	FELLOW
86	James V. Miller	GE	2004	Present	ENGINEER	ENGINEER/INDUSTRY LEADER
87	Xiaodong Tao	GE	2005	2012	ENGINEER	ENGINEER
88	James Ross	GE, BWH	2008	2009	ENGINEER	FELLOW
89	Ming-Ching Chang	GE	2009	2010	ENGINEER	ENGINEER
90	Mahnaz Maddah	GE, SRI International	2009	2010	ENGINEER	ENGINEER
91	Roshni Bhagalia	GE	2010	2011	ENGINEER	ENGINEER
92	Dirk Padfield	GE	2010	2012	ENGINEER	ENGINEER
93	Harini Veeraraghavan	GE	2011	2012	ENGINEER	ENGINEER
94	Kunlin Cao	GE			ENGINEER	ENGINEER
95	Steve Pieper	Isomics	2004	Present	ENGINEER	ENGINEER/INDUSTRY LEADER
96	Alex Yarmarkovich	Isomics	2004	Present	ENGINEER	ENGINEER
97	Arthur W Toga	UCLA	2004	2011	FACULTY	FACULTY
98	Ivo D. Dinov	UCLA	2004	2005	FACULTY	FACULTY
99	Karen Crawford	UCLA	2004	2005	ENGINEER	ENGINEER/ACADEMIC
100	Fotis Konstantinidis	UCLA	2004	2005	STUDENT	INDUSTRY/MANAGER
101	David Rex	UCLA	2004	2005	STUDENT	FACULTY
102	Prathibha Deshikachar	UCLA, Wize Commerce	2005	2006	STUDENT	INDUSTRY/TECH LEAD

	Name	Institutional Affiliation(s)	Year Start	Year End	Role at start	role now (inside or outside namic)
103	Michael Pan	UCLA	2005	2006	STUDENT	PROGRAMMER
104	Jagadeeswan Rajendiran	UCLA	2005	2008	STUDENT	PROGRAMMER
105	Jia wei Tam	UCLA, GOOGLE	2006	2008	ENGINEER	INDUSTRY/CHROME WEB STORE UI ENGINEER
106	Celia Cheung	UCLA	2008	2009	ENGINEER	WEB DESIGNER, UCLA
107	Nathan Hageman	UCLA	2008	2010	STUDENT	MD/PHD PROGRAM, UCLA
108	Zhizhong Liu	UCLA	2009	2010	ENGINEER	ENGINEER/ACADEMIC
109	John D Van Horn	UCLA	2010	Present	FACULTY	FACULTY
110	Jeffery Alger	UCLA	2010	2011	FACULTY	FACULTY
111	David Hovda	UCLA	2010	2011	FACULTY	FACULTY
112	Paul Vespa	UCLA	2010	2011	FACULTY	FACULTY
113	Ian Bowman	UCLA	2010	2012	ENGINEER	ENGINEER/ACADEMIC
114	Andrei Irimia	UCLA	2011	2012	FELLOW	FELLOW
115	Mark Ellisman	UCSD	2004	2010	FACULTY	FACULTY
116	Jeffrey Grethe	UCSD	2004	Present	FACULTY	FACULTY
117	Shava Smallen	UCSD, San Diego Supercomputer Center	2004	2005	ENGINEER	ENGINEER/ACADEMIC
118	David Little	UCSD	2005	2006	ENGINEER	ENGINEER/ACADEMIC
119	Brendan Flaherty	UCSD, Dartmouth Hitchcock Medical Center, Google	2006	2007	ENGINEER	ENGINEER/INDUSTRY
120	Jones Neil	UCSD	2007	2008	STUDENT	ENGINEER/ACADEMIC
121	Bryan Smith	UCSD	2006	2008	STUDENT	INDUSTRY/CHIEF SCIENTIST POKITDOK
122	Marco Ruiz	UCSD	2008	2012	ENGINEER	SOFTWARE ENGINEER CONSULTANT
123	William J Schroeder	Kitware	2004	Present	ENGINEER	ENGINEER/INDUSTRY LEADER
124	Luis Ibanez	Kitware	2004	2012	ENGINEER	ENGINEER
125	Sebastien Barre	Kitware	2004	2010	ENGINEER	ENGINEER
126	William Hoffman	Kitware	2004	2011	ENGINEER	ENGINEER
127	Ken Martin	Kitware	2004	2008	ENGINEER	ENGINEER
128	Brad King	Kitware	2004	2008	ENGINEER	ENGINEER
129	Andy Cedilink	Kitware	2004	2008	ENGINEER	ENGINEER
130	Zack Galbreath	Kitware	2008	2010	ENGINEER	ENGINEER
131	Stephen R Aylward	Kitware	2010	Present	ENGINEER	ENGINEER/INDUSTRY LEADER
132	Julien Finet	Kitware	2010	2012	ENGINEER	ENGINEER

	Name	Institutional Affiliation(s)	Year Start	Year End	Role at start	role now (inside or outside namic)
133	Julien Jomier	Kitware	2010	2011	ENGINEER	ENGINEER
134	Zach Mullen	Kitware	2010	2012	ENGINEER	ENGINEER
135	Martha Shenton	HMS	2004	2007	FACULTY	FACULTY
136	Robert W. McCarley	HMS	2004	2006	FACULTY	FACULTY
137	Hae-Jeong Park	HMS	2004	2005	FELLOW	FACULTY, KOREA
138	Georgia Bushnell	HMS	2004	2006	RESEARCH ASSOCIATE	LAW SCHOOL
139	Sophie Woolston	HMS	2004	2006	RESEARCH ASSOCIATE	PHYSICIAN
140	Kristina Pike	HMS	2004	2006	Admin ASST	ADMIN ASST
141	Adam Cohen	BWH	2006	2007	RESEARCH ASSOCIATE	STUDENT
142	Katharina Quintus	BWH	2006	2008	ENGINEER/ACADEMIC	ENGINEER/ACADEMIC
143	Marek Kubicki	BWH	2007	2010	FACULTY	FACULTY
144	Usman Khan	BWH	2007	2008	RESEARCH ASSOCIATE	MD/PHD PROGRAM
145	Jorge Alvarado	BWH	2008	2009	RESEARCH ASSOCIATE	MEDICAL SCHOOL
146	Padmapriya Srinivazan	BWH	2008	2009	RESEARCH ASSOCIATE	RESEARCH ASSOCIATE
147	Jennifer Goodrich	BWH	2008	2009	ADMIN ASST	ADMIN ASST
148	Julien Von Siebenthal	BWH	2009	2010	FELLOW	FELLOW
149	Andrew Rauch	BWH	2009	2010	RESEARCH ASSOCIATE	MEDICAL SCHOOL
150	Douglas Terry	BWH	2009	2010	RESEARCH ASSOCIATE	GRADUATE SCHOOL
151	Mai-Anh Vu	BWH	2009	2010	RESEARCH ASSOCIATE	GRADUATE SCHOOL
152	Andrew Saykin	Dartmouth, University of Indiana	2004	2007	FACULTY	FACULTY
153	C Calkins	Dartmouth	2004	2005	TECHNICIAN	?
154	Laura Flashman	Dartmouth	2004	2007	FACULTY	FACULTY
155	Fillia Makedon	Dartmouth, U Texas, Arlington	2004	2007	COMPUTER SCIENCE	FACULTY
156	Alex Mamourian	Dartmouth, U Penn	2004	2007	FACULTY	FACULTY
157	Thomas McAllister	Dartmouth	2004	2007	FACULTY	FACULTY
158	Tara McHugh	Dartmouth	2004	2007	OTHER	
159	Heather Pixley	Dartmouth	2004	2007	OTHER	
160	R Roth	Dartmouth	2004	2006	FACULTY	FACULTY

	Name	Institutional Affiliation(s)	Year Start	Year End	Role at start	role now (inside or outside namic)
161	John Weaver	Dartmouth	2004	2007	FACULTY	FACULTY
162	John West	Dartmouth, INDIANA UNIVERSITY	2004	2007	ENGINEER	ENGINEER
163	N. Koven	Dartmouth, Bates College	2005	2006	FACULTY	FACULTY
164	Steven G Potkin	UCI	2004	2007		
165	Gustavo Alva	UCI	2004	2006		
166	Diane Hoghum	UCI	2006	2007		
167	Jessica Turner	UCI	2004	2007		
168	Hal Stern	UCI	2004	2007		
169	James Fallon	UCI	2004	2007		
170	Padhraic Smyth	UCI	2004	2007		
171	Kirsten Fleming	UCI	2004	2006		
172	Satra Satram	UCI	2004	2006		
173	Yi Jin	UCI	2005	2007		
174	Lisa Kilpatrick	UCI	2005	2006		
175	Aaron Kemp	UCI	2005	2006		
176	Liv Trondsen	UCI	2006	2007		
177	Martina Panzenboeck	UCI	2006	2007		
178	James Kennedy	CAMH	2004	2007		
179	Fabio Macciardi	CAMH, UC IRVINE	2004	2006	FACULTY	FACULTY, PROFESSOR
180	Dan Mueller	CAMH, Germany, University of Toronto	2004	2006	FELLOW	PROFESSOR
181	Natalie Potapova	CAMH	2004	2007	FELLOW	SENIOR RESEARCH ANALYST/ACADEMIC
182	Sajid Shaikh	CAMH	2006	2007	RESEARCH TECHNICIAN	DNA CURATOR
183	Claudia Rothe	CAMH, UNC	2006	2007	FELLOW	RESEARCH FELLOW
184	Gabor Fichtinger	Queens University	2007	2010	FACULTY	FACULTY
185	Purang Abolmaseumi	Queens University	2007	2009	FELLOW	FACULTY
186	David Gobbi	Queens University	2007	2009	ENGINEER	ENGINEER

	Name	Institutional Affiliation(s)	Year Start	Year End	Role at start	role now (inside or outside namic)
187	Jonathan Boisvert	Queens University, National Research Council Canada	2007	2008	FELLOW	RESEARCH OFFICER
188	Siddharth Vikal	Queens University	2008	2010	ENGINEER	ENGINEER
189	Andras Lasso	Queens University	2009	2010	ENGINEER	ENGINEER
190	Jeremy Bockholt	Mind Institute	2007	2010	ENGINEER	ENGINEER
191	Chuck Gasparovic	Mind Institute	2007	2008	FACULTY	FACULTY
192	Mark Scully	Mind Institute, U of Iowa	2008	2012	ENGINEER	ENGINEER
193	Hans J Johnson	U of Iowa	2010	Present	FACULTY	FACULTY
194	Norman K Williams	U of Iowa	2010	2011	ENGINEER	ENGINEER

Appendix C: Funded NIH and International Collaborations

	Funding	Project Title	Notes
1	PAR-08-183 R21EB00990	Skull stripping segmentation algorithm	Institution: Johns Hopkins University PI: Jerry L. Prince NA-MIC: N Aucoin, R Kikinis Funding Duration: 08/01/2009-07/31/2011 Status: Completed
2	PAR-07-209 R01AA016788	Measuring alcohol and stress interaction with structural and perfusion MRI	Institution: Wake Forest University Health Sciences PI: James B. Daunais NA-MIC: K Pohl, S Wells, A Fedorov Funding Duration: 07/15/2009 - 03/31/2010 Status: Completed
3	PAR-07-249 5RO1EB008171	3D shape analysis for computational anatomy	Institution: Johns Hopkins University PI: Michael I. Miller NA-MIC: S Aylward, W Schroeder, M Audette Funding Duration: 05/21/2009-02/28/2013 Status: Active
4	PAR-07-249 5R01CA131718	Virtual colonoscopy	Institution: Massachusetts General Hospital PI: Hiroyuki Yoshida NA-MIC: N Hata, S Pieper, A Yarmarkovich Funding Duration: 01/26/2009-11/30/2009 Status: Completed
5	PAR-07-249 R01MH084795	The microstructural basis of abnormal connectivity in autism	Institution: University of Utah PI: Janet Lainhart NA-MIC: R Whittaker Funding Duration: 01/04/2009-01/31/2014 Status: Active
6	PAR-07-249 R01EB006733	Development and dissemination of robust brain MRI measurement tools	Institution: University of North Carolina Chapel Hill PI: Dinggang Shen NA-MIC: J Miller, X Tao Funding Duration: 09/17/2008-08/31/2011 Status: Completed
7	PAR-05-063 R01CA124377	An Integrated System for Image-Guided Radiofrequency Ablation of Liver Tumors	Institution: Georgetown University PI: Kevin R. Cleary NA-MIC: Nobuhito Hata Funding Duration: 09/14/2007 - 7/31/2012 Status: Completed
8	PAR-05-063 1R01EB005973	Integrating automated FE mesh development into NA-MIC toolkit	Institution: University of Iowa PI: Nicole M. Grosland NA-MIC: S Pieper Funding Duration: 09/20/2006-06/30/2011 Status: Completed
9	PA-10-067 1R01EB014947	Enabled pediatric radiologic decision support	Institution: Massachusetts General Hospital PI: Shawn N. Murphy NA-MIC: RL Gollub Funding Duration: 8/1/2012 - 7/31/2016 Status: Active
10	Pending Council Approval	Airway Inspector: a chest imaging biomarker software platform for	Institution: Brigham and Women's Hospital PI: Raul Estepar San Jose NA-MIC:

		COPD clinical research	Funding Duration: Status: Active
11	Pending Council Approval	The clinical impact of pulmonary vascular remodeling in smokers	Institution: Brigham and Women's Hospital PI: Raul Estepar San Jose NA-MIC: Funding Duration: Status: Active
12	U24RR026057	Collaborative Tools Support Network (CTSN-BIRN)	Institution: Massachusetts General Hospital PI: Bruce Rosen, MGH NA-MIC: R Kikinis, S Pieper Funding Duration: 09/30/2009-08/31/2013 Status: Active
13	5U24RR025736	Bioinformatics Research Network Coordinating Center (BIRN-CC)	Institution: University of Southern California PI: Carl Kesselman NA-MIC: R Kikinis, J Grethe, S Pieper Funding Duration: 12/15/2008-11/30/2013 Status: Completed
14	U54EB005149 (U54LM008748)	Biomedical Computation Research NCBC Symbios Stanford (subproject)	Institution: Stanford University PI: Russ B. Altman (Scott Delp) NA-MIC: R Kikinis, S Pieper Funding Duration: 09/19/2008-07/31/2010 Status: Completed
15	NIH Blueprint for Neuroscience Research U54EB005149	Neuroimaging Informatics Tools and Resources Clearinghouse (NITRC)	Institution: Kennedy Consulting, Neuromorphometrics, UCSD PI: ? NA-MIC: S Pieper, D Kennedy Funding Duration: 08/01/2008-07/31/2009 Status: Completed
16	NHLBI U01HL089897 and U01HL089856	COPDGene	Institution: Brigham and Women's Hospital PI: Edwin K. Silverman NA-MIC: R San Jose, J Rosss Funding Duration: 09/27/2007-07/31/2012 Status: Completed
17	R01NS050568	Brains morphology and image atlas	Institution: University of Iowa PI: Vincent A. Magnotta NA-MIC: S Pieper Funding Duration: 05/15/2007-03/31/2010 Status: Completed
18	NCMIR U54EB005149	Confocal microscopy	Institution: UCSD PI: Jeffrey S. Grethe NA-MIC: B Smith Funding Duration: 08/01/2006-07/31/2008 Status: Completed
19	R01CA111288	Prostate BRP	Institution: Brigham and Women's Hospital PI: Clare Tempany NA-MIC: Nobuhiko Hata, Junichi Tokuda Funding Duration: 07/01/2006-05/31/2016 Status: Active

20	5U24RR021992	fBIRN	Institution: University of California Irvine PI: Steven G. Potkin NA-MIC: R Kikinis, S Pieper Funding Duration: 02/08/2006-11/30/2010 Status: Completed
21	U41RR019703	NCIGT	Institution: Brigham and Women's Hospital PI: Ferenc Jolesz, Clare Tempny NA-MIC: R Kikinis, T Kapur, N Hata, H Liu, S Pieper Funding Duration: 09/29/2005-07/31/2010 Status: Active
22	U54LM008748	I2B2	Institution: Harvard University PI: Isaac Kahane NA-MIC: R Kikinis, R Gollub Funding Duration: 09/15/2004-7/31/2010 Status: Completed
23	U24RR021382	mBIRN	Institution: Massachusetts General Hospital PI: Bruce Rosen NA-MIC: R Kikinis, S Pieper Funding Duration: 09/30/2004-05/31/2010 Status: Completed
24	P41RR013218	NAC	Institution: Brigham and Women's Hospital PI: R Kikinis NA-MIC: W Wells, C-F Westin, S Pieper, M Halle Funding Duration: 09/30/1998-05/31/2013 Status: Active
25	UI1RR025758	Catalyst Translational Imaging Consortium	Institution: Massachusetts General Hospital PI: Bruce Rosen, Director; R Gollub Co-Director NA-MIC: C Tempny, R Kikinis, C Guttmann, T Perlstein, G Williams Funding Duration: ? Status: Completed
	NSF and John Simon Guggenheim Foundation	Teragrid neurosurgery	Institution: College of William and Mary PI: Nikos Chrisochoides NA-MIC: A Fedorov Status: Active
	Private	Pediatric cardiology	Institution: Stanford/SCI/SPL/Boston Children's Hospital/Northeastern PI: John Triedman, Matthew Jolley, Dana Brooks NA-MIC: S Pieper, K Pohl Status: Active
1	International	OCAIRO/SPARKit	Institution: Ontario Consortium for Adaptive Radiation Oncology PI: Gabor Fichtiger, Terry Peters NA-MIC: R Kikinis, S Pieper Status: Active
2	International	CO-ME (COME) Image-Guided Brain Tumor Surgery	Institution: The National Centre of Competence in Research, Zurich, Switzerland PI: Network of leading clinics and engineering sites NA-MIC: R Kikinis, S Pieper Status: Active

3	International	NA-MIC collaboration for neurosurgical intervention	Institution: University Hospital of Marburg, Germany PI: Jan Egger, Bernd Freisleben, Christopher Nimsky NA-MIC: R Kikinis, R Colen, A Golby Status: Active
4	International	CTK Multi-institution international collaboration to share development of a common toolkit for medical image analysis	Institution: International consortium Leadership: Ron Kikinis, NA-MIC and Hans-Peter Meinzer, German Cancer Research Center, Heidelberg, Germany NA-MIC: R Kikinis, S Pieper, S Aylward, W Schroeder, J-C Fillion-Robin, J Finet, J Jomier Status: Active
5	International	Soft tissue organ deformation for computer-assisted Surgery (Australia)	Institution: University of Western Australia PI: Karol Miller NA-MIC: R Kikinis Status: Active
6	International	AIST Japan Research and development project on intelligent surgical instruments	Institution: Consortium of Japanese Universities and Companies PI: Kiyoyuki Chinzei NA-MIC: N Hata, R Kikinis Funding Duration: 04/01/2007-12/31/2011 Status: Completed
7	International	Vascular Modeling Toolkit (Italy)	Institution: Mario Negri Institute, Italy PI: Luca Antiga NA-MIC: R Kikinis, S Pieper Status: Completed