Harvard Medical School/Harvard School of Dental Medicine
Format for the Curriculum Vitae

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Place of Birth: Parramatta, Australia

Education

1991	B.Sc.	Computer Science	University of New South Wales, Australia
1993	B.E. Honors Class 1	Electrical Engineering	University of New South Wales, Australia
1997	Ph.D.	Computer Science and Engineering (Advisor: John Hiller, Ph.D.)	University of New South Wales, Australia

Postdoctoral Training

1996-1998	Research Fellow	Radiology	Brigham & Women's Hospital, Harvard Medical School, Boston, MA USA
1997-1998	Post-doc	Medical Imaging (Advisor: Ron Kikinis, M.D.)	Brigham & Women's Hospital, Harvard Medical School, Boston, MA USA

Faculty Academic Appointments

1998-2001	Instructor	Radiology	Brigham & Women's Hospital, Harvard Medical School, Boston, MA USA

2001-2004	Assistant Professor	Radiology	Brigham & Women's Hospital, Harvard Medical School, Boston, MA USA
2002-2007	Research Affiliate	CSAIL	Massachusetts Institute of Technology, Cambridge, MA USA
2004-2007	Associate Professor	Radiology	Brigham & Women's Hospital, Harvard Medical School, Boston, MA USA
2007-2010	Associate Professor	Radiology	Boston Children's Hospital, Harvard Medical School, Boston, MA USA
2010-	Professor	Radiology	Boston Children's Hospital, Harvard Medical School, Boston, MA USA
2014-	Thorne Griscom Chair	Radiology	Boston Children's Hospital, Harvard Medical School, Boston, MA USA

Appointments at Hospitals/Affiliated Institutions

1994, 1996-1998	Research Fellow	Radiology	Brigham & Women's Hospital, Harvard Medical School, Boston, MA USA
1998-2001	Research Associate	Radiology	Brigham & Women's Hospital, Harvard Medical School, Boston, MA USA
2001-2007	Director	Computational Radiology Laboratory	Brigham & Women's Hospital, Harvard Medical School, Boston, MA USA
2007-	Director	Computational Radiology Laboratory	Boston Children's Hospital, Harvard Medical School, Boston, MA USA
2014-	Director	Research MRI Core	Boston Children's Hospital, Harvard Medical School, Boston, MA USA

Other Professional Positions

2006-2013	Member, Research and Investment Advisory Council (RIAC)	CSIRO eHealth Research Centre

Major Administrative Leadership Positions

2008-	Director of Radiology Research	Boston Children's Hospital, Harvard Medical School, Boston, MA
2008-2011	Site Core Leader, Harvard Medical School CTSC Translational Technologies Imaging Consortium	Harvard Medical School, Boston Children's Hospital, Boston, MA

Committee Service

Local

2005-2006	Bioinformatics in Functional and Molecular Imaging Committee	Brigham & Women's Hospital, Boston, MA
2005-2007	Division of Newborn Medicine Scholarship Advisory Committee	Boston Children's Hospital, MA
2007-	MRI Research Committee	Boston Children's Hospital, MA
2008-2010	Harvard Neonatal-Perinatal Fellowship Program Thesis Scholarship Oversight Committee	Harvard Medical School, Boston, MA
2009-2018	Scientific and Resource Review Committee (SRRC), Harvard Catalyst Participant and Clinical Interactions Resource (PCIR)	Harvard Medical School, Boston, MA
2018	Department of Radiology Scientific Review Committee for IRB Submissions	Boston Children's Hospital, MA
2018	Department of Radiology Research Imaging Advisory Committee	Boston Children's Hospital, MA

National

2004-2013	NiFTI Geometry Format Working Group	NIH
2008	Advisory Committee Member	Osteoarthritis Initiative (OAI)

International

1998	Program Committee Member	MICCAI 98 1st International Conference on Medical Image Computing and Computer Assisted Intervention
1999	Scientific Review Committee Member	MICCAI 99 2nd International Conference on Medical Image Computing and Computer Assisted Intervention
2001	Scientific Review Committee Member	MICCAI 01 3rd International Conference on Medical Image Computing and Computer Assisted Intervention
2002	Scientific Review Committee Member	ISBI 2002: International Symposium on Biomedical Imaging
2002	Scientific Review Committee Member	IS4TM 2003: International Symposium on Surgical Simulation and Soft Tissue Modeling
2002	Scientific Review Committee Member	MICCAI 02 5th International Conference on Medical Image Computing and Computer Assisted

		Intervention
2002	Scientific Review Committee Member	ISMRM 2003: International Society for Magnetic Resonance in Medicine Eleventh Scientific Meeting
2003	Scientific Review Committee Member	ISBI 2004: International Symposium on Biomedical Imaging
2003	Scientific Review Committee Secretary	MICCAI 03 6th International Conference on Medical Image Computing and Computer Assisted Intervention
2003	Scientific Review Committee Member	WBIR 2003: Workshop on Biomedical Image Registration
2003	Scientific Review Committee Member	ISMRM 2004: International Society for Magnetic Resonance in Medicine Twelfth Scientific Meeting
2004	Scientific Review Committee Member	Second International Symposium on Medical Simulation
2004	Scientific Review Committee Member	MICCAI 04 7th International Conference on Medical Image Computing and Computer Assisted Intervention
2005	Program Committee Member	ISBI 2006: International Symposium on Biomedical Imaging
2005	Program Committee Member	Computer Vision for Biomedical Image Applications
2005	Scientific Review Committee Member	WBIR 2005: Workshop on Biomedical Image Registration
2005	Scientific Review Committee Member	MICCAI 05 8th International Conference on Medical Image Computing and Computer Assisted Intervention
2006	Scientific Review Committee Member	3rd Symposium on Biomedical Simulation
2006	MICCAI 06 Workshop on Joint Disease Program Committee Member	MICCAI 06 9th International Conference on Medical Image Computing and Computer Assisted Intervention
2006	Scientific Review Committee Member	MICCAI 06 9th International Conference on Medical Image Computing and Computer Assisted Intervention
2006	Scientific Review Committee Member	International Conference on Pattern Recognition 2006
2007	International Program Committee for Visual Communications (VC 2008) Member	International Association of Science and Technology for Development (IASTED) VC 2008
2007	Program Committee Member	MICCAI 07 10th International Conference on Medical Image Computing and Computer Assisted

		Intervention
2008	International Program Committee Member	IASTED International Conference on Internet and Multimedia Systems/Visual Communications
2008	Program Committee Member	MICCAI 08 11th International Conference on Medical Image Computing and Computer Assisted Intervention
2008	Program Committee Member	International Symposium on Computational Models for Biomedical Simulation (ISBMS)
2008-2011	Annual Meeting Program Committee (AMPC) Member	International Society for Magnetic Resonance in Medicine (ISMRM)
2009	Program Committee Member	MICCAI 09 12th International Conference on Medical Image Computing and Computer Assisted Intervention
2010	Program Committee Member	MICCAI 10 13th International Conference on Medical Image Computing and Computer Assisted Intervention
2011	Program Committee Member	MICCAI 11 14th International Conference on Medical Image Computing and Computer Assisted Intervention
2011	Review Team Member	CSIRO Information and Communication Technology Centre Science Review - Australia
2012	Program Committee Member	MICCAI 12 15th International Conference on Medical Image Computing and Computer Assisted Intervention
2013	Program Committee Member	MICCAI 13 16th International Conference on Medical Image Computing and Computer Assisted Intervention
2013	Scientific Review Committee Member	MICCAI 13 16th International Conference on Medical Image Computing and Computer Assisted Intervention
2013	Organizational Committee Member	MICCAI 13 16th International Conference on Medical Image Computing and Computer Assisted Intervention

2014	Scientific Review Committee Member	MICCAI 14 17th International Conference on Medical Image Computing and Computer Assisted Intervention
2014	Program Committee Member	MICCAI 2014 17th International Conference on Medical Image Computing and Computer Assisted Intervention
2014	Scientific Review Committee Member	ECCV 2014 European Conference on Computer Vision
2014	Scientific Review Committee Member	IEEE 2014
2015	Organizing Committee	ISBI 2015: International Symposium on Biomedical Imaging
2015	Review Committee Member	ICCV 2015 International Conference on Computer Vison
2016	Scientific Review Committee Member	ISBI 2016 International Symposium on Biomedical Imaging
2016	Scientific Review Committee Member	OHBM 2016 22nd Annual Meeting, The Organization for Human Brain Mapping
2016-17	Chair, Program Committee	ISBI 2017 International Symposium on Biomedical Imaging
2016	Program Committee Member	MICCAI 2016 Brain Lesion Workshop
2016	Program Committee Member	MLMI 2016, 7th International Workshop on Machine Learning in Medical Imaging
2016	Scientific Advisory Committee Member	FLI-IAM/OFSEP MICCAI Challenge in Multiple Sclerosis
2017	Review Committee Member	MLMI 2017, 8th International Workshop on Machine Learning in Medical Imaging
2017	Review Committee Member	ICCV 2017 International Conference on Computer Vision
2017-18	Review Committee Member	CVPR 2018 IEEE Conference on Computer Vision and Pattern Recognition
2018	Program Committee Member	ISBI 2018 International Symposium on Biomedical Imaging
2018	Program Committee Member	MICCAI 2018 21st International Conference on Medical Image Computing & Computer-Assisted Intervention
2018	Scientific Review Committee Member	ECCV 2018 European Conference on Computer Vision
2019	Review Committee Member	ICCV 2019 International Conference

		on Computer Vision

Professional Societies

1998-	International Society for Magnetic Resonance in Medicine (ISMRM)
1998-	Member
1998-	Institute for Electrical and Electronics Engineers (IEEE)
1998-	Member
2007-	Senior Member
2019-	Fellow
2001-	IEEE Computer Society
2001-	Member
2001-	IEEE Signal Processing Society
2001-	Member
2001-	American Association for the Advancement of Science
2001-	Member
2004-	Medical Image Computing and Computer Assisted Intervention (MICCAI)
2004-	Member
2013-	Society for Pediatric Radiology (SPR)
2013-	Member
2015-	American Society of Functional Neuroradiology (ASFNR)honors class
2015-	Member

Grant Review Activities

2004	NIDA: Design Evaluation, and Integration of Image Analysis	NIH
2004	Member	
2004	ZRG1 SBIB-Q 50 Study Section	NIH
2004	Member	
2005-2007	BDCN K-10 Study Section	NIH
2005-2007	Member	
2005	NIDA review panel RFC No.: N43DA-5-4403 (Topic 067)	NIH
2005	Ad-hoc Member	
2006	ZRG1 SBIB-L (40) MR P41	NIH
2006	Member	
2006	Australian Research Council	Australian Research Council
2006	Reviewer	
2006-2007	ZRG1 BDCN-K 50M	NIH

2006-2007	Member	
2007	Discovery Project	Australian Research Council
2007	Reviewer	
2007	European Young Investigator Award	European Science Foundation
2007	Reviewer	
2007	Sheffield Hospitals Charitable Trust	Sheffield Hospitals Charitable Trust
2007	Reviewer	
2007	ZRG1 BDCN-E (10) B Clinical Neurophysiology, Devices & Neuroprosthetics	NIH
2007	Member	
2007	ZRG1 BDCN-F (03) S Clinical Neurophysiology, Devices & Neuroprosthetics	NIH
2007	Member	
2008	ZRG1 SBIB U(91) Innovative Ultrasound and Imaging	NIH
2008	Member	
2008	New Research Project Proposal	Research Foundation – Flanders (Belgium) (FWO)
2008	Referee	
2008	Swiss National Science Foundation	Swiss National Science Foundation
2008	Reviewer	
2008	CFI Expert Review Committee	Canada Foundation for Innovation
2008	Member	
2009	SBIB-D 53 Peer Review	NIH
2009	Member	
2010	Human Connectome Project (HCP) RFA-MH-10-020	NIH/NIMH
2010	Member	
2011	ESAB Meeting - VCU P01	NIH
2011	Member	
2011	BDMA Study Section	NIH
2011	Member	
2011	NIH BDCN N02 Special Emphasis Panel	NIH
2011	Member	
2011	Australian Research Council (ARC) FT11	ARC
2011	Member	
2011	CSIRO Information and Communication Technology (ICT) Science Review	CSIRO
2011	Member	
2012	Australian Research Council (ARC) FT12	ARC
2012	Member	
2012	2012/10 ZRG1 SBIB-V (82) S – SBIB Pediatric and Fetal Applications	NIH

2012	Member	
2012	2012/10 ZRG1 DTCS-A (81) S – Clinical and Translational Imaging Applications	NIH
2012	Member	
2013	Sir Henry Dale Fellowship Expert Review	Wellcome Trust and Royal Society - London
2013	Member	
2013	2013/10 ZRG1 BDCN-M (90) S -DBD Review Panel	NIH
2013	Member	
2013	VA Review Panel	United States Veterans Administration
2013	Member	
2014	2014/10 DBD Review Panel	NIH
2014	Member	
2014	2014/10 ZRG1 MOSS-C (02) M Review Panel	NIH
2014	Member	
2014	2014/08 ZMH1 ERB-C (09) R - BRAIN Initiative: Development and Validation of Novel Tools	NIH
2014	Member	
2015	2015/01 ZRG1 SBIB-V (82) S SBIB Clinical Pediatric and Fetal Applications	NIH
2015	Member	
2017-2021	Biodata Management and Analysis (BDMA) Study Section	NIH
2017-2021	Member	
2018	Netherlands Organization for Scientific Research (NWO)	NWO
2018	Member	
2018	Czech Science Foundation (GACR)	GACR
2018	Member	

Editorial Activities

Ad-hoc Reviewer

1996	Ad-hoc Reviewer	Pattern Recognition Letters
1999-2016	Ad-hoc Reviewer	IEEE Transactions on Medical Imaging
1999-	Ad-hoc Reviewer	NeuroImage
1999-	Ad-hoc Reviewer	Medical Image Analysis
2000-	Ad-hoc Reviewer	Graphical Models
2000-	Ad-hoc Reviewer	Journal of Biomedical Informatics

2001-	Ad-hoc Reviewer	Signal Processing
2001-	Ad-hoc Reviewer	IEEE Transactions on Biomedical Engineering
2001-	Ad-hoc Reviewer	IEEE Transactions on Image Processing
2002-	Ad-hoc Reviewer	International Journal of Image and Graphics
2003-	Ad-hoc Reviewer	Human Brain Mapping
2003-	Ad-hoc Reviewer	Medical and Biological Engineering and Computing
2005-	Ad-hoc Reviewer	Cerebral Cortex
2005-	Ad-hoc Reviewer	Image and Vision Computing
2006-	Ad-hoc Reviewer	International Journal of Radiation Oncology Biology Physics
2006-	Ad-hoc Reviewer	Pattern Analysis and Applications
2007-	Ad-hoc Reviewer	Pediatrics Research
2007-	Ad-hoc Reviewer	Nature Clinical Practice Neurology
2008-	Ad-hoc Reviewer	Pediatrics
2008-	Ad-hoc Reviewer	Neuroinformatics
2017-	Ad-hoc Reviewer	Annals of Neurology
2018-	Ad-hoc Reviewer	Journal of Neuroimaging
2018-	Ad-hoc Reviewer	Magnetic Resonance in Medicine

Other Editorial Roles

2005-2016	Associate Editor	IEEE Transactions on Medical Imaging
2005-	Member, Editorial Board	Medical Image Analysis
2018	Associate Editor	eLife

Honors and Prizes

1993	Australian Postgraduate Research Award	University Of New South Wales, Australia
1993	B.E. Honors Class 1 (Electrical Engineering)	University Of New South Wales, Australia
1993	UNSW Faculty of Engineering Postgraduate Award	University Of New South Wales, Australia
1997-1998	National Multiple Sclerosis Society Postdoctoral Fellowship Award	National Multiple Sclerosis Society
1998	ISMRM Student/Postdoctoral Fellow Stipend Award	ISMRM
2000	CIMIT New Concept Award	CIMIT
2005	CIMIT New Concept Award	CIMIT
2005	Ferrant et al. Med Imag Anal 2002 - Top 1% Most Cited Paper in the Field	Thompson/ISI
2006	Edward M. Kennedy Award for Health Care Innovation	CIMIT
2006-	International Fellow	CSIRO

2008		
2006	Fast Breaking Paper - Warfield et al. IEEE TMI 2004 -Top 1% Most Cited Paper in the Field	Thomson/Essential Science Indicators
2008	Australia-Harvard Fellowship	Harvard Club of Australia
2012	Best Paper Award – Taquet et al. Interpolating multi-fiber models by Gaussian mixture simplification.	ISBI
2012	Best Paper Award - Scherrer B et al. Super-resolution reconstruction to increase the spatial resolution of diffusion weighted images from orthogonal anisotropic acquisitions.	Medical Image Analysis
2014	Best Paper Award – Taquet et al. A fully Bayesian inference framework for population studies of the brain microstructure.	17th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI Sept 2014)
2016	Estimation of Incoherent Motion Parameters from Diffusion-Weighted MRI Data	Patent 9492101, awarded 11/15/16
2017	Intel High Performance Computing (HPC) Developer Conference Award: Artificial Intelligence - Accelerated Characterization of Neural Circuits of the Brain.	Intel High Performance Computing (HPC) Developer Conference (Nov 11-12)
2018	John Caffey Award, Best Scientific Paper – Kurugol S et al. Feed and Wrap Magnetic Resonance Urography (MRU).	Society for Pediatric Radiology
2018	Translational Research Program Award – Kurugol S. • Non-sedated feed and wrap MRI • Deep learning tools for automated radiation-free kidney function quantification	Boston Children's Hospital
2019	Awarded title of Fellow in recognition of outstanding record of accomplishment	Institute of Electrical and Electronics Engineers (IEEE)

Report of Funded and Unfunded Projects

Funding Information

Past

1993-1996	PI	UNSW Faculty of Engineering	
Segmentation of Magnetic Resonance Images of the Brain			

1993-1996	PI	Australian Government	
Segmentation of Magnetic Resonance Images of the Brain			

1998-2000	PI	NMSS RG 3094A1/T	
Characterization of Multiple Sclerosis Lesions from MRI			
Successfully developed algorithms to automatically and accurately characterize multiple sclerosis lesions as seen on MRI, and to segment multiple sclerosis lesions with high sensitivity and specificity.			

1998-2003	Investigator	NIH P41 RR013218 Project	
High Performance Computing for Neuroimaging Center: 3D MRI Data			
The main research focus of the NAC High Performance Computing Project is to develop post-processing methods for digital medical imaging data and to use these algorithms for clinical applications.			

1999-2001	Investigator	NIH R21 CA80945	
Virtual Cystoscopy for Detection of Small Bladder Tumors			
The project was a 2-year feasibility study to develop and test the potential of virtual cystoscopy as a non-invasive technique for the detection of small (<2cm) bladder tumors. Developed high sensitivity and specificity algorithms for detecting small bladder tumors from high resolution CT.			

1999-2002	Investigator	NIH	
Visible Human Project Image Processing Tools			
The main goal of this project is to perform software engineering, validation, algorithm integration, and test bed application.			

2000-2002	PI	Center for Innovative Minimally Invasive Therapy	
Intraoperative MRI Guided Liver Cryotherapy Testbed to Develop Technologies for the Operating Room of the Future			
Minimally invasive image guided liver cryotherapy is an excellent test bed for the development of computer algorithms to enhance and augment image guided surgical procedures. This project will develop new algorithms to improve liver cryotherapy guidance by improving intraoperative navigation, simulation of ice ball formation and quantitative monitoring.			

2000-2003	Investigator	NIH R01 NS35142	
Optimized 3D Spin-Echo MR Imaging of the CNS			
The purpose of this project is to advance the state of the art for high resolution, three-			

dimensional (3D) magnetic resonance imaging of the central nervous system, with a particular emphasis on imaging of the brain. My role is to provide expertise and guidance in the validation of image analysis algorithms for segmentation of white matter signal abnormalities from high-resolution magnetic resonance images.

2001-2006	Investigator	NIH R25 CA089017	
Multidisciplinary Training in Image Guided Therapy			
The major goal of this project is to train postdoctoral candidates in cancer related clinical and translational research settings in the field of Image-Guided Therapy. My role is to provide training in image-guided therapy to postdoctoral candidates.			

2001-2006	Investigator	NIH R01 CA086879	
Control System for MRI Monitored Thermal Therapies			
The major goals of this project are to develop, implement, and validate use of a computerized control system for MR-monitored thermal therapies that is to be attached to our 0.5T open configuration interventional MR scanner. My role is to provide expertise and mentoring for graduate students developing automated real-time image analysis algorithms.			

2002-2003	Investigator	NIH R01HD038261	
Neurodevelopment and Experience: qEEG and MRI			
The aim of the proposed study is to identify specific adaptations of the PT brain in the last 12 weeks of gestation to the transient experience of the NICU environment in order to estimate the potential of such experience in remodeling neuroanatomical structure and neurodevelopmental function. A prospective randomized clinical trial will be conducted.			

2002-2003	PI	NIH P41 RR013218 Project	
Understanding Neonatal Periventricular Leukomalacia			
Periventricular leukomalacia (PVL), characterized by ischemic necrosis of periventricular white matter, is an important cause of brain injury in premature infants. It is hypothesized that the observed reduction in cortical gray matter associated with PVL in premature infants occurs primarily in regions of the cortex to which the disrupted white matter would normally project fibers. The objective of this research is to utilize quantitative volumetric image processing algorithms to characterize structural alterations of the brains of neonate due to PVL.			

2002-2006	PI	Brigham Radiology Research and Education Foundation	
Quantitative Assessment of Structural Neonate Brain Changes Associated with Periventricular Leukomalacia			
The purpose of this pilot study is to use a computational image-processing approach to quantitatively characterize the regional distribution of gray matter reduction in premature infants with periventricular leukomalacia.			

2002-2006	PI	Whitaker Foundation	

Characterization of Newborn Brain Development
The objective of this research is to develop algorithms to enable the characterization of the spatial and temporal development of the brain of newborn infants as observed through magnetic resonance imaging.

2002-2007	Investigator	NIH P01 AG04953	
Age-Related Changes of Cognition in Health and Disease: Image Analysis Core			
The major goals of this project are to utilize magnetic resonance imaging for morphometric analysis and tissue characterization to distinguish the patterns of brain atrophy and gray or white matter changes in normal aging or Alzheimer's disease. My role is to provide expertise and guidance in the application of quantitative MRI analysis.			

2003-2006	Investigator	NIH R01 HL073319	
Free-Breathing 3D Cardiac MR Imaging			
In cardiac MRI applications, the need to freeze or resolve both cardiac and respiratory motion poses a difficult challenge. We propose a novel approach to detect and correct for the complex respiration-induced motion of the heart, while capturing its beating motion. A respiration compensated, 3D cardiac imaging method will be developed and tested in its ability to evaluate myocardium motion, as compared to our current clinical wall-motion protocol.			

2003-2006	Investigator	NIH R01 LM007861	
Improved Tumor Resection in Image Guided Neurosurgery			
Develop image analysis techniques to enable improved tumor resection in image-guided neurosurgery through a neurosurgical decision aid. My role is the creation of algorithms for statistical validation of tumor resection in image guided neurosurgery.			

2003-2006	PI	NIH R21 MH67054	
White Matter Architecture of Cognitive Dysfunction			
The objective of this project is to examine the relationship between white matter lesions as indicated by conventional MRI, white matter connectivity as indicated by DT-MRI and cognitive performance, as determined by the Rao Brief Repeatable Battery, in a cross-sectional study of multiple sclerosis patients.			

2003-2008	PI	NIH P41 RR013218 Project	
Developmental Neuroinformatics at the Neuroimaging Analysis Center (NAC)			
The Neuroimaging Analysis Center (NAC) is a National Research Resource Center operating in an application-oriented, clinical environment with the mission of focused computer-science based technology research and development. This proposal represents a continuation and expansion of ongoing efforts, with a shift in focus from generic image analysis capabilities to neuroimage informatics techniques tightly coupled to support particular applications. These neuroscientific and clinical applications provide demanding neuroimage informatics challenges which require new technology research and development, which, when solved, will have widespread applicability. The proposed core activities include algorithm development for the			

analysis of white matter architecture using diffusion tensor MRI and characterization of the spatial and temporal development of the structures in the infant brain, as well as the development of image informatics tools that are aimed at facilitating the exploitation of fMRI-derived information in neurosurgical and neuroscientific applications. In addition, novel methods of medical image representation and visualization will be explored and developed, as well as a new multi-modal digital anatomical atlas.

2004-2006	Project Director	NIH P41 RR013218 Project	
Grid Enabling the Insight Toolkit			
The Insight Toolkit (ITK) has become the de facto standard platform for advanced segmentation and registration research at many laboratories. At the same time, there is an increasing trend to deploy grid-computing infrastructures to support computations on extremely large data sets like those associated with the Visible Human Project. The architecture of ITK is not designed to support such efforts. We believe it is important to revisit and refine critical aspects of the architecture of ITK to support the emerging standards in the grid-computing community and to develop example applications to demonstrate the power of the ITK/grid combination in real-world research computing scenarios.			

2004-2007	Co-PI	NIH R01 HD046855	
Preterm Fetal Growth Restriction and Developmental Care			
This project will test the effectiveness of an in-NICU intervention for FGR infants. The study will be significant in understanding ways to reduce long-term functional morbidities in FGR infants, as well as in identifying opportunities for enhancing last trimester brain development.			

2004-2007 (extended to 2008)	PI	NSF NSF ITR 0426558	$250,000/year
ITR: Collaborative Research - \(ASE\) - \(DMC\): DDDAS: A Novel Grid Architecture Integrating Real-Time Data and Intervention During Image Guided Therapy			
The aim of this project is the development and deployment of an integrated and practical grid architecture for data driven intra-operative volumetric simulation of brain deformation during image guided therapy (IGT) and specifically for image guided neurosurgery (IGNS) to be employed in the operating room of the future.			

2005-2006	PI	CIMIT	
Improved Analysis for Patient-Specific Epilepsy Surgical Planning			
The goal of this work is to develop an optimized MRI acquisition protocol, and post-acquisition analysis strategy to enable improved pediatric epilepsy surgical planning (ESP).			

2005-2007	Investigator	NIH U41 RR019703	
Image Guided Therapy Center			
The IGT Center proposed under this application will provide a unique, centralized			

infrastructure for clinical investigators, biomedical engineers, and basic scientists in promoting and advancing IGT methods and related clinical applications. The center will develop and make available new innovative technologies in five discrete TRD Core Projects: 1) the Computational Core; 2) the Imaging Core; 3) the MRI-guided Therapy Core; 4) the Image-Guided Neurosurgery Core; and 5) the Focused Ultrasound Therapy Core.

2006-2008 (extended to 2009)	PI	NIH R03 CA126466	$50,000/year
Total Lagrangian Explicit Dynamics Finite Element Method for Brain Registration			
The aims of this proposal are to 1) develop a very efficient finite element solver using Total Lagrangian formulation and explicit time integration scheme, suited to computing brain deformation in real time; 2) implement the new constitutive model of brain tissue, accounting for brain tissue higher stiffness in compression than in extension in finite element code; 3) carry out extensive validation and evaluation of the proposed model in the setting of intraoperative MRI alignment.			

2006-2008	Co-Investigator	NIH R01 HL074942	$368,850/year
Ventilation Model and CNS Injury in Baboons with BPD			
In this study we propose to investigate the nature of cerebral injury in a prematurely born primate model (Papio sp) developed as a model of bronchopulmonary dysplasia, utilizing both magnetic resonance imaging (MR) and histopathology.			

2008-2009	PI	NIH R01 EB008015-S1	$50,000/year
GUI and Tutorial for Software for Validation of Image Segmentations			
This is an administrative supplement to the NIH R01 EB008015 grant entitled "Assessment of Improved Navigation for Pediatric Brain Tumor Surgery." The overall objective of this supplement is to enhance our existing software and disseminate a new graphical user interface together with enhanced training materials for users in the form of a tutorial description of our STAPLE algorithm and its implementation.			

2008-2010	Co-Investigator	NMSS RG4032A1	
From Probable to Definite Multiple Sclerosis: an Imaging Based Predictive Model (PI: D. Goldberg-Zimring)			
The goal of this project is the detection, delineation and modeling of major white matter fiber tract segments in a healthy volunteer (WMFTS) and the identification of disrupted WMFTS in the study population to determine the relationship between the decrease of cognitive performance and disrupted WMFTS. This will enable us to model the architecture of white matter and assess the relationship between disrupted WMFTS and cognitive dysfunction.			

2004-2007 (extended to 2010)	PI	NMSS RG3478A2	$110,000/year
Disruption of White Matter Circuits and Cognitive Deficits in Multiple Sclerosis			
This study will construct statistical atlases of conventional MRI and Diffusion Tensor MRI			

utilizing 3.0T MRI of healthy controls and early diagnosis multiple sclerosis patients. Patterns of white matter alteration associated with multiple sclerosis will be determined.

2006-2010	PI	NIH R01GM074068	$130,000/year
Bioinformatics Tools for Multi-Center Diagnostic Trials			
Over the past decade, multi-center clinical trials utilizing diagnostic imaging modalities have been conducted and sponsored by the National Institutes of Health. The long-term goal is to develop efficient ways for better analyzing clustered data and utilizing prior knowledge in multi-center clinical trials.			

2008-2009 (extended to 2010)	PI	CIMIT 08-293	$100,000/year
Bayesian Source Imaging of Pediatric Epilepsy			
The goal of this project is to create a new device capable of locating epileptogenic foci and thereby make curative surgery available to a larger population at an earlier age. This will be demonstrated through significant impact on clinical surgical planning in pediatric epilepsy.			

2008-2010	Mentor	William Randolph Hearst Fund	
Study of cerebral perfusion using arterial spin labeling in term newborn infants with hypoxic-ischemic encephalopathy (PI: P. Wintermark)			
I served as mentor for Pia Wintermark during the period of her Hearst Fund award. This study developed an effective arterial spin labeling MRI strategy for characterizing perfusion in newborns with and without hypoxic-ischemic encephalopathy.			

2008-2010	Mentor	Thrasher Research Fund	
Study of cerebral perfusion using arterial spin labeling in term newborn with hypoxic-ischemic encephalopathy (PI: P. Wintermark)			
I served as mentor for Pia Wintermark during the period of her Early Career award from the Thrasher. The main purpose of the study was to measure the temporal evolution of perfusion in newborns with underlying HI encephalopathy. We acquired critically important data to guide the application of tailored neuroprotective strategies to specific infants, especially those targeted to prevent reperfusion injury, with the potential to decrease brain injury associated with HIE.			

2009-2011	Mentor	NIH KL2 RR025757	$69,900/year
Improved Source Localization for Pediatric Epilepsy (PI: D. Hyde)			
I am serving as mentor for Damon Hyde during the period of his training program. This research project seeks to dramatically increase the number of pediatric epilepsy patients who			

are cured by surgical intervention by developing `computational electrocorticography', a non-invasive alternative to electrocorticography, now made possible for the first time by a combination of major advances in electroencephalography, magnetic resonance imaging, and sophisticated patient-specific numerical simulations of bioelectromagnetic field propagation.

2006-2010 (extended to 2011)	PI	NIH R01 RR021885	$200,000/year
Bioinformatics Software for MRI of Brain Development			
The major goals of this project are the enhancement of an existing software package for quantitative analysis of MRI of the developing brain by the implementation, as open-source software, of existing validated and proven algorithms, and the creation of a user-friendly graphical user interface to enable end users to easily apply these methods.			

2009-2010 (extended to 2011)	PI	NIH R01 RR021885-S1	$190,000/year
Bioinformatics Software for MRI of Brain Development			
This is an administrative supplement to the NIH R01 RR021885 grant. The overall goal is to improve care of preterm newborns by providing quantitative MRI tools for the identification of high-risk infants. This research supplement proposes the development of a battery of tests, based on the tools in the parent grant, which will predict later neurodevelopmental outcome in infants based on MRI taken at term.			

2008-2011	Site Co-Director	NIH/NCRR UL1 RR025758	
Harvard Clinical and Translational Science Center (PI: L. Nadler)			
Provide enriched resources to educate and develop the next generation of researchers trained in the complexities of translating research discoveries into clinical trials and ultimately into practice. Design new and improved clinical research informatics tools for analyzing research data and managing clinical trials. Support outreach to underserved populations, local community and advocacy organizations, and health care providers. Assemble interdisciplinary teams and forge new partnerships with private and public health care organizations.			

2009-2010 (extended to 2011)	PI	NIH R03 EB008680	$100,000/year
Improved Interoperability and Dissemination of Software for Simultaneous Truth and Performance Level Estimation			
This is an R03 grant for one year of funding to develop and to disseminate image analysis an enhanced and extended implementation of the algorithm called STAPLE (Simultaneous Truth and Performance Level Estimation). Our objective is to enable scientists to utilize the software for neuroimage analysis, by providing the software, example data and tutorial explanation of how to use the software effectively.			

2009-2011	Co-PI	NIH R41 MH086984	$102,160/year
Prospective/Retrospective Motion Correction System for Motion Robust Pediatric MR			
This project aims at the development and evaluation of an integrated hardware/software system for motion robust pediatric MRI in order to minimize or eliminate the need for sedation. The			

integration of the aims will be quantitatively and critically evaluated in this project through controlled experiments and statistical hypotheses testing.

2010-2011 (extended to 2012)	PI	Harvard Catalyst/NIH	$50,000/year
Assessing Brain Connectivity Disruption in TSC			
The overall objective of this project is to characterize neurostructural alterations in a mouse model of Tuberous Sclerosis Complex, and to compare these with the diffusion MRI signal changes through. The data will result in the optimization of MRI techniques for evaluating neuronal changes in TSC, correlation of the MRI findings with neurohistochemical findings, and evaluation of a therapeutic approach longitudinally in a well controlled animal model.			

2006-2011 (extended to 2012)	Co-Investigator	NIHCD R01HD047730	
Does Early Experience Improve Preterm Neurodevelopment? (PI: H. Als)			
About fifty percent of prematurely born infants develop learning/behavior problems and school failure. The study will test the primary hypotheses, that preterm infants (PT) randomized to developmental care in the Newborn Intensive Care Unit (NICU) will be superior in cognitive performance at school age when compared to their peers, who did not receive the intervention.			

2007-2011 (extended to 2013)	PI	NIH R01 EB008015	$225,000/year
Assessment of Improved Navigation for Pediatric Brain Tumor Surgery			
This research proposal aims to apply and evaluate novel surgical navigation technology to improve outcomes in pediatric brain tumor surgery. The specific aims of this research are to 1) Evaluate target registration error in nonrigid registration algorithms for pediatric brain tumor surgery, (2) Significantly improve the duration of precise alignment and data fusion during pediatric brain tumor surgery, and 3)Evaluate the efficacy of enhanced navigation by assessing post-operative tumor resection volume.			

2010-2013(extended to 2014)	PI	NIH R01 LM010033	$250,000/year
Informatics Algorithms for Neural Circuitry Ultrastructure			
The specific aims of this proposal are to facilitate the analysis and interpretation of neural ultrastructure by: 1.) Creation of 3D volumes of neural ultrastructure from 2D images, 2.) create large 2D images of neural Uultrastructure from 2D camera tiles, and 3.) segmentation and detection of neural ultrastructure. The research to achieve each of these specific aims involves the development, implementation and evaluation of novel informatics algorithms especially designed to meet the requirements of high resolution large data acquisition electron microscopy of neural ultrastructure.			

2010-2015	Co-Investigator	NIH R01 NS065051	$250,000/year
CNS Plasticity in Pediatric Complex Regional Pain Syndrome (PI: D. Borsook)			

This unique multidisciplinary effort will dovetail with the broader objectives of the NIH Pain Consortium by (1) significantly improving insights into the pathophysiology of both adult and pediatric CRPS; and (2) placing critical emphasis on translational applications leading to more responsive treatments, the elimination of unwanted pain, accelerated recoveries, shorter and less costly hospitalizations, and enhanced quality of life.

2011-2012 (extended to 2014)	Mentor	Thrasher Research Fund Thrasher Early Career Award	$25,000/year
Three-dimensional High-resolution Fetal MRI for Enhanced In-vivo Analysis of Congenital Anomalies (PI: A. Gholipour)			
I am serving as mentor for Ali Gholipour during the period of this research career development award. The objective of this research is the development of advanced technology for 3D high-resolution (HR) motion-compensated fetal MRI to dramatically improve the diagnosis, analysis, and prognosis of congenital anomalies, specifically anomalies of the brain and lung.			

2011-2013 (extended to 2014)	PI	Children's Hospital Boston Translational Research Program Core Grant	$50,000/year
Quantitative Imaging Biomarker Research Core at Children's Hospital			
The overall objective in this proposal is to establish a quantitative imaging biomarker core that will facilitate the rapid utilization of advanced unique image reconstruction and quantitative analysis techniques by translational and clinical researchers. Successful transition of these research capabilities to clinical practice will ultimately improve patients' management and outcome.			

2011-2013 (extended to 2014)	Co-Investigator	NIH R03 DE022109	$75,000/year
Super-resolution Reconstruction of Fetal Craniofacial MRI (PI: A. Gholipour)			
The overall objective of this project is to dramatically improve the capability of fetal MRI for diagnosis, analysis, and prognosis of craniofacial developmental disorders. The aim of this proposal is the development of novel models of soft tissue, fluid, and bone in craniofacial structures and local motion estimation based on these models as well as the reconstruction of high-resolution fetal craniofacial MRI and their classification based on various types of disorders.			

2011-2014	Co-Investigator	US Department of Defense W81XWH1110365	$162,846/year
Early Electrophysiological Behavioral and Clinical Markers of ASD in Infants with TSC (PI: C.			

Nelson)
This proposal aims to establish a consortium of five Children's Hospitals that are geographically-distributed throughout the US to recruit TSC patients in the first year of life to test the hypothesis that hypothesis that longitudinal assessment of white matter integrity in TSC infants can be used as an early biomarker of subsequent ASD in this genetic disease. State of the art imaging with 3Tesla MRI scanners, EEG, validated neurodevelopmental assessment tools, advanced genetic analysis, and standardized clinical measures through age 36 months will be utilized.

2011-2015	Mentor	NIH K25 NS067068	$161,775/year
Improved Source Localization for Pediatric Epilepsy (PI: D. Hyde)			
I am serving as mentor for Damon Hyde during the period of this research career development award. This proposal will use structural and functional information extracted from MR images to help improve the accuracy of source localization techniques. Improved maps of seizure activity will have a significant impact upon human health by allowing neurosurgeons to perform curative surgery in a larger portion of patients whose epilepsy is poorly controlled by current drug therapy.			

2013-2014	PI	Boston Children's Hospital Translational Research Program	$100,000/year
DW-MRI in Pediatric Crohn's Disease			
The overall objective of this proposal is to develop and validate a novel imaging technique (IM-MRI) that will enable improved characterization of CD activity through its sensitivity to inflammatory processes.			

2012-2015	PI (Co-PI: Nevo, E.)	NIH R42 MH086984-03A1	$165,763/year
Prospective/Retrospective Motion Correction System for Motion Robust Pediatric MR (Phase II)			
The proposed project aims to develop and test an add-on system that can be used on any type of scanner without any change in the hardware or software of the host scanner. Such a system will drastically decrease the sensitivity of MRI to motion of the scanned subject and thus will enable the acquisition of high quality MR images in the presence of motion. A retrospective correction algorithm will be applied to construct a motion-free, 3D image set for the clinical user.			

2012-2016	PI	NIH R01 EB013248-01A1	$212,175/year
Improved Quantitative Assessment of the Fetal Brain from 3D Volumetric MRI			
The overall objective of this project is to dramatically improve the capability of fetal MRI for diagnosis, analysis, and prognosis of high-risk pregnancies. We propose novel imaging and image processing technology using super-resolution reconstruction of three-dimensional high spatial resolution volumetric T2w images of the fetal brain, construction of a spatiotemporal			

fetal brain atlas, comparison of fetal brain biometry and evaluation using 2D MRI, 2D sonography and 3D MRI, and improved assessment of ventriculomegaly is using 3D fetal MRI.

2012-2017	Co-Investigator	NIH 1U01 NS082320	$2,171,876/year
Early Biomarkers of Autism Spectrum Disorders in Infants with TSC (PI: M. Sahin)			
We will investigate whether longitudinal assessment of brain connectivity using MRI and EEG in children with Tuberous Sclerosis Complex (TSC) can identify an early biomarker of subsequent ASD in this genetic disease. This will result in better understanding of brain connectivity and its relationship to ASD in TSC and will pave the way for new interventions for this and related causes of autism.			

2013-2015	Co-Investigator	US Department of Defense W81XWH1310464	$275,225/year
Detection of Brain Reorganization in Pediatric Multiple Sclerosis Using Functional MRI (PI: R. Suarez)			
The overall objective is to study the current need for more advanced methods of monitoring MS disease progression that are able to detect changes in the functional organization of eloquent cortex.			

2013-2018	PI	NIH R01NS079788	$720,276/year
MRI Biomarkers of Patients with Tuberous Sclerosis Complex and Autism			
Our overall objective is to identify the brain changes associated with ASD in patients with TSC, by the evaluation of advanced MRI of healthy controls, ASD patients without TSC, and TSC patients with and without ASD. We propose to recruit a cohort of children, aged 5-10 years old, and to carry out comprehensive MRI, image analysis and cognitive phenotyping. We propose to study these children longitudinally for five years to develop and evaluate a set of quantitative anatomic and diffusion MRI measures that characterize white matter, cortical and subcortical gray matter, and harmatomas. To improve the accuracy and reliability of the MRI measures, we will develop novel algorithms for MRI analysis of these subjects, building on our own recent work; implement open source software tools to apply these algorithms; and validate these tools in comparison to conventional analysis strategies. We will distribute the imaging data and these software tools to the imaging community. The primary outcome will be the development for the first time of a capability to discriminate between controls, patients with ASD without TSC, TSC patients without ASD, and TSC patients with ASD.			

2014-2015	Awardee	Intel Corporation	$199,045
Modernizing Medical Image Computing Softward with improved Parallel Computing			
The CRL has been designated an Intel Parallel Computing Center which are universities, institutions, and labs that are leaders in their field. The centers are focusing on modernizing applications to increase parallelism and scalability through optimizations that leverage cores, caches, threads and vector capabilities of microprocessors and coprocessors. All this hardware equipment will provide ample compute capacity for the analysis and visualization of the imaging data.			

2014-2015	Awardee	Dell Corporation	$100,000
Equipment Award			
This award was for equipment. Specifically, 4 PowerEdge R720 machines with each having dual socket 10 cores (80 cores total) Intel Xeon E-2680v2 Processors (25M Cache, 2.8Ghz) with a Force 10 Switch (48 x 10GbE SFP+, 4 x 40GbE QSFP+, 1 x AC PSU, 2xFM, IO to PSU Panels) and a PowerVault Storage System (28TB of storage).			

2015-2017	Mentor	NIH/NICHD 5R21HD083956-02	$275,000
Spatio-temporal Patterns of Early Cortical Folding in the Human Fetal Brain (Significant Contributor: C. Rollins)			
The proposed project will develop a tool to explore individual clinical fetal MRIs and quantify the deviation from the normal spatio-temporal patterns of early cortical folding from 18 weeks (the earliest for routine clinical fetal MRI at Boston Children's Hospital) to 28 weeks gestational age. This study is the first step toward a practical clinical use of quantitative MRI analysis for individual fetal diagnosis. Our quantitative individual fetal analysis is expected to correlate with clinical diagnosis of abnormal brain growth after birth and show its potential as an assist to clinical qualitative assessments during the early stage.			

2015-2017	PI	NIH/NIBIB R01EB019483	
Improved Motion Robust MRI of Children			
An urgent, unmet need exists for an accurate, safe, and reliable imaging technique that will enable the radiologist to scan the young child without the use of sedation or anesthesia while producing images of superior diagnostic value. We will develop a novel combination of image acquisition techniques that effectively compensates for patient motion by taking advantage of motion-free time (quiescent periods during the scanning session) and produces high quality images when the child is still. As a direct benefit, many patients will no longer need to be sedated or anesthetized during MRI, effectively eliminating potentially life-threatening side effects. A secondary benefit will be a substantial reduction in overall health care costs.			

2016-2017	Co-Mentor	Harvard Medical School	$30,000
Fetal Brain Development in Congenital Heart Disease - Eleanor and Miles Shore 50th Anniversary Fellowship (PI: C. Rollins)			
Many survivors of surgery for congenital heart disease face life-long neurological sequelae ranging from subtle learning disabilities to more significant cognitive impairment. Recent research suggests that abnormalities in brain structure are present at birth, even before these children undergo surgery. This study will use fetal MRI to investigate brain abnormalities in utero. We will describe whether congenital heart disease affects specific brain regions more than others and determine the timing of onset during pregnancy. We will also examine whether fetal brain findings in this population relate to infant and toddler development.			

2016-2017	Awardee	Brain and Behavior Research Foundation	$100,000
Imaging of the Early Development and Maturation of Neural Circuits to Predict Mental Health			

Disorders - 2016 National Alliance for Research on Schizophrenia and Depression (NARSAD) Distinguished Investigator Grant
The award will enable us to use innovative technology that allows researchers to image the brain, even while the fetus is moving, to build structural maps of the connections between neurons in the developing fetal brain during pregnancy. Motion-robust MRI and other imaging techniques will enable quantitative analysis of neural connections in the early brain. We will analyze both healthy fetuses and at-risk fetuses of pregnancies having maternal risk factors for the development of mental health disorders, including stressful events during pregnancy or obstetric hypoxic complications. We aim to differentiate between abnormal and normal brain development in order to facilitate the identification of fetuses that are at risk for mental health disorders.

2016-2017	Co-Investigator	NIH/NIMH 2R44MH086984-06A1	$798,308
Prospective/Retrospective Motion Correction System for Motion Robust Pediatric MRI (PI: E. Nevo)			
The project aims to enable MRI in children and non-cooperative adults without sedation or anesthesia. If successful, it will reduce healthcare costs as sedation or anesthesia for MRI doubles or triples the cost of the scan; it will expand the use of MRI in children and non-cooperative adults to smaller hospitals that do not have the required resources to conduct MRI under sedation or anesthesia; and it will eliminate the risks associated with sedation or anesthesia and thus will enable to expand the use of MRI to clinical and research application where it is now not being used due to associated risks.			

Current

2012-2018	Co-Investigator	NIH 1U01NS082320	$3,164,329/year
Early Biomarkers of Autism Spectrum Disorders in Infants with TSC (PI: M. Sahin)			
We will investigate whether longitudinal assessment of brain connectivity using MRI and EEG in children with Tuberous Sclerosis Complex (TSC) can identify an early biomarker of subsequent ASD in this genetic disease. This will result in better understanding of brain connectivity and its relationship to ASD in TSC and will pave the way for new interventions for this and related causes of autism.			

2013-2019	PI	NIH R01NS079788	$407,470/year
MRI Biomarkers of Patients with Tuberous Sclerosis Complex and Autism			
We seek to identify MRI measures that distinguish healthy controls, patients with idiopathic ASD, TSC patients without ASD and TSC patients with ASD. We will develop and validate advanced MRI measures in a longitudinal study of children aged 5-10 years old. TSC is a genetic disorder for which brain modifying drug treatment is currently available. The development of a validated set of MRI measures that uniquely identifies the brain changes that underlie ASD in TSC will be critical enabling technology for drug trials in TSC, and for evaluating response to drug therapy. By imaging from an early age, before brain maturation is complete, it may be possible to predict, for an individual patient, an increased risk of			

development of ASD, and ultimately to tailor interventions to alter the developmental trajectory.

2014-2018	Co-Investigator	NIH 1R01 DK100404	$217,500/year
Novel MRI Imaging Tools and Software for Assessing Pediatric Crohn's Disease (PI: M. Freiman)			
Our project is aimed at developing and refining a new type of parametric imaging—accelerated spatially constrained incoherent motion MRI (aSCIM-MRI)—as a highly accurate quantitative biomarker for cell proliferation, density and size, and tissue perfusion—all indices that characterize the extent of disease activity (i.e., inflammation) in the tissue micro-structure of the bowel.			

2015-2020	PI	NIH R01EB019483	$225,000/year
Improved Motion Robust MRI of Children			
An urgent, unmet need exists for an accurate, safe, and reliable imaging technique that will enable the radiologist to scan the young child without the use of sedation or anesthesia while producing images of superior diagnostic value. We will develop a novel combination of image acquisition techniques that effectively compensates for patient motion by taking advantage of motion-free time (quiescent periods during the scanning session) and produces high quality images when the child is still. As a direct benefit, many patients will no longer need to be sedated or anesthetized during MRI, effectively eliminating potentially life-threatening side effects. A secondary benefit will be a substantial reduction in overall health care costs.			

2016-2019	Co-Investigator	NIH/NIMH 5R44MH086984-07	$699,165
Prospective/Retrospective Motion Correction System for Motion Robust Pediatric MRI (PI: E. Nevo)			
The project aims to enable MRI in children and non-cooperative adults without sedation or anesthesia. If successful, it will reduce healthcare costs as sedation or anesthesia for MRI doubles or triples the cost of the scan; it will expand the use of MRI in children and non-cooperative adults to smaller hospitals that do not have the required resources to conduct MRI under sedation or anesthesia; and it will eliminate the risks associated with sedation or anesthesia and thus will enable to expand the use of MRI to clinical and research application where it is now not being used due to associated risks.			

2016-2018	Awardee	DPEI EQA-031 201	€10,000 ($11,199)
International Exchanage Research Collaboration Support			
The award supports the team BARBANT (Boston and Rennes Brain Image Analysis Team), a research collaboration within INRIA between the VisAGeS team (Christian Barillot, PI) and the Computational Radiology Laboratory at Boston Children's Hospital/Harvard Medical School (Simon Warfield, PI). Research focuses on a better understanding of the behavior of the normal and pathological central nervous system, with particular interest in multiple sclerosis,			

psychiatric conditions, and diseases such as multiple sclerosis and tuberous sclerosis in the pediatric population, with the goal of using imaging characteristics to optimally select or adapt treatment, particularly in the early stage of disease.

2016-2023	Mentor	NIH/NICHD 1UG3OD023348-01	$1,118,336
Environment, Epigenetics, Neurodevelopment and Health of Extremely Preterm Children. (Co-investigator/site PI: C. Rollins)			
This project will identify environmental factors, particularly those associated with inflammation early in life, that contribute to neurodevelopmental impairments among individuals born extremely prematurely, referring to birth born 28 weeks of gestation. The research findings could also apply to good groups, such as children who are not born prematurely.			

2017-2021	Co-Mentor	NIH/NINDS 1K23NS101120-01	$951,787
Fetal Brain Development in Congenital Heart Disease. K23 Mentored Patient Oriented Research Career Development Award (PI: C. Rollins)			
Congenital heart disease is the most common structural birth defect, with neurodevelopmental impairment the most important long-term morbidity. This proposal will investigate structural and physiologic aspects of fetal brain development in congenital heart disease using fetal MRI techniques. The findings will inform the development of rational fetal neuroprotective therapies to prevent or minimize neurodevelopmental sequelae in this population.			

2018-2019	Awardee	NIH 1S10OD025111-01	$2,000,000
Acquisition of a Siemens 3T MRI Instrument for Research Imaging (PI: S.K. Warfield)			
The award contributes toward the procurement of a research-dedicated Siemens 3T Prisma MRI scanner, which will have a substantial positive impact on the NIH funded research and the long range biomedical research goals of Boston Children's Hospital.			

2018-	Mentor	National Energy Research Scientific Computing Center (NERSC)	30 million super-computing hours on Cori KNL cluster
Consensus Equilibrium Method for Extreme-Scale CT Image Reconstruction (PI: X. Wang)			

2018-	Mentor	Young Investigator Grant, Society for Pediatric Radiology (SPR)	$30,000
High Performance Engine for Dose-Reduced CT Imaging System (PI: X. Wang)			

Unfunded Projects

1996-	PI	Assessment of Knee Cartilage from MRI
This project is developing imaging and image analysis technologies to improve our ability to quantitatively characterize cartilage of the knee from MRI.		

Report of Local Teaching and Training

Teaching of Students in Courses

2008	Planning for Image Guided Pediatric Neurosurgery (HST Course)	
Post-graduate students	Lecturer	1 hour
2010	Interventional Imaging (HST Course)	
Post-graduate students	Lecturer	1 hour

Clinical Supervisory and Training Responsibilities

2004-2007	Harvard Neonatal-Perinatal Medicine Fellowship Thesis Scholarship Oversight Committee – Deirdre O'Reilly, M.D.	5%
2008-2010	Harvard Neonatal-Perinatal Medicine Fellowship Thesis Scholarship Oversight Committee – Pia Wintermark, M.D.	5%

Laboratory and Other Research Supervisory and Training Responsibilities

2001-2007	Director, Computational Radiology Laboratory, BWH - Mentor	20%
2007-	Director, Computational Radiology Laboratory, BCH - Mentor	20%
2008-	Director of Radiology Research, Boston Children's Hospital - Mentor	20%

Formally Supervised Trainees

1997-1998	Chahin Pachai, Ph.D.	President & CEO, THERALYS, Lyon, France
1997-2000	Michael Kaus, Ph.D.	Director, Research and Advanced Development at Philips Healthcare, Madison, WI
1998-2002	Matthieu Ferrant, Ph.D.	Product Manager, Clinical Applications, Agfa Healthcare, Belgium
1999-2000	Olivier Cuisenaire, Ph.D.	Staff Scientist, Philips Medical Systems, Paris, France
1999-2000	Torsten Butz, Ph.D.	Staff Scientist, ImaSys SA, PSE, Lausanne, Switzerland

1999-2002	Xingchang Wei	Clinical Professor, University of Calgary, Alberta, Canada
2000-2001	Aditya Bharatha, M.D.	Diagnostic and Interventional Neuroradiologist, St. Michael's Hospital, Toronto, Canada
2000-2001	Alida Tei	Finance Manager, General Dynamics Information Technology, Washington, DC
2000-2002	Ying Wu	Professor, Electrical Engineering and Computer Science, Northwestern University, Evanston, IL
2001-2002	Jan Rexilius, Ph.D.	Computer Scientist, MeVis, Bremen, Germany
2001-2002	Sylvain Jaume, Ph.D.	Computer Science and Artifical Intelligence Laboratory, Massachusetts Institute of Technology, Cambridge, MA
2001-2006	Andrea Mewes, M.D.	Resident, Charite Hospital, Berlin, Germany
2002-2003	Vicente Grau-Colomer, Ph.D.	Associate Professor, Department of Engineering Science, University of Oxford, UK
2003-2012	Neil Weisenfeld, Ph.D.	Computational Biologist, Broad Institute
2003-2004	Lara Vigneron, Ph.D.	Business Development Engineer, Materialise, Belgium
2003-2005	Aloys du Bois d'Aische, Ph.D.	Founder & CEO, Eonix, Belgium
2003-2006	Mathieu De Craene, Ph.D.	Research Engineer, Phillips, Paris
2003-2006	Mahnaz Maddah, Ph.D.	Cofounder & Director of R&D, Cellology, Inc, San Francisco
2003-2007	Daniel Goldberg-Zimring, Ph.D.	Research Scientist, Project Manager, Brigham & Women's Hospital, NextLab (Incubator), Boston, MA
2004-2006	Annika Berger, M.D.	Resident, University Hospital Regensburg, Germany

2004-2007	Dierdre O'Reilly, M.D.	Neonatologist, Beth Israel Deaconess Medical Center
2005-2006	Neculai Archip, Ph.D.	Global Executive Leadership, Siemens Healthcare
2005-2007	Julien Dauguet, Ph.D.	Image Computing Manager, Mauna Kea Technologies, France
2007-2008	Michelle Krishnan, M.D.	MRC Clinical Research Training Fellow, Centre for the Developing Brain, Kings College, London
2007-2009	Olivier Commowick, Ph.D.	Senior Research Scientist, INRIA-Rennes, France
2007-2013	Arne Hans, Ph.D.	Patent Attorney, Cesari and McKenna, Boston, MA
2007-2010	Pia Wintermark, M.D.	Assistant Professor of Pediatrics, McGill University, Canada
2008-	Xavier Tomas-Fernandez, M.Sc.	PhD Student, Computational Radiology Lab, Boston Children's Hospital
2008-2010	Ayelet Akselrod-Ballin, Ph.D.	Postdoctoral Fellow, Weizmann Institute of Science, Israel
2008-	Ali Gholipour, Ph.D.	Assistant Professor in Radiology, Computational Radiology Lab, Boston Children's Hospital
2008-	Damon Hyde, Ph.D.	Instructor, Computational Radiology Lab, Boston Children's Hospital
2008-2009	Žiga Špiclin, Ph.D.	Researcher, Laboratory of Imaging Technologies, Faculty of Electrical Engineering, University of Ljubljana, Slovenia
2009-2010	Julien de Siebenthal, Ph.D.	Lead Engineer, Visualization and Algorithms, Symbios
2009-	Ralph Suarez, Ph.D.	Instructor in Radiology, Computational Radiology Lab, Boston Children's Hospital

2009-	Benoit Scherrer, Ph.D.	Instructor in Radiology, Computational Radiology Lab, Boston Children's Hospital
2010-2012	Martin Polak, M.D.	Pediatrician at Sourasky Medical Center, Tel Aviv, Israel
2010-	Alireza Akhondi-Asl, Ph.D.	Instructor in Radiology, Computational Radiology Lab, Boston Children's Hospital
2010-2012	Signe Thorup, Ph.D.	Researcher, Lund University, Lund, Denmark
2010-2012	Michael Sass Hansen, Ph.D.	Scrum Master & Software Developer, CLAAS, Denmark
2010-2016	Jurriaan Peters, M.D.	Assistant Professor of Neurology, Division of Epilepsy and Clinical Neurophysiology, Boston Children's Hospital
2010-	Moti Freiman, Ph.D.	Instructor in Radiology, Computational Radiology Lab, Boston Children's Hospital
2010-	Maxime Taquet, Ph.D.	Postdoctoral Fellow, Computational Radiology Lab, Boston Children's Hospital
2010-	Sanjay Prabhu, MBBS	Pediatric Neuroradiologist, Department of Radiology, Boston Children's Hospital
2011-2013	Caterina Stamoulis, Ph.D.	Assistant Professor in Radiology, Boston Children’s Hospital
2011-	Onur Afacan, Ph.D.	Instructor in Radiology, Computational Radiology Lab, Boston Children’s Hospital
2011-	Vahid Taimouri, Ph.D.	Postdoctoral Fellow, Computational Radiology Lab, Boston Children's Hospital
2011-2012	Michael Paldino, M.D.	Staff Radiologist, Texas Children’s Hospital, Houston
2011-2012	Mark Bittman, M.D.	Radiologist, Long Island Jewish Medical Center and North Shore University Hospital, New Hyde Park, NY
2012-	Carl Siversson, Ph.D.	Postdoctoral Fellow, Computational Radiology Lab, Boston Children's Hospital

2013-2014	Daniel Wood	High School Summer Intern, Computational Radiology Lab, Boston Children's Hospital
2013-2013	Virginia Hanstad	High School Summer Intern, Computational Radiology Lab, Boston Children's Hospital
2013-	Aymeric Stamm, Ph.D.	Postdoctoral Fellow, Computational Radiology Lab, Boston Children's Hospital
2013-	Catherine Wan, Ph.D.	Instructor in Radiology, Computational Radiology Lab, Boston Children's Hospital
2013-2017	Burak Erem, Ph.D.	Postdoctoral Fellow, Computational Radiology Lab, Boston Children's Hospital
2013-2014	Yuanyuan Jia	Graduate/PhD student, Chongquing University, Chongquing City, China
2013-	Subrahmanyam Gorthi	Postdoctoral Fellow, Computational Radiology Lab, Boston Children's Hospital
2013-2014	Vinay Jayaram	Graduate Student, Computational Radiology Lab, Boston Children's Hospital
2014-	Sila Kurugol	Instructor in Radiology, Computational Radiology Lab, Boston Children's Hospital
2014-	Anna Prohl	Research Study Assistant, Computational Radiology Lab, Boston Children's Hospital
2014-2014	Francisco Fumero-Batista	Graduate Student, University of La Laguna, Canary Islands, Spain
2014-2014	Rory Piper	Research Fellow, Computational Radiology Lab, Boston Children's Hospital
2014-2017	Cynthia Ortinau, MD	Postdoctoral Fellow/Instructor, Newborn Medicine and Cardiology Departments, Boston Children's Hospital
2014-2014	Robbert Struyven	Graduate Student, Computational Radiology Lab, Boston Children's Hospital
2014-	Caitlin Rollins, MD	Attending Physician, Neurology Department, Boston Children's Hospital

2014-	Rejean Guerriero, DO	Postdoctoral Fellow, Brain Injury Medicine Department of Neurology & Division of Epilepsy, Boston Children's Hospital
2014-	Danielle Pier, MD	Child Neurology Resident, Boston Children's Hospital
2015-	Bahram Marami-Dizaji	Postdoctoral Fellow, Computational Radiology Lab, Boston Children's Hospital
2015-	Hamedeh Jafari	Graduate Student, Computational Radiology Lab, Boston Children's Hospital
2015-2016	Sebastien Tourbier	Graduate Student, Computational Radiology Lab, Boston Children's Hospital
2015-	Abdelhakim Ouaalam	Research Study Assistant, Computational Radiology Lab, Boston Children's Hospital
2015-	Amir Jaberzadeh	Postdoctoral Fellow, Computational Radiology Lab, Boston Children's Hospital
2016-	Alexander Li Cohen, M.D., Ph.D.	Behavioral Neurology Fellow, Boston Children's Hospital
2016-2018	Hengameh Marzaalian Dastjerdi, Ph.D.	Postdoctoral Fellow, Computational Radiology Lab, Boston Children's Hospital
2016-	Monet Dugan	Clinical Research Assistant, Computational Radiology Lab, Boston Children's Hospital
2017-	Marisela Dy	Clinical Fellow in Neurology, Boston Children's Hospital
2017-	Rene-Paul DeBroize	Research Data Manager, Computational Radiology Lab, Boston Children's Hospital
2017-	Seyhmus Guler, Ph.D.	Research Fellow, Computational Radiology Lab, Boston Children's Hospital
2017-	W. Scott Hoge, Ph.D.	Instructor in Radiology, Harvard Medical School, Department of Radiology, Boston Children's Hospital
2017-	Yechiel Lamash, Ph.D.	Research Fellow in Radiology,

		Computational Radiology Lab, Boston Children's Hospital
2017-	Jamshid Sourati, Ph.D.	Research Fellow, Computational Radiology Lab, Boston Children's Hospital
2017-	Yao Sui, Ph.D.	Research Fellow in Radiology, Computational Radiology Lab, Boston Children's Hospital
2017-	Xiao Wang, Ph.D.	Research Fellow in Radiology, Computational Radiology Lab, Boston Children's Hospital
2017-	Tess Wallace, Ph.D.	Postdoctoral Research Fellow, Computational Radiology Lab, Boston Children's Hospital
2018-	Marzieh Haghighi	Postdoctoral Research Fellow, Computational Radiology Lab, Boston Children's Hospital

Formal Teaching of Peers (e.g., CME and other continuing education courses)

2007	Algorithms for Planning for Pediatric Neurosurgery	One
New Horizon: Biomedical Engineering, Cancer Modeling, Virtual Reality & Simulation in Image Guided Therapy	Washington, D.C.	International Brain Mapping and Intraoperative Surgical Planning Society
2007	Algorithms for Assessing Pediatric Brain MRI	One
Knowledge-Based Image Analysis	Banff, AB, Canada	Mathematical Methods in Medical Image Analysis
2008	Segmentation	One
Image Processing	Toronto, ON, Canada	ISMRM
2008	Clinical and Methodological Issues in Pediatric Neuroimaging	One
	Melbourne, Australia	Organization for Human Brain Mapping

2008	Imaging the Early Developing Brain: Challenges and Potential Impact	One
	New York, NY	MICCAI Society
2009	Image Segmentation	One
Quantitative Imaging and Data Analysis	Honolulu, HI	ISMRM
2009	Algorithms and software for image segmentation	One
Image Analysis	Honolulu, HI	ISMRM
2010	Quantitative MRI Approaches in Clinical Imaging	One
Image Segmentation	Stockholm, Sweden	ISMRM
2010	Evaluation of Image Segmentation	One
Image and Signal Analysis	Hólar, Iceland	Summer School on Sparsity
2010	Accelerated Feature Based Registration for Electron Microscopy Images	One
Image and Signal Analysis	Hólar, Iceland	Summer School on Sparsity
2010	Quantitative Assessment of Brain Development in Tuberous Sclerosis Complex	One
Image and Signal Analysis	Hólar, Iceland	Summer School on Sparsity
2010	Translation of Neuroimaging Technologies to Advance Clinical Care	One
Image and Signal Analysis	Hólar, Iceland	Summer School on Sparsity
2010	Biomarkers from Images with Segmentation and Validation	One
Lifecycle of an Imaging Biomarker: From Validation to Dissemination	Chicago, IL	RSNA 2010
2011	Image Analysis	One
	Montreal, Canada	ISMRM 2011
2012	Image Analysis: Novel Techniques	One
	Melbourne, Australia	ISMRM 2012
2016	Neonate: The Physicist's Perspective	One

Weekend Educational Course: Neuro 1	Singapore	ISMRM 2016

Local Invited Presentations

2007	MRI Biomarkers of Early Neurodevelopment	Grand Rounds
Boston Children's Hospital		None
2007	Planning for Pediatric Epilepsy Surgery	Seminar
Boston Children's Hospital		None
2008	Advances in Imaging and Image Analysis of Neonates	Seminar
Boston Children's Hospital		None
2009	Image Analysis Algorithms for Pediatric Brain MRI	Seminar
Harvard School of Public Health		None
2014	Innovation that Empowers Surgeons and Improves Patient Outcomes	Innovator's Forum
Boston Children's Hospital		None
2014	Imaging Research and Epilepsy	Epilepsy Research Seminar
Boston Children's Hospital		None
2016	Imaging Innovations for Pediatric Epilepsy	Seminar
Real Colegio Complutense at Harvard (RCC)		None
2018	High-Resolution Motion-Robust MRI Acquisition and Analysis	Seminar Lecture
Boston Children's Hospital		None

Report of Regional, National and International Invited Teaching and Presentations

Regional

1997	Segmentation of Cartilage of the Knee	Plenary Presentation
Orthopedics and Arthritis Center		
1998	Neonate MRI analysis	Seminar
Pediatric Neurology, Massachusetts General Hospital		
1998	Template Moderated Segmentation and Applications	Invited Lecture

Massachusetts Institute of Technology		
2001	Nonrigid Registration and Segmentation	Seminar
Center for Neurological Imaging		
2002	Exploiting Atlases for Medical Image Segmentation	Invited Lecture
Northeastern University		
2004	Biomechanical Simulation for Neurosurgery	Seminar
NSF		
2004	Segmentation and Registration in Medical Image Analysis	Invited Lecture
Massachusetts Institute of Technology		
2004	Image Guided Surgical Planning and Intervention with Patient-Specific Biomechanical and Electromagnetic Simulation	Seminar
Center for the Integration of Medicine and Innovative Technology		
2006	Validation of Image Segmentation with Simultaneous Truth and Performance Level Estimation	Invited Lecture
Massachusetts Institute of Technology		
2008	Planning for Image Guided Pediatric Neurosurgery	Seminar
Massachusetts Institute of Technology		
2016	The Contributions of Neuroimaging in Diagnosing Autism	Invited Presentation
May Institute Annual Clinical Conference: Biomarker Contributions to Understanding Autism Spectrum Disorder		
2018	Imaging Challenges in Discovering the Neural Basis of Autism Spectrum Disorder	Invited Lecture
Northeastern University		

National

1999	High Performance Computing at the Surgical Planning Laboratory	Seminar
Sun Microsystems High Performance Computing Consortium		

2000	Real-Time Biomechanical Simulation of Volumetric Brain Deformation for Image Guided Neurosurgery	Seminar
Sun Microsystems		
2003	Simultaneous Truth and Performance Level Estimation: A new algorithm for the validation of image segmentations	Invited Lecture
Rutgers University, Busch Campus		
2005	Quantitative Medical Image Analysis for Image Guided Therapy	Invited Lecture
University of Kentucky		
2005	Medical Imaging Algorithms for Newborn MRI Analysis	Invited Lecture
Washington University in St. Louis		
2005	Medical Image Computing for Image Guided Surgery	Invited Lecture
College of William and Mary		
2005	Quantitative Neuroimage Analysis: Tools and Techniques for Segmentation, Registration and Validation	Invited Lecture
UCLA		
2006	Advanced Methods for Image Guided Therapy	Invited Lecture
Children's Hospital of St. Louis		
2006	Assessing Rater Performance in Image Segmentation	Invited Lecture
Eastern North American Region/International Biometric Society		
2006	Quantitative Assessment of Newborn MRI	Invited Lecture
Washington University in St. Louis		
2006	Quantitative Neuroimage Analysis	Invited Lecture
RSNA		
2006	3D Visualization and Quantitation	Invited Lecture
AdMeTech Foundation		
2007	Algorithms for Quantitative Assessment of Pediatric Brain MRI	Invited Lecture

National Cancer Institute		
2007	Quantitative Pediatric MRI Neuroimage Analysis: Tools and Techniques for Segmentation, Registration and Validation	Seminar
RSNA 2007		
2010	Image Analysis Algorithms for Pediatric Brain MRI	Seminar
University of Pennsylvania		
2010	Assessing diffusion features of white matter in tuberous sclerosis and autism	Seminar
University of Pennsylvania		
2010	Lifecycle of an Imaging Biomarker: From Validation to Dissemination	Plenary Presentation
RSNA		
2011	Assessing diffusion features of white matter in tuberous sclerosis complex and autism	Invited Lecture
University of Utah		
2011	Lifecycle of an Imaging Biomarker: From Validation to Dissemination	Plenary Presentation
RSNA		
2012	Mathematical Methods for Pediatric MR Image Analysis	Invited Lecture
MMBIA		
2013	Image Processing for Nuclear Medicine and Molecular Imaging: Bridging the Gap Between Advanced Technology and Clinical Practice	Invited Lecture
Society of Pediatric Radiology; San Antonio, TX		
2014	Imaging and Intervention in the Developing Brain	Invited Lecture
Vanderbilt Initiative in Surgery and Engineering (ViSE), Nashville, TN		
2014	Imaging biomarkers of neural circuits in normal development and disease	Invited Lecture
Intel Corporation: Main Stage at the Supercomputing Conference, New Orleans, LA		
2016	Imaging Research and Correlations with Neurophysiology	Invited Lecture
The Michael J. Bresnan Child Neurology Conference, Sept 19-23, Cambridge, MA		

2017	Imaging Biomarkers for ASD in Tuberous Sclerosis Complex	Invited Lecture
National Institute of Neurological Disorders and Stroke (NINDS) 2017, Dec 7-9, Arlington, VA		
2018	Basic Mechanisms – Imaging Connectomic Biomarkers in SUDEP Brain	Plenary Presentation (delivered by O. Afacan in Simon's absence)
Partners Against Mortality in Epilepsy (PAME) 2018, Jun14-16, Alexandria, VA		

International

1995	Segmentation of MRI of the Brain	Seminar
University of New South Wales, Australia		
1999	Template Driven Segmentation	Invited Lecture
MICCAI 1999		
1999	Template Moderated Classification	Seminar
Universite de Louvain, Belgium		
2001	Coupling Segmentation and Nonrigid Registration	Seminar
EPFL, Lausanne, Switzerland		
2001	Segmentation and Nonrigid Registration	Seminar
University Hospital of Geneva		
2002	Simultaneous Truth and Performance Level Estimation	Seminar
Howard Florey Institute of Experimental Medicine and Physiology		
2002	A new algorithm for judging image segmentations	Seminar
University of Technology, Sydney, Australia		
2002	Quantitative Analysis of Medical Images	Seminar
Howard Florey Institute of Experimental Medicine and Physiology		
2002	Quantitative Medical Image Analysis	Seminar
University of New South Wales, Australia		
2003	A statistical estimation algorithm for validation of image segmentation	Seminar
EPFL, Lausanne, Switzerland		

2003	Image Segmentation and Validation: Unifying Statistical Classification and Geometric Models	Invited Lecture
MICCAI 2003		
2003	Capturing Brain Deformation	Plenary Presentation
International Symposium on Surgery Simulation and Soft Tissue Modeling		
2004	Segmentation, Registration and Validation for the Analysis of Medical Images	Seminar
EPFL, Lausanne, Switzerland Modeling		
2005	Medical Image Analysis for Image Guided Therapy	Plenary Presentation
International Pattern Recognition Society		
2005	Algorithms for Image Guided Therapy	Invited Lecture
CSIRO		
2005	Computational Radiology at Children's Hospital	Invited Lecture
University of Canterbury, Christchurch, New Zealand		
2005	Computational Radiology at Children's Hospital	Invited Lecture
Algorithms for Quantitative Neuroimage Analysis		
2007	The New Role of Imaging in Health Care	Plenary Presentation
CSIRO		
2007	Novel Algorithms for Image Guided Therapy	Invited Lecture
University of Western Australia		
2007	Medical Image Computing Algorithms for Understanding Early Brain Development	Plenary Presentation
University of Wales, Aberystwyth, United Kingdom		
2007	Algorithms for Planning for Pediatric Neurosurgery	Invited Lecture
International Brain Mapping and Intraoperative Surgical Planning Society		
2007	Evaluation in Medical Image Analysis	Plenary Presentation
MICCAI Society		
2007	Algorithms for Assessing Pediatric Brain MRI	Invited Lecture

Mathematical Methods in Medical Image Analysis		
2008	Image Processing : Segmentation	Invited Lecture
ISMRM 2008		
2008	Clinical and Methodological Issues in Pediatric Neuroimaging	Invited Lecture
Human Brain Mapping Satellite Meeting		
2008	Image Analysis in Planning for Pediatric Surgery	Plenary Presentation
University of Liege, Belgium		
2008	Image Analysis Algorithms for Pediatric Brain MRI	Invited Lecture
University of Melbourne, Australia		
2008	Neuroimage Informatics to Understand the Developing Brain	Plenary Presentation
The 4th International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP), Sydney, Australia		
2008	Imaging the Early Developing Brain: Challenges and Potential Impact	Invited Lecture
MICCAI 2008		
2009	Image Segmentation	Plenary Presentation
ISMRM 2009		
2009	Algorithms and software for image segmentation	Invited Lecture
ISMRM 2009		
2009	A Survey of Validation Techniques for Image Segmentation and Registration, with a focus on the STAPLE algorithm	Invited Lecture
NITRC-OHBM		
2010	Image Analysis Algorithms for Targeting Treatment and Assessing Response To Therapy	Invited Lecture
MICCAI Workshop on Computational Imaging Biomarkers for Tumors: From Qualitative to Quantitative (CIBT) – MICCAI 2010		
2011	Methodologies for inferring a shape model from multiple template images	Invited Lecture
MICCAI Tutorial on Shape Models for Biomedical Image Segmentation – MICCAI 2011		

2012	Imaging and Assessment of Abnormalities in the Developing Brain	Invited Lecture
MITACS Workshop on Mathematics of Brain Imaging – MITACS 2012		
2012	Multi-Modal Brain Image Analysis of Abnormalities of the Developing Brain	Invited Lecture (Keynote Speaker)
Multimodal Brain Image Analysis – MBIA 2012		
2013	Diffusion-weighted MRI analysis of Crohn's disease in the Bowel	Invited Lecture/Organizing Committee
MICCAI 2013		
2013	Automatic Cortical Tuber Segmentation based on a combined global-local Intensity Mixture Model	Invited Lecture/Organizing Committee
MICCAI 2013		
2013	Model Selection	Invited Lecture
"Séminaire au vert" – INRIA 2013		
2014	T2 Relaxometry and Myelin Water Fraction	Invited Lecture
"Séminaire au vert" – INRIA 2014		
2014	How To Do Research in the US	Invited Lecture
"Séminaire au vert" – INRIA 2014		
2014		Invited Lecture
Sherbrooke Connectivity Imaging Laboratory, University of Sherbrooke, Canada		
2015	Fusing Annotations.	Invited Talk
Brain Lesions workshop (in conjunction with BRATS and ISLES Challenges) - MICCAI 2015		
2016	Planning for Pediatric Epilepsy Surgery: From Algorithms to Clinical Impact	Invited Lectures
	Theme Plenary Lecture: Imaging and Quantitative Assessment of the Developing Fetus and Newborn	
Engineering Medical Innovation Summit (EMedI) 2016, Hong Kong		
2016	Imaging Biomarkers of Neural Circuits in Normal Development and Disease.	Intel Life Sciences Panel
The International Conference for High Performance Computing, Networking, StoraSalt Lake City, UT		
2016	Neuroimaging of Tuberous Sclerosis Complex	Invited Presentation
International TSC Research Conference, Lisbon, Portugal		
2017	Computational Pediatric Imaging and Simulations	Invited Lecture
The 3rd International Symposium on Multidisciplinary Computational Anatomy, Nara, Japan		

2017	Accelerated Characterization of Neural Circuits of the Brain	Invited Presentation
Supercomputing 2017 (SC17) – International Conference for High Performance Computing, Networking, Storage and Analysis, Nov 12-17, Denver CO		
2018	Accelerated Characterization of Neural Circuits of the Brain	Invited Presentation
Intel Artificial Intelligence Developer Conference 2018 (AI DevCon 2018), May 23-24, San Francisco, CA		

Report of Technological and Other Scientific Innovations

I. Patent, "Improved Registration Methods and Apparatus Using Random Projections", Patent No. 8867836, issued 10/21/2014. (Co-Inventors: Simon K. Warfield, Ph.D. and Ayelet Akselrod-Ballin, Ph.D.)

Dr. Warfield demonstrated that the search for correspondences in feature-based image registration may be dramatically accelerated, and computation costs reduced, while at the same time preserving robustness and accuracy of alignment, by utilizing randomized dimension reduction under the Johnson-Lindenstrauss (JL) lemma and accelerated search techniques such as approximate nearest neighbor (ANN) formulations. A transform can be estimated based on the rapidly identified correspondences in a robust manner using a novel expectation maximization iterative closest point search strategy, enabling 3D volume reconstruction from extremely large electron microscopy images, and providing a unique new capability to assess and visualize detailed connectivity of neural ultrastructure.

II. Patent, "Estimation of Incoherent Motion Parameters from Diffusion-Weighted MRI Data", Patent No. 9492101, issued 11/15/16. (Co-Inventors: Simon K. Warfield, Ph.D. and Mordechay Freiman, Ph.D.)

This scheme of stochastic modeling builds on methods of determining a set of parameter estimates for an incoherent motion model from diffusion-weighted magnetic resonance (MR) data of a portion of a biological body. A first set of parameter estimates is determined for a plurality of voxels associated with one or more images based, at least in part, on the diffusion-weighted MR data; a second set is then determined by stochastically perturbing the first set of parameter estimates, followed by determining a third set based, at least in part, on the first and second sets of parameter estimates, and finally determining whether at least one criterion associated with that third set is satisfied; if so, the third set is considered the final model of parameter estimates.

III. Patent, "Diffusion-Weighted MRI Using Multiple B-Values and Constant Echo Time", Patent Appl. 14/431536, published/pending 9/10/15 (Co-Inventors: Simon K. Warfield, Ph.D. and Benoit Scherrer, Ph.D.)

The method comprises selecting a plurality of diffusion gradient vectors, wherein at least two of the plurality of diffusion gradient vectors correspond to different non-zero b-values. A gradient strength is determined for each of the plurality of diffusion gradient vectors such that an echo image time (TE) remains constant when gradients corresponding to each of the plurality of diffusion gradient vectors are applied, then diffusion-weighted images are acquired using a gradient encoding scheme including the gradients corresponding to each of the plurality of gradient vectors

IV. Patent, "Methods and Apparatus for Modeling Diffusion-Weighted MR Data Acquired at Multiple Non-Zero B-Values", Patent Appl 15/022343, published/pending 8/11/2016 (Co-Inventors: Simon K. Warfield, Ph.D. and Benoit Scherrer, Ph.D.)

We describe methods and apparatus for characterizing biological microstructure in a voxel based, at least in part, on a set of diffusion-weighted magnetic resonance (MR) data. A multicompartment parametric model is used to predict a diffusion signal for the voxel using information from the set of diffusion-weighted MR data. Predicting the diffusion signal comprises determining, based on the set of diffusion-weighted MR data, a first set of parameters describing isotropic diffusion in a first compartment of the multi-compartment model and a second set of parameters describing anisotropic diffusion due to the presence of at least one white matter fascicle in a second compartment of the multi-compartment model. At least one first dataset of the set of diffusion-weighted MR data is associated with a first nonzero b-value and at least one second dataset of the set of diffusion-weighted MR data is associated with a second non-zero b-value different than the first non-zero b-value

V. Patent, "Temporal Slice Registration and Robust Diffusion-Tensor reconstruction for improved Fetal Brain Structural Connectivity Analysis:, Patent Appl. 15/290321, published/pending 4/19/17 (Co-Inventors: Simon K. Warfield, Ph.D. and Bahram Marami, Ph.D.)

The application of diffusion weighted magnetic resonance imaging (DWI) to map early development of the human connectome in-utero is challenged by intermittent fetal and maternal motion that disrupts the spatial correspondence of data acquired in the relatively long DWI acquisitions. We introduce a novel robust algorithm to reconstruct in-vivo diffusion-tensor MRI (DTI) of the moving fetal brain and show its effect on structural connectivity analysis, involving multiple steps of image registration incorporating a dynamic registration-based motion tracking algorithm to restore the spatial correspondence of DWI data at the slice level and reconstruct DTI of the fetal brain in the standard (atlas) coordinate space, and can provide information not available in the assessment of the original 2D slices to more reliably study the developing fetal brain connectome.

VI. Patent, "Head Motion Measurement and Correction Using Free Induction Decay (FID) Navigators", Patent Appl. 62/679608, published/pending 7/29/2018 (Co-Inventors: Simon K. Warfield, Ph.D. and Tess Wallace, Ph.D.)

We introduce a novel framework for rapid, intrinsic head motion measurement in MRI using free induction decay-navigators (FIDnavs) from a multichannel head coil array, providing a practical method for retrospective motion compensation in less cooperative patient populations, and resulting in substantial improvements in quantitative image quality metrics across all scans with intentional head motion.

Report of Scholarship

Peer Reviewed Publications in print or other media

Research Investigations

1. Warfield S, Dengler J, Zaers J, Guttmann CR, Wells WM, Ettinger GJ, Hiller J, Kikinis R. Automatic identification of gray matter structures from MRI to improve the segmentation of white matter lesions. J Imag Guid Surg 1995; 1(6):326-338.
2. **Warfield S**. Fast k-NN Classification for multichannel image data. Pattern Recogn Lett 1996; 17(7):713-721.
3. Iosifescu DV, Shenton ME, **Warfield SK**, Kikinis R, Dengler J, Jolesz FA, McCarley RW. An automated registration algorithm for measuring MRI subcortical brain structures. Neuroimage 1997; 6(1):13-25.
4. Huppi PS, **Warfield S**, Kikinis R, Barnes PD, Zientara GP, Jolesz FA, Tsuji MK, Volpe JJ. Quantitative magnetic resonance imaging of brain development in premature and mature newborns. Ann Neurol 1998; 43(2):224-235.
5. **Warfield SK**, Jolesz FA, Kikinis R. A high performance computing approach to the registration of medical imaging data. Parallel Computing 1998; 24(9-10):1345-1368.
6. Guttmann CR, Kikinis R, Anderson MC, Jakab M, **Warfield SK**, Killiany RJ, Weiner HL, Jolesz FA. Quantitative follow-up of patients with multiple sclerosis using MRI: reproducibility. J Magn Reson Imaging 1999; 9(4):509-518.
7. Inder TE, Huppi PS, **Warfield S**, Kikinis R, Zientara GP, Barnes PD, Jolesz F, Volpe JJ. Periventricular white matter injury in the premature infant is followed by reduced cerebral cortical gray matter volume at term. Ann Neurol 1999; 46(5):755-760.
8. **Warfield SK**, Kaus M, Jolesz FA, Kikinis R. Adaptive, template moderated, spatially varying statistical classification. Med Image Anal 2000; 4(1):43-55.
9. Guttmann CR, Benson R, **Warfield SK**, Wei X, Anderson MC, Hall CB, Abu-Hasaballah K, Mugler JP, Wolfson L. White matter abnormalities in mobility-impaired older persons. Neurology 2000; 54(6):1277-1283.
10. **Warfield SK**, Mulkern RV, Winalski CS, Jolesz FA, Kikinis R. An image processing strategy for the quantification and visualization of exercise-induced muscle MRI signal enhancement. J Magn Reson Imaging 2000; 11(5):525-531.
11. Schreyer AG, Fielding JR, **Warfield SK**, Lee JH, Loughlin KR, Dumanli H, Jolesz FA, Kikinis R. Virtual CT cystoscopy: color mapping of bladder wall thickness. Invest Radiol 2000; 35(5):331-334.
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14. Kaus MR, **Warfield SK**, Nabavi A, Black PM, Jolesz FA, Kikinis R. Automated segmentation of MR images of brain tumors. Radiology 2001; 218(2):586-591.
15. Murphy BP, Inder TE, Huppi PS, **Warfield S**, Zientara GP, Kikinis R, Jolesz FA, Volpe JJ. Impaired cerebral cortical gray matter growth after treatment with dexamethasone for neonatal chronic lung disease. Pediatrics 2001; 107(2):217-221.

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Narrative Report (limit to 500 words)

The primary nexus of my research is the Computational Radiology Laboratory (CRL), of which I am the director and founder. The CRL was formed with the goal of improving our understanding of the structure and function of the brain and other organs of the human body, in order to improve our capacity to diagnose and treat disease. The CRL achieves this by developing novel technologies and computational modeling strategies for understanding and interpreting radiological images. My most significant research accomplishments have been the development of novel algorithms for fundamentally new approaches to analyze and interpret images. Many of my algorithmic developments have introduced entirely new approaches in the field, which have been adopted by others nationally and internationally as a basis for new directions for development.

My team and I use neuroscientific and clinical applications to provide focus and constraints for the creation of new algorithms for medical image analysis. This approach has resulted in the creation of robust, reliable, general purpose algorithms which have had significant impact in several clinical areas. Major applications of this research have included quantitative image analysis to detect morphological change and real-time image analysis to support image guided surgery. The primary areas of current research activity are the characterization of fetal and neonatal brain development utilizing magnetic resonance imaging, reconstruction and interpretation of neural ultrastructure from electron microscopy, preoperative assessment of seizure foci and normal function in pediatric epilepsy patients, assessment of white matter structural alterations in neurological disorders, and intraoperative visualization and navigation to enhance image guided surgery.

Throughout my career I have welcomed the opportunities to teach and mentor students in addition to conducting extramurally funded research. Since 1998, I have served as mentor to both graduate and undergraduate computer science and medicine students in the Department of Radiology as well as summer medical and computer science students. I have also co-supervised graduate students of the computer science and artificial intelligence laboratory at MIT, and graduate students from Boston University and prominent international research universities. I have taught courses to peers at prominent international conferences.

My laboratory distributes software implementations of our algorithms to research scientists throughout the world. We participate in national and international efforts to develop a software platform for medical image analysis, and through these efforts my research in medical image analysis has had a significant impact upon the way imaging is utilized in research and in clinical practice.

My research has been characterized by fundamental contributions to the basic science of imaging and medical image analysis, and collaboration with clinicians to translate those contributions into dramatic impact in clinical and translational research. My laboratory has published high impact papers that are highly cited, and we have developed new methodologies that have been widely adopted in the field.