



Masters of Science in
**Neuroimaging and
Informatics (NIIN)**

Keck School of
Medicine of **USC**

USC Institute for Neuroimaging and Informatics

Overview

Imaging of the living brain is one of the most important and powerful approaches in the neurosciences and biomedical sciences. Visualizing and quantifying the brain in form and function provides a unique opportunity to experimentally examine brain activity, explore connectivity, and measure changes occurring over time. Modern neuroimaging methods help to inform and enrich our understanding of the healthy human brain as well as neurological disease and dysfunction.

Proficient application of the myriad of computational methods by which to process, analyze, compile, and mine brain imaging data require considerable training and expertise. What is more, new analytic methods must be developed to keep up with the growing amount of data being obtained as brain scanner technology advances.

Finally, there is an increasing interest in integrating other forms of biomedical data with neuroimages. These include behavioral, genetic, and phenomic variables. Understanding how these and other variables relate to imaging observations of brain structure and function will provide critical insights into the brain's role as part of the complex human biological system.

The Institute of Neuroimaging and Informatics (INI) in the Keck School of Medicine of USC is home to a new, one-year Masters of Science (MS) degree program focused on neuroimaging and the informatics associated with brain imaging. This advanced program of study will provide students with a deep understanding of the scientific and clinical underpinnings of neuroimaging science and how to leverage it in basic and translational research and how to make new and important discoveries in biomedicine.

The year-long program is comprised of didactic lecture courses which address the technology of neuroimaging, a detailed examination of brain anatomy and function, and the variety of data-type dependent as well as integrative computational processing approaches. The program also includes laboratory modules 1) to provide guided, hands-on experience with neuroimaging data collection approaches for examining anatomy, connectivity, and functional activity; and 2) to examine and develop optimized data processing strategies. Finally, studies are enriched by several distinct faculty-guided, discussion-based courses which allow detailed examination of specific aspects of neuroimaging of elemental neurological processes and carefully selected applications in neurological and psychiatric medicine.

Students successfully completing the INI NIIN program will be ideally-positioned to apply to formalized medical training programs, join competitive PhD research training programs, secure laboratory or administrative employment in the growing field of brain imaging neuroscience, or engage in public policy or regulatory administration of academic, clinical or business efforts in this expanding discipline.

NIIN Program Faculty

- **INI Director:** Arthur W. Toga, Ph.D.
- **INI Education Director:** John Darrell Van Horn, Ph.D.
- **INI Executive Administrator:** Grace Liang-Franco, M.B.A.
- **INI NIIN PROGRAM CORE FACULTY**
 - Naveen Ashish, Ph.D., Associate Professor of Research
 - Meredith Braskie, Ph.D., Assistant Professor of Research
 - Kristi Clark, Ph.D., Assistant Professor of Neurology
 - Hongwei Dong, Ph.D., Associate Professor of Neurology
 - Houri Hintiryan, Ph.D., Assistant Professor of Research
 - Derrek Hibar, Ph.D., Assistant Professor of Research
 - Xue Hua, Ph.D., Assistant Professor of Research
 - Andrei Irimia, Ph.D., Assistant Professor of Research
 - Neda Jahanshad, Ph.D., Assistant Professor of Neurology
 - Junning Li, Ph.D., Assistant Professor of Research
 - Scott Neu, Ph.D., Assistant Professor of Research
 - Judy Pa, Ph.D., Assistant Professor of Neurology
 - Yonggang Shi, Ph.D., Assistant Professor of Neurology
 - Paul M. Thompson, Ph.D., Professor

NIIN Program Courses

- **NIIN 500 Neuroimaging and Systems Neuroscience (3, Fall)** This course will provide a detailed overview elemental neuroanatomy and brain systems with an emphasis on a neuroimaging perspective in the human and mouse. Examples from clinical cases and their consequences on behavior will be explored.
- **NIIN 510 Fundamentals of Human Neuroimaging (3, Fall)** Survey of anatomical and functional neuroimaging approaches and their use to explore the healthy as well as diseased human brain.
- **NIIN 520 Experimental Design for Neuroimaging (3, Fall)** An examination of approaches for the design of neuroimaging experiments in the realm of structural and functional MRI.
- **NIIN 530 Neuroimaging Data Acquisition with Magnetic Resonance Imaging (3, Fall)** This course introduces the various approaches which can be used to image the living brain using MR-based techniques. The course covers neuroimaging scanning technologies, pulse sequence design, and sources of image artifact.
- **NIIN 540 Neuroimaging Data Processing Methods (3, Spring)** A comprehensive investigation of data processing methods, software strategies, and workflow design and execution methodologies.
- **NIIN 550 Computational Modeling in Neuroimaging (3, Spring)** Lectures addressing the current neuroinformatics approaches to large-scale data representations, mining, and visualization in brain imaging. Applications in clinical samples will be presented and discussed.
- **NIIN 560 Microscopy Techniques and Neuroinformatics in Animal Models (3, Spring)** Provides a detailed examination of cellular-level imaging using microscopy to visualize individual cells, cell networks, and white matter fiber pathways in the mouse brain.
- **NIIN 570 Neuroimaging Genetics and Phenomics (3, Spring)** Lectures on the linkage of genomic methods for identifying genes and their allelic variants in the context of demographic, neuropsychological, and clinical variables (e.g. phenomics) and their neurological correlates. The course will present a primer on the acquisition of gene sequence information, the gathering of phenomic information, and approaches for associating these with brain form and function in healthy and diseased populations.
- **NIIN 597 Current Topics in Neuroimaging Informatics (1, Fall)** Student-led presentations with faculty-guided discussion of recent literature in the subject of neuroimaging and neuroinformatics.
- **NIIN 598 INI External Speaker Seminar Series (1, Spring)** Reading and discussion of recent papers by the INI speaker of the week and attendance at the speaker's INI seminar.

Contact Information

For more information on USC's Masters of Science in Neuroimaging and Informatics (NIIN) Program, please contact:

Institute for Neuroimaging and Informatics (INI) and Laboratory of Neuro Imaging (LONI)

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