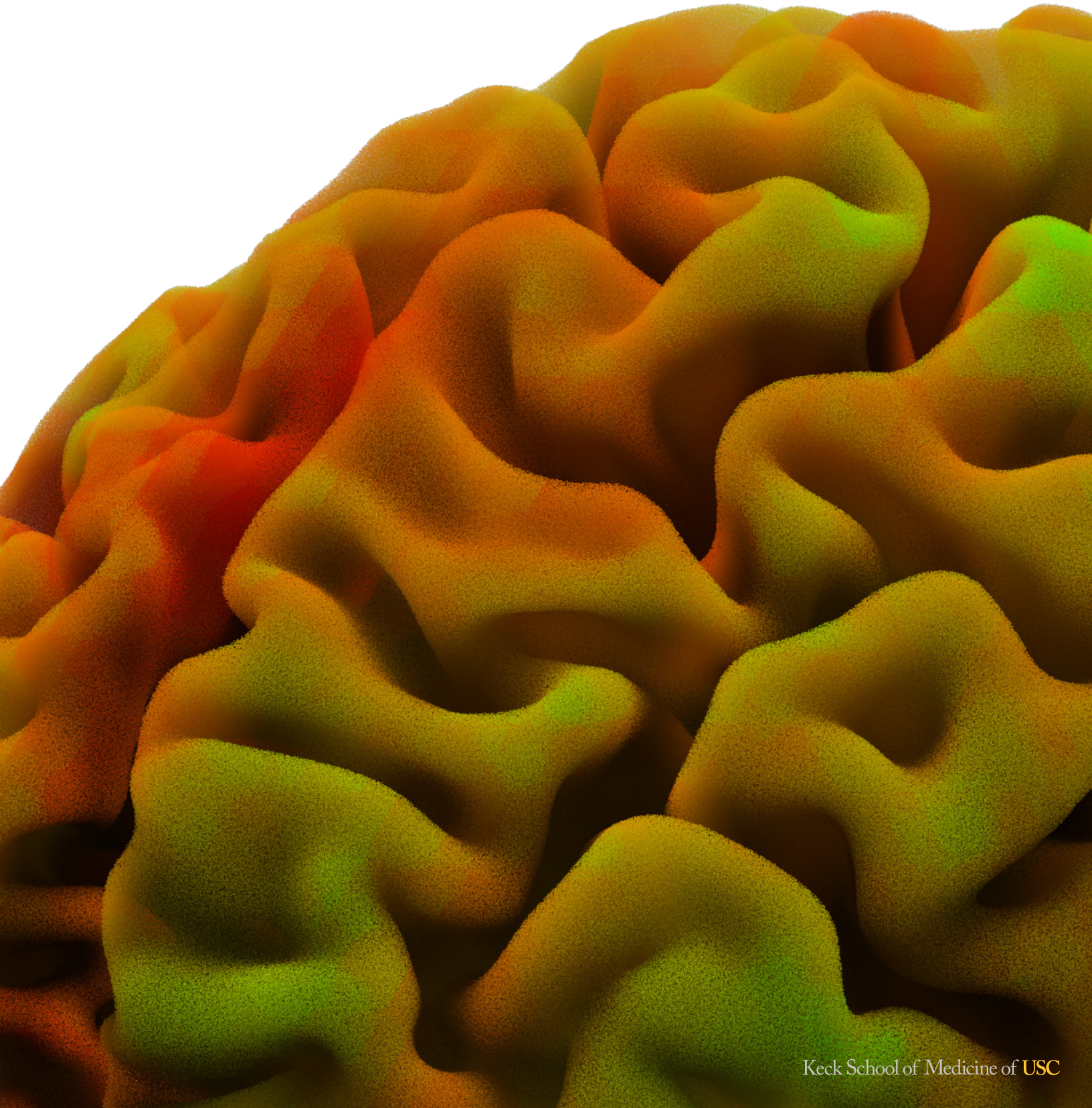
USC Mark and Mary Stevens
Neuroimaging and Informatics Institute

INI

2017

ANNUAL REPORT



Keck School of Medicine of USC

"If you look at the spectrum of neurological disorders, I would argue that it touches more families than cancer and heart disease. It touches youth and it touches old age.

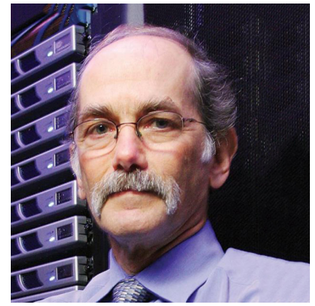
Neuroscience is the next great frontier in medicine and science."

– Mark Stevens
USC trustee and benefactor

INSIDE

DIRECTOR'S LETTER

DIRECTOR'S LETTER



Our annual report describes the things that we have done. We've settled into our new home, Stevens Hall for Neuroimaging; we launched new collaborative studies of epilepsy, Alzheimer's disease, and other conditions; we published 161 peer-reviewed articles.

What's more important is what we will accomplish in the future and where we are headed.

The institute's forward motion is guided by the belief that imaging is a window into discovery. Coupled with other methods of observation, neuroimaging can provide us with a clear and complete picture of the brain in health and disease, solidifying our understanding of the body's most complex organ.

But we can't do this alone. That's why for decades, our team has been a leader in initiating innovative collaborations. We've considered the boundaries that traditionally separate researchers: scientific fields, institutional walls, geographic borders. By blurring these boundaries, we can accelerate the pace of scientific discovery. By rejecting them altogether, we can truly transform human health and medicine.

We've structured our yearly update to maximize its accessibility for the widest group of readers: research colleagues; past, present, and future students and trainees; our generous benefactors; and the larger global community we hope to educate and serve. You'll find stories and statistics about our major centers and initiatives in the body of the report, and fine print about dollars and publications in the appendix.

Thank you for joining us in our mission to launch the biomedical research community into an unprecedented era of progress and discovery.

Arthur W. Toga
Director, Mark and Mary Stevens Neuroimaging and Informatics Institute
Director, Laboratory of Neuro Imaging
Provost Professor of Ophthalmology, Neurology, Psychiatry and the Behavioral Sciences, Radiology and Engineering
Ghada Irani Chair in Neuroscience

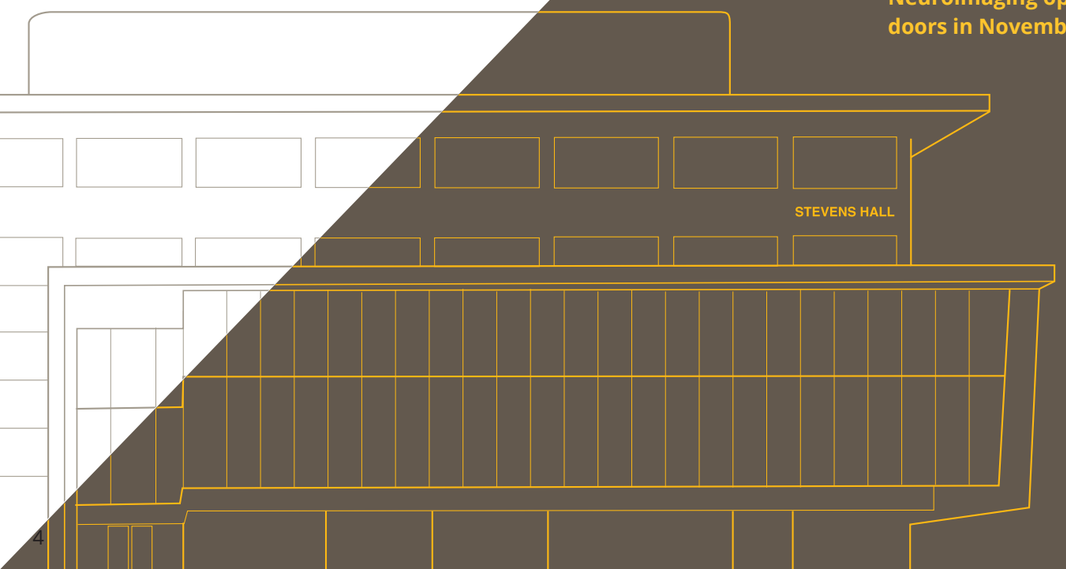
INI MISSION

The USC Mark and Mary Stevens Neuroimaging and Informatics Institute (INI) applies innovative imaging and information technologies to the study of the brain. We collect and analyze imaging, genetics, clinical, and behavioral data to better understand the brain's role in human health, disease, and changes across the lifespan.

Established at USC in 2013 and named in 2015 with a generous gift from Mark and Mary Stevens, the INI encompasses the renowned Laboratory of Neuro Imaging, building on its 34 years of expertise. The institute also houses the Imaging Genetics Center (IGC), Center for Imaging Acquisition CIA), and Center for Integrative Connectomics (CIC).

35,000 square feet
7 petabytes of data storage
2 high-resolution MRI scanners

The Stevens Hall for Neuroimaging opened its doors in November 2016.



IMAGING

INFORMATICS

COLLABORATION

The INI uses cutting-edge imaging technology, including in-house Siemens Magnetom Terra 7T and Prisma 3T MRI scanners, to investigate the structure, function, and connectivity of the human brain in healthy individuals across the lifespan.

Researchers at the institute also study patients with neurodegenerative, neuropsychiatric, and developmental disorders, searching for biomarkers that can be used to identify at-risk individuals. By developing a more comprehensive picture of the brain, they contribute to the development of treatments and cures for some of the world's most debilitating diseases.

The INI is a leader in informatics, which applies information technology to better understand and use data. By employing sophisticated mathematical and computational tools, along with new methods of visualization, informatics researchers seek to glean additional insights from the vast amounts of data scientists collect.

The institute's researchers apply informatics to biomedical data, focusing on unlocking the most elusive secrets of the human brain in health and disease.

The INI was founded upon the view that understanding the brain is impossible for any group to accomplish in isolation. Collaboration is a driving force of the institute's mission, including the publicly available 3D brain atlases and online archival tools developed to facilitate international data sharing.

A key partner in numerous unique national and international collaborations, the INI pools its best resources with those of other experts to speed up the pace of discovery in biomedicine.

INI CENTERS

HISTORY

Director: Arthur W. Toga
The Laboratory of Neuro Imaging encompasses a diverse team of neuroscientists, engineers, and data scientists, all working toward a common goal: mapping the brain. LONI researchers study diseases, including neurodegenerative and neuropsychiatric disorders, and seek to understand changes in the brain across the lifespan.

LONI joined USC as part of the INI in 2013, bringing with it a 30-year tradition of excellence in neuroimaging and informatics. Begun as a research laboratory at the Washington University School of Medicine in St. Louis in 1983, LONI moved to the University of California at Los Angeles in 1987, where it became a leader in building population-based and disease-specific brain atlases and databases.

LONI
Laboratory of Neuro Imaging

RESEARCH

Originally focused on linking brain structure and function using sophisticated connectivity maps, LONI has expanded its work to include the application of 3D visualization, emerging mathematics, and large-scale computational architecture to biomedical datasets.

LONI is a leader in the study of healthy neurological function, as well as brain development and aging, including disorders such as Alzheimer's disease, Parkinson's disease, schizophrenia, Autism Spectrum Disorder, bipolar disorder, HIV, depression and stroke.

PARTNERSHIPS

LONI is a key partner in numerous national and international collaborations, from universities and academic health centers to independent research institutions. A primary focus of the lab is to freely share biomedical data, atlases, and software with the larger research community.

Director: Paul M. Thompson
The Imaging Genetics Center is dedicated to discovering how individual genetic differences influence brain wiring, structure, and function. A research team of neuroscientists, engineers, medical doctors and computer scientists have joined forces to work toward this goal.

IGC
Imaging Genetics Center

RESEARCH

Focusing on how genes determine brain structure and function, the IGC actively develops technical and mathematical tools to study how the brain changes in disorders and diseases such as autism, HIV, schizophrenia, and traumatic brain injury. The IGC uses Diffusion Weighted Imaging, key for mapping connectivity within the brain, and has developed a novel method of labeling white matter brain tissue, which greatly increases the speed of data analysis.

PARTNERSHIPS

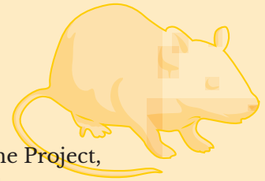
The IGC co-founded the Enhancing Neuro Imaging Genetics through Meta Analysis (ENIGMA) Consortium, which performs big data studies of the human brain, analyzing brain scans of more than 53,000 people worldwide. This collaborative group studies 22 brain diseases in 37 countries, focusing on the interaction between brain health and genetics.

Director: Hong-Wei Dong

Launched in 2017, the Center for Integrative Connectomics houses a cross-disciplinary research group working to develop a detailed connectivity map of the mammalian brain and to understand the neural networks underlying health and disease.

CIC

Center for Integrative Connectomics

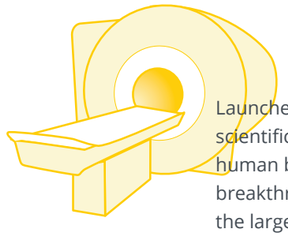


RESEARCH

The CIC houses the revolutionary Mouse Connectome Project, which has traced more than 2,000 pathways within the mouse brain. Other projects include classification of neuronal cell types, as well as the exploration of differences in connectivity underlying neurological disorders such as Autism Spectrum Disorder and Alzheimer's, Parkinson's, and Huntington's diseases.

PARTNERSHIPS

The CIC is engaged in many collaborative efforts, both within USC and beyond. Current projects include mouse models for Alzheimer's and autism, high-resolution gene mapping, development of novel viral tracers for mouse studies, and in-depth neurocircuitry analyses.



Launched in 2016, the Center for Image Acquisition (CIA) employs cutting-edge scientific instruments and analytical approaches to optimize images of the living human brain. The powerful tools and techniques developed by the CIA team enable breakthroughs in both the lab and clinic, and are ultimately perfected and shared with the larger scientific community.

CIA

Center for Image Acquisition

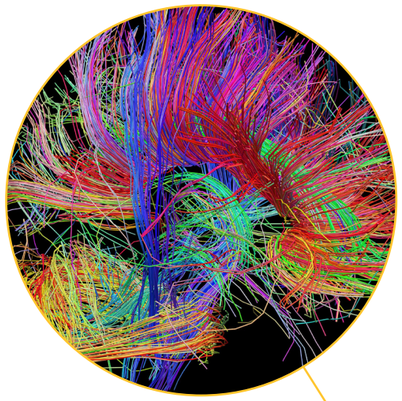
RESOURCES

The CIA houses two of the world's most advanced Magnetic Resonance Imaging (MRI) scanners, along with dedicated supercomputing systems, cutting-edge analysis techniques, and unrivaled professional expertise. The Siemens Prisma 3T MRI scanner boasts a high-end gradient system ideal for clinical imaging studies; the INI's Siemens Terra 7T MRI scanner was the first of its kind installed in North America, and contains a powerful magnet that enables researchers to image the brain in ultra-high resolution.

PARTNERSHIPS

While directly accessible to the INI team, the CIA also offers advanced imaging capabilities to our colleagues at the Keck School of Medicine and across the University of Southern California. Researchers and clinicians may access the center's scanners, computing systems, and analytical tools in order to advance their own biomedical studies.

We're using advanced imaging technologies and techniques to help create the world's most detailed map of connections inside the brain.



HUMAN CONNECTOME PROJECT

The Human Connectome Project (HCP) is a five-year collaboration that aims to provide an unparalleled compilation of neural data, an interface to graphically navigate this data, and the opportunity to achieve never-before-realized conclusions about the living human brain. HCP researchers are working together to map the brain's major pathways, circuits, regions, and functions.

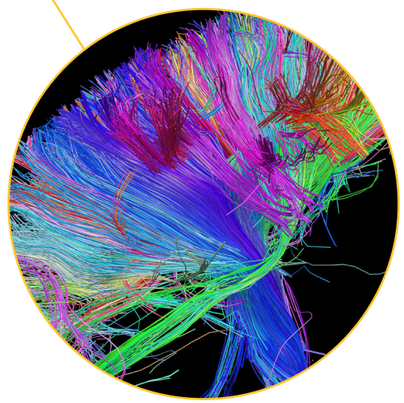
This year, the INI used HCP data to develop a low vision connectivity map, which aids in the understanding of visual impairments. Researchers also created a publicly-accessible brainstem connectivity map, and began studying how the whole brain connectome relates to imaging data capturing tau tangles in Alzheimer's disease.

"Right now, we're using years of data collected through the Human Connectome Project to develop techniques for creating more specialized connectomes. This is very valuable when looking at specific neurological diseases and conditions."
–Yonggang Shi, Assistant Professor of Neurology

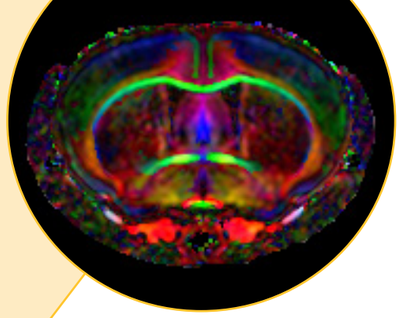
Functional maps

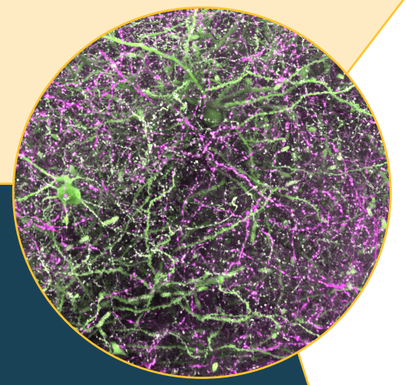
In addition to mapping neural structures and connectivity, INI researchers are combining several tools—including functional imaging, blood flow analysis, and neurochemical measures—to explore how different parts of the brain organize into functional networks and communicate with one another. One approach involves neuromodulation, a process by which researchers initiate a small change in brain activity and observe the results. A better understanding of these networks can lead to treatment of disorders characterized by neuro-electrical imbalance, such as epilepsy and schizophrenia.

"We're looking for relationships in the brain that no one else has seen before, and we're constantly thinking about diagnosis and patient stratification. The research we're doing in the lab should have direct applications for clinicians."
– Kay Jann, Assistant Professor of Research



This year, MCP researchers joined the BRAIN Initiative Cell Census Network, an ambitious collaboration aiming to identify and classify each cell type in the brain.





MOUSE CONNECTOME PROJECT

The Mouse Connectome Project (MCP) is an NIH-funded venture that aims to create a complete mesoscale connectivity atlas of the mouse brain and to subsequently generate its global neural networks. Using fluorescent dyes as tracers and novel computational informatics tools for analysis, the project will provide researchers with a better understanding of how various brain structures organize into networks and communicate with one another.

Developemental maps

INI's Connectivity and Network Development Group (CANDL) develops cutting-edge structural and functional models of how networks of the human brain develop and respond to experiences, with an emphasis on the hippocampus. In addition to mapping normal brain development, CANDL researchers study neurodevelopmental disorders such as dyslexia. The group is currently fine-tuning a novel chain of collaborative imaging that combines tissue processing with in vivo imaging to map the brain at unprecedented levels of detail.

"It's important to start by looking at neuroanatomy and let the biology drive our modeling efforts. This way, we ensure we're building a plausible model that accurately represents the developing human brain."
– *Kristi Clark, Assistant Professor of Neurology*

"When scientists first began studying the brain, we divided it into lobes. Then we began classifying it into progressively smaller regions. Now we're looking at cell types and even individual cells."
– *Hong-Wei Dong, Associate Professor of Neurology*

Mapping tools

The INI develops and shares computational tools to translate neuroimaging data into more accurate maps of the brain. For example, researchers employ sophisticated mathematics to recreate anatomical structures that cannot be represented with traditional geometry. These tools can be broadly applied or tailored to specific conditions such as Alzheimer's disease and retinopathies.

"When we develop new algorithms and tools for better performance, we don't just apply it to our own projects within the institute. We establish diverse collaborations to help with all sorts of other research—everything from angiography to animal studies."
– *Yonggang Shi, Assistant Professor of Neurology*

"Humans are basically visual animals. If we really want to see what's happening in our data, we can't just throw algorithms at it. That can be misleading."
– *Tyler Ard, Assistant Professor of Research*

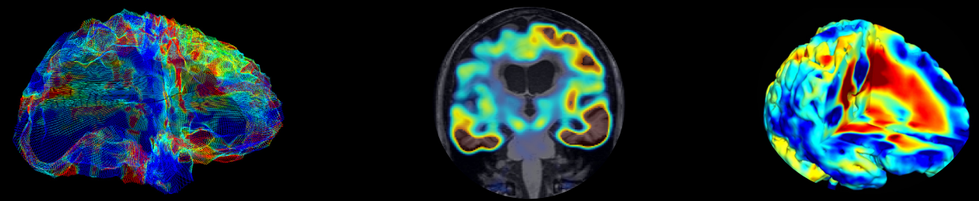
VISUALIZATION SHOWCASE

In order to render highly complex neuroscientific data more accessible, INI has assembled a dedicated team of visualization specialists, including developers, animators, and scientific graphic designers. The visualization team collaborates to help researchers interact more intuitively with their data, and to communicate discoveries to the general public.

This year, the visualization team expanded its explorations in Virtual Reality, creating multiple immersive environments for viewing neuroimaging data, including a volumetric viewer, a highly detailed near-field rendering, an anatomy viewer, and a connectivity map.

UNDERSTANDING DISEASE

"Everything that happens at the Stevens Institute—from interventions to imaging to informatics—at some point, we want to transfer it over to the clinical sphere."
– Meng Law, Director of Neuroradiology, Professor of Radiology, Neurology, Neurological Surgery, and Biomedical Engineering



By combining data from clinical, behavioral, genetics, and imaging studies, we seek to answer key questions about what can go wrong in the brain and learn how to prevent or reverse the damage.

5 year study

5 universities

21.7 $ million

EPILEPSY BIOINFORMATICS STUDY FOR ANTIEPILEPTOGENIC THERAPY

The Epilepsy Bioinformatics Study for Antiepileptogenic Therapy (EpiBioS4Rx) is a collaboration between researchers from USC, UCLA, University of Melbourne, University of Eastern Finland, and the Albert Einstein College of Medicine. With an overall goal of preventing or curing posttraumatic epilepsy, researchers first hope to find a reliable biomarker to predict which patients will develop epilepsy following traumatic brain injury. INI's primary role in the study involves the harmonization and processing of data.

This year, the investigators secured a $21.7 million grant from the National Institutes of Health, launched a public information campaign, and began collecting data.

"After organizing and storing the data, we share it freely and publicly with the broader epilepsy community. Our goal is to encourage collaboration and try to speed up research in the field."
– Dominique Duncan, Assistant Professor of Neurology

GLOBAL ALZHEIMER'S ASSOCIATION INTERACTIVE NETWORK

The Global Alzheimer's Association Interactive Network (GAAIN) advances research into the causes, prevention and treatment of Alzheimer's and related neurodegenerative diseases through a global cooperative of sharing, investigation and discovery. The GAAIN platform is the first open-access, federated Alzheimer's disease data discovery platform of its kind, aimed at fostering collaboration between study investigators through data sharing. Researchers can use the platform to discover clinical, genetic, imaging, and other data collected across many independent studies, as well as to build cohorts and conduct preliminary analyses.

This year, GAAIN launched a new Interrogator interface, giving users unprecedented control in harmonizing, analyzing, and obtaining access to thousands of Alzheimer's disease data points.

"Most of the archives around the world have insufficient numbers of underrepresented groups. One of our priorities is for people of all races and ethnicities to be involved in Alzheimer's clinical trials, because this disease is a problem that affects all of us."
- Arthur W. Toga, INI Director

Animal models

INI's Mouse Connectome Project team not only maps the brains of healthy mice, but investigates how these controls differ from their diseased counterparts. They study a range of conditions including Autism Spectrum Disorder, Parkinson's disease, and Alzheimer's disease, looking for malformed, damaged, or missing connections in the brain.

"These studies take time, but they can show us exactly where disruptions are occurring. The result is that researchers studying behavior have a map that can point them to the region of the brain implicated in a particular disorder."
– Houri Hintiryan, Assistant Professor of Research

Vascular Imaging

INI's Laboratory of Functional MRI Technology (LOFT) is investigating a powerful non-invasive method of imaging blood vessels in the brain, with the goal of eliminating the use of radioactive substances for contrast. The new technology, called Non-contrast 4D Dynamic Magnetic Resonance Angiography, can be applied to most vascular diseases, including stroke and atherosclerosis. The technology is currently being evaluated and optimized for clinical use.

"This technique is especially relevant in pediatrics because we can avoid exposing young patients to unnecessary levels of radiation. Meanwhile, we can still obtain images with very high spatial and temporal resolution."
– Lirong Yan, Assistant Professor of Research

"Once people have dementia, their brain has already undergone massive and possibly irreversible damage. It's crucial for scientists to identify very early risk factors and their associated changes in brain measures or cognitive function. This will help us devise treatments that can prevent the onset of Alzheimer's symptoms."
– Meredith Braskie, Assistant Professor of Research

ALZHEIMER'S DISEASE NEUROIMAGING INITIATIVE

The Alzheimer's Disease Neuroimaging Initiative (ADNI) is a global effort to develop treatments for Alzheimer's disease through research collaboration and data sharing. This multisite longitudinal study analyzes clinical, imaging, genetic, and cognitive biomarkers to examine the brain's structural and functional changes as it progresses through the disease. Data from international studies are aggregated in a centralized database, the LONI Image and Data Archive.

This year, ADNI received funding to extend its efforts for five additional years—including the recruitment and testing of new participants, as well as approval to administer new assessments including amyloid Positron Emission Tomography (PET) scans and new behavioral tests. This year alone, ADNI received 2,540 applications for data access, and investigators submitted 267 manuscripts for review.

launch **2004**

1700+ manuscripts

59 acquisition sites

PARKINSON'S PROGRESSION MARKERS INITIATIVE

The Parkinson's Progression Markers Initiative (PPMI) is the Michael J. Fox Foundation's flagship biomarkers study, which seeks to identify biomarkers of Parkinson's disease progression. The longitudinal study follows more than 1,000 research participants in 33 clinical sites across the United States, Europe, Israel, and Australia. One important product of the study is a shared database where researchers can access a repository of imaging, clinical, and behavioral data, as well as biospecimens.

This year, PPMI investigators generated Whole Genome Sequencing data, and received approval to collect new data types, including blood and skin samples containing pluripotent stem cells. Researchers also submitted more than 110 manuscripts for review and amassed data for substudies analyzing REM sleep disorder, the olfactory system, and the Brain Bank repository.

launch **2010**

33 clinical sites

3 continents

"PPMI is one of the first studies of Parkinson's disease with a comprehensive longitudinal design—we are collecting data in multiple sites worldwide. The richness of these data has helped characterize the progression of the disease in a way that no other study has achieved thus far."
–Arthur W. Toga, INI Director

Stroke Recovery

The Neural Plasticity and Neurorehabilitation Lab (NPNL) aims to enhance neural plasticity in a wide population of individuals, especially those who have suffered severe strokes, exploring the applications of noninvasive brain stimulation, brain computer interfaces, neuroimaging, virtual reality, and behavioral techniques. NPNL's latest project, Rehabilitation Environment using the Integration of Neuromuscular-based Virtual Enhancements for Neural Training (REINVENT), uses virtual reality to reinforce motor commands in treatment-resistant stroke patients, helping reward their impulses to move even when physical activity does not occur. The project received a special jury recognition for innovative use of Virtual Reality Room-Scale Technology in the field of health at this year's SXSW Film Awards.

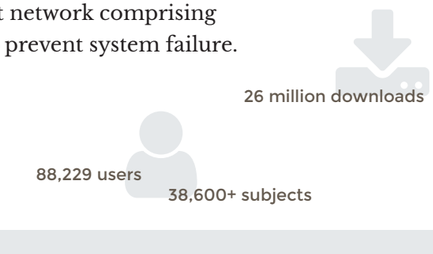
"When I was working as an occupational therapist, I didn't know which of my patients were going to recover following a stroke. And for the people who weren't recovering, I didn't have anything else I could give them. That was really frustrating and a little bit heartbreaking."
- Sook-Lei Liew, Assistant Professor of Neurology, Biokinesiology and Physical Therapy

DEVELOPING SHARABLE TOOLS

INI designs experimental protocols, software, and analytical tools to aid the larger research community, and has helped revolutionize data sharing by creating public archives that facilitate worldwide collaboration.

IMAGE AND DATA ARCHIVE

LONI's Image and Data Archive (IDA) is a secure date archiving system, currently housing data from more than 38,000 subjects. The IDA uses a robust infrastructure to provide researchers with a flexible and simple interface for de-identifying, searching and disseminating their biomedical data. With thousands of investigators across the globe and millions of data downloads to date, the IDA guarantees reliability with a fault-tolerant network comprising multiple switches, routers, and Internet connections to prevent system failure.

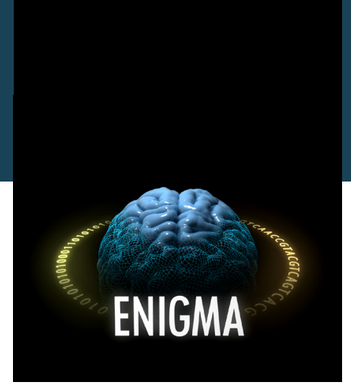


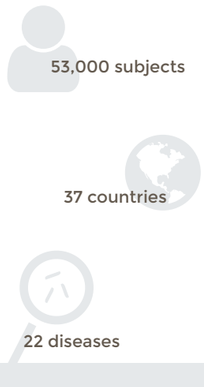
This year, the data repository has acquired 16 new studies, which investigate a broad range of neurological conditions including: Alzheimer's disease in Down Syndrome; Congenital Adrenal Hyperplasia; pediatric deafness; low vision, blindness, and sight restoration; and health and aging among Latino elders. The IDA has also distributed more than 9 million scans to investigators in 62 countries.

Image & Data Archive
Powered by LONI
IDA

"The IDA is a secure and long-term data repository for neuroscience studies ranging from aging, dementia, and brain injury studies to studies of multiple sclerosis, Parkinson's disease, Alzheimer's disease, and Down Syndrome. It plays a significant role in collecting and distributing data to thousands of scientists around the world."
– Scott Neu, Assistant Professor of Research

BIG DATA TO KNOWLEDGE: ENHANCING NEURO IMAGING GENETICS THROUGH META ANALYSIS





The Enhancing Neuro Imaging Genetics through Meta Analysis (ENIGMA) Consortium, based at INI's Imaging Genetics Center (IGC), performs big data studies of the human brain, focusing on the interaction between brain health and genetics. ENIGMA has published some of the largest neuroimaging studies of schizophrenia, major depression, bipolar disorder, obsessive-compulsive disorder, and several rare genetic diseases. The consortium unites research groups across the United States, South America, Europe, India, Russia, Australia, South Africa, and beyond.

This year, ENIGMA won additional funding from the Kavli Foundation to launch the Kavli ENIGMA Exchange program. The new initiative will coordinate additional big data analyses and collaborative exchanges with new countries. ENIGMA also published a big data MRI study on bipolar disorder, mapping the brains of more than 6,000 participants.

"ENIGMA—where crowdsourcing meets neuroscience—has become one of the largest scientific studies ever done. It looks at how our genetic code affects healthy and diseased brains, and factors that are helpful or harmful to the brain."
– Paul Thompson, INI Associate Director

"Rare genetic disorders—which are often extremely devastating—are hard to research because a given city won't contain enough patients to perform a full analysis. By combining data from around the world, we can start making real progress."
– Neda Jahanshad, Assistant Professor of Neurology

LONI RESOURCE

The Laboratory of Neuro Imaging Resource (LONIR) develops, optimizes and shares innovative solutions for the investigation of imaging, genetics, behavioral, and clinical data. This includes researching and implementing better ways to share and manage data, as well as creating new algorithms for processing brain scans with increased speed and accuracy. Through LONIR, the INI has partnered with hundreds of biomedical investigators around the world and developed tools to advance their research projects. The LONIR team also hosts a range of training seminars for faculty, postdoctoral researchers, graduate and undergraduate students, and K-12 groups to provide training and education in the field of neuroinformatics.

2,184 publications

50 free software downloads

357 trainees

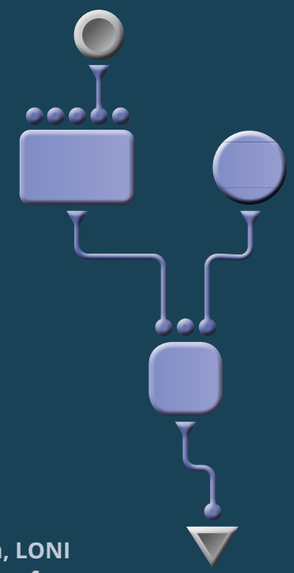
This year, LONIR researchers developed new technologies for extracting connectomic features from brain scan data, and created machine learning algorithms to identify and flag errors in large datasets.

"At INI, we have large datasets for many diseases, including Alzheimer's, stroke, and autism. A preliminary—but very important—step in analyzing a large dataset is checking the quality of its images, which can take years to do by hand. LONI Quality Control is a machine learning tool that greatly increases the speed of this process."
– Hosung Kim, Assistant Professor of Neurology

SCANNING TOOLS

The Laboratory of Functional MRI Technology (LOFT) leads the INI in developing novel tools for the first key step in neuroimaging studies: scanning the brain. LOFT team members create specialized software to aid in collecting images at the highest spatial and temporal resolution possible, including specialized parameters for vascular imaging and neuromodulation studies.

"At LOFT we focus on the technology side, and our impact can be much broader compared with tools that apply only to a single area. A good technology can be translated very quickly to have a fast, broad impact across the field. We want to do something that leaves a mark."
– Danny JJ Wang, Professor of Neurology



LONI PIPELINE

INI's most popular software program, LONI Pipeline, is a free workflow application for neuroimaging researchers, providing a graphical framework for the development, maintenance, and dissemination of neuroimaging data-analysis protocols. INI provides additional software tools to aid scientists in de-identifying, processing, analyzing, and displaying imaging data.

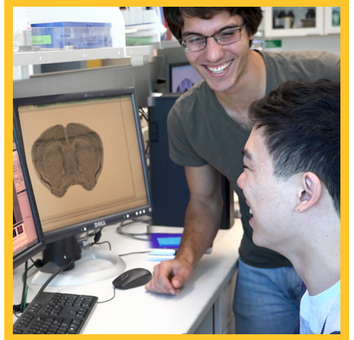
TRAINING NEW LEADERS

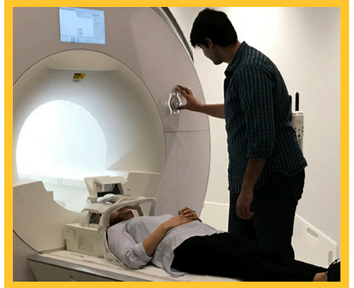
Our one-year M.S. program in Neuroimaging and Informatics prepares scientists for rewarding careers in biomedicine. We also offer a series of workshops, seminars, and online educational tools to train researchers in the latest imaging and informatics technology.

Master of Science in Neuroimaging and Informatics

In 2015, INI launched its premier one-year Master of Science degree in Neuroimaging and Informatics (NIIN). This advanced program of study provides students with a deep understanding of the scientific and clinical underpinnings of neuroimaging, as well as strategies for leveraging that knowledge in working with large biomedical datasets. The 26-unit program comprises didactic lecture courses, an in-depth examination of brain anatomy and function, and an exploration of computational processing approaches.

This year, students will begin receiving hands-on training with INI's onsite MRI scanners. Graduates of the program's first two classes have attended medical school, joined Ph.D. programs, secured industry jobs, and accepted full-time positions at the institute.





"I always tell students that the best science experiments give rise to 10 new questions. Sometimes they take us down a new path that we didn't expect. My job is to train students to be good critical thinkers—I think that's the most important thing about being a scientist."
- Judy Pa, Assistant Professor of Neurology

BDDS
BIG DATA FOR DISCOVERY SCIENCE

NIH
Big Data to Knowledge(BD2K)

This year, BDDS hosted its third annual California Big Data to Knowledge Workshop, uniting researchers from multiple big data biomedicine projects to share progress, findings, and tools. BDDS researchers have also published significant big data findings on Alzheimer's disease, the human plasma proteome, and personal genomic fingerprints.

Big Data to Knowledge: Big Data for Discovery Science Center

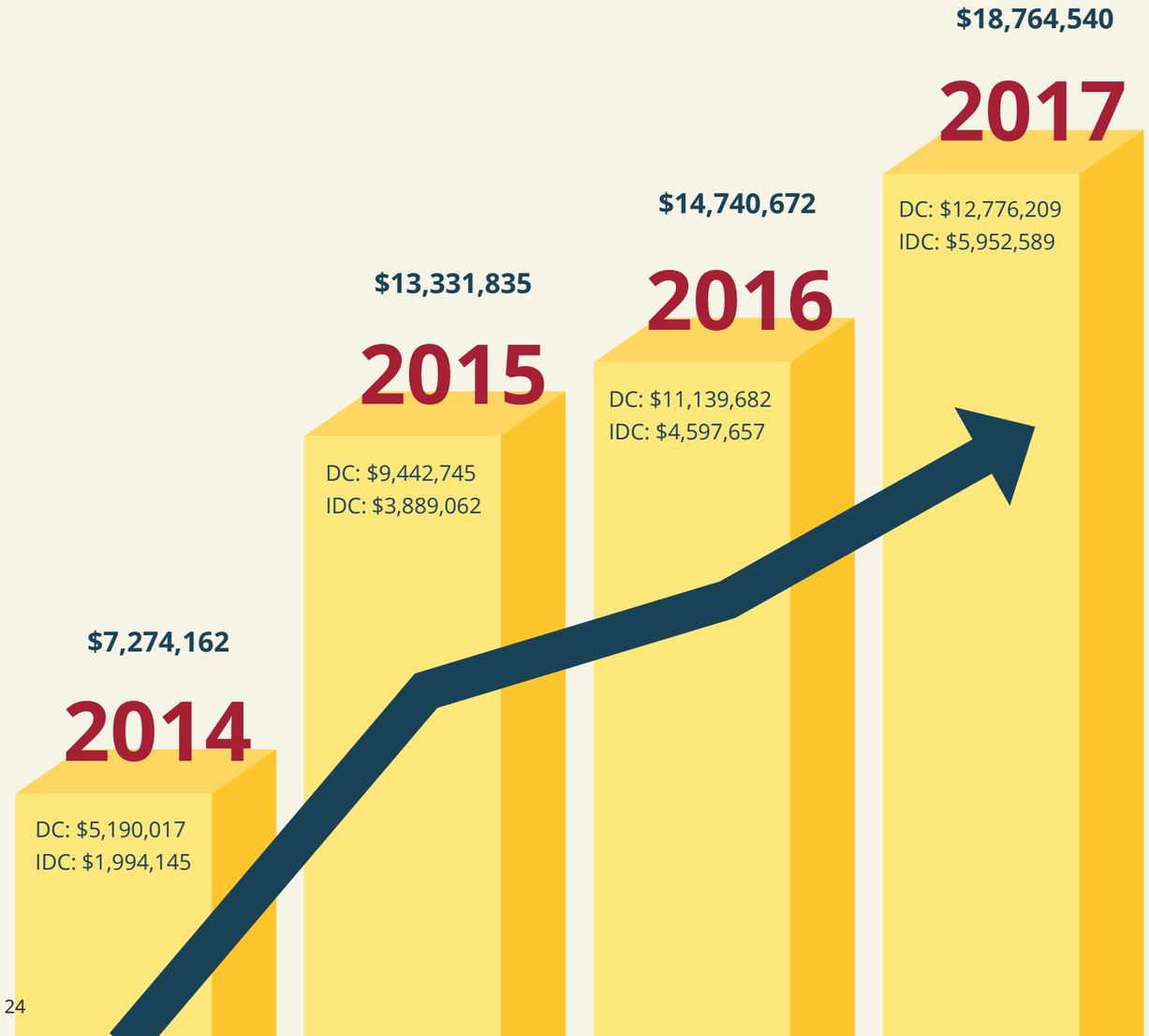
The Big Data for Discovery Science Center (BDDS) is an NIH-support undertaking involving close collaboration between the INI, USC's Information Sciences Institute, the Computation Institute at the University of Chicago, and the Institute for Systems Biology in Seattle, Washington. The initiative seeks to train investigators around the world how to maximize existing datasets, and provides them with the resources to do so. BDDS sponsors seminars and provides researchers with access to its Knowledge Discovery Interface, an intuitive training system comprising lectures, tutorials, and other educational material.

"We're training the next generation of scientists in data science techniques and technologies. They need to be prepared early so that they know how to handle the ever-more data we're going to collect."
- John D. Van Horn, INI Director of Education and Associate Professor of Neurology

INI FINANCIAL SUMMARY

ACTIVE FUNDING OVER TIME

INI's active research funding continues to increase each year.



FY 2017

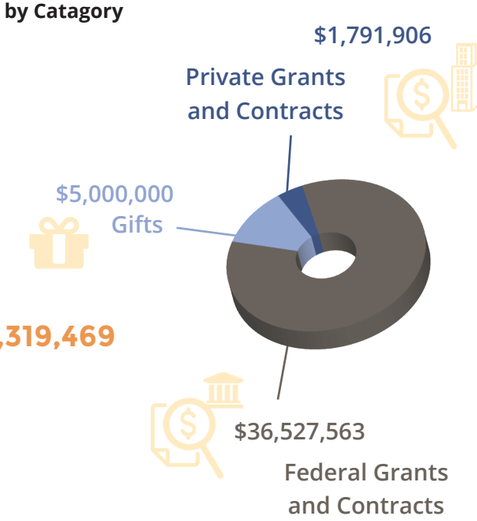
$38,319,469
Grant dollars awarded

DC: $28,044,618
IDC: $10,274,851

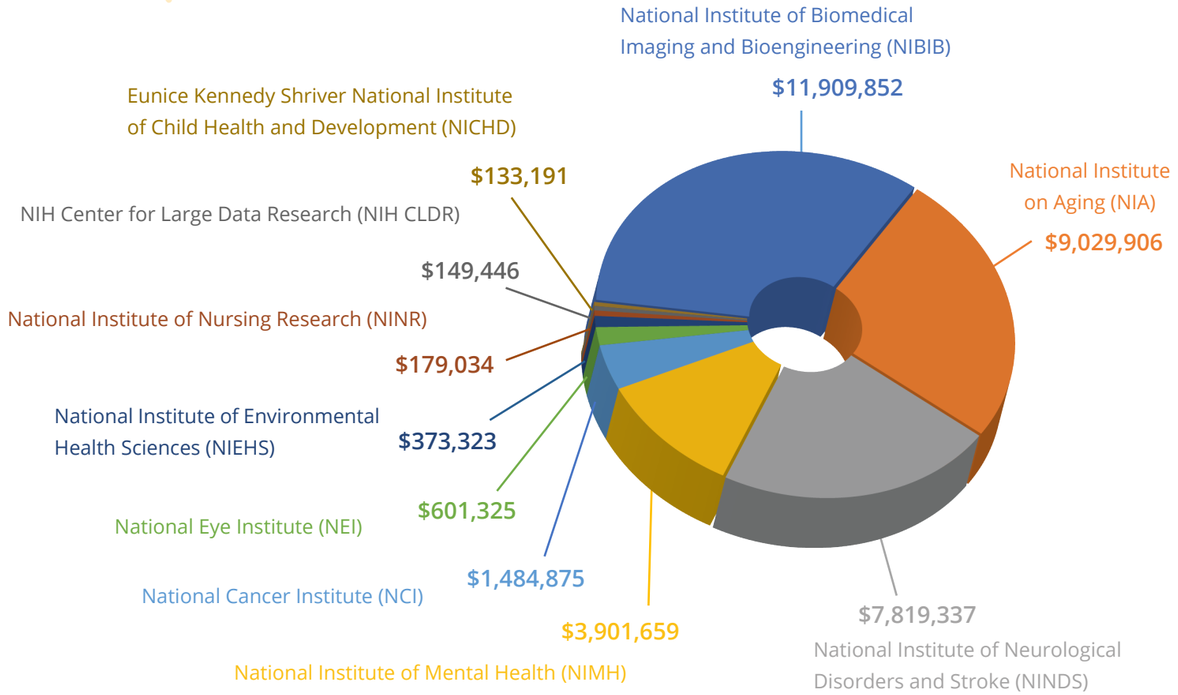
68
AWARDS AND SUPPLEMENTS

Includes newly awarded federal and private grants for multi-phase studies that will remain active for several years

Grants, Contracts, and Gifts by Catagory



Federal Funding Awarded by Agency

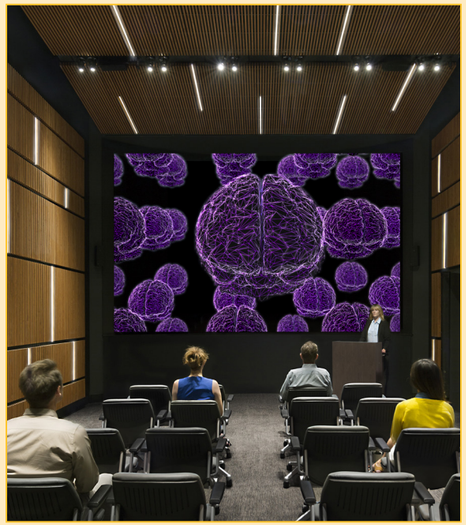


INI INFRASTRUCTURE AND FACILITIES

In November 2016, the INI moved into the specially designed and remodeled Stevens Hall for Neuroimaging on the USC Health Sciences Campus. The building houses a 50-seat interactive Data Immersive Visualization Environment (DIVE), two state-of-the-art MRI scanners, a 3,000 square foot data center, and modern computer workstations and conference spaces.

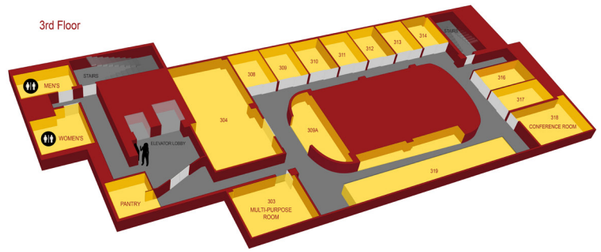
THE DIVE

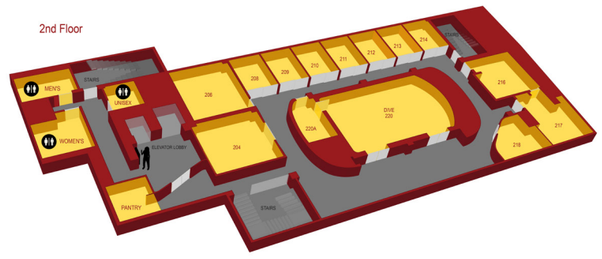
The Data Immersive Visualization Environment is a 50-seat high definition theater featuring a large curved display that can present highly detailed images, video, interactive graphics and other specialized scientific media. The space is designed to facilitate research communication, dissemination, training and high levels of interaction.

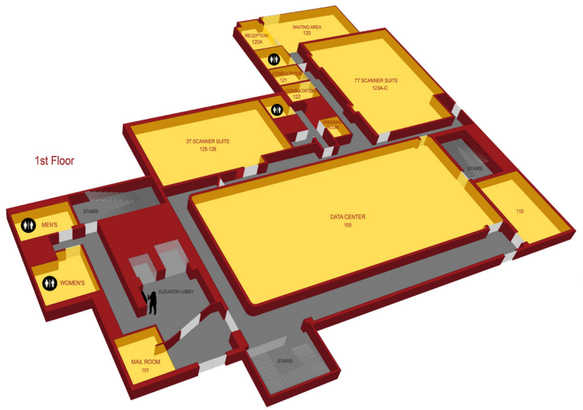


DATA CENTER

On the first floor of Stevens Hall, a custom 48-rack data center powers the institute's Image and Data Archive as well as other massive datasets. Secured by three levels of access and a fault-tolerant network to prevent system failure, the data center can store up to 7.9 petabytes of material.







CENTER FOR IMAGE ACQUISITION

INI's Center for Image Acquisition (CIA) houses two of the world's most powerful MRI scanners: the Siemens Prisma 3T and the Siemens Terra 7T, the first ultra-high field scanner of its kind installed in North America. The CIA is also equipped with dedicated supercomputing systems, cutting-edge analysis techniques, and unrivaled professional expertise.

OUR TEAM

FACULTY

Arthur W. Toga
Director, Mary and Mark Stevens Neuroimaging and Informatics Institute
Director, Laboratory of Neuro Imaging
Provost Professor of Ophthalmology, Neurology, Psychiatry and the Behavioral Sciences, Radiology, and Engineering
Ghada Irani Chair in Neuroscience

Paul Thompson
Associate Director, Mary and Mark Stevens Neuroimaging and Informatics Institute
Director, Imaging Genetics Center
Professor of Ophthalmology, Neurology, Psychiatry and the Behavioral Sciences, Radiology, Pediatrics and Engineering

Meng Law
Professor of Radiology, Neurology, Neurological Surgery and Biomedical Engineering
Director of Neuroradiology, Director of Neuroradiology Fellowship Program
Director of Alzheimer's Disease Neuroimaging Core

Danny JJ Wang
Professor of Neurology
Director of Imaging Technology Innovation

Jack Van Horn
Associate Professor of Neurology
Director of Education

Hongwei Dong
Associate Professor of Neurology
Director, Center for Integrative Connectomics

Tyler Ard
Assistant Professor of Research

Meredith Braskie
Assistant Professor of Research

Kristi Clark
Assistant Professor of Neurology

Dominique Duncan
Assistant Professor of Neurology

Houri Hintiryan
Assistant Professor of Research

Neda Jahanshad
Assistant Professor of Neurology

Kay Jann
Assistant Professor of Research

Hosung Kim
Assistant Professor of Neurology

Sook-Lei Liew
Assistant Professor of Neurology
Assistant Professor of Biokinesiology and Physical Therapy, USC Chan Division of Occupational Science and Occupational Therapy

Scott Neu
Assistant Professor of Research

Judy Pa
Assistant Professor of Neurology

Yonggang Shi
Assistant Professor of Neurology

Lirong Yan
Assistant Professor of Research

ADMINISTRATION

Ryan Ebrahamian
Office/Building Assistant

Michael DePalma
Office/Building Assistant

Grace Liang-Franco
Program Manager

Venkatesh Lokare
Office/Building Assistant

Sandy Lui
Director of Finance

Henrietta Movsessian
Department Contracts & Grants Coordinator

Danielle Quinteros
Budget/Business Analyst

Piyush Patil
Office/Building Assistant

Sandra Phung
Home Department Coordinator

Angeles Sedano
Office/Building Assistant

Catalina Soria
Home Department Coordinator

Natalie Yu
Administrative Assistant

PROGRAMMING

Sumiko Abe
Research Programmer

Shreshta Alladi
Junior Programmer Analyst

Ian Bowman
Research Programmer

Raksha N Bysani
Junior Programmer Analyst

Kaelan Cotter
Programmer Analyst

Sam Hobel
Programmer Analyst

Zachary Jacokes
Programmer Analyst

Kishan Kesavan
Junior Programmer

Akhil Manchikanti
Junior Programmer

Shyam Mohanchandran
Programmer Analyst

Ankit Pandey
Programmer Analyst

Mher Poghosyan
Programmer Analyst

Amir Sayyah
Junior Programmer Analyst

Natalya Shatokhina
Programmer Analyst

Seita Yamashita
Programmer Analyst

SCIENCE VISUALIZATION GROUP

Zara Abrams
Communications Manager

Krish Bhanushali
Web Developer

Ragini Jain
Web Developer

Caroline O'Driscoll
Medical Illustrator and Senior Scientific Graphic Designer

Dawen Tan
Web Developer

Daniel Smith
Junior Web Developer

James Stanis
Medical Animator

The INI is home to a cross-disciplinary group of more than 100 researchers, programmers, graduate students, visualization specialists and support staff, spanning fields such as neuroscience, engineering, and biophysics.

POSTDOCTORAL FELLOWS

Dogu Baran Aydogan
Michael Bienkowski
Ryan Cabeen
Joey Contreras
Fabian Corlier
Emily Dennis
Ben Duffy
Jin Kyu Gahm
Vikash Gupta
Boris Gutman
Mayank Jog
Maz Khansari
Mengting Liu
Fabrizio Pizzagalli
Lauren Salminen
Wei Sun
Yuchun Tang
Junyan Wang
Jiong Zhang
Lu Zhao

UNDERGRADUATE STUDENT RESEARCHERS AND TRAINEES

Lei Cao
Chang Fan
Xuetao Hao
Giselle Kim
Nimisha Narayanan

SYSTEMS ADMINISTRATION

George Bouziden
Systems Administrator

Richard Lesh
Senior Systems Engineer

Randy Lovin
Senior Systems Engineer

VISITING SCHOLARS

Laura Korobkova
Kenia Martinez
Yuchuan Qiao
Yelong Shen
Yuchuan Tang
Feifei Xu
Junhai Xu

PROJECT MANAGERS

Joe Ames
Jeana Kamdar
Agnes McMahon

GRADUATE STUDENT RESEARCHERS

Shobhit Agarwal
Nora Benavidez
Joshua Cheung
Linda Ding
Clio Gonzalez Zacarias
Kirsten Lynch
Samantha Ma
William Matloff
Kaida Ning
Talia Nir
Shruti Priya
Vishnupriya Ravibalan
Brandalyn Riedel
Daniel Rinker
Ashwin Sakhare
Xingfeng Shao
Mona Sharifi Sarabi
Monica Song
Julio Villalon
Kai Wang
Yihao Xia
Alice Yang
Artemis Zavaliangos- Petropul
Muye Zhu
Alyssa Zhu

STAFF RESEARCHERS, TECHNICIANS, AND PROJECT SPECIALISTS

Sana Azam
Marlene Becerra
Avnish Bhattrai
Jyl Boline
Christina Boyle
Marlene Casey
Rita Castelo Branco
Conor Corbin
Karen Crawford
Franklin Feingold
Nicholas Foster
Lin Gou
Lisette Isenberg
David Johnson
Somieh Neda Khanjani
Deydepp Kothapalli
Hei Yeung Lam
Xiaoyu Lei
Darrick Lo
Aryan Madani
Katherin Martin
Teresa Monreal
Sander Nizni
Max Orozco
Christopher Patterson
Dmitrii Petrov
Ashley Ramirez
Faisal Rashid
Arvin Saremi
Farshid Sepehrband
Crystal Stewart
Alexis Takahashi
Sophia Thomopoulous
Carinna Torgerson
Alexandra Udd
Hanna Villa-Reusenmann
Hanpeng Xu
Bin Zhang

INI PUBLICATIONS

1. **Jann K**, Hauf M, Kellner-Weldon F, El-Koussy M, Kiefer C, Federspiel A, Schroth G. Implication of cerebral circulation time in intracranial stenosis measured by digital subtraction angiography on cerebral blood flow estimation measured by arterial spin labeling. *Diagnostic and Interventional Radiology*. 2016 Jul.

2. Jog MA*, **Yan L***, Kilroy E, Krasileva K, **Jann K**, LeClair H, Elashoff D, **Wang DJ**. Developmental trajectories of cerebral blood flow and oxidative metabolism at baseline and during working memory tasks. *Neuroimage*. 2016 Jul. (*co-first authors)

3. Nayyar M, Mayo MC, Shiroishi M, Commins D, Liu CY, Go JL, Kim PE, Zee CS, **Law M**, Lerner A. Atypical central neurocytoma with metastatic craniospinal dissemination: A Case Report. *Clin Imaging*. 2016 Jul.

4. Dolui S, Wang Z, **Wang DJ**, Mattay R, Finkel M, Elliott M, Desidario L, Inglis B, Mueller B, Stafford R, Launer L, Jacobs D, Bryan RN, Detre JA. Comparison of Noninvasive MRI Measurements of Cerebral Blood Flow in a Large Multisite Cohort. *J Cereb Blood Flow Metab*. 2016 Jul.

5. Chen G, Lei D, Ren J, Zuo P, Suo X, **Wang DJ**, Wang M, Zhou D, Gong Q. Patterns of posticcal cerebral perfusion in idiopathic generalized epilepsy: a multi-delay multi-parametric arterial spin labelling perfusion MRI study. *Scientific Reports*. 2016 Jul.

6. Miller C, **Sepehrband F**, Williams C, Talishinsky A, Mehta S, **Bienkowski M**, **Gonzalez-Zacarias C**, Barnes S, Jacobs R, **Toga A**, **Dong HW**, **Clark K**. ZOom^ 3: A three-dimensional super-resolution technique to map brain connectivity from millimeters to molecules. *Journal of Neuropathology and Experimental Neurology*. 2016 Jul.

7. Ho ML, Patoon AC, DeLone DR, **Kim H**, Gilbertson JR, Felmlee J, Watson RE. Brain Injury in the Preterm and Term Neonate. *Current Radiology Reports*. 2016 Jul.

8. Ringman JM, Cacerses N, **Clark KA**, Chui HC. Dopamine Responsive Features in Alzheimer's Disease, Alzheimer's Disease with Lewy Bodies (LB), and Pure LB Disease. *Alzheimer's & Dementia*. 2016 Jul.

9. Lorenzi M, **Gutman BA**, Altmann A, Hibar DP, **Jahanshad N**, Alexander DC, **Thompson PM**, Ourselin S. Linking gene pathways and brain atrophy in Alzheimer's disease. *Alzheimer's & Dementia*. 2016 Jul.

10. **Neu SC**, **Crawford K**, **Bhatt P**, **Ashish N**, **Toga AW**. Information Searching in the Global Alzheimer's Association Interactive Network. *Alzheimer's & Dementia*. 2016 Jul.

11. **Neu SC**, **Hobel Z**, **Pa J**, **Toga AW**. Effects of the APOE Gene on Cognitive Status and Hippocampus Atrophy Using Data from the Global Alzheimer's Association Interactive Network. *Alzheimer's & Dementia*. 2016 Jul.

12. **Jann K**, Smith R, Piedra EAR, Dapretto M, **Wang DJ**. Noise reduction in Arterial Spin Labeling based Functional Connectivity using nuisance variables. *Frontiers in Neuroscience*. 2016 Aug.

13. **Hintiryan H**, **Foster NN**, **Bowman I**, **Bay M**, **Song MY**, **Gou L**, **Yamashita S**, **Bienkowski MS**, Zingg B, **Zhu M**, Yang XW, Shih JC, **Toga AW**, **Dong HW**. The mouse cortico-striatal projectome. *Nature Neuroscience.* 2016 Aug.

14. Dinov ID, Heavner B, Tang M, Glusman G, Chard K, Darcy M, Madduri R, Pa J, Spino C, Kesselman C, Foster I, Deutsch EW, Price ND, **Van Horn JD**, Ames J, **Clark K**, Hood L, Hampstead BM, Dauer W, and **Toga, AW.** Predictive Big Data Analytics: A Study of Parkinson's Disease using Large, Complex, Heterogeneous, Incongruent, Multi-source and Incomplete Observations. *PLoS ONE*. 2016 Aug.

15. Davenport EM, Urban JE, Mokhtari F, Lowther EL, **Van Horn JD**, Vaughan CG, Gioia GA, Whitlow CT, Stitzel JD, Maldjian JA. Subconcussive Impacts and Imaging Findings Over a Season of Contact Sports. *Concussion*. 2016 Aug.

16. Yang X, Shi L, Daianu M, Tong H, Liu Q, **Thompson PM**. Blockwise Human Brain Network Visual Comparison Using NodeTrix Representation. *IEEE Transactions on Visualization and Computer Graphics*. 2016 Aug.

17. **Liew S-L**, Rana M, Cornelsen S, Furtunato de Barros Filho M, Birbaumer N, Sitaram R, Cohen L, Soekadar S. Improving motor cortico-thalamic communication after stroke using real-time fMRI connectivity-based neurofeedback. *Neurorehabilitation and Neural Repair*. 2016 Aug.

18. Mormino EC, Sperling RA, Holmes AJ, Buckner RL, De Jager PL, Smoller JW, Sabuncu MR; **Alzheimer's Disease Neuroimaging Initiative**. Polygenic risk of Alzheimer disease is associated with early- and late-life processes. *Neurology*. 2016 Aug.

19. Leng Y, **Shi Y**, Yu Q, **Van Horn JD**, Tang H, Li J, Xu W, Ge X, **Tang Y**, Han Y, Zhang D, Xiao M, Zhang H, Pang Z, **Toga AW**, Liu S. Phenotypic and Genetic Correlations Between the Lobar Segments of the Inferior Fronto-occipital Fasciculus and Attention. *Scientific Reports*. 2016 Sep.

20. Zhu Y, Guo Y, Lingala SG, Lebel RM, **Law M**, Nayak KS. GOCART: GOlden-angle CArtesian randomized time-resolved 3D MRI. *Magn Reson Imaging*. 2016 Sep.

21. Gao B, Lerner A, **Law M**. The Clinical Outcome of Posterior Reversible Encephalopathy Syndrome. *American Journal of Neuroradiology*. 2016 Sep.

22. Sabuncu MR, Ge T, Holmes AJ, Smoller JW, Buckner RL, Fischl B; **Alzheimer's Disease Neuroimaging Initiative**. Morphometricity as a measure of the neuroanatomical signature of a trait. *Proc Natl Acad Sci U S A*. 2016 Sep.

23. **Kim H**, Lepage C, Maheshwary R, Hess C, Evans AC, Barkovich AJ, Xu D. NEOCIVET: Towards an accurate morphometry of neonatal gyrification using an adapted CIVET pipeline. *Neuroimage*. 2016 Sep.

24. Hassanpour MS*, **Yan L***, **Wang DJ**, Lapidus RC, Arevian AC, Simmons WK, Feusner JD, Khalsa SS. How the heart speaks to the brain: neural activity during cardiorespiratory interoceptive stimulation. *Philosophical Transactions of the Royal Society B*. 2016 Oct. (*co-first authors)

25. Jog MV, Smith RX, **Jann K**, Dunn W, Lafon B, Truong D, Wu A, Parra L, Bikson M, **Wang DJ**. In-vivo Mapping of Magnetic Fields Induced by Transcranial Direct Current Stimulation (tDCS) in Human Brain using MRI *Scientific Reports*. 2016 Oct.

26. Caldairou B, Bernhardt BC, Kulaga-Yoskovitz J, **Kim H**, Bernasconi N, Bernasconi A. A Surface Patch-Based Segmentation Method for Hippocampal Subfields. *Med. Image. Comp. Comp. Assist. Interv*. 2016 Oct.

27. Paredes MF, James D, Gil-Perotin S, **Kim H**, Cotter JA, Nguyen C, Rowitch DH, Xu D, Garcia-Verdugo J-M, Huang EJ, Alvarez-Buylla A. Extensive Migration of Young Neurons into the Infant Human Frontal Lobe. *Science*. 2016 Oct.

28. Li J, **Shi Y**, **Toga AW**. Transformation Invariant Control of Voxel-Wise False Discovery Rate. *IEEE Tran. Med. Imag.* 2016 Oct.

29. **Aydogan D, Shi Y.** Probabilistic tractography for topographically organized connectomes. *Proc. MICCAI 2016.* 2016 Oct.

30. **Gahm JK, Shi Y.** Riemannian metric optimization for connectivity-driven surface mapping. *Proc. MICCAI 2016.* 2016 Oct.

31. Wang B, Prastawa M, Irimia A, Saha A, Liu W, Goh SYM, Vespa PM, **Van Horn JD**, and Gerig G. Modeling 4D Pathological Changes by Leveraging Normative Models. *Computer Vision and Image Understanding*. 2016 Oct.

32. Colom R, Hua X, Martínez K, Burgaleta M, Román FJ, Gunter JL, Carmona S, Jaeggi SM, **Thompson PM**. Brain structural changes following adaptive cognitive training assessed by Tensor-Based Morphometry (TBM). *Neuropsychologia*. 2016 Oct.

33. Fu K, Nathan R, Dinov I, Li J, **Toga AW**. T2-Imaging Changes in the Nigrosome-1 Relate to Clinical Measures of Parkinson's Disease. *Frontiers in Neurology*. 2016 Oct.

34. HH Adams et al. incl. **Jahanshad N, Thompson PM**. Novel genetic loci underlying human intracranial volume identified through genome-wide association. *Nature Neuroscience*. 2016 Oct.

35. **Kim H**, Kim J-H, Winer J, Possin KL, Geschwind MD, Xu D, Hess CP. Surface-based Morphometry Reveals Caudate Subnuclear Structural Damage in patients with premotor Huntington Disease. *Brain Imaging and Behavior*. 2016 Oct

36. Ito K, **Liew S-L**. Calculating the laterality index using FSL for stroke neuroimaging data. *GigaScience*. 2016 Oct.

37. Kan E, Anglin J, Borich M, **Jahanshad N**, **Thompson PM**, **Liew S-L**. Facilitating big data meta-analyses for clinical neuroimaging through ENIGMA wrapper scripts. *GigaScience*. 2016 Oct.

38. Zhang X, Mormino EC, Sun N, Sperling RA, Sabuncu MR, Yeo BT; **Alzheimer's Disease Neuroimaging Initiative**. Bayesian model reveals latent atrophy factors with dissociable cognitive trajectories in Alzheimer's disease. *Proc Natl Acad Sci U S A*. 2016 Oct.

39. T Guadalupe et al. incl. **Whelan CD, Kelly S, Jahanshad N, Thompson PM**. Human subcortical brain asymmetries in 15,847 people worldwide reveal effects of age and sex. *Brain Imaging Behav.* 2016 Oct.

40. Liu C, Russin J, Keck C, Kawata K, ADiga R, Yen W, Lanbert J, Stear B, **Law M**, Marquez Y, Crino P, Millett D, Langford D. Dysregulation of PINCH signaling in mesial temporal epilepsy. *Journal of Clinical Neuroscience*. 2016 Nov.

41. Soosman SK, Joseph-Mathurin N, **Braskie MN**, Bordelon YM, Wharton D, Casado M, Coppola G, McCallum H, Nuwer M, Coutin-Churchman P, Apostolova LG, Benzinger T, Ringman JM. Widespread White Matter and Conduction Abnormalities in *PSEN1*-Related Spastic Paraparesis. *Neurobiology of Aging*. 2016 Nov.

42. Li J, **Gahm JK**, **Shi Y**, **Toga AW**. Topological false discovery rates for brain mapping based on signal height. *NeuroImage*. 2016 Nov.

43. Joshi SH, Vizueta N, Foland-Ross L, Townsend JD, Bookheimer SY, **Thompson PM**, Narr KL, Altshuler LL. Relationships Between Altered fMRI Activation and Cortical Thickness in Euthymic Bipolar I Disorder *Biological Psychiatry*. 2016 Nov.

44. Kochunov P, Rowland LM, Fieremans E, Veraart J, **Jahanshad N**, Eskandar G, Du X, Muellerklein F, Savransky A, Shukla D, Sampath H, **Thompson PM**, Hong LE. Diffusion weighted imaging uncovers likely sources of processing speed deficits in schizophrenia, *Proc Natl Acad Sci U S A*. 2016 Nov.

45. Jin Y, Huang C, Daianu M, **Zhan L**, **Dennis EL**, Reid RI, Jack CR Jr, Zhu H, **Thompson PM**; Alzheimer's Disease Neuroimaging Initiative. 3D tract-specific local and global analysis of white matter integrity in Alzheimer's disease. *Hum Brain Mapp*. 2016 Nov.

46. Joshi RB, Gaspard N, Goncharova I, Duckrow RB, **Duncan D**, Gerrard JL, Spencer DD, Hirsch LJ, Zaveri HP. Regional and Network Relationship in the Intracranial EEG Second Spectrum. *Clinical Neurophysiology*. 2016 Nov.

47. Schmitz TW, Nathan Spreng R; **Alzheimer's Disease Neuroimaging Initiative**. Basal forebrain degeneration precedes and predicts the cortical spread of Alzheimer's pathology. *Nat Commun*. 2016 Nov.

48. Lao Y, Nguyen B, Tsao S, Gajawelli N, **Law M**, Chui H, Weiner M, Wang Y, Leporé N. A T1 and DTU fused 3D Corpus Callosum Analysis in MCHI subjects with high and low cardiovascular risk profile. *Neuroimage Clin*. 2016 Dec.

49. Scott JA, **Braskie MN**, Tosun D, Maillard P, **Thompson PM**, Weiner MW, DeCarli C, Carmichael OT. Cerebral Amyloid Is Associated with Greater White-Matter Hyperintensity Accrual in Cognitively Normal Elderly. *Neurobiology of Aging*. 2016 Dec.

50. Wang Y, Shao X, Martin T, Moeller S, Yacoub E, **Wang DJ**. Phase-cycled simultaneous multi-slice balanced SSFP imaging with CAIPIRINHA for efficient banding reduction. *Magn. Reson. Med*. 2016 Dec.

51. Lou X, Yu S, Scalzo F, Starkman S, Ali LK, Kim D, Rao NM, Hinman JD, Vespa PM, Jahan R, Tateshima S, Gonzalez NR, Duckwiler GR, Saver JL, Yoo B, Salamon N, Lyu J, Ma L, **Wang DJ**, Liebeskind DS. Multi-Delay ASL can identify leptomeningeal collateral perfusion in endovascular therapy of ischemic stroke. *Ontotarget*. 2016 Dec.

52. Condro MC, Matynia A, **Foster NN**, Ago Y, Rajbhandari AK, Van C, Jayaram B, Parikh S, Diep AL, Nguyen E, May V, **Dong HW**, Waschek JA. High-resolution characterization of a PACAP-EGFP transgenic mouse model for mapping PACAP-expressing neurons. *J Comp Neurol*. 2016 Dec.

53. Roshchupkin G, **Gutman BA**, Vernooij MW, **Jahanshad N**, van Duijn CM, Hofman A, Uitterlinden AG, Wright MJ, Niessen WJ, **Thompson PM**, Ikram MA, Adams HH. Heritability of subcortical brain structures in the general population: volumes, shapes, and beyond. *Nature Communications*. 2016 Dec.

54. Chard K, D'Arcy M, Heavner B, Foster I, Kesselman C, Madduri R, Rodriguez A, Soiland-Reyes S, Goble C, **Clark KA**, Deutsch EW, Dinov I, Price N, **Toga AW**. I'll Take That to Go: Big Data Bags and Minimal Identifiers for Exchange of Large, Complex Datasets. *Proceedings of the 2016 IEEE International Conference on Big Data*, Washington, DC. 2016 Dec.

55. Kashdan E, **Duncan D**, Parnell A, Schattler H. Mathematical methods in systems biology. *Mathematical Biosciences and Engineering*. 2016 Dec.

56. **Duncan D** and Strohmer T. Classification of Alzheimer's Disease using Unsupervised Diffusion Component Analysis. *Mathematical Biosciences and Engineering*. 2016 Dec.

57. Lee PH, Baker JT, Holmes AJ, **Jahanshad N**, Ge T, Jung JY, Cruz Y, Manoach DS, Hibar DP, Faskowitz J, McMahon KL, de Zubicaray GI, Martin NH, Wright MJ, Öngür D, Buckner R, Roffman J, **Thompson PM**, Smoller JW. *Molecular Psychiatry*. 2016 Dec.

58. Kochunov P, Ganjgahi H, Winkler A, Kelly S, Shukla DK, Du X, **Jahanshad N**, Rowland L, Sampath H, Patel B, O'Donnell P, Xie Z, Paciga SA, Schubert CR, Chen J, Zhang G, **Thompson PM**, Nichols TE, Hong LE. Heterochronicity of white matter development and aging explains regional patient control differences in schizophrenia. *Human Brain Mapping*. 2016 Dec.

59. Wendelken LA, **Jahanshad N**, Rosen HJ, Busovaca E, Allen I, Coppola G, Adams C, Rankin KP, Milanini B, Clifford K, Wojta K, **Nir TM**, **Gutman BA**, **Thompson PM**, Valcour V. ApoE ε4 Is Associated With Cognition, Brain Integrity, and Atrophy in HIV Over Age 60. *J Acquir Immune Defic Syndr.* 2016 Dec.

60. **Kim H**, Suh S, Joo EY, Hong SB. Morphological alterations in amygdalo-hippocampal substructures in narcolepsy patients with cataplexy. *Brain Imaging and Behavior*. 2016 Dec.

61. **Hafzalla G**, Prasad G, **Baboyan VG**, **Faskowitz J**, **Jahanshad N**, McMahon KL, de Zubicaray GI, Wright MJ, **Braskie MN**, & **Thompson PM**. 2016 The heritability of the functional connectome is robust to common nonlinear registration methods. International Society for Optics and Photonics Medical Imaging 2016, San Diego, CA.

62. Acharya J, Rajamohan A, Skalski MR, **Law M**, Kim P, Gibbs W. CT Angiography of the Head in Extracorporeal Membrane Oxygenation. *American Journal of Neuroradi*ology. 2017 Jan.

63. Yu S, Ma S, Liebeskind D, Yu D, Li N, Qiao X, Shao X, **Yan L**, Yoo B, Scalzo F, Hinman J, Ali L, Rao N, Jahan R, Tateshima S, Duckwiler G, Saver J, Salamon N, **Wang DJ**. ASPECTS-Based Reperfusion Status on Arterial Spin Labeling Can Predict Clinical Outcome in Acute Ischemic Stroke Patients. *J Cereb Blood Flow Metab*. 2017 Jan.

64. Nashiro K*, Guevara-Aguirre J*, **Braskie, MN***, **Hafzalla GW**, Velasco R, Balasubramian P, **Thompson PM**, Mather M, Nelson MD, Guevara A, Teran E, Longo V. Brain structure and function associated with younger adults in growth hormone receptor deficient humans. *J Neuroscience*. 2017 Jan. (*co-first authors)

65. Scott JA, Tosun D, **Braskie MN**, Maillard P, **Thompson PM**, Weiner M, DeCarli C, Carmichael OT, ADNI. Independent value added by diffusion MRI for prediction of cognitive function in older adults. *Neuroimage Clinical*. 2017 Jan.

66. Yassine H, **Braskie MN**, Mack WJ, Castor K, Fonteh A, Schneider L, Harrington M, Chui H. Association of Docosahexaenoic Acid Supplementation with Alzheimer Disease Stage in Apolipoprotein E ε4 carriers. *JAMA Neurology*. 2017 Jan.

67. Chen Z, Xue R, Zhang P, Sun K, Zuo Z, Zhuo Y, He S, **Wang DJ.** Multi-Phase Passband Balanced SSFP fMRI with 50ms Sampling at 7 Tesla Enables High Precision in Resolving Temporal Events. *Magn Reson Imaging*. 2017 Jan.

68. Li R, Xiao HF, Lyu JH, **Wang DJ,** Ma L, Lou X. Differential diagnosis of mitochondrial encephalopathy with lactic acidosis and stroke-like episodes (MELAS) and ischemic stroke using 3D pseudocontinuous arterial spin labeling. *J Magn Reson Imaging*. 2017 Jan.

69. Wijtenburg S, Wright S, Korenic S, Gaston F, Ndubuizu N, Chiappelli J, McMahon R, Chen H, Savransky A, Du M, **Wang DJ**, Kochunov P, Hong L, Rowland L. Altered Glutamate and Regional Cerebral Blood Flow Levels in Schizophrenia: A 1H-MRS and pCASL study *Neuropsychopharmacology*. 2017 Jan.

70. **Jahanshad N**, **Thompson PM**. Multimodal neuroimaging of male and female brain structure in health and disease across the life span. *J Neurosci Res*. 2017 Jan.

71. **Van Horn JD**, **Bhattrai A**, Irimia A. Multimodal imaging of neurometabolic pathology due to traumatic brain injury. *Trends in Neurosciences*. 2017 Jan.

72. Hull J, **Jacokes Z**, **Torgerson CM**, **Van Horn JD**, and the GENDAAR Research Consortium. Resting-state functional connectivity in Autism Spectrum Disorder (ASD). *Frontiers in Child and Adolescent Psychiatry*. 2017 Jan.

73. Watson C, Busovaca E, Foley JM, Allen IE, Schwarz CG, **Jahanshad N**, **Nir TM**, Esmaeili-Firidouni P, Milanini B, Rosen H, Carmichael OT, **Thompson PM**, Valcour VG. White Matter Hyperintensities Correlate to Cognition and Fiber Tract Integrity in Older Adults with HIV. *Journal of Neurovirology*. 2017 Jan.

74. **Zhu D**, Li Q, **Riedel BC**, **Jahanshad N**, Hibar DP, Veer IM, Walter H, Schmaal L, Veltman DJ, Grotegerd D, Dannlowski U, Sacchet MD, Gotlib IHH, Ye J, **Thompson PM**. Large-scale classification of major depressive disorder via distributed Lasso. *SPIE 12th International Symposium on Medical Information Processing and Analysis (SIPAIM)*. 2017 Jan.

75. Lorenzi M, **Gutman BA**, **Thompson PM**, Alexander DC, Ourselin S, Altmann A. Secure multivariate large-scale multi-centric analysis through on-line learning: An imaging genetics case study, *SPIE 12th International Symposium on Medical Information Processing and Analysis (SIPAIM)*. 2017 Jan.

76. **Isaev DY**, **Gutman BA**, **Moyer D**, **Faskowitz J**, and **Thompson PM**. Cortical Connectome Registration Using Spherical Demons. *SPIE 12th International Symposium on Medical Information Processing and Analysis (SIPAIM)*. 2017 Jan.

77. **Pizzagalli F**, Auzias G, Kochunov P, **Faskowitz J**, **Thompson PM**, **Jahanshad N**. The Core Genetic Network Underlying Sulcal Morphometry. *SPIE 12th International Symposium on Medical Information Processing and Analysis (SIPAIM)*. 2017 Jan.

78. Harrison MB, **Riedel BC**, Prasad G, **Faskowitz J**, **Thompson PM**. Using brain measures for large-scale classification of autism applying EPIC. *SPIE 12th International Symposium on Medical Information Processing and Analysis (SIPAIM)*. 2017 Jan.

79. **Gupta V**, Prasad G, **Thompson PM**. Clustering white matter fibers using support vector machines: A volumetric conformal mapping approach. *SPIE 12th International Symposium on Medical Information Processing and Analysis (SIPAIM)*. 2017 Jan.

80. **Isaev DY**, **Nir TM**, **Jahanshad N**, **Villalon-Reina JE**, Zhan L, Leow AD, **Thompson PM**. Improved Clinical Diffusion MRI Reliability using a Tensor Distribution Function compared to a Single Tensor. *SPIE 12th International Symposium on Medical Information Processing and Analysis (SIPAIM)*. 2017 Jan.

81. **Zavaliangos-Petropulu A**, **Dennis EL**, Steeg GV, Babikian T, Mink R, Babbitt C, Johnson J, Giza CC, Asarnow RF, **Thompson PM**. Variable Clustering Reveals Associations between Subcortical Brain Volume and Cognitive Changes in Pediatric Traumatic Brain Injury. *SPIE 12th International Symposium on Medical Information Processing and Analysis (SIPAIM)*. 2017 Jan.

82. **Dennis EL**, Alger JR, Babikian T, **Rashid F**, **Villalon-Reina JE**, Mink R, Babbitt C, Johnson J, Giza CC, Asarnow RF, **Thompson PM**. Tract-Based Spectroscopy to Investigate Pediatric Brain Trauma. *SPIE 12th International Symposium on Medical Information Processing and Analysis (SIPAIM)*. 2017 Jan.

83. Celis JS, Velasco NF, **Villalon-Reina JE**, **Thompson PM**, Romero E. Bayesian super-resolution in brain diffusion weighted magnetic resonance imaging (DW-MRI). *SPIE 12th International Symposium on Medical Information Processing and Analysis (SIPAIM)*. 2017 Jan.

84. Thylur DS, Jacobs RE, Go JL, **Toga AW**, Niparko JK. Ultra-High-Field Magnetic Resonance Imaging of the Human Inner Ear at 11.7 Tesla. *Otology & Neurotology*. 2017 Jan.

85. D Hibar et al. incl. **Jahanshad N**, **Ching CR**, **Gutman BA**, **Toga AW, Thompson PM**. Novel genetic loci associated with hippocampal volume. *Nature Neuroscience*. 2017 Jan.

86. Acheson A, Wijtenburg SA, Rowland LM, Winkler A, Mathias CW, Hong LE, **Jahanshad N**, Patel B, **Thompson PM**, McGuire SA, Sherman PM, Kochunov P, Dougherty DM. Reproducibility of tract-based white matter microstructural measures using the ENIGMA-DTI protocol. *Brain Behav*. 2017 Jan.

87. **PM Thompson** et al. incl. **Jahanshad N, Gutman BA, Stein JL**. ENIGMA and the individual: predicting factors that affect the brain in 35 countries worldwide. *Neuroimage*. 2017 Jan.

88. PS Boedhoe et al. incl. **Jahanshad N, Thompson PM**. Distinct Subcortical Volume Alterations in Pediatric and Adult OCD: A Worldwide Meta- and Mega-Analysis. *Am J Psychiatry*. 2017 Jan.

89. Lou X, Ma X, Liebeskind DS, Ma N, Tian C, Lyu J, Long X, Ma L, **Wang DJ**. Collateral perfusion using arterial spin labeling in symptomatic versus asymptomatic middle cerebral artery stenosis. *J Cereb Blood Flow Metab*. 2017 Jan.

90. Zhou Z, Han F, **Yan L**, **Wang DJ**, Hu P. Golden-Ratio Rotated Stack-of-Stars Acquisition for Improved Volumetric MRI. *Magn Reson Med*. 2017 Feb.

91. Wang J, **Braskie MN**, **Hafzalla G**, **Faskowitz J**, McMahon K, de Zubicaray G, Wright M, Yu C, **Thompson PM**. Relationship of a common OXTR gene variant to brain structure and default mode network function in healthy humans. *Neuroimage*. 2017 Feb.

92. Lin W, Liu J, Lou X, Zheng D, Wu B, **Wang DJ**, Ma L. A longitudinal study of cerebral blood flow under hypoxia at high altitude using 3D pseudo-continuous arterial spin labeling. *Scientific Report*. 2017 Feb.

93. Kochunov P, Wey HY, Fox PT, Lancaster JL, Davis MD, **Wang DJ**, Lin AL, Bastarrachea RA, Andrade MC, Frost P, Higgins PB, Mattern V, Comuzzie AG, Voruganti VS. Changes in cerebral blood flow during an alteration in glycemic state in a large non-human primate (Papio hamadryas Sp.). *Front. Neurosci. - Brain Imaging Methods*. 2017 Feb.

94. Cui J, Olga T, Desikan R, Flynn T, **Kim H**, Gano D, Hess CP, Ferriero DM, Barkovich AJ, Xu D. Microstructure of the default mode network in the preterm infants. *AJNR*. 2017 Feb.

95. Chen C, **Van Horn, JD**, and the GENDAAR Research Consortium. Developmental Neurogenetics and Multimodal Neuroimaging of Sex Differences in Autism. *Brain Imaging and Behavior*. 2017 Feb.

96. Gupta A, Mayer EA, Acosta JR, Hamadani K, **Torgerson C**, **Van Horn JD**, Chang L, Naliboff B, Tillisch K, Labus JS. Early adverse life events are associated with altered brain network architecture in a sex- dependent manner. *Neurobiology of Stress*. 2017 Feb.

97. M Hoogman et al. incl. **Hibar DP, Jahanshad N, Thompson PM**. Subcortical brain volume differences in participants with attention deficit hyperactivity disorder in children and adults: a cross-sectional mega-analysis. *Lancet Psychiatry*. 2017 Feb.

98. Karolis V, Froudist-Walsh S, Kroll J, Brittain P, Tseng C-E, Nam K-W, Reinders S, Murray R, Williams S, **Thompson PM**, Nosarti C. Volumetric grey matter alterations in adults who were born very preterm suggest accelerated age-dependent maturational processes. *Neuroimage*. 2017 Feb.

99. Hoque KE, Myers CJ, **Law M**, Kim P. MRI Brain Findings of Intravenous Iron Therapy. *Neurographics*. 2017 Feb.

100. Gibbs WN, Skalski MR, Kim PE, Go JL, **Law M**. C1-2 Puncture: A Safe, Efficacious, and Potentially Underused Technique. *Neurographics*. 2017 Feb.

101. Lefebvre S, **Liew S-L**. Anatomical parameters of tDCS to modulate the motor system after stroke: A review. *Frontiers in Neurology*. 2017 Feb.

102. Sainburg R, **Liew S-L**, Frey S, Clark F. Promoting translational research between movement science, occupational science, and occupational therapy. *Journal of Motor Behavior*. 2017 Feb.

103. Sugiyama T, **Liew S-L**. The effects of sensory manipulations on motor behavior: From basic science to clinical rehabilitation. *Journal of Motor Behavior*. 2017 Feb.

104. Grothe MJ, Villeneuve S, Dyrba M, Bartrés-Faz D, Wirth M; **Alzheimer's Disease Neuroimaging Initiative**. Multimodal characterization of older APOE2 carriers reveals selective reduction of amyloid load. *Neurology*. 2017 Feb.

105. **Shao X**, Wang Y, Moeller S, **Wang DJ**. A constrained slice-dependent background suppression scheme for simultaneous multi-slice pseudo-continuous arterial spin labeling *Magn Reson Med*. 2017 Feb.

106. **Sepehrband F,** O'Brien K, Barth M. A Time-Efficient Acquisition Protocol for Multi-Purpose DiffusionWeighted Microstructural Imaging At 7T. *Mag. Reson. Med*. 2017 Feb.

107. Sun K, Zhang P, Zuo Z, Chen Z, Wang B, Martin T, Wang Y, Chen L, He S, **Wang DJ** Integrated SSFP for functional brain mapping at 7T with reduced susceptibility artifact *J Magn Reson*. 2017 Mar.

108. Martin R, Wright M, Lutkenhoff E, **Van Horn, JD**, Tubi M, Alger JR, McArthur DA, Vespa PM. Traumatic Hemorrhagic Brain Injury: Impact of Location and Resorption on Cognitive Outcome. *Journal of Neurosurgery*. 2017 Mar.

109. Gupta A, Mayer EA, Hamadani K, Bhatt R, Fling C, Alaverdyan M, **Torgerson C**, Ashe-McNalley C, **Van Horn JD**, Naliboff B, Tillisch K, Sanmiguel CP, and Labus JS. Sex differences in the influence of body mass index on anatomical architecture of brain networks. *International Journal of Obesity (Lond).* 2017 Mar.

110. Sulaimany S, Khansari M, Zarrineh P, Daianu M, **Jahanshad N**, **Thompson PM**, Masoudi-Nejad A. Predicting Brain Network Changes in Alzheimer's Disease with Link Prediction Algorithms. *Molecular Biosystems*. 2017 Mar.

111. **Duncan D**, Newman B, Saslow A, Wanserski E, **Ard T**, **Essex R**, **Toga**

A, VRAIN: Virtual reality assisted intervention for neuroimaging, In Virtual Reality (VR). *IEEE 2017*. 2017 Mar.

112. **Ard T**, Krum DM, Phan T, **Duncan D**, **Essex R**, Bolas M, **Toga A**. NIVR: Neuro imaging in virtual reality, In Virtual Reality (VR). *IEEE 2017*. 2017 Mar.

113. T Frodl et al. incl. **Hibar DP, Jahanshad N, Thompson PM**. Childhood adversity impacts on brain subcortical structures relevant to depression. *J Psychiatry Res*. 2017 Mar.

114. **Nir TM**, **Jahanshad N**, **Villalon-Reina JE**, **Isaev D**, **Zavaliangos-Petropulu A**, Zhan L, Leow AD, Jack CR Jr, Weiner MW, **Thompson PM**; Alzheimer's Disease Neuroimaging Initiative (ADNI). Fractional anisotropy derived from the diffusion tensor distribution function boosts power to detect Alzheimer's disease deficits. *Magn Reson Med*. 2017 Mar.

115. Russo MJ, Campos J, Vázquez S, Sevlever G, Allegri RF; **Alzheimer's Disease Neuroimaging Initiative**. Adding Recognition Discriminability Index to the Delayed Recall Is Useful to Predict Conversion from Mild Cognitive Impairment to Alzheimer's Disease in the Alzheimer's Disease Neuroimaging Initiative. *Front Aging Neurosci*. 2017 Mar.

116. Munilla J, Ortiz A, Górriz JM, Ramírez J; **Alzheimer's Disease Neuroimaging Initiative**. Construction and Analysis of Weighted Brain Networks from SICE for the Study of Alzheimer's Disease. *Front Neuroinform.* 2017 Mar.

117. Park JY, Na HK, Kim S, Kim H, Kim HJ, Seo SW, Na DL, Han CE, Seong JK; **Alzheimer's Disease Neuroimaging Initiative**. Robust Identification of Alzheimer's Disease subtypes based on cortical atrophy patterns. *Sci Rep*. 2017 Mar.

118. **Dennis EL**, **Faskowitz J**, **Rashid F**, Babikian T, Mink R, Babbitt C, Johnson J, Giza C, **Jahanshad N**, **Thompson PM**, Asarnow R. Diverging Volumetric Trajectories Following Pediatric Traumatic Brain Injury. *Neuroimage Clinical*. 2017 Mar.

119. Possin KL, **Kim H**, Geschwind MD, Moskowitz T, Johnson ET, Sha SJ, Apple A, Xu D, Miller BL, Finkbeiner S, Hess CP, Kramer JH. Egocentric and allocentric visuospatial working memory in premotor Huntington's disease: A double dissociation with caudate and hippocampal volumes. *Neuropsychologia*. 2017 Apr.

120. Irimia A, **Torgerson C**, **Jacokes Z**, **Van Horn, JD**, and the GENDAAR Research Consortium. The connectomes of males and females with autism spectrum disorder have significantly different white matter connectivity densities. *Scientific Reports*. 2017 Apr.

121. Fong S, Paholpak P, Daianu M, Deutsch MB, **Riedel B**, Carr A, Jimenez EE, Mather MM, **Thompson, PM,** Mendez M. The Attribution of Animacy and Agency in Frontotemporal Dementia versus Alzheimer's Disease. *Cortex*. 2017 Apr.

122. Bearden C, **Thompson PM**. Emerging Global Initiatives in Neurogenetics: The Enhancing Neuroimaging Genetics through Meta-analysis (ENIGMA) Consortium. *Neuron*. 2017 Apr.

123. **Moyer D**, **Gutman BA**, **Faskowitz J**, **Jahanshad N**, **Thompson PM**. Continuous representations of brain connectivity using spatial point processes. *Med Image Anal.* 2017 Apr.

124. **Dennis EL**, **Rashid F**, **Faskowitz J**, Jin Y, McMahon KL, Zubicaray GI, Martin NG, Hickie IB, Wright MJ, **Jahanshad N**, **Thompson PM**. Mapping age effects along fiber tracts in young adults. *IEEE International Symposium on Biomedical Imaging.* 2017 Apr.

125. **Petrov D**, **Gutman BA**, Ivanov A, **Faskowitz J**, **Jahanshad N**, Belyaev M, **Thompson PM**. Structural connectome validation using pairwise classification. *IEEE International Symposium on Biomedical Imaging.* 2017 Apr.

126. **Gutman BA**, **Pizzagalli F**, **Jahanshad N**, Wright MJ, McMahon KL, de Zubicaray G, **Thompson PM**. Approximating principal genetic components of subcortical shape. *IEEE International Symposium on Biomedical Imaging.* 2017 Apr.

127. **Dennis EL**, **Rashid F**, **Jahanshad N**, Babikian T, Mink R, Babbitt C, Johnson J, Giza CC, Asarnow RF, **Thompson PM**. A network approach to examining injury severity in pediatric TBI. *IEEE International Symposium on Biomedical Imaging.* 2017 Apr.

128. **Riedel BC**, **Jahanshad N**, **Thompson PM**. Graph theoretical approaches towards understanding differences in frontoparietal and default mode networks in Autism. *IEEE International Symposium on Biomedical Imaging.* 2017 Apr.

129. Anglin J, Sugiyama T, **Liew S-L**. Visuomotor adaptation in head-mounted virtual reality versus conventional training. *Scientific Reports*. 2017 Apr.

130. Mora-Gutiérrez JM, Garcia-Fernandez N, Slon Roblero MF, Páramo JA, Escalada FJ, **Wang DJ**, Benito A, Fernández-Seara MA. Arterial spin labeling MRI is able to detect early hemodynamic changes in diabetic nephropathy. *J Magn Reson Imag*. 2017 Apr.

131. Zhou Z, Han F, Yu S, Yu D, Rapacchi S, Song HK, **Wang DJ**, Hu P, **Yan L**. Accelerated non-contrast enhanced 4-dimensional intracranial MR angiography using golden-angle stack-of-stars trajectory and compressed sensing with magnitude subtraction. *Magn Reson Med*. 2017 May.

132. Ito KL, Anglin J, **Kim H**, **Liew S-L**. Semi-automated Robust Quantification of Lesions (SRQL) Toolbox. *Research Ideas and Outcomes*. 2017 May.

133. Garmire LX, Gliske S, Nguyen QC, Chen JH, Nemati S, **Van Horn JD**, Moore JH, Shreffler C, Dunn M. The training of next generation data scientists in biomedicine. *Pacific Symposium on Biocomputing*. 2017 May.

134. **Van Horn JD**, Irimia A, **Torgerson CM**, **Bhattrai A**, **Jacokes Z**, and Vespa PM. Mild cognitive impairment and structural brain abnormalities in a sexagenarian with a history of childhood traumatic brain injury. *Journal of Neuroscience Research*. 2017 May.

135. **DP Hibar** et al. for the ENIGMA Bipolar Disorder Working Group incl. **Jahanshad N, Cheung JW, Thompson PM.** for the ENIGMA Bipolar Disorder Working Group. Cortical abnormalities in bipolar disorder: an MRI analysis of 6503 individuals from the ENIGMA Bipolar Disorder Working Group, *Molecular Psychiatry*. 2017 May.

136. Lin A, Ching C, Vajdi A, Sun D, Jonas R, Jalbrzikowski M, Kushan-Wells L, Hansen LP, Krikorian E, **Gutman BA**, Helleman G, **Thompson PM**, Bearden C. Mapping 22q11.2 Gene Dosage Effects on Brain Morphometry. *Journal of Neuroscience*. 2017 May.

137. Guo S, Lai C, Wu C, Cen G; **Alzheimer's disease Neuroimaging Initiative**. Conversion Discriminative Analysis on Mild Cognitive Impairment Using Multiple Cortical Features from MR Images. *Front Aging Neurosci*. 2017 May.

138. Boedhoe P, Schmaal L, **Thompson PM,** Stein DJ, van den Heuvel OA, ENIGMA-OCD Working Group. Neuroimaging of Cortical Brain Alterations in Adult and Pediatric Obsessive-Compulsive disorder: Preliminary Findings from the ENIGMA Obsessive-Compulsive Disorder Working Group. *Biological Psychiatry*. 2017 May.

139. Kelly S, van Velzen L, Veltman D, **Thompson PM**, **Jahanshad N**, Schmaal L. White Matter Microstructural Differences in Major Depression: Meta-Analytic Findings from Enigma-MDD DTI. *Biological Psychiatry*. 2017 May.

140. R Morey et al. incl. **Dennis EL, Jahanshad N, Thompson PM**. Volume of Sub-Cortical Structures in Posttraumatic Stress Disorder from Multi-Site Investigation by ENIGMA and PGC Consortia. *Biological Psychiatry*. 2017 May.

141. E Walton et al. incl. **Hibar DP, Jahanshad N, Kelly S, Thompson PM**. Prefrontal cortical thinning links to negative symptoms in schizophrenia via the ENIGMA consortium. *Psychol Med*. 2017 May.

142. ME Renteria et al. incl. **Hibar DP, Jahanshad N, Thompson PM**. Subcortical brain structure and suicidal behaviour in major depressive disorder: a meta-analysis from the ENIGMA-MDD working group. *Transl Psychiatry*. 2017 May.

143. Yang Y, Joshi SH, **Jahanshad N**, **Thompson PM**, Baker LA. Neural correlates of proactive and reactive aggression in adolescent twins. *Agress Behav*. 2017 May.

144. Sprugnoli G, Rossi S, Emmerdorfer A, Tatti E, Rossi A, di Lorenzo G, **Liew S-L**, Rossi S, Pascual-Leone A, Santarnecchi E. Neural correlates of Eureka moments. *Intelligence*. 2017 May.

145. **Shi Y, Toga AW**. Connectome Imaging for Mapping Human Brain Pathways. *Molecular Psychiatry*. 2017 May.

146. **Wang J, Aydogan DB, Varma R, Toga AW, Shi Y**. Topographic regularity for tract filtering in brain connectivity. *International Conference on Information Processing in Medical Imaging*. 2017 May.

147. Bui AAT, **Van Horn JD**, NIH BD2K Centers Consortium. Envisioning the Future of "Big Data" Biomedicine. *J Biomed Inform*. 2017 May.

148. Radoeva P, Welker O, Aylward E, **Van Horn JD**, Pelphrey K, Webb DJ. Gender Differences in the Uncinate Fasciculus in Children and Adolescents with ASD as Compared to Typically Developing Youth. *Biological Psychiatry*. 2017 May.

149. Roy B, Woo MA, **Wang DJ**, Fonarow GC, Harper RM, Kumar R. Reduced regional cerebral blood flow in patients with heart failure. *Eur J Heart Fail*. 2017 May.

150. Mora-Gutierrez JM, Fernandez-Seara MA, Slon F, **Wang DJ**, Paramo JA, Escalada J, Garcia-Fernandez N. Arterial Spin Labeling Magnetic Resonance Imaging (ASL-MRI) and Renal Perfusion Data in Diabetic Patients. *Nephrology Dialysis Transplantation*. 2017 May.

151. Coulthard LG, Hawksworth OA, Li R, Balachandran A, Lee JD, **Sepehrband F**, Kurniawan N, Lisgo SN, Simmons DG, Wolvetang E, Woodruff TM. Complement C5aR1 Signaling Promotes Polarization and Proliferation of Embryonic Neural Progenitor Cells through PKCζ. *J of Neurosci*. 2017 May.

152. Pope JM, Verkicharla PK, **Sepehrband F**, Suheimat M, Schmid KL, Atchison DA. Three-dimensional MRI study of the relationship between eye dimensions, retinal shape and myopia. *Biomed. Opt. Express*. 2017 May.

153. Nashiro K, Sakaki M, **Braskie MN**, Mather M. Resting-state networks associated with cognitive processing show more age-related decline than those associated with emotional processing. *Neurobiology of Aging*. 2017 Jun.

154. **Kim H**, Shapir KA, Mandelli ML, Rogers EE, Gano D, Ferriero DM, Barkovich AJ, Gorno-Tempini ML, Glass HC, Xuan D. Early changes in brain structure correlate with language outcomes in children with neonatal encephalopathy. *Neuroimage: Clinical*. 2017 Jun.

155. Mannino C, Glenn T, Hovda D, Vespa P, McArthur D, **Van Horn JD**, Wright M. Acute Glucose and Lactate Metabolism are Associated with Cognitive Recovery Following Traumatic Brain Injury. *Journal of Neuroscience Research*. 2017 Jun.

156. Tate DF, Wade BSC, Velez CS, Drennon AM, Bolzenius J, **Gutman BA**, **Thompson PM**, Lewis JD, Wilde EA, Bigler ED, Shenton ME, Ritter J, York GE. Volumetric and Shape Analyses of Subcortical Structures United States Service Members with Mild Traumatic Brain Injury. *Journal of Neurology*. 2017 Jun.

157. L Shmaal et al. incl. **Hibar DP, Jahanshad N, Cheung JW, Thompson PM**. Cortical abnormalities in adults and adolescents with major depression based on brain scans from 20 cohorts worldwide in the ENIGMA Major Depressive Disorder Working Group. *Molecular Psychiatry*. 2017 Jun.

158. BRAINS (Brain Imaging in Normal Subjects) Expert Working Group, Shenkin SD, Pernet C, Nichols TE, Poline JB, Matthews PM, van der Lugt A, Mackay C, Lanyon L, Mazoyer B, Boardman JP, **Thompson PM**, Fox N, Marcus DS, Sheikh A, Cox SR, Anblagan D, Job DE, Dickie DA, Rodriguez D, Wardlaw JM. Improving data availability for brain image biobanking in healthy subjects: practice-based suggestions from an international multidisciplinary working group. *NeuroImage*. 2017 Jun.

159. Zhang G, Kochunov P, Hong E, Kelly S, Whelan C, **Jahanshad N, Thompson PM**, Chen J. ENIGMA-Viewer: interactive visualization strategies for conveying effect sizes in meta-analysis. *BMC Bioinformatics*. 2017 Jun.

160. RM Brouwer et al. incl. **Hibar DP, Jahanshad N, Thompson PM**. Genetic influences on individual differences in longitudinal changes in global and subcortical brain volumes: Results of the ENIGMA plasticity working group. *Human Brain Mapping*. 2017 Jun.

161. Hafzalla GW, Ragothaman A, Faskowitz J, **Jahanshad N**, McMahon KL, de Zubicaray GI, Wright MJ, **Braskie MN**, Prasad G, **Thompson PM**. A comparison of network definitions for detecting sex differences in brain connectivity using support vector machines. 2017 IEEE International Symposium on Biomedical Imaging; ISBI**.**

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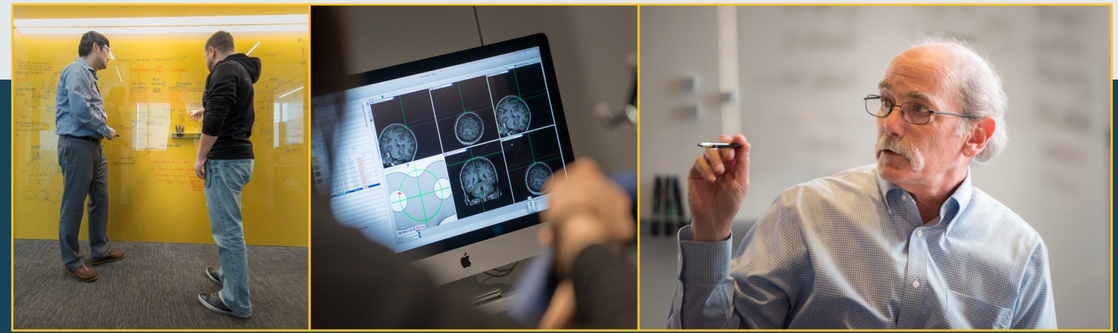

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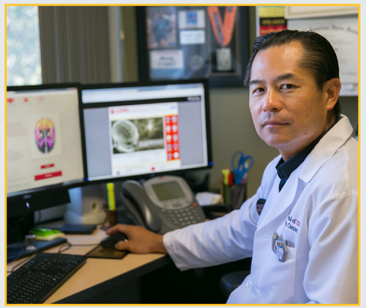

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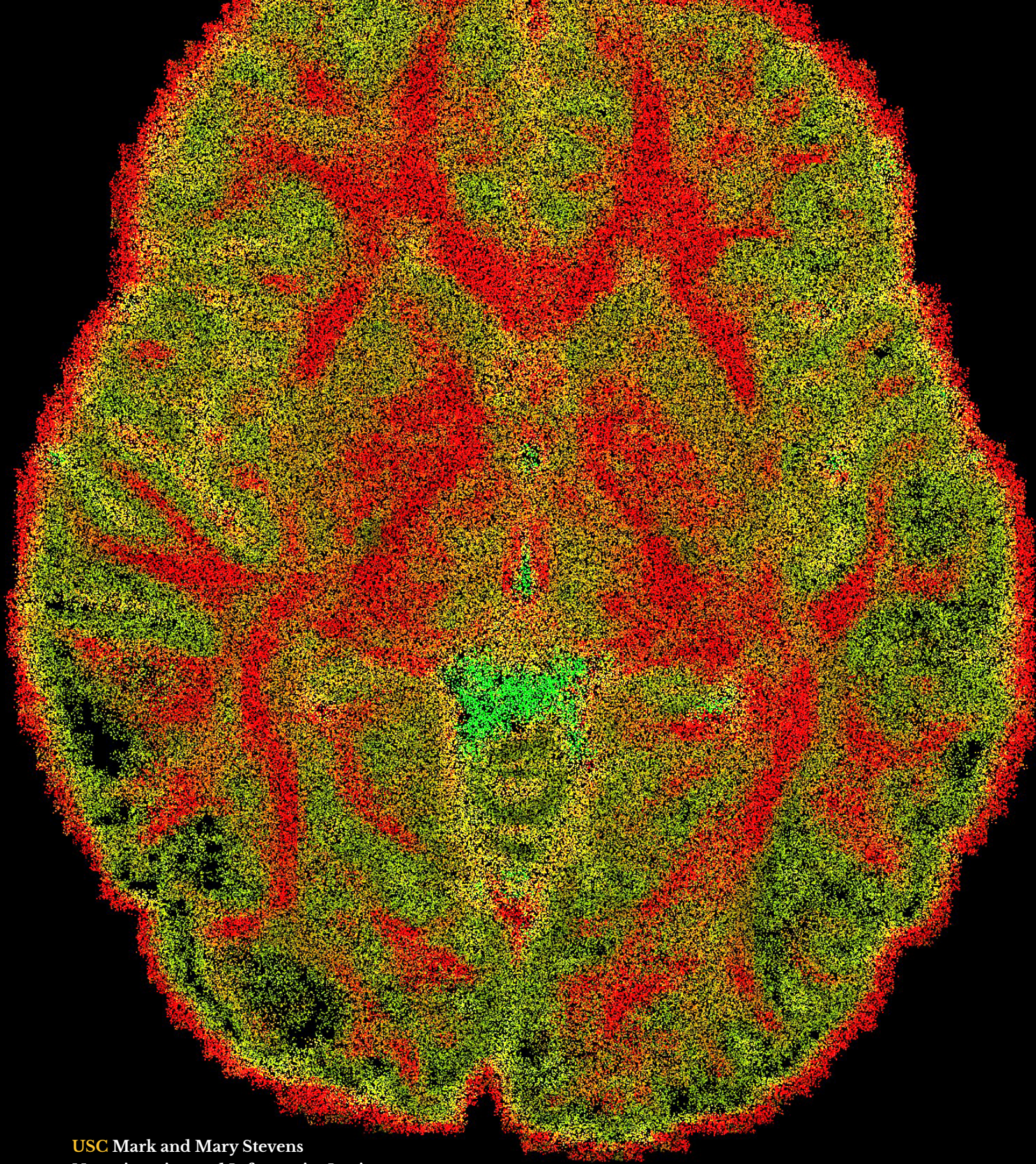
Advanced facilities and equipment are essential to achieving our vital mission.

Stevens Hall, home to the USC Mark and Mary Stevens Neuroimaging and Informatics Institute on the USC Health Sciences Campus, is optimized for the study of the brain and holds the world's first Siemens 7T MRI, an industry-standard 3T Prisma, and other pioneering technologies. The institute also employs an advanced data center, a secure facility that offers an integrated computing, network, and storage environment with multiple levels of data backup and power supplies.

However, maintaining our world-class facilities and ensuring that we can continue to lead at the cutting edge of scientific discovery requires significant, ongoing investments. Your support of the institute's facilities, equipment, and technology will empower our world-class faculty to continue to conduct innovative and life-changing research to benefit our community, nation, and world.

To learn more about how you can support transformative neuroimaging and informatics research, please contact:
Hazel Breen
hazel.breen@med.usc.edu
Phone: 323-442-0142



USC Mark and Mary Stevens
Neuroimaging and Informatics Institute
Keck School of Medicine of USC
2025 Zonal Avenue, Los Angeles, CA 90033
Phone: (323) 44-BRAIN (442-7246)
info@ini.usc.edu

USC University of Southern California