



# Big Data Neuroscience Workshop

Organized by the **Advanced  
Computational Neuroscience Network**  
Supported by the National Science Foundation

Indiana University Bloomington  
September 8-9, 2017

## Key Statistics for the Big Data Neuroscience Workshop 2017

- 186 people registered
- Four keynote and 11 invited speakers
- 17 contributed talks and 10 posters
- 60 different universities and institutes
- 20 states, 4 countries
- 33% faculty, 18% post-doctoral scholars, 49% students
- 69 students received registration and/or travel support scholarships

## Sponsors

This work is sponsored by National Science Foundation Award 1636893. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.



This workshop was also generously supported by the following. **Without this critical support, the workshop could not have had grown as it did.**

- Midwest Big Data Hub
- Indiana University College of Arts and Science
- Department of Psychological and Brain Sciences
- Indiana University Office for Vice President for Research Technologies
- Indiana University Program in Cognitive Science
- Indiana University Program in Neuroscience
- Indiana University Emergent Area of Research Initiative: "Learning: Brains, Machines and Children"
- Indiana University Network Science Institute
- Indiana University Conference Services

# Table of Contents

|    |   |
|----|---|
| 2  | Schedule  |
| 4  | Contributed Talks and Posters                                   |
| 8  | Student Travel Support Awardees                                 |
| 10 | Advanced Computational Neuroscience Network                     |
| 14 | Midwest Big Data Hub  |
| 15 | Brain-Life  |
| 16 | Indiana University Network Science Institute                    |
| 17 | Indiana University Program in Cognitive Science                 |
| 18 | Indiana University Program in Neuroscience                      |
| 19 | Indiana University Department of Psychological & Brain Sciences |
| 20 | Future Big Data Neuroscience Workshops                          |
| 21 | Map of Indiana Memorial Union                                   |

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[#BDN2017](https://twitter.com/BDN2017)



## Schedule - Friday

| Time            | Location                 | Activity   |
|-----------------|--------------------------|--|
| 7:30AM          | Frangipani               | Registration opens   |
| 8:00AM-8:30AM   | Frangipani               | Light breakfast  |
| 8:30AM-8:45AM   | Whittenberger            | Welcome Introductory remarks- <b>Franco Pestilli</b>   |
| 8:45AM-9:00AM   | Whittenberger            | Big Data and Cyberinfrastructure at IU: <b>Bradley Wheeler</b> , Indiana University Vice President for Technology  |
| 9:00AM-9:35AM   | Whittenberger            | <b>Keynote Vince Calhoun</b> (University of New Mexico): <i>The mind-research network: Large-scale analysis of multimodal medical images</i>   |
| 9:35AM-10:00AM  | Whittenberger            | <b>Invited Speaker Andrew Saykin</b> (Indiana University School of Medicine): <i>A systems perspective on Alzheimer's disease: Challenges and opportunities of multi-modality neuroimaging and -omics data</i> |
| 10:00AM-10:30AM | Whittenberger            | <b>Invited Speaker Richard Gonzalez</b> (University of Michigan): <i>Statistical methods for big data neuroscience</i>   |
| 10:30AM-10:45AM |                          | Coffee break   |
| 10:45AM-11:10AM | Whittenberger            | <b>Invited Speaker Dhableswar K. Panda</b> (Ohio State University): <i>Exploiting High-Performance Computing (HPC) and Big Data to Accelerate Processing of NeuroScience Data</i>                              |
| 11:10AM-11:35AM | Whittenberger            | <b>Invited Speaker Lei Wang</b> (Northwestern University): <i>SchizConnect Work-in-Progress: Data Mediation, BIDSification and Pipelines for Neuroimaging Research in Schizophrenia</i>                        |
| 11:35AM-12:10PM | Whittenberger            | <b>Keynote Randy Buckner</b> (Harvard, Mass General Hospital): <i>Deep Phenotyping of the Individual: Data Science Challenges and Opportunities</i>  |
| 12:10PM-1:20PM  | Frangipani               | Lunch break and networking session   |
| 1:20PM-2:35PM   | Whittenberger & Oak Room | <b>Breakout Sessions</b> – See full listing on pages 4 and 5<br>Session 1 in Whittenberger<br>Session 2 in Oak Room  |
| 2:35PM-3:35PM   | Frangipani               | Coffee break and Poster Session – see listing on page 6  |
| 3:35PM-4:35PM   | Whittenberger & Oak Room | <b>Breakout Sessions</b> – See full listing on page 5<br>Session 3 in Whittenberger<br>Session 4 in Oak Room   |
| 4:35PM-5:00PM   | Whittenberger            | <b>Invited Speaker Bill Miller</b> , National Science Foundation   |
| 5:00PM-5:25PM   | Whittenberger            | <b>Invited Speaker Ivo Dinov</b> (University of Michigan): <i>Predictive Big Brain Data Analytics</i>  |
| 5:25PM-5:50PM   | Whittenberger            | <b>Invited Speaker Franco Pestilli</b> (Indiana University): <i>Brain-Life: Engaging Neuroscience in Big Data Reproducible Research</i>  |
| 5:50PM-6:00PM   | Whittenberger            | Concluding remarks and planning for Day 2  |

## Schedule - Saturday

| Time            | Location      | Activity  |
|-----------------|---------------|---|
| 8:00AM-8:30AM   | Frangipani    | Light breakfast   |
| 8:30AM-8:35AM   | Whittenberger | Introduction-Franco Pestilli  |
| 8:35AM-9:10AM   | Whittenberger | <b>Keynote Terry Jernigan</b> (University of California, San Diego): <i>The Adolescent Brain Cognitive Development (ABCD) Study</i>   |
| 9:10AM-9:35AM   | Whittenberger | <b>Invited Speaker Satya Sahoo</b> (Case Western University): <i>A Scalable Neuroinformatics Workflow for Deriving Functional Brain Networks Using Electrophysiological Signal Data</i>                             |
| 9:35AM-10:00AM  | Whittenberger | <b>Invited Speaker Olaf Sporns</b> (Indiana University): <i>Network Neuroscience: Mapping and Modeling Complex Brain Networks</i>   |
| 10:00AM-10:15AM | Whittenberger | Coffee break  |
| 10:15AM-10:40AM | Whittenberger | <b>Invited Speaker Melissa Cragin</b> (Midwest Big Data Hub): <i>Accelerating the Big Data Innovation Ecosystem</i>   |
| 10:40AM-11:05AM | Whittenberger | <b>Invited Speaker Amanda Mejia</b> (Indiana University Bloomington): <i>Borrowing strength from big data: Estimating resting-state networks and connectivity at the subject level with population-level priors</i> |
| 11:05AM-11:40AM | Whittenberger | <b>Keynote Brian Wandell</b> (Stanford University): <i>A project on scientific transparency</i>   |
| 11:40AM-12:00PM | Whittenberger | <b>Demonstrations</b>   |
| 12:00PM-12:30PM | Whittenberger | Concluding remarks, future programming discussion   |
| 12:30PM         | Frangipani    | Program concludes – take away lunches available   |

# Contributed Talks and Posters

*Oral presentations are scheduled on Friday for 12 minutes each with 3 minutes question and answer period following each talk.*

## Session 1: Whittenberger Auditorium

**1:20PM-1:35PM:** *Individual differences in brain functional network organization relate to behavior* by Benjamin A Seitzman, Caterina Gratton, Timothy O Laumann, Evan M Gordon, Babatunde Adeyemo, Adrian W Gilmore, Jeffrey J Berg, Mario Ortega, Annie Nguyen, Deanna J Greene, Kathleen B McDermott, Steven M Nelson, Bradley L Schlaggar, Nico Uf Dosenbach and Steven E Petersen

**1:35PM-1:50PM:** *Estimation of White Matter Fiber Parameters from Compressed Multiresolution Diffusion MRI using Sparse Bayesian Learning* by Pramod Pisharady, Stamatios Sotiropoulos, Julio Duarte-Carvajalino, Guillermo Sapiro and Christophe Lenglet

**1:50PM-2:05PM:** *Seed to whole brain dynamic functional connectivity revealed through a dual clustering approach* by Lorenzo Pasquini, Jesse Brown, Jeresy Deng, Yann Cobigo, Adam Staffaroni, Joel Kramer and William Seeley

**2:05PM-2:20PM:** *Analysis Challenges for Big Data from Optical Imaging* by Mark Reimers

**2:20PM-2:35PM:** *Overdominant effect of a CHRNA4 polymorphism on cingulo-opercular network activity and cognitive control* by Sepideh Sadaghiani, Bernard Ng, Andre Altmann, Valerio Napolioni and Michael Greicius

## Session 2: Oak Room

**1:20PM-1:35PM:** *Designing High-Performance and Scalable Middleware for HPC and Deep Learning* by Hari Subramoni

**1:35PM-1:50PM:** *Inflammatory imaging phenotype discovery in panoramic radiographs leveraging high throughput computing* by Gary Pack, Mark Craven and Amit Acharya

**1:50PM-2:05PM:** *NeuroScience Meets HPC Cloud: Designing High-Performance MPI and Big Data Libraries on Virtualized InfiniBand Clusters for NeuroScience Applications* by Xiaoyi Lu and Dhabaleswar Panda

**2:05PM-2:20PM:** *The EurekaMetric Connectome: Discovering neuroscience research pathways* by Malhar Jere, Ravi Kiran Raman and Lav Varshney

## Contributed Talks and Posters

**2:20PM-2:35PM:** *Widespread distribution of tau occurs in preclinical Alzheimer's disease* by Stephanie Schultz, Brian Gordon, Shruti Mishra and Yi Su Stephanie Schultz, Brian Gordon, Shruti Mishra, Yi Su, John Morris, Beau Ances, and Tammie Benzinger

### Session 3: Whittenberger Auditorium

**3:35PM-3:50PM:** *Maximizing the individual fingerprints of human functional connectomes through decomposition into brain connectivity modes* by Enrico Amico and Joaquin Goni

**3:50PM-4:05PM:** *Prediction of mild cognitive impairment progression to Alzheimer's disease using multiple data sources* by Yogatheesan Varatharajah, Ravishankar Iyer and Prashanthi Vemuri

**4:05PM-4:20PM:** *T-SNE projections of single trial ERP's demonstrate a reduced sensitivity to environmental regularities in patients with schizophrenia* by David Bridwell, Benjamin Liddle, Kent Kiehl, Godfrey Pearson and Vince Calhoun

**4:20PM-4:35PM:** *Brain connectivity differences in bipolar and unipolar depression during win and loss anticipation* by Anna Manelis, Jorge Almeida, Richelle Stiffler, Jeanette Lockovich, Haris Aslam and Mary Phillips

### Session 4: Oak Room

**3:35PM-3:50PM:** *Brain connectivity-informed regularization under generalized linear model via griPEER* by Damian Brzyski, Marta Karas, Jaroslaw Harezlak, Timothy Randolph and Joaquin Goni

**3:50PM-4:05PM:** *Simultaneous NIRS and EEG Responses to Investigate the Role of Chromatic Separation on Visual Discomfort* by Sarah Haigh, Nicholas Cooper and Arnold Wilkins

**4:05PM-4:20PM:** *Molecular Alterations of the Blood-Brain Barrier in Brain Metastases of Lung Cancer* by Gozde Uzunalli, Makayla Wiley, Chinyere Kemet and L. Tiffany Lyle

## Contributed Talks and Posters

*Posters will be on display in the Frangipani Room during the workshop. Please join us for a coffee break and poster session from 2:35PM to 3:35PM on Friday.*

**Poster 1:** *Developmental changes in visual scene statistics* by Christina Deserio, Jason Gold, Swapnaa Jayaraman, Rowan Candy and Linda Smith

**Poster 2:** *MPI-LIFE: Designing High-Performance Linear Fascicle Evaluation of Brain Connectome with MPI* by Shashank Gugnani, Xiaoyi Lu, Franco Pestilli, Cesar Caiafa and Dhableswar Panda

**Poster 3:** *Accelerated Analysis and Mining of BigData using Spark and TensorFlow over RDMA* by Rajarshi Biswas, Xiaoyi Lu and Dhableswar Panda

**Poster 4:** *Accelerating the Performance of Scientific Applications using MVAPICH2 MPI Library* by Mohammadreza Bayatpour, Sourav Chakraborty, Hari Subramoni and Dhableswar Panda

**Poster 5:** *OASIS-3: MRI, PET, and Clinical Data on Normal Aging and AD from over 10yrs of Follow-up* by Pamela LaMontagne, Lauren Wallace, Sarah Keefe, Tammie Benzinger, John Morris, Krista Moulder, Randy Buckner, and Daniel Marcus

**Poster 6:** *Exploring Differences in Gene Expression and Relative Cell-Type Balance in the Hippocampus of a Selectively Bred Rat Model for Internalizing and Externalizing Psychiatric Disorders* by Isabelle Birt, Megan Hagenauer, Sarah Clinton, Cigdem Aydin, Peter Blandino, Fan Meng, John Stead, Robert Thompson, Stanley Watson and Huda Akil

**Poster 7:** *Accelerating Apache Hadoop on HPC Clusters and Case Studies with Neuroscience Applications* by Haiyang Shi, Xiaoyi Lu and Dhableswar K. Panda

**Poster 8:** *A comparison of methods of batch correction in a confounded experimental design.* by Ying Ma, Megan Hagenauer, Elyse Aurbach, Jun Li, Marquis Vawter, Robert Thompson, Cortney Turner, William Bunney, Richard Myers, Jack Barchas, Alan Schatzberg, Stanley Watson and Huda Akil

**Poster 9:** *The Effects of the Top 20 AD Risk Variants on Brain Amyloidosis* by Eddie Stage, Liana Apostolova, Tugce Duran, Shannon Risacher, Naira Goukasian, John West, Triet Do, Holly Wilhalme, Kwangsik Nho, Meredith Phillips, David Elashoff, Andrew Saykin and Diana Svaldi

**Poster 10:** *Neurogenomics of Paternal Care in Three-spined Stickleback Fish* by Syed Abbas Bukhari, Christopher H Seward, Michael C Saul, Huimin Zhang, Rebecca M Trapp, Noelle James, Sihai D Zhao, Sriram Chandrasekaran, Lisa Stubbs and Alison M Bell



# Notes

## Student Support Awards

With the support of the National Science Foundation and our generous sponsors, we are proud to support 69 undergraduate, graduate, and post-doctoral students in participation at the Workshop. (Three students not listed by request.)

**Aman Arya**, *Math Department, Ischool*, University of Washington  
**Sonia Bansal**, *Psychiatry*, University of Maryland  
**Mohammadreza Bayatpour**, *Computer Science and Engineering*, The Ohio State University  
**Richard O. Bido-Medina**, *Neuroscience*, University of Illinois at Urbana-Champaign  
**Isabelle Birt**, *Neuroscience*, University of Michigan  
**Rajarshi Biswas**, *Computer Science and Engineering*, The Ohio State University  
**David Bridwell**, *Mind Research Network*  
**Qasim Bukhari**, *Brain and Cognitive Sciences*, MIT  
**Syed Abbas Bukhari**, *Illinois Informatics Institute*, University of Illinois at Urbana-Champaign  
**Aldo Camargo**, *Coma Science Group*, University of Liege  
**Ying Chen**, *Special Education and Disorder Communications*, University of Nebraska, Lincoln  
**Shelly Cooper**, *Psychological and Brain Sciences*, Washington University in St. Louis  
**Debarshi Datta**, *Behavioral Science*, Florida Atlantic University  
**Duy Anh Duong-Tran**, *School of Industrial Engineering*, Purdue University  
**Maximillian Egan**, *Psychology*, University of Illinois at Urbana-Champaign  
**Koji Fujita**, *Center for Neurosciences*, The Feinstein Institute for Medical Research  
**Arthur Gershon**, *Population & Quantitative Health Sciences*, Case Western Reserve University  
**Tanya Glozman**, *Electrical Engineering*, Stanford University  
**Mengyuan Gong**, *Psychology*, Michigan State University  
**Shashank Gugnani**, *Computer Science*, The Ohio State University  
**Sarah Haigh**, *Psychiatry*, University of Pittsburgh  
**Lindsay Hanford**, *Psychiatry*, University of Pittsburgh  
**Muhammad Haseeb Javed**, *Computer Science and Engineering*, The Ohio State University  
**Audreyana Jagger-Rickels**, *Psychology*, Southern Illinois University  
**Janak A Jain**, *Data Science*, Columbia University  
**Amin Jalali**, *Wisconsin Institute for Discovery*, University of Wisconsin-Madison  
**Daniel Kessler**, *Statistics*, University of Michigan  
**Kiran Kumar**, *Psychology*, Indiana University  
**Payel Kundu**, *Neuroscience*, University of Illinois at Urbana-Champaign  
**Quan Lei**, *Psychology*, University of Minnesota  
**Henry A Leopold**, *Systems Design Engineering, Joint Vision Science*, University of Waterloo  
**Ying Ma**, *Biostatistics*, University of Michigan  
**Sameer Manchanda**, *Computer Science*, University of Illinois at Urbana-Champaign  
**Anna Manelis**, *Psychiatry*, University of Pittsburgh  
**Butovens Médé**, *Cognitive & Information Sciences*, University of California, Merced  
**Sean Noah**, *Psychology*, University of California, Davis

## Student Support Awards

**Shauna M. Overgaard**, *Biomedical Health Informatics*, University of Minnesota  
**Lorenzo Pasquini**, *Neurology*, University of California, San Francisco  
**Miguel Pebes**, *Statistics*, Indiana University  
**Ryan Philips**, *Center for BrainHealth*, University of Texas at Dallas  
**Pramod Kumar Pisharady**, *Center for Magnetic Resonance Research, Radiology*, University of Minnesota  
**Nandakishore Puttashamachar**, *Computer Engineering-Machine Learning*, University of Central Florida  
**Ravi Kiran Raman**, *Electrical and Computer Engineering*, University of Illinois at Urbana-Champaign  
**Stephanie Schultz**, *Radiology*, Washington University in St. Louis  
**Benjamin Seitzman**, *Neurology*, Washington University School of Medicine  
**Joseph Shaffer**, *Radiology*, University of Iowa  
**Haiyang Shi**, *Department of Computer Science and Engineering*, The Ohio State University  
**Isabelle Simard**, *Forensic Psychology*, University of Ontario Institute of Technology (UOIT)  
**Eddie Stage**, *Medical Neuroscience*, Indiana University School of Medicine  
**Diana Svaldi**, *Neurology*, Indiana University School of Medicine  
**Uttara Tipnis**, *Industrial Engineering*, Purdue University  
**Han Tong**, *Neuroscience Graduate Program*, University of Cincinnati  
**Danika Tumbleson-Brink**, *Medical and Molecular Genetics, Neuroscience*, Indiana University School of Medicine  
**Gozde Uzunalli**, *Comparative Pathobiology*, Purdue University  
**Joshua Valdez**, *Population and Quantitative Health Sciences*, Case Western Reserve University  
**Yogatheesan Varatharajah**, *Electrical and Computer Engineering*, University of Illinois at Urbana-Champaign  
**Parul Verma**, *Chemical Engineering*, Purdue University  
**Sophia Vinci-Booher**, *Psychological & Brain Sciences, Program in Neuroscience*, Indiana University  
**Louis N. Vinke**, *Graduate Program in Neuroscience*, Boston University  
**Yu Wang**, *Electrical Engineering and Computer Science*, MIT  
**Samantha Williams**, *Psychology*, Saint Louis University  
**Di Wu**, *Physics*, Indiana University  
**Cedric Xia**, *Psychiatry*, University of Pennsylvania  
**Xiaoran Yan**, *Network Science Institute*, Indiana University  
**Mahmoud Zeydabadinezhad**, *Pediatrics and Computer Science*, Emory University

# The Advanced Computational Neuroscience Network

The **Advanced Computational Neuroscience Network (ACNN)** aims to build broad consensus on the core requirements, infrastructure, and components needed to develop a new generation of sustainable interdisciplinary Neuroscience Big Data research. As a network, ACNN leverages community strengths and resources to drive innovation and collaboration for the understanding of the structure, physiology, and function of the human brain through partnerships and services in education, tools, and best practices. Six major universities in the Midwest (**Michigan, Ohio, Indiana, Case Western, Northwestern and Washington U, St. Louis**) coordinate the ACNN research, development, training, and dissemination activities. Over 25 other universities, industry partners, neuroscience research centers and hospitals collaborate with ACNN investigators on a wide range of basic science, modeling, analytics and applied neuroscience research.

ACNN identifies barriers to neuroscience data sharing, interoperability, and challenges associated with managing Big Data. ACNN forges new collaborations to establish standards using neuroscience-focused ontologies, incorporate provenance metadata management, aggregate tools, index resources and repositories, and curate and share validated pipeline workflow.

Visit [networkneuroscience.org](http://networkneuroscience.org) for more information.

## Core Team

**Richard Gonzalez, PhD:** Dr. Gonzalez is a Professor of Psychology, Statistics, and Marketing, and Director, Biosocial Methods Collaborative at the University of Michigan. His research area includes databases and computing, human and statistical genetics, statistical applications, bioinformatics software, systemic modeling and systems biology. Dr. Gonzalez serves as Director of the Advanced Computational Neuroscience Network (NSF# 1636840). He is a Fellow of the Association for Psychological Science (APS) and the American Psychological Association (APA). He also directs the Biosocial Methods Collaborative (BMC) at the University of Michigan, which specializes in collecting and analyzing heterogeneous, multilevel, multivariate time series biological and behavioral data. The BMC can serve as a testbed for issues that arise during data collection, creating of metadata and depositing data to archives. The BSM also has active industry research projects (e.g., Proctor and Gamble, Adidas, General Motors) and will assist with industry partnerships.



# The Advanced Computational Neuroscience Network



**Dhabaleswar Panda, PhD:** Dr. Panda is a University Distinguished Professor of Computer Science and Engineering at The Ohio State University, and he leads the Network-Based Computing Research Group. Dr. Panda's research is focused on parallel computer architecture, high performance networking, InfiniBand, network-based computing, exascale computing, programming models, GPUs and accelerators, high performance file systems and storage, virtualization and cloud computing and Big Data (Hadoop (HDFS, MapReduce and HBase) and Memcached). Dr. Panda has served as Program Chair/Co-Chair/Vice Chair of many international conferences and workshops including ExaComm (15-16), ESPM2 (15-16), HPBDC (15-16), CCGrid '16, PGAS '15, and HPBDC '15. He is Fellow of IEEE and a member of ACM. He is a Co-Director of the multi-institutional Advanced Computational Neuroscience Network (NSF# 1636840).



**Xiaoyi Lu, PhD:** Dr. Lu is a Research Scientist of the Department of Computer Science and Engineering at The Ohio State University. His current research interests include high performance interconnects and protocols, Big Data, Hadoop/Spark/Memcached Ecosystem, Parallel Computing Models (MPI/PGAS), Virtualization and Cloud Computing. He has published over 70 papers in international journals and conferences related to these research areas. He has been actively involved in various professional activities (PC Co-Chair, PC Member, Reviewer, Session Chair) in academic journals and conferences. Recently, Dr. Lu is leading the research and development of RDMA-based accelerations for Apache Hadoop, Spark, HBase, and Memcached, and OSU HiBD micro-benchmarks, which are publicly available from (<http://hibd.cse.ohio-state.edu>). These libraries are currently being used by more than 205 organizations from 29 countries. More than 19,250 downloads of these libraries have taken place from the project site. He is a core member of the MVAPICH2 (High Performance MPI over InfiniBand, iWARP and RoCE) project and he is leading the research and development of MVAPICH2-Virt (high-performance and scalable MPI for hypervisor and container based HPC cloud). He is a member of IEEE and ACM.

**Hari Subramoni, PhD:** Dr. Subramoni received the Ph.D. degree in Computer Science from The Ohio State University, Columbus, OH, in 2013. He is a Research Scientist in the Department of Computer Science and Engineering at the Ohio State University, USA, since August 2015. His current research interests include high performance interconnects and protocols, parallel computer architecture, network-based computing, exascale computing, network topology aware computing, QoS, power-aware LAN-WAN communication, fault tolerance,





## The Advanced Computational Neuroscience Network

virtualization, and cloud computing. He has published over 50 papers in international journals and conferences related to these research areas. He has been actively involved in various professional activities in academic journals and conferences. Recently, Dr. Subramoni is doing research and working on design and development for of MVAPICH2 (High Performance MPI over InfiniBand, Omni-Path, iWARP and RoCE) and MVAPICH2-X (Hybrid MPI and PGAS (OpenSHMEM, UPC and UPC++)) software packages. He is a member of IEEE. Dr. Subramoni has served as Program Chair/Co-Chair/Vice Chair/ of many international conferences and workshops including ExaComm (15-16) and ESPM2 (15-16).



**Franco Pestilli, PhD:** Dr. Pestilli is an Assistant Professor of Psychological and Brain sciences at the Indiana University, Bloomington. His research examines white-matter, microstructure, anatomy and brain tractography using computational modeling of human behavior and functional activity. He is an expert in functional as well as diffusion-weighted magnetic resonance imaging and tractography, with application to human visual impairment, attention and Alzheimer's Disease. He is a Co-Director of the multi-institutional Advanced Computational Neuroscience Network (NSF# 1636840).

**Olaf Sporns, PhD:** Prof. Sporns is Distinguished Professor, Provost Professor, Robert H. Shaffer Chair at Indiana University, Bloomington. His research spans computational and cognitive neuroscience; connectomics; network models of the human brain; brain networks across the computational models of brain dynamics. He is a Co-Director of the multi-institutional Advanced Computational Neuroscience Network (NSF# 1636840) and a Co-Scientific Director of the Indiana University Network Science Institute. He is the founding editor of the MIT Press journal, *Network Neuroscience*.



**Andrew J. Saykin, Psy.D:** Prof. Saykin is Raymond C. Beeler Professor of Radiology and Imaging Sciences, Professor of Medical and Molecular Genetics, Director, Indiana Alzheimer Disease Center, Director, Center for Neuroimaging, and a Co-Scientific Director of the Indiana University Network Science Institute. His research spans multiple imaging methodologies to understand the process of human aging as well as psychiatry disorders. He is a Co-Director of the multi-institutional Advanced Computational Neuroscience Network (NSF# 1636840) and Director of the ADNI Genetic Core (NIH U01 AG024904).

# The Advanced Computational Neuroscience Network

**Satya Sahoo, PhD:** Dr. Sahoo is Associate Professor of Biomedical Informatics in the Department of Epidemiology and Quantitative Health Sciences, Electrical Engineering and Computer Science Department, and Department of Neurology at the Case Western Reserve University (CWRU). His research is in biomedical big data, data-driven approaches to understand role of brain connectivity in epilepsy seizure networks, ontology engineering, and scientific reproducibility using provenance metadata. He is a Co-Director of the multi-institutional Advanced Computational Neuroscience Network (NSF# 1636840). Sahoo is the PI of the NIH-funded Big Data to Knowledge (BD2K) software development project to develop a new provenance-metadata based framework for supporting scientific reproducibility and rigor called Provenance for Clinical and Healthcare Research (ProvCaRe). The ProvCaRe framework will be applied in this project to support data quality, embedding of provenance metadata in BRAIN dataset for reproducibility and citation, and resource discoverability.



**Lei Wang, PhD:** Dr. Wang is an Associate Professor of Psychiatry and Behavioral Sciences and Radiology at the Northwestern University. Dr. Lei Wang's research is focused on the development of multidimensional and multimodal neuroimaging biomarkers using the tools of computational anatomy. He designs and develops protocols for data harmonization, CDEs and automated pipelines to delineate brain structures based on simultaneous mappings of multiple structures from multiple atlases.

**Daniel Marcus, PhD:** Dr. Marcus is an Associate Professor in the Department of Radiology at the Washington University, and Director of the Neuroimaging Informatics and Analysis Center (NIAC). Dr. Marcus is an expert on neuroinformatics, development of data management systems, ontologies, and visualization tools. He is the principal architect of XNAT, open source imaging informatics platform widely used in academic and industry research organizations around the world. He is also a vocal advocate for open data sharing, which he practices through the Human Connectome Project, OASIS, and XNAT Central projects, which together have provided open access data to over 10,000 researchers and led to over 500 publications.



*The research, development, education activities, and scholarship of the Advanced Computational Neuroscience Network (ACNN) is made possible by: The National Science Foundation (NSF). NSF grants 1636840, 1636846, 1636893, 1636850, and 1550320 provide partial ACNN support.*

# Midwest Big Data Hub

The Midwest Big Data Hub welcomes you to the ACCN Workshop!



The MBDH works to develop effective cross-sector, data-enabled networks to solve shared problems of regional and societal interest. By connecting domain experts, researchers, data scientists, and industry experts, we are accelerating big data innovation, and enhancing the national Big Data ecosystem.

MBDH Goals:

## **Cultivate communities**

- Accelerate partnerships and catalyze new research
- Convene meetings; match-making; support travel
- Identify shared use cases and mobilize data for access

## **Reduce friction in Data-to-Decision systems**

- Enable access and use of data from many sources
- Facilitate sharing and access arrangements

## **Build capacity in data science and data literacy**

- Workforce development, training and education
- Improve access to data, tools & services

Learn more at [midwestbigdatahub.org](http://midwestbigdatahub.org)  
and follow @MWBigDataHub on Twitter

# Brain Life

Brain Life is a big data neuroscience project that aims at promoting the “upcycling” of neuroimaging data derivatives. Data derivatives are the data and algorithms, products of brain analytics, created by researchers when studying the human brain. These data derivatives often times are underutilized, either used for a single study or never published at all. Brain Life will comprise of an online software platform that will allow submission and collection of data, and analytic tools (applications or apps).

The platform will reach out to multiple communities of researchers (neuroscientists, psychologists, computer scientists and engineers). Investigators will be allowed to access these data and analytical tools to reuse them for other projects. The Brain Life platform is fully integrated with the Indiana University high-performance compute clusters, the national supercomputers and public and commercial cloud systems.

This workflow process, data and applications made available on Brain-Life are meant to promote open data sharing and reproducibility of scientific results as well as to expand the user base of data and algorithms to multiple communities of researchers.

Through the platform, these materials and tools will be made widely available so that high-scale computational analyses can be performed on an entire population of human brains, including the Human Connectome data set — one of the largest brain network mapping efforts to date.



Visit [brain-life.org](http://brain-life.org) for more information.

# Indiana University Network Science Institute

The mission of the Indiana University Network Science Institute (IUNI) is to strengthen the theories, methods, analytic tools, and practice of network science, and to foster collaborative, interdisciplinary network science approaches to understanding and improving the complex challenges of our world.

IUNI has a unique and strong resource in the diversity of network scholars on our campuses. There are over 170 faculty on IU campuses who study networks - neuroscientists, sociologists, health scholars, computer scientists and physicists. IUNI works to bring them together and to help them work with scholars in other areas of specialization to spark transdisciplinary breakthroughs.



Since our founding in 2014, IUNI has had some notable successes, including founding the only network science spoke in the NSF Big Data Hub. We are also a part of the new National Science Foundation funded National Research Traineeship for graduate studies, the Interdisciplinary Training in Complex Networks and Systems program (see [cns-nrt.indiana.edu](http://cns-nrt.indiana.edu) for more information). We directly support grant-writing and information technology needs of IU faculty, in addition to sponsoring talks and events, such as NetSci 2017 (Indianapolis) the annual meeting of the Network Science Society.

IUNI is proud to support the Advanced Computational Neuroscience Network and to help host the Big Data Neuroscience Workshop 2017 in Bloomington.

Visit [iuni.iu.edu](http://iuni.iu.edu) for more information.



## Indiana University Program in Cognitive Science

Established in 1989, the Program in Cognitive Science at Indiana University brings together faculty and students from many departments to study cognition and information. We celebrated our 25th anniversary in 2015. During 2010-2015, we ran the NSF-funded IGERT graduate training program on the dynamics of brain-body-environment systems in behavior and cognition.

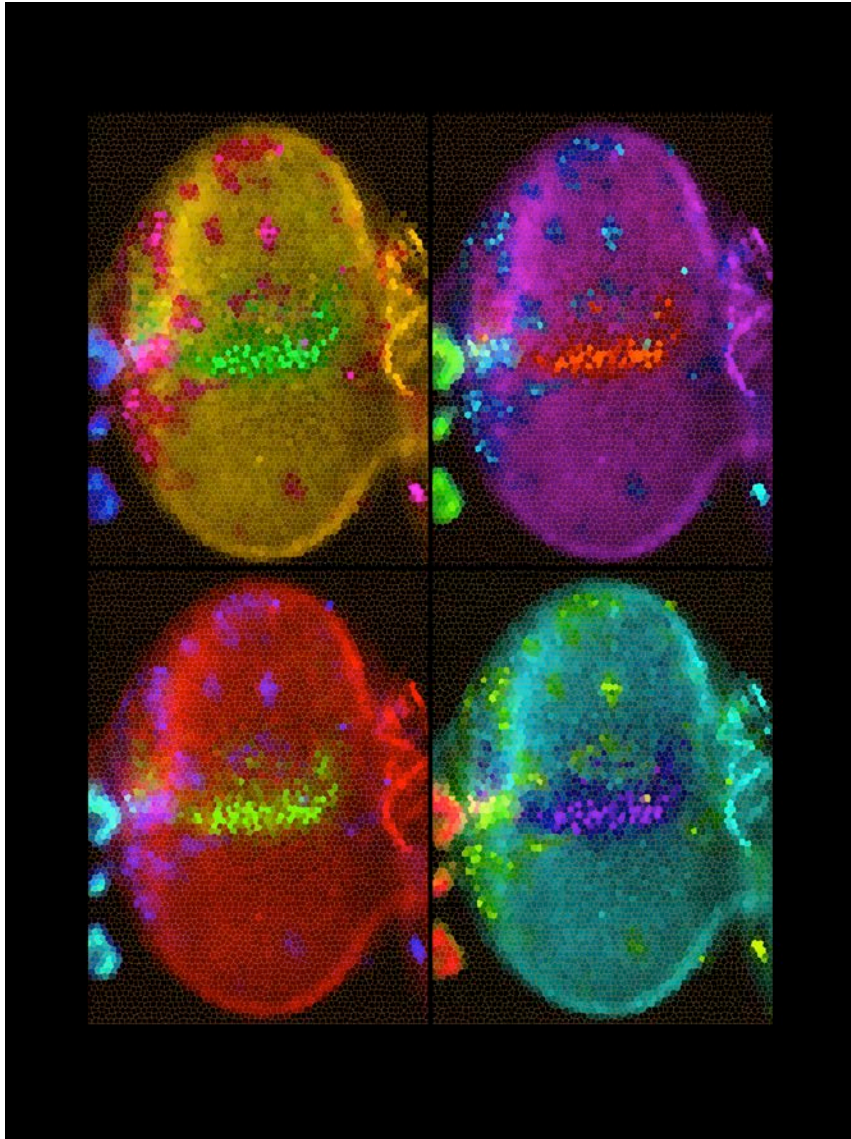


We have over 200 affiliated faculty, 50 graduate students, and 60 undergrads in the program. Representation is strong from the departments of psychology, philosophy, computer science/informatics, and linguistics. Other participating departments include biology, anthropology, education, library and information science, optometry, speech and hearing, and mathematics.

Visit [www.cogs.indiana.edu](http://www.cogs.indiana.edu) for more information.

## Program in Neuroscience

Founded in 1965, the Program in Neuroscience at Indiana University now includes over 85 faculty members and 55 pre-doctoral researchers working with faculty members from 13 departments or schools across campus, including psychological and brain sciences, biology, cognitive science, kinesiology, physics, optometry, and speech and hearing sciences. About half of the

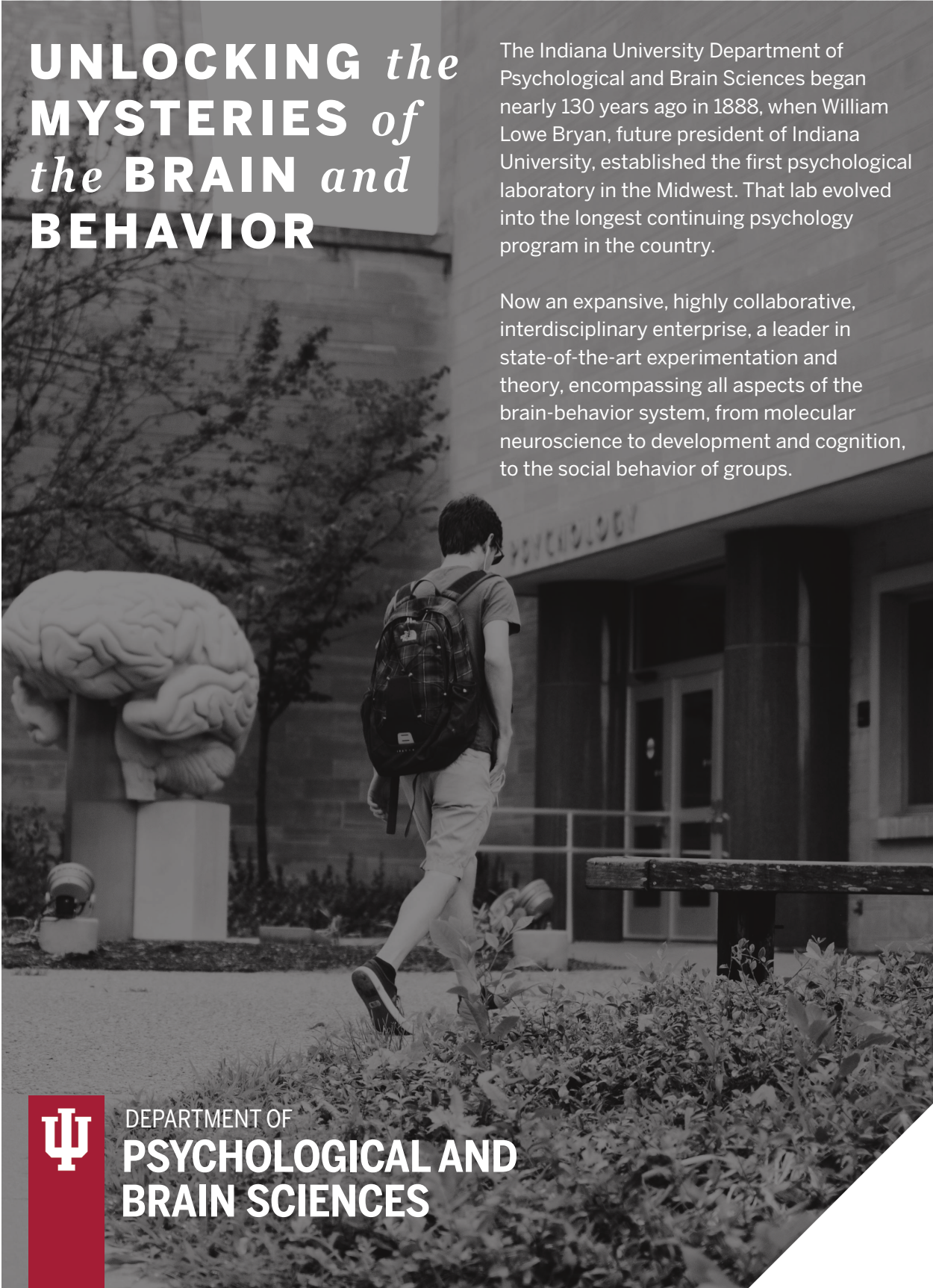


program's faculty has been added in the past couple of years, underscoring the dynamic growth of neuroscience and the campus commitment to neuroscience. This expansion has broadened the scope of the program to include a wide-ranging spectrum of four key areas: molecular and cellular neuroscience, behavioral neuroscience, cognitive and computational neuroscience, and clinical and translational neuroscience.

A third larval instar eye-antennal disc of *Drosophila* in which the growth organizing factor Eyegone (orange/red) is assayed in cells lacking (blue/aqua) the Pax6 transcription factors Eyeless (Ey) and Twin of Eyeless (Toy). *Photo credit: Jinjin Zhu and Justin P. Kumar*

Visit [neuroscience.indiana.edu](http://neuroscience.indiana.edu) for more information.





# UNLOCKING *the* MYSTERIES *of* *the* BRAIN *and* BEHAVIOR

The Indiana University Department of Psychological and Brain Sciences began nearly 130 years ago in 1888, when William Lowe Bryan, future president of Indiana University, established the first psychological laboratory in the Midwest. That lab evolved into the longest continuing psychology program in the country.

Now an expansive, highly collaborative, interdisciplinary enterprise, a leader in state-of-the-art experimentation and theory, encompassing all aspects of the brain-behavior system, from molecular neuroscience to development and cognition, to the social behavior of groups.



DEPARTMENT OF  
**PSYCHOLOGICAL AND  
BRAIN SCIENCES**

# Future Big Data Neuroscience Workshops

**Mark your calendar for the Big Data Neuroscience Workshop 2018!**

**When:** September 6 – 7, 2018

**Where:** George S. Dively Building, Case Western Reserve University, Cleveland Ohio

**Objectives:** The ACNN 2018 workshop will continue our work on the development of common practices and standardization to make it easier for neuroscience researchers to annotate and process data; to share data, tools and protocols, and to work with distributed high-performance computing environments. The workshop will bring together members of the Midwest, national, and the global neuroscience research community to promote data reuse, aggregation, result validation and new discoveries in neuroscience.

The University of Michigan will host BDN 2019.

Check [www.networkneuroscience.org](http://www.networkneuroscience.org) for more information about future workshops and resources, trainings, research, and other news of the Advanced Computational Neuroscience Network.





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# FIRST FLOOR



The Advanced Computational Neuroscience Network is dedicated to building and advancing a new generation of sustainable interdisciplinary Neuroscience Big Data research.

Learn more about our efforts in education, tools, and best practices at [www.neurosciencenetwork.org](http://www.neurosciencenetwork.org).



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