TAKUYA ITO

197 University Avenue ◇ Newark, NJ 07102
taku.ito1@gmail.com ◇ ito-takuya.github.io

RESEARCH INTEREST

My research is in cognitive, network, and computational neuroscience.

I study the role of large-scale brain network organization in distributed information processing. In particular, I am interested in the computational and network mechanisms of how information is transferred and transformed between brain areas, and how these processes relate to flexible behaviors. To address these questions, I use a combination of statistical analyses of neural data sets and mathematical/computational modeling.

EDUCATION

Rutgers University *2015 - Present*
Ph.D. in Neuroscience (*in progress*)
Advisor: Michael W. Cole, Ph.D.
Co-mentor: Horacio G. Rotstein, Ph.D.
Dissertation title: *Brain network mechanisms of cognitive information transformation*

Washington University in St. Louis *2009 - 2013*
B.A. in Mathematics (Theoretical track)
Secondary Major: Philosophy-Neuroscience-Psychology (Cognitive Neuroscience track)
Minor: Computer Science

RESEARCH EXPERIENCE

Center for Molecular & Behavioral Neuroscience Newark, NJ
Ph.D. research (with M.W. Cole) *2015 - Present*
Research in biophysical circuit models and spiking resonance (with H.G. Rotstein) *2016 - Present*
Research assistantship in fMRI and functional connectivity methods (with M.W. Cole) *2014 - 2015*

Collaborative Research in Computational Neuroscience (CRCNS) Berkeley, CA
Berkeley summer course in mining and modeling neuroscience data (fully-funded) *July 2018*

Okinawa Institute of Science & Technology Okinawa, Japan
Computational Neuroscience Course (fully-funded 3-week intensive workshop) *June 2016*

Washington University in St. Louis St. Louis, MO
Research assistant with T.S. Braver in the Cognitive Control & Psychopathology Lab *2011 - 2014*

TEACHING EXPERIENCE

Rutgers University - Guest Lectures
Behavioral & Neural Sciences Graduate Bootcamp - Molecular Techniques (3x) *Fall 2016 - 2019*
Behavioral & Neural Sciences Graduate Bootcamp - Synaptic Plasticity (3x) *Fall 2016 - 2019*
Computational Neuroscience (MATH 430/630) *Fall 2016*

Rutgers University - Teaching Assistant
Foundations of Neuroscience III - Cognitive Neuroscience (Graduate-level) *Spring 2018*
Computational Neuroscience (MATH 430/630; Graduate- and undergraduate-level) *Fall 2016, 2019*

Washington University in St. Louis - Academic Mentor in Mathematics
Foundations of Higher Mathematics (MATH 310; Undergraduate-level) *2013*
Elementary to Intermediate Statistics (MATH 3200; Undergraduate-level) *2013*

PROFESSIONAL MEMBERSHIPS

Society for Neuroscience *2016 - Present*
Cognitive Neuroscience Society
Organization for Human Brain Mapping *2017 - Present*

PUBLICATIONS

Preprints:

Cocuzza CV, **Ito T**, Schultz DH, Bassett DS, Cole MW (2019). Flexible coordinator and switcher hubs for adaptive task control. *bioRxiv*. https://doi.org/10.1101/822213

Ito T, Brincat SL, Siegel M, Mill RD, He BJ, Miller EK, Rotstein HG, Cole MW (2019). Task-evoked activity quenches neural correlations and variability in large-scale brain systems. *bioRxiv*. https://doi.org/10.1101/560730

Ito T, Cole MW (2018). Network dimensionality underlies flexible representation of cognitive information. *bioRxiv*. https://doi.org/10.1101/262626

Peer-reviewed publications:

Kar K, **Ito T**, Cole MW, Krekelberg B (2019). Transcranial alternating current stimulation reduces BOLD adaptation and increases functional connectivity. *Journal of Neurophysiology*. https://doi.org/10.1152/jn.00376.2019

Ito T, Hearne LJ, Mill RD, Cocuzza CV, Cole MW (2019). Discovering the computational relevance of brain network organization. *Trends in Cognitive Sciences*. https://doi.org/10.1016/j.tics.2019.10.005

Cole MW, **Ito T**, Schultz DH, Mill RD, Chen RH, and Cocuzza CV. Task activations produce spurious but systematic inflation of task functional connectivity estimates. *NeuroImage*. https://doi.org/10.1016/j.neuroimage.2018.12.054

Chen RH, **Ito T**, Kulkarni KR, Cole MW. (2018). The human brain traverses a common activation-pattern state space across task and rest. *Brain Connectivity*. https://doi.org/10.1089/brain.2018.0586

Schultz, DH, **Ito T**, Solomyak LI, Chen RH, Mill RD, Anticevic A, Cole MW. (2018). Global Connectivity of the Frontoparietal Cognitive Control Network is Related to Depression Symptoms in the General Population. *Network Neuroscience*. https://doi:10.1162/NETN_a_00056

Ito T, Kulkarni KR, Schultz DH, Mill RD, Chen RH, Solomyak LI, Cole MW (2017). Cognitive task information is transferred between brain regions via resting-state network topology. *Nature Communications*. https://doi.org/10.1038/s41467-017-01000-w

Mill RD, **Ito T**, Cole MW (2017). From connectome to cognition: The search for mechanism in human functional brain networks. *NeuroImage*. http://dx.doi.org/10.1016/j.neuroimage.2017.01.060

Cole MW, **Ito T**, Bassett DS, Schultz DH (2016). Activity flow over resting-state networks shapes cognitive task activations. *Nature Neuroscience*. http://doi.org/10.1038/nn.4406

Cole MW, **Ito T**, Braver TS (2015). Lateral prefrontal cortex contributes to fluid intelligence through multinetwork connectivity. *Brain Connectivity*, 5(8), 497?504. http://doi.org/10.1089/brain.2015.0357

Cole MW, **Ito T**, Braver, TS (2015). The Behavioral Relevance of Task Information in Human Prefrontal Cortex. *Cerebral Cortex*. http://doi.org/10.1093/cercor/bhv072

PEER-REVIEWED CONFERENCE PAPERS

Ito T, Keane BP, Mill RD, Chen RH, Hearne LJ, Arnemann KL, He BJ, Rotstein HG, Cole MW (2018). A dynamical systems model of intrinsic and evoked activity, variability, and functional connectivity. Conference on Cognitive Computational Neuroscience, Philadelphia, PA. https://doi.org/10.32470/CCN.2018.1049-0

Cole MW, **Ito T** (September 2017). Computational network mechanisms of task-evoked functional connectivity. Conference on Cognitive Computational Neuroscience, New York NY.

TALKS

Organization for Human Brain Mapping (Oral session), *Cognitive information differentiates between connectivity and activity across the cortical hierarchy*, Montreal, Canada (*Upcoming: June 2020*).

Courant Institute for Mathematical Sciences (Biomathematics colloquium), New York University, New York, NY (February 2020).

Section on Functional Imaging Methods, National Institute of Mental Health, Bethesda, MD (January 2020).

Laboratory of Professor Yukiyasu Kamitani, Department of Information Science and Technology, Kyoto University, Kyoto, Japan (January 2020).

Institute of Science and Technology for Brain-inspired Intelligence, Fudan University. Shanghai, China (November 2019).

Center for Theoretical Neuroscience, Zuckerman Mind Brain Behavior Institute, Columbia University. New York, New York (November 2019).

Laboratory of Professor John D. Murray, Department of Psychiatry, Yale School of Medicine. New Haven, Connecticut (November 2019).

SELECTED CONFERENCE ABSTRACTS AND PRESENTATIONS

2020

Ito T, Hearne LJ, Cole MW (*Upcoming: June 2020*). Cognitive information differentiates between connectivity and activity across the cortical hierarchy. Poster and talk to be presented at Organization for Human Brain Mapping, Montreal, Canada.

Ito T, Yang GR, Laurent P, Schultz DH, Cole MW (*Upcoming: March 2020*). Parameterizing a task-performing neural network using human fMRI data. Poster to be presented at From Neuroscience to Artificially Intelligent Systems, Cold Spring Harbor Laboratory, New York.

2019

Ito T, Yang GR, Cocuzza CV, Schultz DH, Cole MW (June 2019). Predicting motor behavior using neural encoding models during complex cognitive tasks. Poster presented at Organization for Human Brain Mapping, Rome, Italy.

Ito T, Schultz KM (February 2019). Computation across scales: From receptive fields to cognitive maps. Poster presented at Present and Future Frameworks of Theoretical Neuroscience, San Antonio, TX.

2018

Ito T, Rotstein HG, Cole MW (July 2018). A dynamical systems model of intrinsic and evoked activity, variability, and functional connectivity. Poster presented at Neurobiology of Cognition Gordon Research Conference, Newry Maine. [Honorable mention for poster award competition]

Ito T, Cole MW (June 2018). Dimensionality of intrinsic network connectivity underlies flexible task representation. Poster presented at Organization for Human Brain Mapping, Singapore.

2017

Ito T, Cole MW (November 2017). Cognitive control networks contain a mixture of diverse connectivity patterns characteristic of predicted flexible hub mechanisms. Poster presented at Society for Neuroscience, Washington DC.

2016

Ito T, Schultz DH, Solomyak LI, Chen RH, Mill RD, Cole MW (November 2016). Cognitive control networks route task information to other networks via intrinsic functional connectivity pathways. Poster presented at Society for Neuroscience, San Diego, CA.

Ito T, Schultz DH, Solomyak LI, Chen RH, Mill RD, Cole MW (August 2016). Intrinsic functional connectivity shapes task information between networks. Poster presented at 15th Neural Computation and Psychology Workshop, Philadelphia, PA.

Ito T, Schultz DH, Solomyak LI, Chen RH, Mill RD, Cole MW (April 2016). Flexible hub updates between tasks associated with global informational connectivity changes. Poster presented at Cognitive Neuroscience Society, New York, NY.

RESEARCH MENTORSHIP

· Miguel Vivar Lazo, Undergraduate research assistant *Spring 2016 - Spring 2017*
  – Now, PhD student in Biomedical Engineering at Johns Hopkins University

· Jamila Sinkler, Undergraduate research assistant *Fall 2015*
  – Data entry and organization, behavioral scoring

AD HOC REVIEWER FOR JOURNALS

NeuroImage (*5x*)
Neuron (*2x*)
Journal of Neuroscience (*1x*)
Journal of Cognitive Neuroscience (*1x*)
Scientific Reports (*1x*)
Nature Neuroscience (*3x*)
Proceedings of the National Academy of Sciences (*1x*)
Brain Structure & Function (*1x*)
Cerebral Cortex (*1x*)

TECHNICAL SKILLS

Programming/Scripting Languages
- Fluent: Python, Matlab, Bash shell scripting
- Proficient: Julia, R, LaTeX
- Familiar: C, Java, SAS

fMRI processing, analysis, visualization
- AFNI, Freesurfer, FSL, Connectome workbench, NiPy

Statistical and mathematical modeling
- Nonlinear dynamics, numerical methods, neural network modeling
- Biophysical modeling (conductance-based and firing rate models)
- Regression analysis, multivariate pattern analysis, machine learning, deep learning (PyTorch)

Other
- Linux and Mac server system administration
- High performance computing (e.g., cluster computing)
- Microsoft Office Suite, Git