Randy Ellis

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Education

Icahn School of Medicine at Mount Sinai, New York, NY
Doctor of Philosophy, Biomedical Science, August 2017-present

Florida Atlantic University, Boca Raton, FL
Bachelor of Science, *cum laude*, Neuroscience & Behavior, December 2014
Minor, Psychology

Research Experience

Yasmin Hurd, Icahn School of Medicine at Mount Sinai, New York, NY
Graduate student, July 2018-Present

- Machine learning - Using RNA-seq data from post-mortem human brains of heroin abusers and controls, discovered gene sets highly predictive of heroin overdose
- Electronic health records - Retrospective cohort studies on the Mount Sinai clinical population (~8 million patients) to investigate outcomes of patients with opioid use disorder
- Bioinformatics - RNA-seq, ATAC-seq analysis, co-expression network analysis (MEGENA, WGCNA), differential gene correlation analysis, correlations of gene expression with phenotypes of opioid abusers (e.g., urine morphine levels, years of use)
- Behavior - Heroin self-administration, sucrose reversal learning, animal husbandry, maintenance, data analysis
- Computational modeling - Maximum likelihood and a posteriori estimation of exploration and learning in response to rewards and punishments in the rat gambling task
- Lentiviral overexpression, stereotaxic surgery - Lentiviral overexpression of gene targets derived from bioinformatics analysis for the purpose of assessing effects on heroin self-administration and reinstatement behaviors

Avi Ma'ayan, Icahn School of Medicine at Mount Sinai, New York, NY
Graduate rotation student, October 2017-June 2018

- Machine learning, biomedical informatics - Trained machine learning models on lab tests and vital signs from the Mount Sinai Hospital's electronic medical records system to predict diagnosis of substance dependence disorders, and probed which tests are most important to elucidate clinical factors most related to and potential phenotypic signatures of substance abuse. Also explored diagnoses, prescriptions, and procedures during the five years prior to the initial diagnosis of substance dependence to understand the clinical profile of substance abusers.

Mike Michaelides, National Institute on Drug Abuse, Baltimore, MD
Postbac Intramural Research Training Award (IRTA), August 2015-August 2017
Special Volunteer, August 2017-Present

- Bioinformatics – Built microarray analysis workflows to discover novel genes relevant to cocaine administration from open data sets. Differential expression of candidates was confirmed via independent pharmacological experiments.
    - Ample experience with Python, R/Bioconductor
    - GUI tools including STRING, GEO, Allen Brain Atlas, GeneNetwork, IPA, Ensembl, MGI, DAVID, CTD, GWASCentral
- Machine learning/neural networks – Used machine learning and neural network models for decoding natural images from calcium imaging data curated by the Allen Brain Observatory and

reached ~96% decoding accuracy.
- Rodent behavior – Operant self-administration, open field, conditioned place preference, rotarod, elevated plus maze
- Molecular biology – RNA extraction, real-time qPCR
- Histology - laser capture microdissection, cryostat sectioning

Robert P. Vertes, Florida Atlantic University, Boca Raton, FL
Research Assistant, August 2013-January 2015
- Histology - perfused and extracted rat brains, sliced/mounted brain tissue, stained slides with cresyl violet, captured photos of brain sections, prepared physiological buffers
- Behavior - Intradimensional-Extradimensional task assessing the effects of electrolytic lesions of the ventral midline thalamus on odor and texture discrimination
- Assisted in stereotaxic electrolytic lesion surgery
- Awarded a research grant to investigate the antidepressant effects of dextromethorphan hydrobromide in the forced swim test

J.A. Scott Kelso, Florida Atlantic University, Boca Raton, FL
Research Assistant, January 2013-April 2013
- Facilitated human participants through duration of EEG experiments
- Conducted relative phase locking analysis with MATLAB
- Recorded and analyzed coordinative finger oscillation data

Reviewer experience - Annals of Medicine, Nature Scientific Reports, eNeuro, Intelligence-Based Medicine

Professional Experience
Caron Renaissance, Boca Raton, FL
Quantitative EEG (qEEG) neurofeedback technician, January 2015-August 2015
- Developed and implemented neurofeedback protocols for patients suffering from substance abuse disorders and myriad comorbidities at a world-renowned addiction treatment center
- Used NeuroGuide software to acquire baseline EEGs, map and quantify regional dysregulation referenced to a normative database and used this information to develop personalized protocols to address psychiatric symptoms
- Conducted neurofeedback sessions, monitored and recorded progress in an electronic medical records system
- Attended clinical meetings with clinical director, psychiatrists, and therapists to advocate neurofeedback for the most treatment-resistant patients
- Created PowerPoints presented across the country by supervisor to undergraduates and above
- Presented clinical data and a comprehensive plan for departmental expansion to the CEO

Publications
Ellis, R. J., Rahman, T., Sherman, J. & Hurd, Y. L. SnapShot: Neurobiology of opioid use disorder. Cell 184, 1648-1648.e1 (2021).

Suprun, M., **Ellis, R. J.**, Sampson, H. A. & Suárez-Fariñas, M. bbeaR: an R package and framework for epitope-specific antibody profiling. Bioinformatics 37, 131–133 (2021).

Egervari, G. et al. Chromatin accessibility mapping of the striatum identifies tyrosine kinase FYN as a therapeutic target for heroin use disorder. Nature Communications 11, 1–15 (2020).
Gomez, J. L. et al. Zinc potentiates dopamine neurotransmission and cocaine seeking. bioRxiv

2020.08.29.273482 (2020).

Ellis, R. J., Wang, Z., Genes, N. & Ma'ayan, A. Predicting opioid dependence from electronic health records with machine learning. BioData Mining 12, 3 (2019).

Michaelides, M. et al. Striatal Rgs4 regulates feeding and susceptibility to diet-induced obesity. Mol Psychiatry 25, 2058–2069 (2018).

Ellis, R. J. & Michaelides, M. High-accuracy Decoding of Complex Visual Scenes from Neuronal Calcium Responses. bioRxiv 271296 (2018).

Ellis, R. J., Michaelides, M. & Wang, G.-J. Neurodysfunction in Addiction and Overeating as Assessed by Brain Imaging. in Processed Food Addiction: Foundations, Assessment, and Recovery (CRC Press, 2017).

Gomez, J. L. et al. Chemogenetics revealed: DREADD occupancy and activation via converted clozapine. Science 357, 503–507 (2017).

Awards and Honors:

Fellowship, NIDA-funded F31 National Research Service Award (August 2021-Present)

Traineeship, NIGMS-funded Integrated Pharmacological Sciences Training Program T32 GM062754 (June 2019-June 2021)

Interviewed by the Allen Institute (November 2018) for Brain Science on work with Dr. Michael Michaelides:
https://alleninstitute.org/what-we-do/brain-science/news-press/articles/data-stories-addiction-visual-system?utm_source=Newsletter&utm_medium=email&utm_campaign=BrainJuneNews19&utm_content=DataStories

NIH Postbac Intramural Research Training Award (August 2015 - August 2017): Two-year fellowship at the National Institute on Drug Abuse under Mike Michaelides, PhD.

2nd Place in the Biological Sciences - Oral Presentation category at Florida Atlantic University's Undergraduate Research Symposium (April 2015) for "Antidepressant Efficacy of Dextromethorphan in the Forced Swim Test."

$500 Research Grant (April 2014): As an undergraduate, I won a $500 research grant to assess the effects of a NMDA antagonist, dextromethorphan, on a pre-clinical depression assay, the Porsolt forced swim test.

Graduated Cum Laude (December 2014) - 3.56 cumulative GPA.

Phi Kappa Phi, 2013-2014

Posters:

Presented:
"Fyn Kinase Linked to Glutamatergic Related Synaptic Alterations and Tau Pathology in the Striatum of Human Heroin Abusers"
Akpoyibo, D, Ellis, RJ, Egervari, G, Landry, J, Callens, J, Roussos, P, Hurd, YL.

- Annual Neuroscience Retreat at Mount Sinai, New York, NY, May 2019

"High-accuracy decoding of complex visual scenes from neuronal calcium responses"
Ellis, RJ, Michaelides, M.

- Society for Neuroscience Annual Meeting, San Diego, CA, November 2018

"Prediction of Substance Dependence Status from Electronic Health Records with Machine Learning"
Ellis, RJ, Wang, Z, Genes, N, Ma'ayan, A.

- Intelligent Systems in Molecular Biology, Chicago, IL, July 2018
- BD2K-LINCS Data Science Symposium, Miami, FL, February 2018

"Visual Decoding of Neuronal Calcium Responses Using Deep Neural Networks"
Ellis, RJ, Michaelides, M.

- Inaugural Conference on Cognitive Computational Neuroscience, Columbia University, New York, NY, September 2017

"Empirical validation of cocaine targets in the striatum identified using big data"
Ellis, RJ, Gomez, JL, Rodriguez, LA, Michaelides, M.

- Society for Neuroscience Annual Meeting, San Diego, CA, November 2017
- NIH Postbac Poster Day, Bethesda, MD, 2016, 2017
- NIDA Poster Day, Baltimore, MD, May 2016, 2017

"A bioinformatic pipeline for the discovery of translational targets relevant to cocaine abuse"
Ellis, RJ, Gomez, JL, Rodriguez, LA, Michaelides, M.

- Society for Neuroscience Annual Meeting, San Diego, CA, November 2016

"The Cocaine Ignorome: Assessing Differential Gene Expression Predicted via Bioinformatic Analysis"
Ellis, RJ, Gomez, JL, Rodriguez, LA, Michaelides, M.

- Johns Hopkins Behavioral Pharmacology Research Unit Symposia, July 2016

"Antidepressant Efficacy of Dextromethorphan in the Forced Swim Test"
Ellis, RJ, Vertes, RP.

- Synapse Poster Session at Max Planck Florida Institute, Jupiter, FL, January 2015
- Florida Undergraduate Research Conference, Daytona, FL, February 2015

"Effects of Electrolytic Lesions of the Reuniens and Rhomboid Nuclei on Cognitive Behaviors Using the Intradimensional Extradimensional (IED) Task in Rats"
Ellis, RJ, Pinedo, P, Linley, SB, Vertes, RP.

- FAU's Fourth Annual Undergraduate Research Symposium, Boca Raton, FL, April 2014

Co-author:
"Behavioral effects of dietary zinc manipulation and methods for brain zinc assessment" Rodriguez, LA, Gomez, J, Ellis, R, Michaelides, M.

- Society for Neuroscience Annual Meeting, San Diego, CA, November 2016.

"Effects of dietary zinc manipulation and methods for brain zinc assessment"
Rodriguez, LA, Gomez, J, Ellis, R, Michaelides, M.

- NIDA Poster Day, Baltimore, MD, May 2016.

"Localization of zinc in the rodent brain and behavioral effects of dietary zinc manipulation" Rodriguez, LA, Ellis, R, Gomez, J, Michaelides, M.

- NIH Postbac Poster Day, Bethesda, MD, April 2016.

"Lesions of the Ventral Midline Thalamus Impair Reversal Learning Using an Odor Texture Discrimination Task in the Rat"
Gallo, M, Ellis, RJ, Barbeito, C, Vertes, RP, Linley, SB.

- Society for Neuroscience Annual Meeting, Washington, DC, November 2014.

Oral Presentations:

"Antidepressant Efficacy of Dextromethorphan in the Forced Swim Test"
Ellis, RJ, Vertes, RP.

- FAU's Fifth Annual Undergraduate Research Symposium, Boca Raton, FL, April 2015.

"Frequency Coordination in Virtual Partner Interaction"
Ellis, RJ, Dumas, G, Tognoli, E, Kelso, JA.

- FAU's Third Annual Undergraduate Research Symposium, Boca Raton, FL, April 2013.