

Tom Earnest

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EDUCATION

Doctor of Philosophy, Computational and Data Sciences 2025 (expected)
Division of Computational and Data Sciences
Washington University in St Louis

Master of Science, Psychiatric Research 2017
Institute of Psychiatry, Psychology, and Neuroscience
King's College London

Bachelor of Arts, Biology with Concentration in Neuroscience 2016
Grinnell College

RESEARCH EXPERIENCE

Doctoral Research 2020-current

Washington University in St. Louis

Advised by [Aristeidis Sotiras, Ph.D.](#)

- Used data-driven methods (especially non-negative matrix factorization) to define and evaluate a staging system for brain pathology in Alzheimer's Disease
- Applied supervised machine learning with nested cross-validation for prediction of cognitive decline in Alzheimer's Disease
- Managed storage and organization of three multimodal neuroimaging datasets in a high-performance computing cluster
- Developed code for preprocessing, analysis, and visualization of neuroimaging data from >1,000 subjects

Research Technician II 2019-2020

Washington University in St. Louis

Supervised by [Alexxai Kravitz, Ph.D.](#), and [Meaghan Creed, Ph.D.](#)

- Created two graphical user interfaces in Python for analysis and visualization of data from open-source rodent experimentation devices
- Developed code for visualization of rodent electrophysiological data
- Collected behavioral and neuroanatomical data to study reward and motivation circuits in rodents

Postbac Program

2017-2019

National Institute of Dental and Craniofacial Research

Supervised by Hans Jürgen Solinski, Ph.D., and [Mark Hoon, Ph.D.](#)

- Learned programming to automate research tasks, such as experimental blinding and cell counting
- Ran behavioral experiments to study the neurobiology of sensorimotor circuits in mice
- Bred and genotyped transgenic mice
- Used confocal imaging to characterize neuronal populations involved in pain and itch

Master's Research

2016-2017

Institute of Psychiatry, Psychology, and Neuroscience; King's College London

Supervised by Elizabeth Shephard, Ph.D., and Patrick Bolton, Ph.D.

- Primary researcher on a project using movement trackers to assess hyperactivity in a population of children and adolescents with tuberous sclerosis complex
- Traveled within England to administer psychometric assessments to individuals with varying levels of cognitive and behavioral impairment (~30 visits)
- Developed statistical analyses of motion tracking data to predict cognitive constructs

Mentored Advanced Project

2015-2016

Grinnell College

Supervised by Nancy Rempel-Clower, Ph.D.

- Co-planned and ran a project studying the effects of stress on behavior and neurobiology in adolescent rodents
- Applied tests to study anxiety-like behavior in rats
- Conducted brain dissections to measure neuroanatomical changes correlated with behavioral differences

PUBLICATIONS

Leading asterisk signifies preprint or submitted work.

Bani, A., Ha, S. M., Xiao, P., **Earnest, T.**, Lee, J., & Sotiras, A. (2023). Scalable Orthonormal Projective NMF via Diversified Stochastic Optimization. In A. Frangi, M. de Bruijne, D. Wassermann, & N. Navab (Eds.), *Information Processing in Medical Imaging* (pp. 497–508). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-34048-2_38

De Araujo Salgado, I., Li, C., Burnett, C. J., Rodriguez Gonzalez, S., Becker, J. J., Horvath, A., **Earnest, T.**, Kravitz, A. V., & Krashes, M. J. (2023). Toggling between food-seeking and self-preservation behaviors via hypothalamic response networks. *Neuron*, 111(18), 2899–2917.e6. <https://doi.org/10.1016/j.neuron.2023.06.006>

* **Earnest, T.**, Bani, A., Ha, S. M., Hobbs, D. A., Kothapalli, D., Yang, B., Benzinger, T. L. S., Gordon, B. A., & Sotiras, A. (in review). Data-driven decomposition and staging of flortaucipir uptake in Alzheimer's Disease. *Alzheimer's & Dementia*.

Earnest, T., Shephard, E., Tye, C., McEwen, F., Woodhouse, E., Liang, H., Sheerin, F., & Bolton, P. F. (2020). Actigraph-Measured Movement Correlates of Attention-Deficit/Hyperactivity Disorder (ADHD) Symptoms in Young People with Tuberous Sclerosis Complex (TSC) with and

- without Intellectual Disability and Autism Spectrum Disorder (ASD). *Brain Sciences*, 10(8), Article 8. <https://doi.org/10.3390/brainsci10080491>
- * Kumar, S., **Earnest, T.**, Payne, P. R. O., Sotiras, A., & Initiative, the A. D. N. (2023). *Analyse patient-level heterogeneity in Alzheimer's Disease using multimodal normative modelling* (p. 2023.08.15.553412). bioRxiv. <https://doi.org/10.1101/2023.08.15.553412>
- * Lee, J. J., **Earnest, T.**, Ha, S. M., Bani, A., Kothapalli, D., Liu, P., Sotiras, A., & Initiative, the A. D. N. (2023). *Patterns of Glucose Metabolism in [18F]FDG PET Indicate Regional Variability and Neurodegeneration in the Progression of Alzheimer's Dementia* (p. 2023.11.10.23298396). medRxiv. <https://doi.org/10.1101/2023.11.10.23298396>
- Matikainen-Ankney, B. A., **Earnest, T.**, Ali, M., Casey, E., Wang, J. G., Sutton, A. K., Legaria, A. A., Barclay, K. M., Murdaugh, L. B., Norris, M. R., Chang, Y.-H., Nguyen, K. P., Lin, E., Reichenbach, A., Clarke, R. E., Stark, R., Conway, S. M., Carvalho, F., Al-Hasani, R., ... Kravitz, A. V. (2021). An open-source device for measuring food intake and operant behavior in rodent home-cages. *eLife*, 10, e66173. <https://doi.org/10.7554/eLife.66173>
- * Reimann, G. E., Dupont, R. M., Sotiras, A., **Earnest, T.**, Jeong, H. J., Durham, E. L., Archer, C., Moore, T. M., Lahey, B. B., & Kaczkurkin, A. N. (in review). Using Machine Learning to Derive Neurobiological Subtypes of General Psychopathology in Late Childhood. *Journal of Psychopathology and Clinical Science*.
- Shephard, E., McEwen, F. S., **Earnest, T.**, Friedrich, N., Mörtl, I., Liang, H., Woodhouse, E., Tye, C., & Bolton, P. F. (2022). Oscillatory neural network alterations in young people with tuberous sclerosis complex and associations with co-occurring symptoms of autism spectrum disorder and attention-deficit/hyperactivity disorder. *Cortex*, 146, 50–65. <https://doi.org/10.1016/j.cortex.2021.10.007>
- Slivicki, R. A., **Earnest, T.**, Chang, Y.-H., Pareta, R., Casey, E., Li, J.-N., Tooley, J., Abiraman, K., Vachez, Y. M., Wolf, D. K., Sackey, J. T., Kumar Pitchai, D., Moore, T., Gereau IV, R. W., Copits, B. A., Kravitz, A. V., & Creed, M. C. (2023). Oral oxycodone self-administration leads to features of opioid misuse in male and female mice. *Addiction Biology*, 28(1), e13253. <https://doi.org/10.1111/adb.13253>
- Solinski, H. J., Dranchak, P., Oliphant, E., Gu, X., **Earnest, T. W.**, Braisted, J., Inglese, J., & Hoon, M. A. (2019). Inhibition of natriuretic peptide receptor 1 reduces itch in mice. *Science Translational Medicine*, 11(500), eaav5464. <https://doi.org/10.1126/scitranslmed.aav5464>
- Solinski, H. J., Kriegbaum, M. C., Tseng, P.-Y., **Earnest, T. W.**, Gu, X., Barik, A., Chesler, A. T., & Hoon, M. A. (2019). Nppb Neurons Are Sensors of Mast Cell-Induced Itch. *Cell Reports*, 26(13), 3561–3573.e4. <https://doi.org/10.1016/j.celrep.2019.02.089>
- Vachez, Y. M., Tooley, J. R., Abiraman, K., Matikainen-Ankney, B., Casey, E., **Earnest, T.**, Ramos, L. M., Silberberg, H., Godynyuk, E., Uddin, O., Marconi, L., Le Pichon, C. E., & Creed, M. C. (2021). Ventral arkypallidal neurons inhibit accumbal firing to promote reward consumption. *Nature Neuroscience*, 24(3), Article 3. <https://doi.org/10.1038/s41593-020-00772-7>

PRESENTATIONS

Earnest, T., Bani, A., Ha, S. M., Kothapalli, D., Yang, B., Lee, J., Sotiras, A. (2023, July). *Detecting flortaucipir signatures of Alzheimer's Disease with non-negative matrix factorization*. Poster at Organization for Human Brain Mapping 2023. Montreal, Canada.

Earnest, T. W., Solinski, H. J., Kriegbaum, M. C., Tseng, P. Y., Gu, X., Barik, A., ... Hoon, M. A. (2019, May). *Nppb-neurons are sensors of mast cell-induced itch*. Poster at NIH Postbac Poster Day. Bethesda, MD.

Earnest, T. W., Solinski, H. J., Kriegbaum, M. C., Tseng, P. Y., Gu, X., Barik, A., ... Hoon, M. A. (2019, April). *Nppb-neurons are sensors of mast cell-induced itch*. Poster at the NIDCR Fellows Retreat. Washington, DC.

Earnest, T. (2017, July). *Using actigraphy to measure ADHD symptoms in tuberous sclerosis complex*. Poster at the IoPPN Psychiatric Research MSc year end session. London, UK.

Earnest, T. (2016, February). *Behavioral and morphological effects of stress in adolescent rats*. Talk in the Biology Student Seminar Series at Grinnell College. Grinnell, IA.

Earnest, T., Yetter, M. (2015, November). *Behavioral and morphological effects of stress in adolescent rats*. Talk in the Psychology Student Seminar Series at Grinnell College. Grinnell, IA.

Yetter, M., **Earnest, T., Rempel-Clower, N.** (2015, October). *Acute corticosterone treatment increases anxiety and dendritic elongation and arborization in the orbitofrontal cortex in mid-adolescent but not early-adolescent rats*. Poster at the Faculty for Undergraduate Neuroscience at the Society for Neuroscience Annual Meeting. Chicago, IL.

Earnest, T. (2015, September). *Acute stress increases anxiety behaviors in mid-adolescent rats and may cause dendritic elongation & arborization in the orbitofrontal cortex*. Poster at Iowa State Neuroscience Research Day. Ames, IA.

REVIEWER

- Imaging Neuroscience

TEACHING EXPERIENCE

Assistant to the Instructor (AI) – Washginton University in St Louis

- ESE 359: Signals, Data, and Equity
- PSYCH 3604: Cognitive Neuroscience (planned: Spring 2024)

AWARDS

- Outstanding Poster Award at NIH Postbac Poster Day (2019)

- NIH Postbaccalaureate Intramural Research Training Award (2017)
- Dean's Medal (2017): Best overall performance in all postgraduate taught programs in the Institute of Psychology, Psychiatry, and Neuroscience
- Sir Robin Murray Prize (2017): Best overall performance in the Psychiatric Research MSc
- Honorable Mention for poster presented at the Iowa State Neuroscience Research Day (2015)
- Dean's List for all semesters at Grinnell College (2012-2016)
- Trustee Honor Scholarship at Grinnell College (2012-2016)

TECHNICAL SKILLS

Programming

- Python (proficient):
 - Packages: pandas, matplotlib, seaborn, numpy, scipy, keras, PyQT, nilearn, nibabel
 - Applications: data science, machine learning, data visualization, interactive visualizations, graphical user interfaces, packaging, documentation, neuroimaging, data wrangling, open-source software development
- R (proficient)
 - Packages: dplyr, tidyverse, stringr, ggplot2
 - Applications: data science, statistical analysis, regression, data visualization, data wrangling, neuroimaging
- Bash (experience):
 - Applications: neuroimaging, high performance computing, scripting
- MATLAB (familiar):
 - Applications: optimization, unsupervised machine learning

Software

- Version control (Git/GitHub)
- High performance computing (SLURM)
- Data visualization (Graphpad Prism, Microsoft Office)
- Statistical analysis (SPSS)
- Presentation and publication (Microsoft Office, Latex, Marp, Typora)
- Project Management (Trello, Miro, Microsoft Office)
- Neuroimaging (FSL, ANTs, FreeSurfer)