**Tom Earnest**

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**EDUCATION**

*Doctor of Philosophy, Computational and Data Sciences* 2026 (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

**WORK EXPERIENCE**

**Data Science Intern** Summer 2024

Reinsurance Group of America

* Analyzed internal logs of employee interactions with a large language model (LLM) chatbot, developing a Streamlit dashboard for summarizing and forecasting usage costs
* Committed to company codebase for internal LLM deployment
* Developed custom tools and applied Amazon Textract for extracting insights from company tax forms

**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 Fellow**2017-2019

National Institute of Dental and Craniofacial Research

Supervised by Hans Jürgen Solinski, Ph.D., and Mark Hoon, Ph.D.

* 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
* Learned programming to automate research tasks, such as experimental blinding and cell counting

**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., Lee, J. J., Benzinger, T. L. S., Gordon, B. A., Sotiras, A., & Initiative, for the A. D. N. (2024). Data-driven decomposition and staging of flortaucipir uptake in Alzheimer’s disease. *Alzheimer’s & Dementia*, *20*(6). <https://doi.org/10.1002/alz.13769>

**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>

**\* Earnest, T.**, Yang, B., Kothapalli, D., Sotiras, A., & Initiative, A. D. N. (2024). Comprehensive evaluation of AT (N) imaging biomarkers for predicting cognition. *medRxiv*, 2024–11.

\* 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>

Lenzini, P., **Earnest, T.**, Ha, S. M., Bani, A., Sotiras, A., & Bijsterbosch, J. (2023). Morphological Versus Functional Network Organization: A Comparison Between Structural Covariance Networks and Probabilistic Functional Modes. In A. Abdulkadir, D. R. Bathula, N. C. Dvornek, S. T. Govindarajan, M. Habes, V. Kumar, E. Leonardsen, T. Wolfers, & Y. Xiao (Eds.), *Machine Learning in Clinical Neuroimaging* (pp. 163–172). Springer Nature Switzerland. <https://doi.org/10.1007/978-3-031-44858-4_16>

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. (2024). Using machine learning to derive neurobiological subtypes of general psychopathology in late childhood. *Journal of Psychopathology and Clinical Science*, *133*(8), 647.

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>

Yang, B., **Earnest, T.**, Kumar, S., Kothapalli, D., Benzinger, T., Gordon, B., & Sotiras, A. (2024). Evaluation of ComBat Harmonization for Reducing Across-Tracer Differences in Regional Amyloid PET Analyses. *Human Brain Mapping*, *45*(16), e70068.

**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**

* American Journal of Neuroradiology
* Imaging Neuroscience (2x)

**TEACHING EXPERIENCE**

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

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

**AWARDS**

* American Journal of Neuroradiology Academy of Reviewers (2024): Exemplary example of peer review shared for potential reviewers
* 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: abagen, langchain, matplotlib, neuromaps, nibabel, nilearn, numpy, pandas, PyQT, scikit-image, scikit-learn, scipy, seaboarn, statsmodels, streamlit
  + Applications: data science, machine learning, deep learning, data visualization, interactive visualizations, graphical user interfaces, packaging, documentation, neuroimaging, data wrangling, open-source software development
* R (proficient)
  + Packages: anticlust, dplyr, ggplot2, ggseg, mclust, lme4, stringr, survival, tidyverse
  + Applications: data science, statistical analysis, regression, data visualization, data wrangling, neuroimaging
* Bash (experienced):
  + Applications: neuroimaging, high performance computing, scripting
* MATLAB (familiar):
  + Applications: optimization, unsupervised machine learning

**Open-source projects**

* [seedir](https://github.com/earnestt1234/seedir): A Python package for creating, editing, and reading folder tree diagrams
* [nifti-overlay](https://github.com/earnestt1234/nifti_overlay): Program for creating tiled images of volumetric neuroimaging data
* [FED3VIZ](https://github.com/earnestt1234/FED3_Viz) / [fed3](https://github.com/earnestt1234/fed3): Software for analyzing data from open-source rodent experimentation devices
* [wubwub](https://github.com/earnestt1234/wubwub): Create mini sequencer music with Python
* [cargoat](https://github.com/earnestt1234/cargoat): Custom Monty Hall problem simulations in Python

**Software**

* Automated text extraction (Amazon Textract)
* Data visualization (Graphpad Prism, Microsoft Office)
* High performance computing (AWS EC2, AWS S3, Domino Data Lab, SLURM)
* Large Language Models (Amazon Bedrock)
* Neuroimaging (FSL, ANTs, FreeSurfer)
* Presentation and publication (Microsoft Office, Latex, Marp, Typora)
* Project Management (Trello, Miro, Microsoft Office)
* Statistical analysis (SPSS)
* Version control (Git/GitHub)