CHARLIE BURTON

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EDUCATION

PhD Student, Physics — Present
Northwestern University, Evanston, IL, USA

AB Physics, AB Neuroscience — May 2022
Earlham College, Richmond, IN, USA
3.81 Cumulative GPA with College Honors

RESEARCH INTERESTS

Using statistical physics, network science, and information theory to explore structure/function relations in complex systems.

RESEARCH EXPERIENCE

Research Analyst — Jun 2023 – Jun 2024
Territo Lab, Stark Neuroscience Research Institute, Indiana University School of Medicine, Indianapolis, IN
- Built novel tools for the analysis of PET images in a network neuroscience context such as region enrichment analysis, an analysis parallel to gene set enrichment analysis used to determine functional properties in covariance networks of PET images
- Assisted in the data collection, analysis, and publication novel preclinical research into the metabolic and perfusion network dynamics of transgenic/genetically modified models of Alzheimer's Disease
- Mentored two (summer 2023) undergraduate students and one (current) master's student on image and data analysis projects (connectomic analysis and multidimensional uncoupling analysis, respectively)
- Continued responsibilities of role below

***Skills acquired**: expertise in SPSS, MATLAB, Python, network neuroscience, applied graph theory, statistical inference, mentorship*

Laboratory Research Assistant — Jun 2022 – Jun 2023
Territo Lab, Stark Neuroscience Research Institute, Indiana University School of Medicine, Indianapolis, IN
- Co-ran tracer modeling, image validation components of Territo Lab research under Dr. Paul Territo
- Assisted in mapping imaging data into brain atlas space, dimensionality reduction and analysis of imaging data
- Developed novel multi-plex image quantification methods to maximize efficiency and output data towards translational modeling of Alzheimer's Disease
- Developed workflows to maintain consistent experimental and statistical methods, reduce error

***Skills acquired**: proficiency in SPSS, MATLAB, autoradiography, immunohistochemistry, immunofluorescence, animal research, pharmacokinetics/dynamics, connectomics, biological modeling*

TEACHING EXPERIENCE

Computational Neuroscience Independent Study — Feb 2022 – May 2022
Earlham College, Richmond, IN
- Created and carried out an independent study on the history and current applications of computational neuroscience
- Read classical and contemporary papers on computational and mathematical neuroscience
- Proposed a neural network based on the Hebbian feedback design

***Skills acquired**: academic literacy, curricular design, mathematical modeling, development/improvement of Python and MATLAB languages*

Teacher's Assistant Sep 2020 – Dec 2021

Earlham College Department of Physics and Astronomy, Richmond, IN

- Assisted in lab components of PHYS 120/125 and PHYS 230/235
- Hosted tutoring hours for students with homework and lab report questions
- Aided professors in development of the curriculum, manuals, and apparatuses for physics students in lab sections
- Graded lab reports

***Skills acquired**: teaching, problem-solving, conflict-resolution, pedagogical development*

PUBLICATIONS

Kotredes KP, Pandey RS, Persohn S, et al. Characterizing molecular and synaptic signatures in mouse models of late-onset Alzheimer's disease independent of amyloid and tau pathology. *Alzheimer's Dement*. 2024; 20: 4126–4146. https://doi.org/10.1002/alz.13828

Chumin EJ, Burton CP, Silvola R, et al. Brain metabolic network covariance and aging in a mouse model of Alzheimer's disease. *Alzheimer's Dement*. 2024; 20: 1538–1549. https://doi.org/10.1002/alz.13538

Onos KD, Lin PB, Pandey RS, et al. Assessment of neurovascular uncoupling: *APOE* status is a key driver of early metabolic and vascular dysfunction. *Alzheimer's Dement*. 2024; 20: 4951–4969. https://doi.org/10.1002/alz.13842

Burton CP, Chumin EJ, Collins AY, Persohn SA, Onos KD, Pandey RS, Quinney SK and Territo PR (2024) Levetiracetam modulates brain metabolic networks and transcriptomic signatures in the 5XFAD mouse model of Alzheimer's disease. *Front. Neurosci*. 17:1336026. doi: 10.3389/fnins.2023.1336026

J. A. K. Chong Chie, S. C. Persohn, E. W. Miner, C. P. Burton, P. Salama and P. R. Territo, "Total Variation Based 2D Image Registration of Post-Mortem Mouse Brain Images," 2024 IEEE International Symposium on Biomedical Imaging (ISBI), Athens, Greece, 2024, pp. 1-4, doi: 10.1109/ISBI56570.2024.10635196.

For the most updated list, please use Google Scholar or search "CP Burton" in Google Scholar.

PRESENTATIONS AND POSTERS

World Molecular Imaging Congress, "Application of Neurovascular Uncoupling and Whole Brain Network Connectomics to Assess the Role of Genetic and Dietary Risk Factors in the LOAD2 Mouse Model.", 2023.

Preclinical Imaging Consortium, "Assessing the risk potential of ABCA7*A1527G in a novel mouse model of late-onset Alzheimer's Disease.", 2023.

Neuroscience Senior Research Presentation, "Short-term Effects of MBSR on Psychological and Physiological Well-Being," Earlham College Department of Neuroscience, 2021.

Commencement of the Class of 2022 Speaker, Earlham College, 2022.

Presentation of Learning, "Natural History of the American Southeast," Earlham College Biology Colloquium, 2022.

COMPUTER SKILLS

Programming: Python, R, MATLAB, Mathematica

Applications: MATLAB, R Studio, JASP, Neuron, ImageJ (FIJI), SPSS, Wolfram, Microsoft Excel, Microsoft Word, MCID, QuPath, Nutil, QuickNII, Ilastik, Dedoose

HONORS AND AWARDS

George Van Dyke Distinguished Student in Physics Award 2022
- Presented to a graduating senior who showed excellence in physics throughout their undergraduate study

Charles A. Frueuaff Award 2021
- Presented to a student in the natural sciences who displayed exceptional creativity in their work

21st Century Scholarship 2018-22
- Awarded by maintaining high academic standing in high school and college

LEADERSHIP POSITIONS AND EXTRACURRICULAR INVOLVEMENT

Earlham College Society of Physics Students Member/Convener	2019-22
Earlham College Ultimate Frisbee Member/Captain	2018-22
Earlham College Outdoor Education House Co-Convener	2021-22
Earlham College Student Government Senator (two terms)	2019-21
Earlham College COSMOS Astrophysics Club Member	2019-21