

# CHARLIE BURTON

Chicago, IL, 60626 | +12607500846 | cpb@u.northwestern.edu | linkedin.com/in/cpatb

## EDUCATION

---

Doctoral Candidate, Physics and Complex Systems  
Northwestern University, Evanston, IL, USA

Present

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

May 2022

## 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*

- Build novel tools for the analysis of PET images in a network neuroscience context such as region-wise enrichment analysis, an analysis parallel to gene set enrichment analysis used to determine functional properties in covariance networks of PET images
- Assist 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
- Mentor two (summer 2023) undergraduate students and one (current) master's student on image and data analysis projects (connectomic analysis and multidimensional uncoupling analysis, respectively)
- Continue 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

### Industrial Engineering Research Intern

Dec 2021

*American Sealants, Inc., Fort Wayne, IN*

- Investigated issues in the homogeneity of silicon mixing and batching and proposed physics-backed solutions
- Investigated spatial optimization of floor layout in the mixing section of the factory

**Skills acquired:** hands-on engineering, problem solving, industrial workflows

### Remote Research Intern

Jun 2021 – Aug 2021

*Indiana University School of Medicine, Indianapolis, IN*

- Aided in metacognition research under Dr. Margaret McNulty and Andrew Cale investigating the effects of "bootcamp" courses on educational outcomes of first and second-year medical students

- Conducted thematic analysis on a range of qualitative data in Dedoose, analyzed each sample critically

**Skills acquired:** qualitative data analysis, Dedoose, experimental research analysis

### **Cell Physiology Laboratory Researcher**

Aug 2019 – Dec 2019

Earlham College, Richmond, IN

- Tested the effects of simulated predation on the expression of HSP70 in *Manduca sexta*

- Gained proficiency in wet lab research methods and data analysis

**Skills acquired:** gel electrophoresis, PCR processing, micropipetting, Bradford assay, data analysis

### **Binaural Beats Project Leader**

Sep 2019 – Dec 2019

Earlham College, Richmond, IN

- Engaged in a mock-research study on the effects of beta-frequency binaural beats on participants' accuracy, duration, and confidence in a traditional test-taking environment

- Conducted data analysis in R and determined no statistical significance between groups

**Skills acquired:** experimental research analysis, R, study design, scientific method

## **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**

---

[See Google Scholar](#)

<https://orcid.org/0009-0001-3770-2204>

## **PRESENTATIONS AND POSTERS**

---

**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, SPSS Syntax

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

---

## HONORS AND AWARDS

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

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

<b>21<sup>st</sup> Century Scholarship</b>	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