Christian Howell

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EDUCATION

BS, Applied and Computational Mathematics Emphasis   **Aug 2019 – Jun 2023**
Brigham Young University   *Provo, UT*

- Physics concentration
- Minor: Japanese
- Relevant Coursework
    - Linear Algebra
    - Multivariable Calculus
    - Differential Equations
    - Modeling Dynamical Systems
    - Algorithms, Approximation, Optimization
    - Advanced Probability
    - Real and Complex Analysis
    - Mathematical Cryptography
    - Physics: Newtonian, Lagrangian Mechanics
    - Physics: Waves and Optics
    - Physics: Electricity and Magnetism
    - Physics: Relativity, Quantum Mechanics

EXPERIENCE

Machine Learning Engineer   **Aug 2024 – Now**
MetaSource, LLC   *Draper, UT (Remote)*

- Automating the classification of dozens of document types using Microsoft Azure, keyword searches, and NLP models
- Building software program to extract specific details from legal documents and record that information in a useful way
- Optimizing pre-existing code base that performs full-page OCR to accelerate the process of digitizing clients' data

Research and Development Intern   **May 2024 – Aug 2024**
Applied Research Laboratory at Pennsylvania State University   *University Park, PA*

- Utilized time difference of arrival (TDOA) positioning techniques to estimate signal source locations using simulated data
- Evaluated performance of machine learning and deep learning models aimed at reducing required time to perform TDOA
- Presented outcomes in biweekly meetings with chief R&D engineers in the United States Navy

Transportation and Power Systems Intern   **Aug 2023 – Dec 2023**
Argonne National Laboratory   *Lemont, IL*

- Applied machine learning techniques using sklearn to model power consumption of 2013 Scion iQ electric vehicles
- Reduced noise in vehicle data collected from a chassis dynamometer by smoothing it with a Kalman filter
- Visualized signals including battery voltage and state of charge broadcast to and from the CAN bus using Bokeh and Matplotlib
- Analyzed braking trajectories to find most energy efficient way for autonomous vehicles to approach intersections
- Implemented statistical approaches to decode data encoded by vehicle manufacturers and broadcast via CAN bus

Research Assistant | Spectral Twins   **Aug 2022 – Jun 2023**
Brigham Young University   *Provo, UT*

- Wrote Python programs using NumPy and SciPy to determine the cospectral twins of nodes in a graph
- Analyzed various real world networks to examine potential physical interpretations of cospectrality

Research Assistant | Unicyclic Graphs   **Jan 2021 – Aug 2022**
Brigham Young University   *Provo, UT*

- Studied relationship between unicyclic graph representations and the inertia of squared distance matrices
- Proved direct correlation between number of negative eigenvalues of unicyclic graphs and number of attached leaf nodes
- Authored and published a paper containing results in the Electronic Journal of Linear Algebra

Research Intern   **May 2022 – Aug 2022**
Autonomy Technology Research Center   *Dayton, OH (Remote)*

- Conducted research on confidence measures for artificial neural networks
- Integrated and evaluated models into test framework, including VGG-16 and ResNet-50
- Implemented and characterized multiple confidence estimators over multiple datasets
- Communicated results in oral and written form to AFRL research seminar

TECHNICAL SKILLS

Programming Tools: Python (NumPy, SciPy, pandas, Matplotlib, Bokeh, sklearn), LaTeX, Linux, Mathematica, SQL, Microsoft Azure
Concepts: Graph Theory, Numerical Linear Algebra, Singular Value Decomposition, Bayesian Statistics, Gradient Descent, Machine Learning, Decision Trees and Random Forests, Data Structures, Kalman Filter, Information Theory, Fourier Analysis, Simplex Method

Publication

Christian Howell, Mark Kempton, Kellon Sandall, and John Sinkovic. Unicyclic graphs and the inertia of the squared distance matrix. *Electronic Journal of Linear Algebra*, 39, 2023.

Conferences and Posters

"*Validating Machine Learning Predictions of Time Difference of Arrival Geolocation Techniques*," Applied Research Laboratory at Penn State University SOAR Internship Poster Symposium, July 2024

"*Intercepting vehicle communication data and analyzing braking trajectories of autonomous vehicles*," Argonne National Laboratory Research Internship Poster Presentation, December 2023

"*Approximate spectral twins*," Brigham Young University Student Research Conference, March 2023

"*Distance squared matrices of unicyclic graphs*," Joint Mathematics Meeting, January 2023

"*Distance squared matrices of unicyclic graphs*," American Mathematical Society Fall Western Sectional Meeting, October 2022

"*Unicyclic graphs and distance squared matrices*," Brigham Young University Student Research Conference, March 2022

"*Distance squared matrices of unicyclic graphs*," Brigham Young University Student Research Conference, March 2021

Projects

Recipe Recommendation Algorithm
- Implementing web crawling and web scraping to collect recipe information from allowable websites using Beautiful Soup
- Utilizing object oriented programming in Python to create and manage dataset containing recipe information
- Developing algorithm using logistic regression to classify recipes and recommend them to users based on prior likes and dislikes

Magnetic Reconnection Event Classifier | *NASA Space Apps 2023*
- Cleaned and processed data downloaded from NASA's OMNIWeb database using pandas to perform data analysis
- Utilized publicly available data related to earth's magnetic field obtained from multiple spacecraft to classify potential magnetic reconnection events
- Prepared and exhibited visual presentation of project results to panel of judges and NASA Space Apps participants

Modeling Crowd Control | *ACME 2022*
- Performed literature review of crowd control modeling to compare mathematical and computational simulation techniques
- Adapted SIR model to build a mathematical model of crowd movement into and out of a room with several layouts
- Collaborated with a group of four students to develop and visualize Python models based on generated systems of equations