

Tyler James Burch

DATA ANALYSIS, MACHINE LEARNING, BAYESIAN STATISTICS, PERFORMANCE COMPUTING

☎ (618) 210-2081 | ✉ burcht11@gmail.com | 🏠 tylerjamesburch.com | 🔗 tjburch | in tylerjburch

Experience

Boston Red Sox

Boston, MA

SENIOR DATA ANALYST

January 2021 - Present

- Contributor to Player Evaluation domain of analytics, working on forecasting models to project player performance, leveraged in decision-making process for major league contracts and trades.
- Former member of baseball sciences arm of analytics department, leveraging 300 FPS markerless motion capture data to better understand batting.
- Built simulation to quantify batter timing and swing quality incorporating physics domain knowledge. Outputs used in regression models fit with **brms** to create key performance indicators (KPIs) by which batters are measured organization-wide.
- Modernized several core models integral to day-to-day operations. Specific ownership of a model predicting batted ball outcome from hit kinematics, which has outputs that are leveraged in nearly every analytics project.

Argonne National Laboratory

Lemont, IL

POSTDOCTORAL APPOINTEE - PARTICLE PHYSICS SIMULATION WITH MACHINE LEARNING ON EXASCALE SUPERCOMPUTERS

May 2020 - Present

- Studied Bayesian uncertainty quantification methods in machine learning models used in particle physics object identification. Proof-of-concept Bayesian neural network and MC Dropout network fit using **PyTorch**.
- Adapting particle physics simulation software (**MadGraph**) to Intel's OneAPI for use on the first US exascale supercomputer.

Northern Illinois University

DeKalb, Illinois

GRADUATE RESEARCH ASSISTANT

May 2015 - March 2020

- Analyzer searching for Higgs boson pair production, an exceedingly rare physics process, in one of the world's largest datasets collected via the ATLAS detector on the Large Hadron Collider
 - Generated simulation of previously unstudied particle physics processes and detector effects using Monte Carlo techniques.
 - Employed an XGBoost multiclassifier to identify candidate signal events, ultimately improving projected significance by 10%.
- Built a classifier to identify detector signatures coming from photons based on their topology, ultimately showing up to a 25% improvement in background rejection over previous methods.
- Research mentor of 3 undergraduate physics students, instructor of two undergraduate general physics laboratory courses.

Skills

Programming Languages Python, Julia, R, SQL, C++

Libraries and Frameworks PyData Stack (Numpy, Pandas, Scikit-Learn, etc.), misc. modeling libraries (XGBoost, LightGBM, Torch, Keras, etc.), Probabilistic Programming Languages (PyMC, Stan)

Computing and software Git, SVN, \LaTeX , JIRA, VSCode, Emacs, Bash, Microsoft Office, Quarto

Education

Northern Illinois University

DeKalb, IL

DOCTOR OF PHILOSOPHY

August 2014 - March 2020

- **Thesis** - A search for resonant and non-resonant di-Higgs production in the $\gamma\gamma b\bar{b}$ channel using the ATLAS Detector
- **CERN (European Organization for Nuclear Research)**, Geneva, Switzerland — April 2017 - August 2018

Murray State University

Murray, KY

BACHELOR OF SCIENCE, CUM LAUDE - PHYSICS MAJOR, MATH AND MUSIC MINORS

August 2011 - May 2014

Awards

DOE Office of Science Graduate Student Research (SCGSR) Fellowship

Lemont, Illinois

PROPOSAL: UTILIZING MACHINE LEARNING CLASSIFIERS FOR PHOTON IDENTIFICATION

September 2018 - August 2019

Publications & Talks

Phenomenology Symposium (PHENO) 2019

University of Pittsburgh

ATLAS SEARCHES FOR VH/HH RESONANCES

Invited Talk - May 6, 2019

Search for Higgs boson pair production in the $\gamma\gamma b\bar{b}$ final state with 13 TeV pp collision data collected by the ATLAS experiment

J. HIGH ENERG. PHYS. (2018) 2018: 40.

Publication - November 7, 2018

400 publications as a member of the ATLAS Collaboration, January 2017 to February 2022.