

# JACKSON WALTERS

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*Skilled machine learning professional with a background in research mathematics and scientific programming.*

## WORK EXPERIENCE

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### Managing Member

Jackson Walters, LLC

Nov 2022 – Present

Washington, DC

- Performed math research and contributed pull requests for SageMath regarding the unitary and modular discrete Fourier transform of the symmetric group over finite fields
- Prototyped encrypted messaging web/iOS app using lattice-based cryptography methods (ring-LWE, module-LWE) in Python + SQL + PHP on Ubuntu/nginx webserver and Swift
- Prototyped webapp in node.js + postgresql + javascript to display events on a Leaflet map on Ubuntu/nginx webserver
- Tutored students in math from middle school, high school, to adult learners
- Consult to determine appropriate sigmoid function for complex-valued neural network
- Consult for InGo, Inc. to determine appropriate tool for dense graph embeddings (variational autoencoders)

### QA Engineer

Power Auctions, LLC

Oct 2020 – Jan 2021

Washington, DC

- Performed testing for FCC auction 107, the 5G wireless license auction. Closed at 80bil (clock) + 300mil (combinatorial)
- Generated bid data with extreme mean and std. dev., revealing subtle bugs in MILP solver. Fixed bugs, wrote CI tests
- Wrote and presented white paper regarding floating point issues in Gurobi, an industrial optimization solver

### Teaching Fellow

Boston University

Aug 2013 – May 2019

Boston, MA

- Conducted five undergrad math discussions each semester and taught four full courses during summers sessions
- Performed math research resulting in two publications in top journals
- Presented research at conferences and retreats (BU-KEIO)
- Mentored undergraduate student in reading course for machine learning
- Wrote recommendation letters for students (all were accepted)

## PROJECTS

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**operations-research** | <https://github.com/jacksonwalters/operations-research>

Oct 2024

- Optimization examples in Python using Gurobi and cvxpy, building on skills gained at Power Auctions, LLC

**open-encrypt** | <https://github.com/jacksonwalters/open-encrypt>

Sep 2024

- Encrypted messaging webapp prototype using latticed-based methods (ring-LWE, module-LWE) in Python+PHP+SQL
- Implements public key encryption system allowing user to generate public/secret key pairs, send messages, and stores messages encrypted on server

**natural-language-processing** | <https://github.com/jacksonwalters/natural-language-processing>

Sep 2024

- Binary sentence classification via CNN/RNN on Biden/Trump tweets
- Text summarization via Glove embeddings, cosine similarity matrix, and pagerank
- Sentiment analysis via logistic regression
- Keyword extraction via TF-IDF
- Hate speech detection using SGDClassifier
- Next word prediction using Keras/TF
- Spam detection using SMS data, CountVectorizer (bag-of-words), and Multinomial Naive Bayes
- Text classification, part 2 using TF/Keras, IMDB reviews for positive/negative sentiment
- Spelling correction using TextBlob
- Named entity recognition via LSTM (could not train on M1)
- Twitter sentiment analysis, part II. Use Naive Bayes sentiment classifier trained on positive/negative labeled tweets
- Topic modeling using doc2vec embeddings, k-means clustering, TF-IDF scores to label clusters with topic

**cryptography** | <https://github.com/jacksonwalters/cryptography>

Aug 2024

- Cryptography in Python including elliptic curves and lattice-base methods (NTRU, ring-LWE, module-LWE)

**machine-learning** | <https://github.com/jacksonwalters/machine-learning>

Mar 2024

- Used SAMHSA mental health client-level data to produce novel t-SNE plots with k-means labeling
- Clustering based on both life factors and mental health diagnoses reveals slight correlation
- Projects associated to IBM ML Professional Certificate
- Enefit prosumers Kaggle competition models including XGBoost, sklearn models, CNNs

**scotus-v-public** | <https://github.com/jacksonwalters/scotus-v-public>

Feb 2021

- Used tf-idf on SCOTUS opinion corpus and public opinion questions to enable keyword search
- Used binary classifier on public opinion questions to determine political polarity over time
- Plotted linear regression in Flask webapp

## PUBLICATIONS

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- Advances in Mathematics** | Volume 386, 107799. Toroidal prefactorization algebras associated to holomorphic fibrations and a relationship to vertex algebras *Aug 2021*
- Annals of Statistics** | Volume 48, Number 1 (2020), 514-538. Averages of Unlabeled Networks: Geometric Characterization and Asymptotic Behavior *Feb 2020*
- arXiv Preprint** | The Modular DFT of the Symmetric Group [<https://arxiv.org/abs/2404.05796>] *Apr 2024*

## EDUCATION

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- Doctorate of Philosophy in Mathematics** *May 2019*  
Boston University
- Certificate of Completion** *Aug 2018*  
The Data Incubator
- Bachelor of Science in Mathematics, Physics. Minor in Computer Science** *May 2013*  
Virginia Tech
- Study Abroad** *July 2011*  
Victoria University of Wellington

## CERTIFICATIONS

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- Machine Learning Professional** | IBM *Mar. 2024*
- Advanced Data Science Specialization** | IBM *May 2024*
- Rust Fundamentals** | Duke University *May 2024*

## SKILLS (1-5)

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|----------------|-------------------|-------------------|------------------------|
| - Python (4)   | - SageMath (5)    | - LaTeX (3)       | - Machine Learning (4) |
| - PHP (3)      | - Mathematica (4) | - Ubuntu/Unix (3) | - NLP (3)              |
| - Java/C++ (2) | - MATLAB (3)      | - SQL (2)         | - Cryptography (3)     |