ALEXANDER WOOD

Research Fellow

Ann Arbor, MI

[redacted]

[see website]

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WHO AM I?

Committed to research, design, & development of computational solutions to challenging problems. Working to use machine learning and advanced mathematics in collaboration with interdisciplinary teams in order to develop efficient and effective commercial products.

EXPERIENCE

10/2018 – Present **Research Fellow**
5/2017 – 9/2018 **Research Scientist**   **Biomedical & Clinical Informatics Lab, University of Michigan**

- Implemented fully homomorphic encryption for privacy-preserving classification tasks in collaboration with psychology professors at the University of York on a grant awarded by the Centre for Future Health
- Designed and developed a pipeline for X-ray angiogram analysis using machine learning, differential geometry, and image processing
- Collaborated within a large team of clinicians, engineers, mathematicians, and business professionals
- Project lead on the Polytrauma Decision Support System and the AngioAid project
- Designed and created a database consolidating over 500,000 health records and waveforms from 6 independent sources into one cohesive data repository
- Coordinated a group of talented graduate and undergraduate students

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Python  /  C++  /  Matlab  /  LaTeX  /  Mathematica  /  Git  /  SQL
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2014 – 2017
part time
Adjunct Lecturer   **New York University, John Jay College of Criminal Justice, NYC College of Technology**
Designed and taught courses utilizing experiential and collaborative learning techniques. Mentored undergraduate students in a one-on-one capacity. Courses taught include:

- **Python for Engineering** - New York University
- **Cryptography and Cryptanalysis** - John Jay College of Criminal Justice
- **Calculus** - New York University
- **Introduction To Algorithmic Thinking with Python** - New York City College of Technology

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Python  /  C++
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EDUCATION

2018   **Doctor of Philosophy**   **Department of Computer Science, The Graduate Center of the City University of New York**
Doctoral thesis covered the application of fully homomorphic encryption to privacy-preserving machine learning classification tasks.

- Designed and developed algorithms for efficient privacy-preserving classification of sensitive medical data via machine learning models.
- Translated high-level mathematical cryptographic protocols into efficient, implementable algorithms
- Developed a fully homomorphic encryption library in C++ using object-oriented paradigms
- Served as elected representative on the Doctoral Students Council and Graduate Council and chairperson of Computer Science Students' Association

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C++  /  Python  /  LaTeX  /  Git
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2017	**Master of Philosophy** Department of Computer Science, The Graduate Center of the City University of New York

Capstone project on the algorithmic complexity of cryptanalytic attacks on various non-commutative group-based cryptosystems.

- Passed 3 qualification requirement fields: Algorithms and Theory; Artificial Intelligence; and System and Computational Science
- Course projects include:
  - Presentation on weighted-threshold secret sharing schemes
  - Presentation on cryptographic add-ons for BitCoin
  - Designing and implementing mixed-type tables in SQL
  - Implementation and analysis of machine learning methods for high-dimensional data in C++.

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C++ / Python / LaTeX / SQL / Mathematica / Git
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2015	**Master of Science, with Distinction** Department of Mathematics, DePaul University

- Passed qualification exams in Abstract Algebra, Algebraic Topology, Real & Complex Analysis

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LaTeX / Mathematica
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2012	**Bachelor of Arts, Summa Cum Laude** Department of Mathematics, DePaul University

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Mathematica / Java / LaTeX
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SELECTED PUBLICATIONS

2019	**Private Membership Querying Via Private-Key Fully Homomorphic Encryption** Submitted

A. Wood, K. Najarian, D. Kahrobaei

2019	**A Survey on Homomorphic Encryption for Private Machine Learning in Medicine & Bioinformatics** Submitted

A. Wood, K. Najarian, D. Kahrobaei

2019	**Private Naive Bayes Classification of Personal Biomedical Data: Application in Cancer Data Analysis.** Computers in Biology and Medicine

A. Wood, V. Shpilrain, K. Najarian, D. Kahrobaei

2018	**Private-Key Fully Homomorphic Encryption for Privacy-Preserving Classification of Medical Data** Doctoral thesis, The Graduate Center, CUNY

A. Wood

2018	**Fully Automated Spleen Localization and Segmentation Using Machine Learning and 3D Active Contours** Proceedings of the 40th IEEE Engineering in Medicine and Biology Society Conference

A. Wood, S.M.R. Soroushmehr, N. Farzaneh, K. Ward, D. Fessell, J. Gryak, K. Najarian

2018	**Automated Kidney Segmentation for Traumatic Injured Patients through Ensemble Learning and Active Contours** Proceedings of the 40th IEEE Engineering in Medicine and Biology Society Conference

N. Farzaneh, S.M.R. Soroushmehr, H. Patel, A. Wood, J. Gryak, D. Fessell, K. Najarian

2018	**Supraventricular Tachycardia Detection via Machine Learning Algorithms** Proceedings of the IEEE International Conference on Bioinformatics and Biomedicine (BIBM)

Z. Li, H. Derksen, J.Gryak, M. Hooshmand, A. Wood, H. Ghanbari, P. Gunaratne, K. Najarian

2018	**Private-Key Fully Homomorphic Encryption for Private Classification** Mathematical Software – ICMS 2018

A. Wood, V. Shpilrain, K. Najarian, A. Mostashari, D. Kahrobaei

LANGUAGES

English - native
Japanese - rudimentary
Klingon - Qapla'!

HOBBIES

I love science fiction and dogs. I designed and co-organized the first ever LGBTQ panel at an official Star Trek convention in 2016.

NON PROFIT

I volunteer my time as a math & physics tutor for public school students in Ypsilanti, Michigan.