FRANCESCA FALZON

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EDUCATION

University of Chicago — **Chicago, IL, USA**
Ph.D. Computer Science — *September 2020 - June 2023 (Expected)*
- Advisors: Roberto Tamassia and Janos Simon

University of Chicago — **Chicago, IL, USA**
M.S. Computer Science, GPA: 3.884 / 4.0 — *October 2018 - August 2020*
- Thesis: *"Full Database Reconstruction in Two Dimensions"*
- Advisor: David Cash

Rutgers University — **New Brunswick, NJ, USA**
B.A. Mathematics, GPA: 3.903 / 4.0 — *September 2013 - May 2017*
- Summa Cum Laude, Phi Beta Kappa.

RESEARCH AND PROFESSIONAL EXPERIENCE

Brown University — **Providence, RD, USA**
Visiting Reasearch Fellow — *October 2021 to Present*
- Working on encrypted databases under the guidance of Prof. Roberto Tamassia.
- Designing schemes that support multi-dimensional range queries with a sliding scale of trade-offs with respect to security, storage overhead, and bandwidth.

ETH Zürich — **Zürich, Switzerland**
Visiting Student — *June 2021 to September 2021*
- Designed and analyzed leakage-abuse attacks on encrypted graph database schemes that support shortest path queries under the guidance of Prof. Kenneth Paterson.

University of Chicago — **Chicago, IL, USA**
Graduate Research Assistant — *October 2018 to May 2021*
- Designed and deployed a number of database reconstruction attacks from the leakage of range queries over multi-attribute encrypted data. These attacks include both full and approximate database reconstruction; the results can be found here. and here.
- Developed new dynamic encrypted multi-map (EMM) schemes that hide the number of records returned upon each query.

Rutgers University — **New Brunswick, NJ, USA**
Undergraduate Research Assistant — *September 2017 to October 2018*
- Studied collections of sets and their graph representations utilizing tools from combinatorics.
- Formalized the notion of a region graph with the goal of developing scalable, interactive graph-exploration tools.

Lehman College CUNY — **New York, NY, USA**
REU Participant — *September 2016 to October 2017*
- Sought an efficient algorithm for finding the closure of a given set of rooted triples.
- Chosen through a competitive selection process and awarded a stipend of $5000. Supported by the NSF.

PUBLICATIONS AND PREPRINTS

- **Francesca Falzon**, Kenneth G. Paterson. An Efficient Query Recovery Attack Against a Graph Encryption Scheme from ASIA CCS 2021 (Under Review, manuscript available upon request).
- **Francesca Falzon**[*], Evangelia Anna Markatou[*], Zachary Espiritu, Roberto Tamassia. Encrypted Range Search in Multiple Dimensions (Under Review, manuscript available upon request).
- Evangelia Anna Markatou[*], **Francesca Falzon**[*], William Schor, Roberto Tamassia. Reconstructing with Less: Leakage Abuse Attacks in Two-Dimensions. *In Proceedings of the ACM SIGSAC Conference on Computer and Communications Security*. Virtual, South Korea, November 2021. [PDF]
- **Francesca Falzon**[*], Evangelia Anna Markatou[*], Akshima, David Cash, Adam Rivkin, Jesse Stern, Roberto Tamassia. Full Database Reconstruction Attack in Two-Dimensions. *In Proceedings of the ACM SIGSAC Conference on Computer and Communications Security*. Virtual, USA, November 2020. [PDF] This conference publication combines and extends this and this.

INVITED TALKS AND PRESENTATIONS

- *Full Database Reconstruction in Two-Dimensions (Invited talk)*. Microsoft Research Redmond Cryptography Colloquium. Virtual, USA. November 24, 2020.
- *Multi-dimensional database reconstruction (Poster talk)*. 7th Midwest Security Workshop. Chicago, IL. April 2019.
- *On the Complexity of the Rooted Triples Problem (Oral talk)*. Special Session on Mathematical Phylogenetics, American Mathematical Society Sectional Meeting. New York, NY. May 2017.

[*] Indicates that authors contributed equally and are listed in alphabetical or reverse-alphabetical order, respectively.

TA EXPERIENCE

- MPCS Algorithms, University of Chicago. Spring 2021.
- MPCS Foundations of Computational Data Analysis, University of Chicago. Winter 2021.
- MPCS Discrete Math, University of Chicago. Autumn 2020.
- MPCS Algorithms, University of Chicago. Spring 2020.
- Cryptography, University of Chicago. Autumn 2019.
- MPCS Mathematics for Computer Science and Data Analysis, University of Chicago. Winter 2019.
- Cryptography, University of Chicago. Autumn 2018.
- Discrete Mathematics High School Summer Camp, Rutgers University. Summer 2018.
- Learning Strategies & GRE Prep Academic Coach, Rutgers University. Spring 2018.
- Introduction to Proofs, Rutgers University. Spring 2017.
- Calculus II, Rutgers University. Spring 2016.

AWARDS

- Think Swiss Research Scholarship (CHF 4800). 2020.
- Armed Forces Communications and Electronics Association Ralph W. Shrader Diversity Scholarship ($3000). 2019.
- Rutgers University School of Arts and Sciences Excellence Scholarship ($1000). 2016.

VOLUNTEER AND OUTREACH

- ETH Zurich CS PhD Paint Night Social, (*Organizer*). November 2021.
- UChicago CS Ph.D. Student Social Events, (*Student Minister*). 2019 to 2020.
- UChicago CS Ph.D. Student Tea-time, (*Co-founder*, *Student Minister*). 2018 to 2019.
- CompilerHer @ UChicago: Middle School Student Outreach, (*Teacher for Computer Security Course*). April 2019.
- New Jersey Office of Homeland Security, (*Cybersecurity Analysis Intern*). January 2019 to April 2018.
- Princeton Splash: High School Student Outreach, (*Teacher for Cryptography*, *Intro to Mathematical Logic*). April 2018, April 2017.
- Rutgers Women in the Mathematical Sciences Club, (*Co-founder*, *President*). 2016 to 2017.
- Rutgers International Student Orientation, (*Volunteer Organizer*). 2015 to 2016.
- Trim Magazine: Rutgers' Student-run Fashion and Lifestyle Magazine, (*Creative Director*, *Editor*). 2015 to 2016.
- Permanent Mission of Malta to the United Nations, (*Advisory Intern*). 2015.

SKILLS

Technical Skills Python (Libraries: NetworkX, Matplotlib)
Survey Skills Qualtrics
Spoken Languages English (Native), Maltese (Native), Italian (B1)