Sahel Torkamani

Edinburgh, United Kingdom
(+44) (0) 7842 007409
s.torkamani@sms.ed.ac.uk
http://saheltorkamani.github.io

Research Interests

Differential Privacy, Machine Learning, Statistical Learning.

Education

2024– Ongoing **University of Edinburgh**,
PhD of Informatics: LFCS.
Foundations of Computer Science, Databases, Software & Systems Modelling. .

2019–2023 **Sharif University of Technology** ,
Bachelor of Applied Mathematics.
GPA – 3.7/4.

2013–2019 **Farzanegan 1 High-School** ,
Diploma in Physics and Mathematics Discipline,
National Organization for the Development of Exceptional Talent.

Research Projects

March 2022– September 2022 **Sparse MultiDecoder Recursive Projection Aggregation for Reed-Muller Codes**,
Marco Mondelli, Dorsa Fathollahi,
Reed-Muller codes are one of the oldest families of codes. Following Dorsa Fathollahi and Professor Marco Mondelli's previous paper , a sparse recursive projection aggregation (SRPA) decoder has been proposed, which achieves a performance that is close to the maximum likelihood decoder for short-length RM codes. In this project, we simulated an algorithm based on a **neural network** to lower the computational budget while keeping a performance close to that of the SRPA and RPA decoder by performing a better selection of projections in each sparsified decoder.

March 2021– October 2023 **Algorithms and Differential Privacy via Graphs** ,
Javad Ebrahimi, Parastoo Sadeghi, Rafael G. L. D'Oliveira, Muriel Médard,
In this project, we have generalized the previous framework for designing utility-optimal differentially private (DP) mechanisms via graphs in two main directions. First, we studied heterogeneous mechanisms where the partial mechanism can have different probability distributions at the boundary. Secondly, we studied a general heterogeneous privacy setting on neighboring datasets which provides different levels of privacy for each. Then, we extended a partial mechanism, which is only defined at the selected vertices set, to other datasets in the graph via the concept of the strongest induced DP condition in a computationally efficient and utility-optimal manner. .

Publications and Preprints

TPDP 2024 **Improved Counting under Continual Observation with Pure Differential Privacy (arxiv)**,
*Joel Daniel Andersson, Rasmus Pagh, **Sahel Torkamani**.*

JSAIT 2023 **Optimal Differential Privacy via Graphs (arxiv)**,
***Sahel Torkamani**, Javad B. Ebrahimi, Parastoo Sadeghi, Rafael G. L. D'Oliveira, Muriel Médard.*

ISIT 2022 **Heterogeneous Differential Privacy via Graphs (arxiv)**,
***Sahel Torkamani**, Javad B. Ebrahimi, Parastoo Sadeghi, Rafael G. L. D'Oliveira, Muriel Médard.*

Internships and Summer Schools

2022 **Internship on Channel Coding and Machine Learning**,
Supervisor: Marco Mondelli.
Research Internship at IST Austria

2017 **Iran's National Olympiad of Mathematics Summer Camp**,
for elite students winning a 3 round national competition.

2016 **Iran's National Olympiad of Mathematics Summer Camp**,
for elite students winning a 3 round national competition.

Honor and Awards

2019 **Awarded scholarship from the National Elites Foundation** .

2018 **National Silver Medal** , *Iranian Mathematics Olympiad*.

2017 **National and International Gold Ruler** , *Iranian Geometry Olympiad*, Advance Level.

2017 **National Silver Medal** , *Iranian Mathematics Olympiad*.

2016 **National Silver Ruler** , *Iranian Geometry Olympiad*, Medium Level.

2015 **National Gold and International Bronze Ruler** , *Iranian Geometry Olympiad*, Elementary Level.

Relevant Courses

Postgraduate Seminar on Computer Science (Differential Privacy) , Information Theory, Coding Theory, Statistical Inference
, Cryptography
Undergraduate Stochastic Processes, Probability and Applications, Statistics and Applications, Linear Algebra

Skills

- **Programming:** Java, R, Matlab, Python - **Frameworks:** PyTorch, NumPy, CUDA, Jupyter
- **Languages:** Persian (Native), English (IELTS Band Score 7, Toefl Overall Score 101)

Selected Projects

2022 **Trade-Offs in Information-Theoretic Multi-Party One-Way Key Agreement** .
Representing the corresponding book as the final project of the *Cryptography I* course.

2021 **From Error- Correcting codes through sphere packings to simple groups** .
Representing the first section of the corresponding book as the final project of the *Algebra I* course.

2020 **Programming multi-player Hearthstone game over the local network with Java** .
Using Multi-Threading and networking as the final project of the *Advanced Programming* course.

Lectures and Teaching Experience

Autumn 2023 **Information Theory** , *Teaching Assistant*,
Department of Mathematical Sciences, Sharif University of Technology.

Summer 2022 **Homogeneous and Heterogeneous Differential Privacy via Graphs**, *Lecturer*,
Institute of Science and Technology Austria (ISTA).

Summer 2022 **Sparse Multi-Decoder Recursive Projection Aggregation for Reed-Muller Codes with Neural Network Implementation**, *Lecturer*,
Institute of Science and Technology Austria (ISTA).

Autumn 2021 **Introduction to Coding Theory**, *Lecturer (video)*,
Department of Mathematical Sciences, Sharif University of Technology.

Autumn 2021 **Statistics and Applications** , *Teaching Assistant*,
Department of Mathematical Sciences, Sharif University of Technology.

Spring 2021 **Introduction to Algorithms and Python**, *Lecturer*,
Yasan Academy .

Spring 2020 **Algebra and Number Theory in Mathematics Olympiad**, *Lecturer*,
National Organization for Development of Exceptional Talents, Farzanegan 1 .

References

Professor Muriel Médard,
Cecil H. Green Professor,
Massachusetts Institute of Technology,
medard[at]mit.edu.

Professor Marco Mondelli,
Assistant Professor,
Institute of Science and Technology Austria,
marco.mondelli[at]ist.ac.at.

Professor Parastoo Sadeghi,
Professor,
University of New South Wales,
p.sadeghi[at]unsw.edu.au.

Professor Rafael G. L. D'Oliveira,
Assistant Professor,
Clemson University,
rdolive[at]clemson.edu.

Professor Javad Ebrahimi,
Assistant Professor,
Sharif University of Technology,
javad.ebrahimi[at]sharif.edu.