# Sahel Torkamani

Tehran, Iran
(+43) 665 65746207
torkamani.sahel@outlook.com
http://saheltorkamani.github.io

## Research Interests

**Differential Privacy, Coding theory, Information theory**.

## Education

2019–2023 **Sharif University of Technology** ,
*Bachelor of Applied Mathematics. GPA – 3.6/4*.

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

## Research Projects

March 2022–Ongoing **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–Ongoing **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. The problem is how to extend the mechanism, which is only defined at the selected vertices set, to other datasets in the graph in a computationally efficient and utility-optimal manner. We used the partial mechanism as a seed to optimally grow via the concept of the strongest induced DP condition. We showed that this can be done in polynomial time (in the size of the graph) .

## Publications and Preprints

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

(Preprint) **Suitable Pairs in Data Privacy**,
***Sahel Torkamani***, *Javad B. Ebrahimi, Parastoo Sadeghi, Rafael G. L. D'Oliveira, Muriel Médard*.

## Internships and Summer Schools

2022–Ongoing **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 Differential Privacy (Computer Science) Seminar , Information Theory, Coding Theory, Statistical Learning (Regression Analysis) , Cryptography I

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)

## 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.

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

## Lectures and Teaching Experience

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

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

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