CS-523

Advanced topics on privacy enhancing technologies

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Cursus	Sem.	Type
Computer and Communication Sciences		Opt.
Computer science	MA2, MA4	Opt.
Cyber security minor	E	Opt.
Cybersecurity	MA2, MA4	Obl.
Data Science	MA2, MA4	Opt.
SC master EPFL	MA2, MA4	Opt.

Language of teaching	English
Credits	8
Session	Summer
Semester	Spring
Exam	Written
Workload	240h
Weeks	14
Hours	**6 weekly**
Lecture	3 weekly
Exercises	1 weekly
Project	2 weekly
Number of positions	

Summary

This advanced course will provide students with the knowledge to tackle the design of privacy-preserving ICT systems. Students will learn about existing technologies to prect privacy, and how to evaluate the protection they provide.

Content

The course will cover the following topics :
- Privacy definitions and concepts
- Privacy-preserving cryptographics solutions : anonymous credentials, zero-knowledge proofs, secure multi-party computation, homomorphic encryption, Private information retrieval (PIR), Oblivious RAM (ORAM)
- Anonymization and data hiding : generalization, differential privacy, etc
- Machine learning and privacy
- Protection of metadata : anonymous communications systems, location privacy, censorpship resistance
- Online tracking and countermeasures
- Privacy engineering : design and evaluation (evaluation metrics and notions)
- Legal aspects of privacy

Keywords

Privacy, anonymity, homomorphic encryption, secure multi-paty computation, anonymous credentials, ethics

Learning Prerequisites

Required courses

COM-301 Computer security
COM-402 Information security and privacy

Recommended courses

COM-401 Cryptography and security

Important concepts to start the course

Basic programming skills; basics of probabilities and statistics; basics of cryptography

Learning Outcomes

By the end of the course, the student must be able to:

- Select appropriately privacy mechanisms

- Develop privacy technologies
- Assess / Evaluate privacy protection
- Reason about privacy concerns
- Select appropriately appropriately privacy mechanisms
- Develop privacy technologies
- Assess / Evaluate privacy protection
- Reason about privacy concerns

Teaching methods

Lectures and written exercises to deepen understanding of concepts
Programming-oriented assignments to practice use of privacy technologies

Expected student activities

Participation in the lectures. Active participation is encouraged.
Participation in exercise session and complete the exercises regularly
Completion of programming assignments

Assessment methods

Lab project (40%)
Midterm (20%)
Final exam (40%)

Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

Resources

Moodle Link

- https://go.epfl.ch/CS-523