Advanced topics on privacy enhancing technologies

CS-523

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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 protect 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, censorship 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-party 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 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