



INSTITUTE OF COMPUTER SCIENCES AND INFORMATION TECHNOLOGY (ICS/IT)
FACULTY OF MANAGEMENT AND COMPUTER SCIENCES
THE UNIVERSITY OF AGRICULTURE, PESHAWAR
KHYBER PAKHTUNKHWA PAKISTAN

Phone: +92-91-9221323, Ext: 3214, Email: dicsit@aup.edu.pk, Web: www.aup.edu.pk

Program: MS-Computer Science

Course Title: Anonymity and Privacy

Course Code: CS-783

Course Hours: 03

Total Weeks: 16

Total Credit Hours: 48

Course Objective

Technology is evolving quicker than most people's ability to understand it; therefore, it is increasingly critical to be safe online and protect one's privacy. Privacy and anonymity are two major concepts used to protect the user from exploitation by service providers. This course explores the tools and techniques used for Privacy and Anonymity. This course also explores the adversarial models, privacy attacks and metrics used for privacy exposure calculation. Students will be expected to read and present a wide variety of papers related to privacy and anonymity, including technical papers, statutes, court opinions, and the like.

Learning Outcome

The successful student will have an advanced understanding of the theoretical underpinnings of Privacy and Anonymity. They will be able to relate this understanding to areas ranging from the philosophical, political, organizational, and technical aspects. In particular, they will know privacy as a process of adapting to a changing circumstance, understand the significance of randomness in protecting privacy and quantifying risk, and operationalize this understanding.

Skills:

- Identify the need for Privacy and Anonymity for different platforms.
- Evaluate proposed technical mechanisms for privacy estimation.
- Apply privacy and anonymity mechanisms differentially when the sensitivity to requested information to changes in data is readily available.

General Competence:

- Acquisition of new knowledge and skills from the research literature.
- Quantitative and qualitative analysis of problems.
- Relating technology and society.

Course Prerequisites:

The prerequisites for this course are:

- Data Communication/Computer Networks
- Calculus
- Basic Probability Theory and Statistics



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Week Wise Course Content Distribution:

Week-1

- Introduction to Privacy and Anonymity
 - Difference between Privacy and Security
 - Anonymity
 - Cryptography

Week-2

- Legal Foundations of Privacy
- Data Usability Laws and Breaches
- Freedom of expression and 'right to be forgotten' cases

Week-3

- Privacy on Web
 - Web Service Providers
 - Web Search Engine (WSE)
 - WSE Browsing History
 - Cookies and Trackers

Week-4

- Privacy-Aware Web Search
 - Private Information Retrieval Protocols
 - Crowds
 - Useless User Profile (UUP)
 - User Private Information Retrieval Protocol (UPIR)
 - Poshidah
 - Obscure Logging (OSLo)

Week-5

- Privacy-Aware Web Search
 - Unlinkability Solutions
 - Proxy Service
 - Virtual Private Networks
 - Mixed Network
 - Web Mixes

Week-6

- Privacy-Aware Web Search Solutions
 - Indistinguishability Solutions
 - Fake Query Mechanisms
 - Query Transformation Mechanisms
 - Profile Obfuscation Mechanism



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- Hybrid Solutions
 - PEAS
 - X-Search

Week-7

- User Privacy Evaluation Mechanisms
 - Entropy
 - Cross-Entropy Loss
 - Degree of Anonymity
 - Profile Exposure Level (PEL)
 - Kullback-Leibler (KL) Divergence
 - Precision, Recall and F-Measure

Week-8

- Privacy Evaluation Models
 - Sim-Attack
 - QuPiD Attack
 - NN-QuPiD Attack

Week-9

- Privacy and Data Mining
 - Privacy-preserving data mining
 - k -anonymity: A model for protecting Privacy

Week-10

- Privacy and Social Networks
 - Information revelation and privacy in online social networks
 - Privacy leakage in mobile online social networks
 - The effect of anonymity on conformity to group norms in online contexts

Week-11

- Side Channels
 - Timing Analysis of Keystrokes and Timing Attacks on SSH
 - Remote Timing Attacks
 - Device Fingerprinting

Week-12

- Traffic Analysis
 - Wireless Data Traffic
 - Low-Cost Traffic Analysis of Tor
 - Wire Shark

Week-13

- Digital Cash
 - Untraceable Electronic Cash
 - VarietyCash: A Multi-purpose Electronic Payment System
 - CryptoCurrency and Block-Chain



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Week-14

- Anonymous Connectivity
 - TOR (The Onion Router)
 - Mixminion
 - Proxy Services

Week-15

- Internet of Things (IoT)
- Privacy in the internet of things: threats and challenges
- Privacy approaches in the cloud-based IoT

Week-16

- Location Privacy
- Spatial and Temporal Cloaking
- Privacy implications of Geo-tagging
- Private Location Sharing

Total Marks: 100

Recommended Books and Materials:

1. Khan, Rafi Ullah, editor. Protecting User Privacy in Web Search Utilization. IGI Global, 2023. <https://doi.org/10.4018/978-1-6684-6914-9>
2. Peng K. Anonymous communication networks: Protecting privacy on the web. CRC Press; 2014 Apr 10.
3. Kang J. Cyberspace Privacy: A Primer And Proposal. Hum. Rts.. 1999;26:3.
4. Solove DJ. The new vulnerability: data security and personal information. Securing Privacy in the Internet Age. Radin & Chander, eds.
5. Chander A, Gelman L, Radin MJ, editors. Securing privacy in the internet age. Stanford University Press; 2008.
6. Khan, Rafiullah. "On the effectiveness of private information retrieval protocols." Department of Computer Science, Capital University of Science and Technology, Islamabad, Pakistan (2020).

Course Proposed and Designed by:

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