Molecular Data-Storage Platforms

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Thursday, March 5; 4-5 pm; Hardman and Jacobs 225 (Refreshments: 3:30)

Abstract:

Macromolecule-based recorders are emerging platforms for massive archival data storage that use DNA sequences and synthetic and naturally occurring polymers as storage media. Since the storage media, as well as the accompanying recording and reading processes are highly unconventional compared to those used in classical storage systems, new methods for addressing system reliability, random access, parallel data processing and in-memory computation are needed. This lecture will provide an overview the basic operational principles of systems for molecular data recording (e.g., DNA and polymer synthesis, DNA editing), molecular data retrieval (e.g., DNA high-throughput and third-generation sequencing platforms, mass spectrometry systems) and relevant error-correction and constrained coding methods. In addition, the lecture will provide an overview of relevant concepts in bioinformatics and genomic data processing needed to implement operational macromolecular storage devices.

Biography:

Olgica Milenkovic is a professor of electrical and computer engineering at the University of Illinois, Urbana-Champaign (UIUC), and research professor at the Coordinated Science Laboratory. She obtained her master's degree in mathematics in 2001 and Ph.D. in electrical engineering in 2002, both from the University of Michigan, Ann Arbor. Milenkovic heads a group focused on addressing unique interdisciplinary research challenges spanning the areas of algorithm design and computing, bioinformatics, coding theory, machine learning and signal processing. Her scholarly contributions have been recognized by multiple awards, including the NSF Faculty Early Career Development Award, the DARPA Young Faculty Award, the Dean's Excellence in Research Award, and several best paper awards. In 2013, she was elected a UIUC Center for Advanced Study Associate and Willett Scholar, while in 2015 she was elected distinguished lecturer of the Information Theory Society. In 2018 she became an IEEE Fellow. She has served as associate editor of the IEEE Transactions of Communications, the IEEE Transactions on Signal Processing, the IEEE Transactions on Information Theory and the IEEE Transactions on Molecular, Biological and Multi-Scale Communications. In 2009, she was the guest editor in chief of a special issue of the IEEE Transactions on Information Theory on Molecular Biology and Neuroscience.