Biology Seminars

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12:30 - 2:30 pm
Monday, June 10 2024
3M Center, Room 3250

Seminar 2

Dr. Flavia Esposito
Department of Mathematics
University of Bari Aldo Moro

Integrating Biological Data Analysis using low-rank based computational and statistical methods

The analysis of biological and biomedical data are highly challenging due to the unique characteristics of these data, which often render the results of standard statistical tests and computational methods invalid or misleading. Employing appropriate integration mechanisms that merge micro- and macro-biomes with diverse environmental and human data will aid in investigating health issues such as emerging allergies and diseases. In recent years, unsupervised learning methods for the joint analysis of heterogeneous data sources have garnered significant interest, and low-rank latent factor models have proven to be effective tools for data integration. In this talk, we will present some physically informed low-rank models, based on the well-known Nonnegative Matrix Factorization, capable of adequately integrating different information and outcomes in biological or biomedical data. We will also discuss emerging health challenges discerned through interdisciplinary collaboration and mathematical exploration.

Biograpghy

Flavia Esposito is a temporary junior assistant professor (RTD-a) at the Dipartimento di Matematica, Università degli Studi di Bari Aldo Moro. She has PhD in Informatics and Mathematics with curriculum Mathematics and label Doctor Europaeus (2019), and a MSc Degree in Mathematics (2015) from Università degli Studi di Bari Aldo Moro, Italy. She has been research fellow at IRCSS-Tumori Giovanni Paolo II in Bari (2020) and at Dept. of Ingegneria Elettrica e dell'Informazione, Politecnico di Bari, Italy (2019). She has done a visiting research period at Université de Mons, Belgium to work with Prof. Nicolas Gillis (2016-2018). She have organized several scientific events: three editions of the Summer School of Mathematical Methods in Data Science hold in Bari in 2018, 2019, 2021 and the third edition of the Workshop PRIMO (Post Graduate Researchers in Inverse Problems, Machine Learning and Optimization) in 2023.

Her research focuses on mathematics for data science with an emphasis on Dimensionality Reduction techniques, Matrix Decompositions and Optimization for the study of hyperparameter tuning in Machine Learning problems. She aims to understand the mathematics behind data, analyzing it in different application domains such as Bioinformatics (Drug discovery, Oncology) and environmental science. Her main works are devoted to the analysis of biomedical data with a particular focus on Transcriptomic data such as Gene Expression Profiling.

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