The number of large-scale high-dimensional datasets recording different aspects of interrelated phenomena is growing, accompanied by a need for mathematical frameworks for discovery from data arranged in structures more complex than that of a single matrix. In the three sessions of this minisymposium we will present recent studies demonstrating "Discovery from Data," in "I: Systems Biology," and "II: Personalized Medicine," by developing and using the mathematics of "III: Tensors."

I: Systems Biology • 5 May 2018
10:45am–11:15am Patterns of DNA Copy-Number Alterations Revealed by the GSVD and Tensor GSVD Encode for Cell Transformation and Predict Survival and Response to Platinum in Adenocarcinomas
Orly Alter,1 Sri Priya Ponnapalli,1 Heidi A. Hanson1
1University of Utah

11:15am–11:45am Systems Biology of Drug Resistance in Cancer
Antti Hakkinen,1 Sampsa Hautaniemi1
1University of Helsinki

11:45am–12:15pm Single-Cell Entropy for Estimating Differentiation Potency in Waddington’s Epigenetic Landscape
Andrew E. Teschendorff6
6Shanghai CAS-MPG Computational Biology Institute and University College London

12:15pm-12:45pm Dimension Reduction for the Integrative Analysis of Multilevel Omics Data
Gerhard G. Thallinger,1 Bettina Pucher,1 Natascha Fladischer,1 Oana A. Zeleznik2
1Graz University of Technology, 2Harvard Medical School

II: Personalized Medicine • 6 May 2018
1:45pm- 2:15pm Mathematically Universal and Biologically Consistent Astrocytoma Genotype Encodes for Transformation and Predicts Survival Phenotype
Sri Priya Ponnapalli,1 Orly Alter4
1University of Utah

2:15pm– 2:45pm Statistical Methods for Integrative Clustering Analysis of Multi-Omics Data
Qianxing Mo1
1Baylor College of Medicine

2:45pm– 3:15pm Structured Convex Optimization Method for Orthogonal Nonnegative Matrix Factorization with Applications to Gene Expression Data
Junjun Pan,1 Michael Ng1
1Hong Kong Baptist University

3:15pm– 3:45pm Mining the ECG Using Low Rank Tensor Approximations with Applications in Cardiac Monitoring
Sabine Van Huffel6
6KU Leuven

III: Tensors • 7 May 2018
10:35am–11:05am Tensor Higher-Order GSVD: A Comparative Spectral Decomposition of Multiple Column-Matched but Row-Independent Large-Scale High-Dimensional Datasets
Sri Priya Ponnapalli,1 Orly Alter1
1University of Utah

11:05am–11:35am The GSVD: Where are the Ellipses?
Alan Edelman,1 Yuyang Wang2
1Massachusetts Institute of Technology, 2Amazon AI

11:35am–12:05pm Tensor Convolutional Neural Networks (tCNN): Improved Featureization Using High-Dimensional Frameworks
Elizabeth Newman,1 Lior Horesh,2 Haim Avron,2 Misha E. Kilmer1
1Tufts University, 2IBM TJ Watson Research Center, 2Tel Aviv University

12:05pm–12:35pm Three-way Generalized Canonical Correlation Analysis
Arthur Tenenhaus,1 Arnaud Gloaguen,2 Laurent Le Brusquet,2 Cathy Philippe,2 Vincent Frouin3
1CentraleSupélec, 2NeuroSpin