

Data Science Seminar

Hosted by the Department of Mathematics and Statistics

- Date: Tuesday, October 24, 2023
- Time: 12:00pm – 1:00pm
- Room: Whitney Hall 100E
- Speaker: Dr. Luis Carvalho (Boston University)
- Title: Deviance Matrix Factorization.

Abstract

The singular value decomposition can be used to find a low-rank representation of a matrix under the Frobenius norm (entrywise square-error loss) and, for this reason, it enjoys an ubiquitous presence in many areas, including in Statistics with principal component and factor analyses. In this talk, we discuss a generalization of this matrix factorization, the deviance matrix factorization (DMF), that assumes broader deviance losses and thus allows for more meaningful and representative decompositions under different data domains and variance assumptions. We provide an efficient algorithm for the DMF and discuss using entrywise weights to represent missing data. We propose two tests to identify suitable decomposition ranks and data distributions and prove a few theoretical guarantees such as consistency. To showcase the practical performance of the proposed decomposition, we present a number of case studies in genetics, network analysis, and image classification. Finally, we offer a few directions for future work. This is joint work with Liang Wang.

Biography of the speaker: Dr. Carvalho is an Associate Professor in the Department of Mathematics and Statistics at Boston University. He received a BS in Civil Engineering from the Federal University of Ceara (UFC), Brazil, a MSc in Transportation Engineering from the Federal University of Rio de Janeiro (UFRJ), a MSc in Computer Science from UFC, and a PhD in Applied Mathematics from Brown University. His research interests are in Bayesian and computational statistics, with a focus on inference in discrete and structured spaces. He works with many applications of statistics in genetics and computational biology, environmental science and remote sensing, social sciences, and transportation engineering.

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