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A new sparse PCA algorithm with guaranteed asymptotic properties and applications in methylation data

Abstract: I will introduce ReFACTor, a very simple new algorithm for sparse PCA (or sparse SVD). I will show how the algorithm is better than the state of the art in the context of analysis of whole-genome methylation data, where the low rank signal arises from the fact that the measurements are taken across a mixture of cell types, while the cell counts are unknown. I will further introduce a Bayesian extension to the algorithm which leverages the sparse PCA algorithm in order to impute cell counts. Finally, I will describe theoretical results demonstrating that under model where the data is assumed to be the sum of a low rank column-sparse signal matrix and a random noise matrix (similar to the Tipping Bishop model), ReFACTor provides improved results over standard SVD, and it is therefore desired to perform ReFACTor in addition to SVD when one searches for a low rank approximation of the signal matrix.

Biography: Dr. Eran Halperin is a professor in the departments of Computer Science, Human Genetics and Anesthesiology in UCLA. He is also the associate director of informatics in the Institute of Precision Health in UCLA. Dr. Halperin received his Ph.D. in computer science from Tel-Aviv University. Prior to his current position, he held research and postdoctoral positions at the University of California, Berkeley, the International Computer Science Institute in Berkeley, Princeton University, and Tel-Aviv University. He is a computational biologist who develops statistical and computational methods for the analysis of human genetic and epigenetic variation in the context of complex human diseases. His group has developed methods and software that have been used by hundreds of researchers worldwide to understand the genetic causes of diseases such as cardiovascular diseases, non-Hodgkin's lymphoma, and breast cancer. He has published over 100 peer-reviewed articles across different disciplines such as human genetics, computational biology, and theoretical computer science. He received various honors for academic achievements, including the Rothschild Fellowship, the Technion-Juludan prize, and the Krill Prize.

