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Dynamic analysis of high dimensional microarray time series data using various dimensional reduction methods

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This research focuses on dynamic analysis of reduced dimension models of two microarray time series datasets. Underlying research achieves two main objectives; namely, (1) various dimension reduction techniques used on time series microarray data, and (2) estimating autoregressive coefficients using several penalized regression methods like ridge, SCAD, and lasso. The research methodology includes two research tasks. Firstly, applying several dimension reduction methods on two microarray data sets, and modeling comparisons based on accuracy and computation cost. Secondly, applying the sparse vector autoregressive (SVAR) model to estimate gene regulatory network based on gene expression profile from time series microarray experiment on two datasets and the autoregressive coefficients estimation were calculated using several penalized regression methods, and then performing comparisons among various regression methods for each dimension reduction model. Study results show that the dimension reduction methods producing orthogonal independent variables are performing better because orthogonality leads to reasonable coefficient estimation with low standard errors. On the other hand, regarding dynamic analysis, it could be seen that factor analysis (FA) outperformed the rest of dimension reduction methods with regards to goodness of fit after applying several penalized regression methods on each model. The reason behind this is due to using varimax rotation in FA, in which most of the coordinates are set closer to zero, and in turn makes the data sparser.

Biography

Aven Samareh is a current PhD student at Northeastern University working as a graduate research assistant at Health Care Systems Engineering Institute (HSyE) affiliated to Northeastern University, in Boston, Massachusetts. She is a part of the statistical process quality (SPC) group at HSyE, in which her research is narrowed down in theatrical problems using statistical methods with application in healthcare. Her master's thesis focus was on big data, and dimension reduction with a focus on applied statistics, biostatics. She is serving as student consultant at Tufts Medical Center and is a part of research statistical process control team working on de-identified surgical site infection data, from 40 community hospitals in the Duke Infection Control Outreach Network.

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