Spatial and temporal regularized matrix factorization for urban traffic monitoring

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Abstract

Urban transport systems are of great importance to the economic, social, and environmental aspects of cities. It is quite common that the traffic sensors suffer from severe data loss. Taken floating car data as an example, spatial and temporal distributions of the probe vehicles are highly skewed. Traffic information cannot be extracted for a specified road link at certain time span without any traversing probe vehicles. The research question is posed as how to infer the complete traffic matrix from the sparse matrix with missing values.

In this study, we proposed a novel traffic data interpolation model based on matrix rank minimization of the traffic matrix. The traffic matrix is further factorized and regularized with spatial and temporal constrain matrices, which are formulated using domain knowledge from spatial and temporal traffic data analysis. The proposed model has been competed with other interpolation models using real-world floating car data. It yields more accurate results than other competing models, particularly under higher data loss ratios.

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