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Matrix Completion: Climate Field Reconstruction Using Tree Rings

Timothy Chen
Washington University in St. Louis

Matrix Completion: Climate Field Reconstruction Using Tree Rings

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Mentor: Arye Nehorai

The premise behind matrix completion is that given existing data entries in a matrix, we are able to interpolate missing data entries of the matrix, provided that the matrix is low rank. We use a particular method of matrix completion, called the Singular-Value-Thresholding (SVT) algorithm, to reconstruct a full climate field based on tree ring proxy data. As tree rings form year-to-year, they are a good indicator of the climate and temperature around its environment. However, existing tree ring data are sparse due to missing entries. Using existing tree ring data from North America, we build a complete tree ring matrix using the SVT algorithm. The complete tree matrix will subsequently be used to solve the temperature matrix using a singular value decomposition-based approach, and compared to previous reconstructions done using the incomplete data set.