GLEE: Geometric Laplacian Eigenmap Embedding

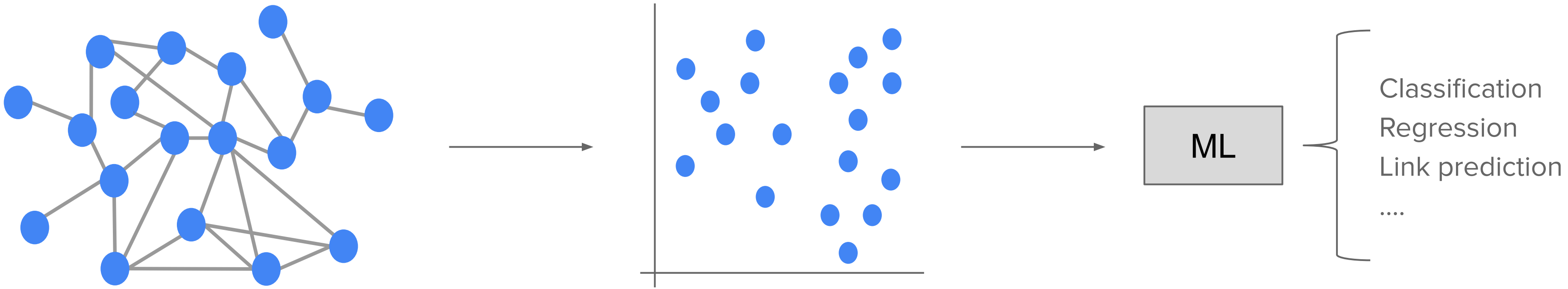
Leo Torres

Kevin S. Chan and Tina Eliassi-Rad

DEVCOM ARMY RESEARCH LABORATORY

netsi Northeastern University Network Science Institute

The problem of embedding



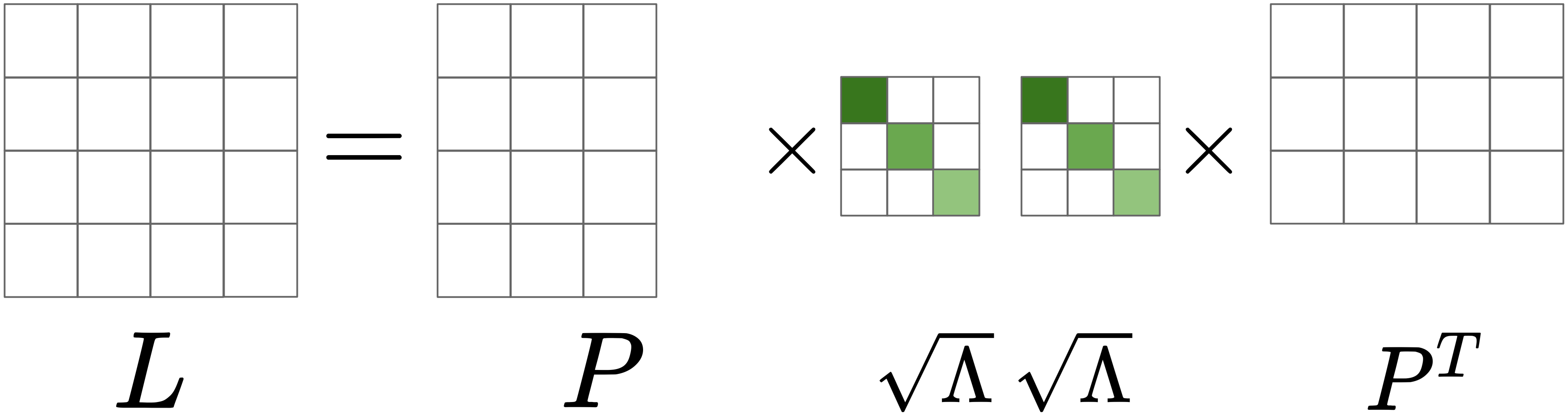
Laplacian Eigenmaps

$$\min_Y tr(Y^t LY)$$
$$s.t. Y^T DY = I$$

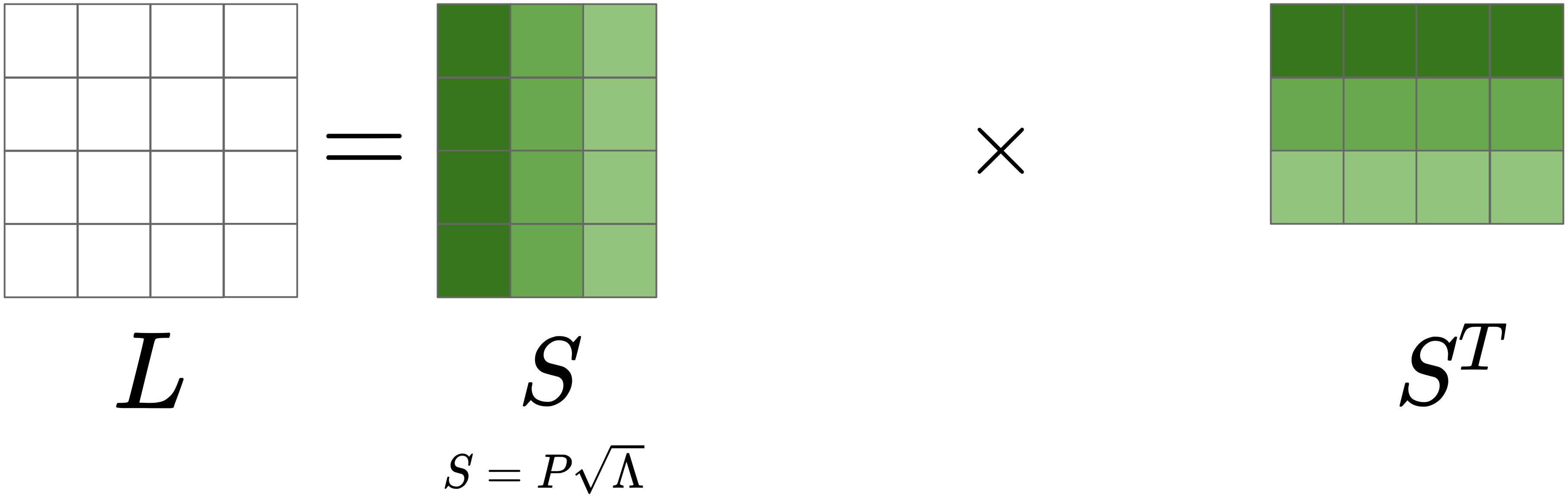
Solution given by the eigenvectors of the normalized Laplacian **$D^{-1}L$**.

[1] M. Belkin and P. Niyogi. Laplacian eigenmaps for dimensionality reduction and data representation.Neural Computation, 15(6):1373–1396, 2003

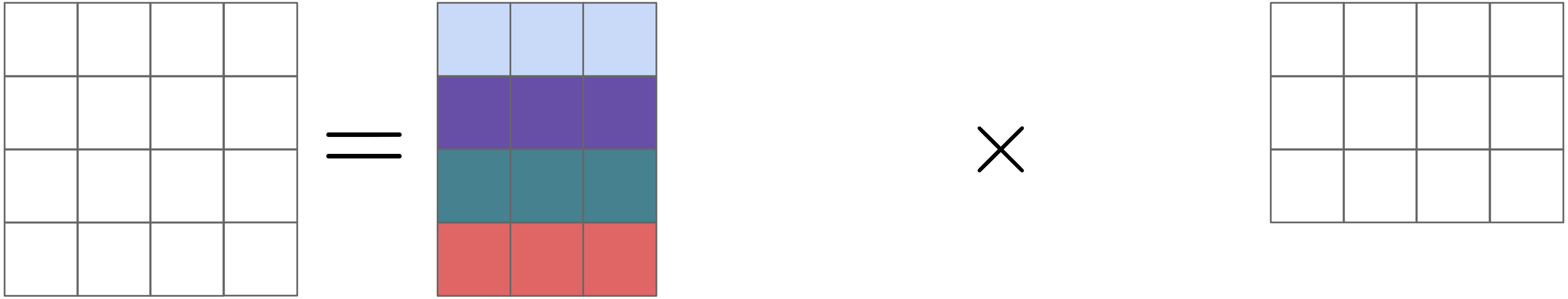
GLEE: Geometric Laplacian Eigenmap Embedding



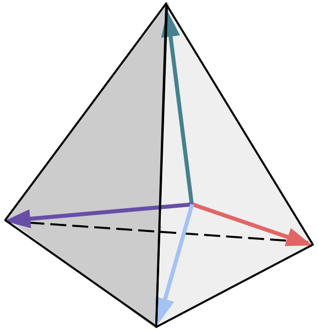
GLEE: Geometric Laplacian Eigenmap Embedding



GLEE: Geometric Laplacian Eigenmap Embedding

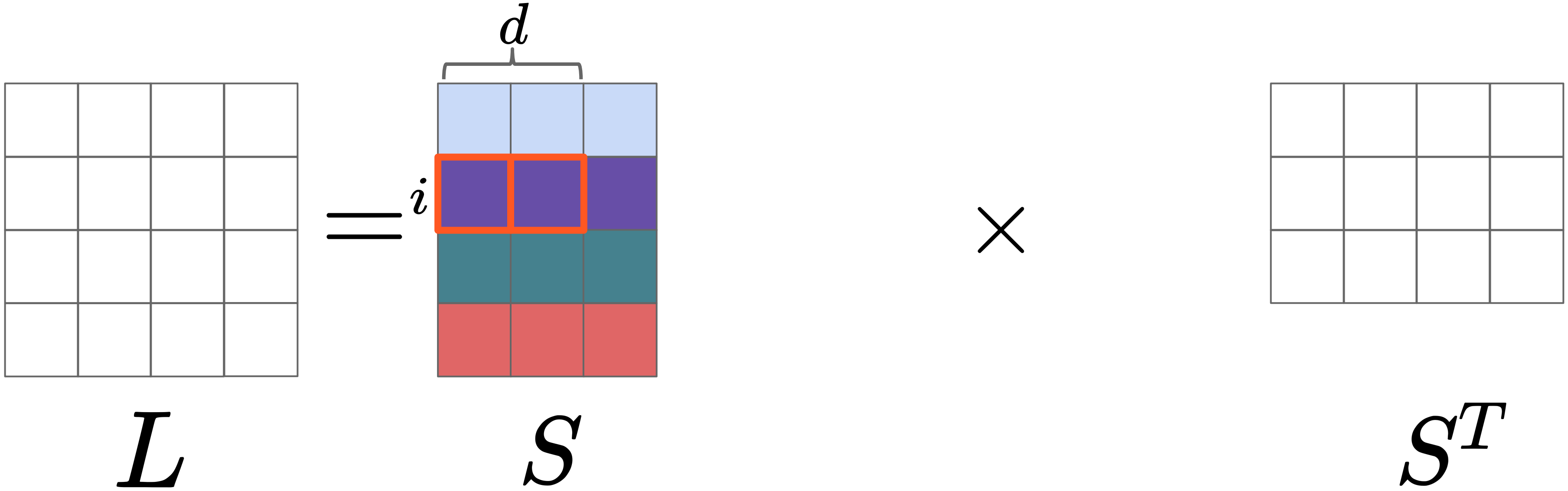


Rows of ***S*** point to the vertices of an **(n-1)**-D **simplex**.

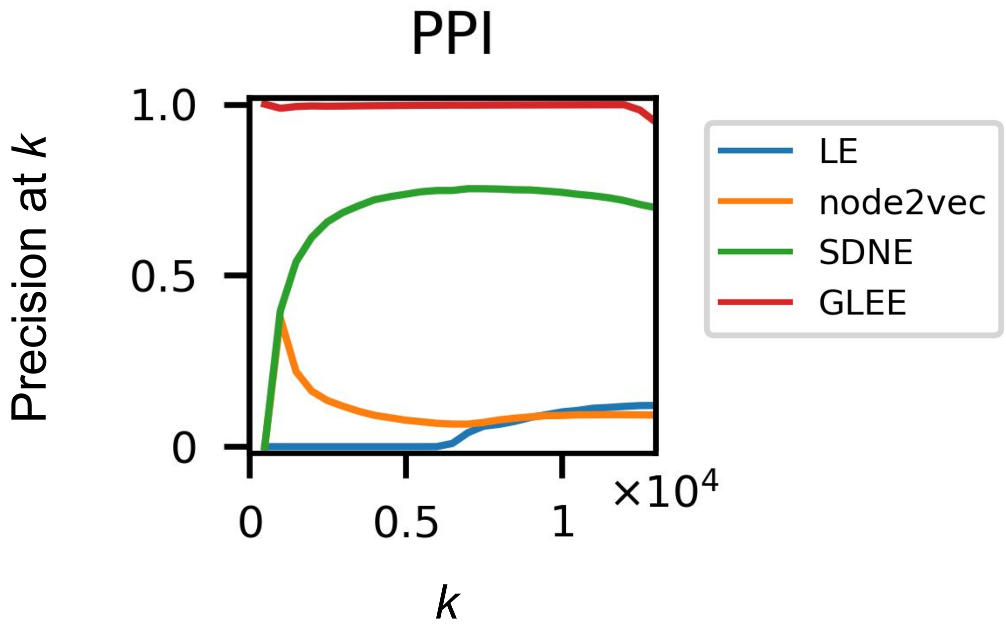


[2] K. Devriendt and P. Van Mieghem. The simplex geometry of graphs.The Journal of Complex Networks, 2019.

GLEE: Geometric Laplacian Eigenmap Embedding

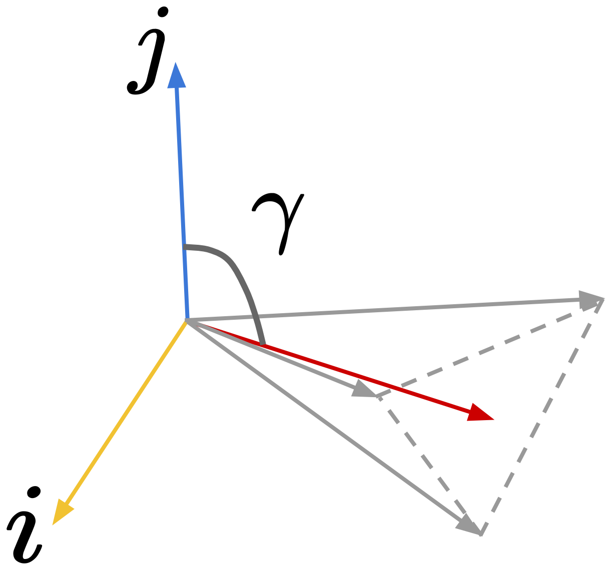


Graph Reconstruction

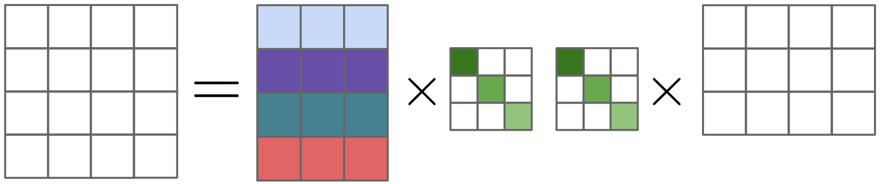


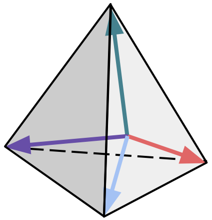
Link Prediction: common neighbors

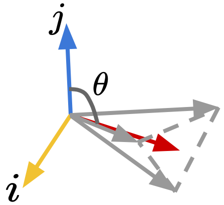
In many networks (e.g. social networks), the number of common neighbors is an excellent predictor of links because of **triadic closure**.



¡Gracias!







Code: github.com/**leotrs**/glee

Paper: arxiv.org/abs/**1905.09763**

Contact: leo@**leotrs**.com

Supported by **NSF** CNS-1314603, **NSF** IIS-1741197, Army Research Laboratory
Cooperative Agreement W911NF-13-2-0045.