NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE
School of Computer Science and Engineering
College of Engineering

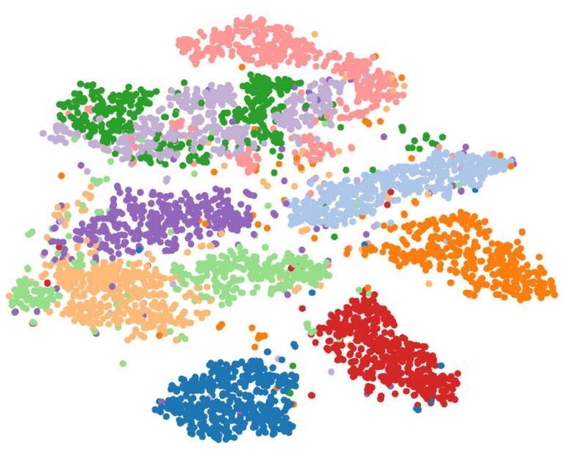
GraphTSNE

A Visualization Technique for Graph-Structured Data

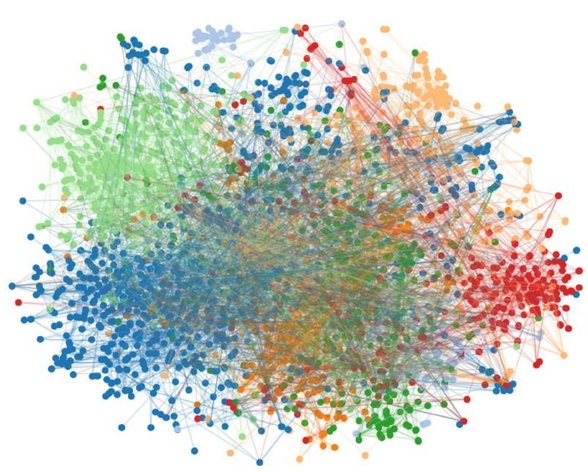
GRAPH-STRUCTURED DATA IS EVERYWHERE.

Just think molecular structures, social networks, gene-regulatory networks, and more. With the growing importance of graph-structured data, **we need a better way of visualizing them.**

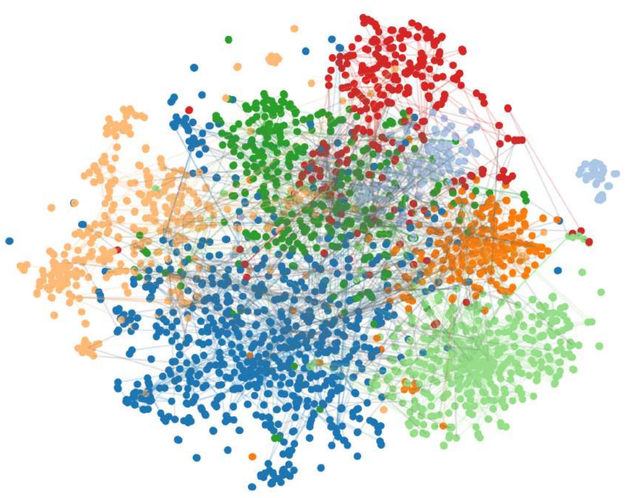
t-SNE on MNIST



t-SNE on Cora network



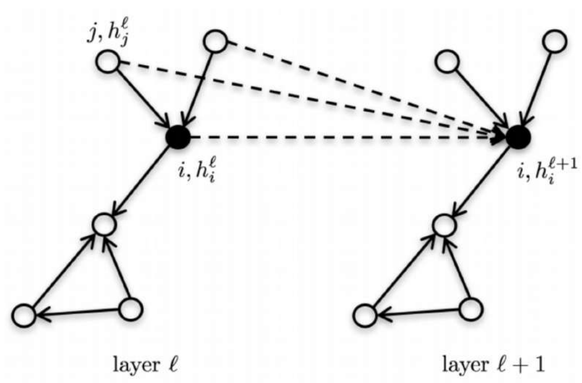
GraphTSNE on Cora network



$$\boldsymbol{h}_i^{l+1} = \mathrm{ReLU}\left(\boldsymbol{U}^l \boldsymbol{h}_i^l + \frac{1}{|n(i)|} \sum_{j \to i} \eta_{ij} \odot \boldsymbol{V}^l \boldsymbol{h}_j^l\right) + \boldsymbol{h}_i^l$$

THE METHOD

GraphTSNE uses a graph convolutional network and unsupervised training on a composite t-SNE loss function.

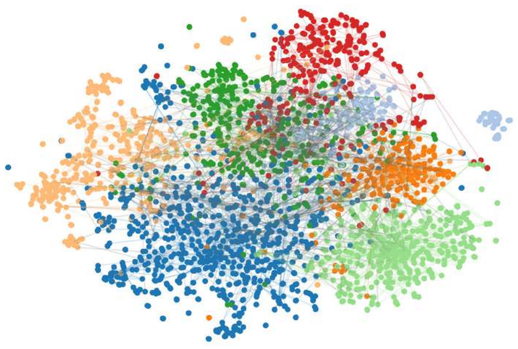


Graph convolutional networks

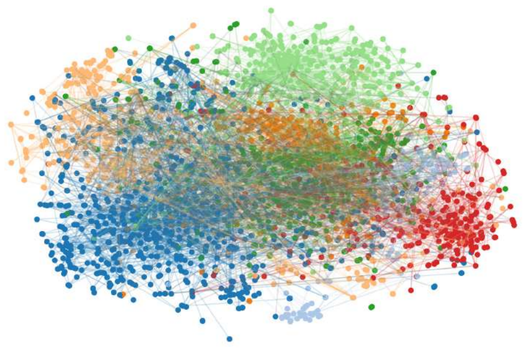
THE RESULTS

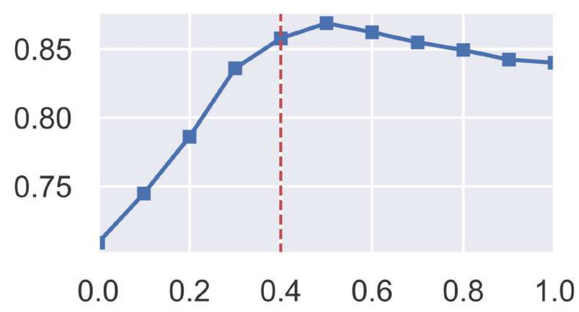
GraphTSNE is qualitatively and quantitatively better than existing methods: t-SNE and tsNET.

GraphTSNE
Proposed Visualization
$\alpha = 0.4$



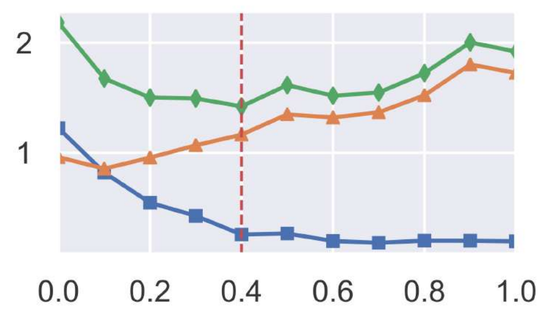
Classical t-SNE
Pure Feature Clustering
$\alpha = 0$





1-NN generalization accuracy

Accuracy



Visualization distance metrics

Graph-based distance $P_{\mathcal{G}}$
Feature-based distance P_X
Combined distance $P_{\mathcal{G}} + P_X$

By incorporating both GRAPH CONNECTIVITY and NODE FEATURES, GraphTSNE produces compelling visualizations graph-structured datasets.

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