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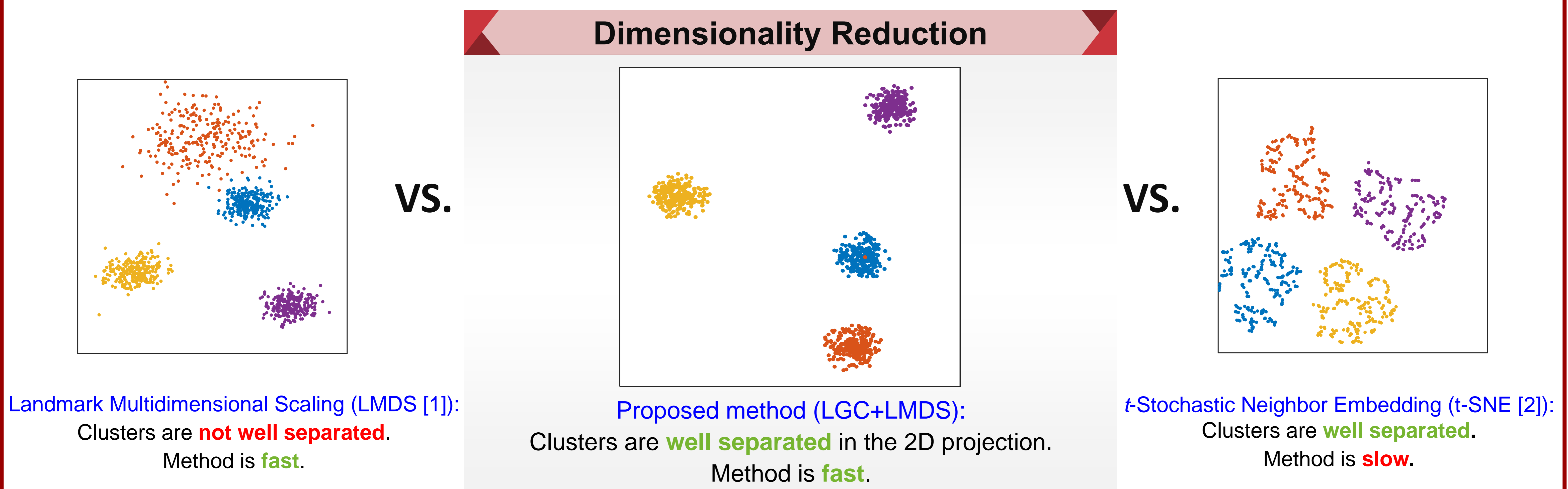
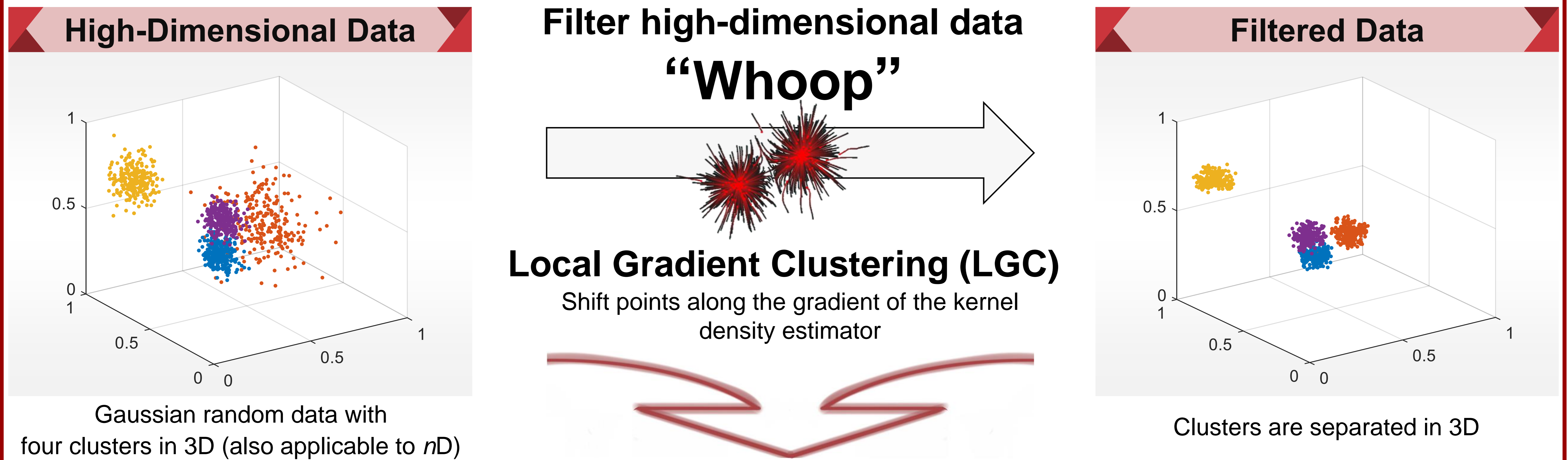
Visualizing High-Dimensional Chemical Abundance Space in GALAH DR2

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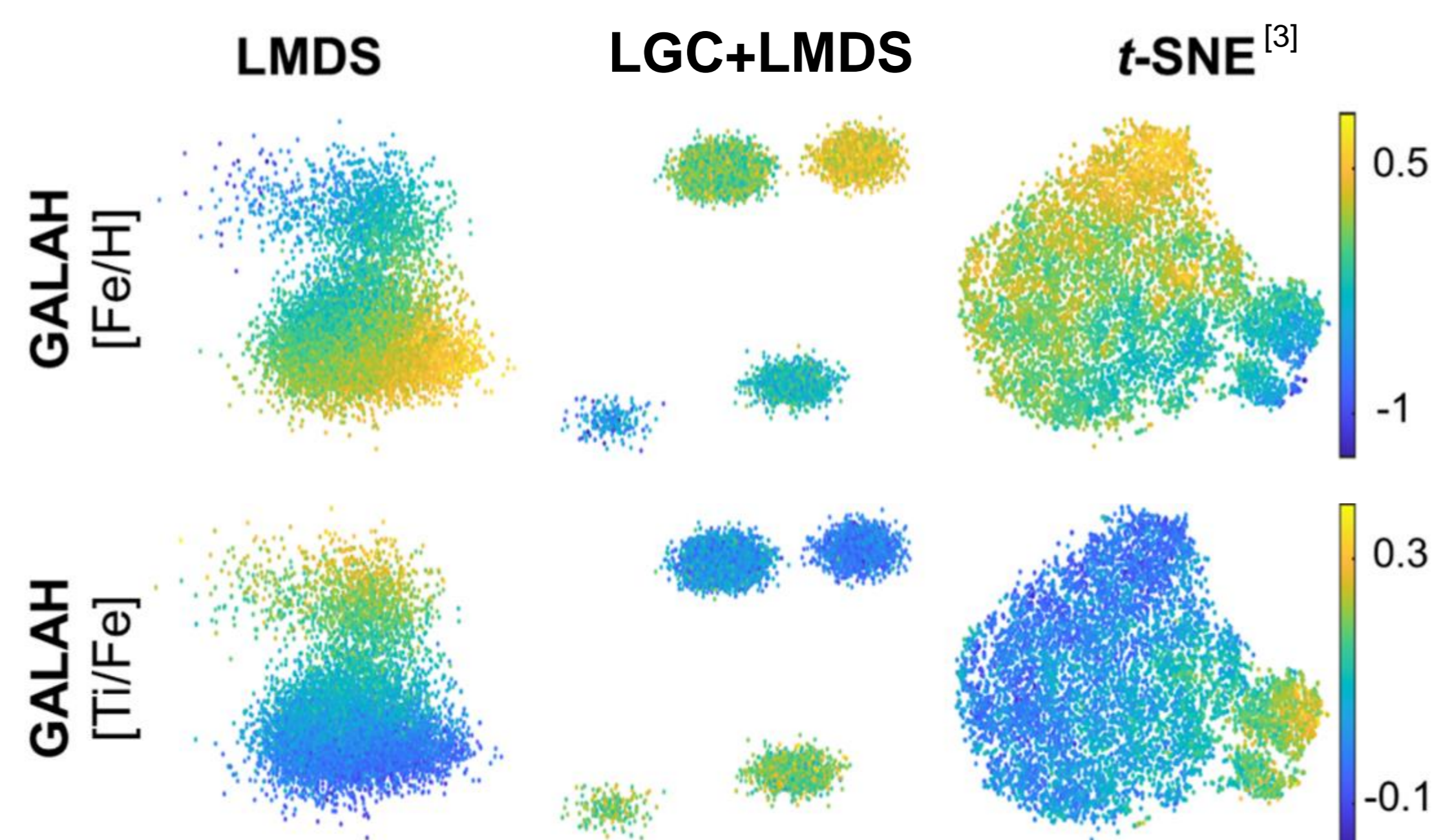
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Aim: Visualize high-dimensional data to find interesting patterns and underlying structures



GALAH DR2

- Dataset:** 10K observations are randomly chosen from the second data release of GALactic Archaeology with HERMES survey (GALAH DR2) [4] cross-matched with *Gaia* DR2 [5-6]. 10-D data set that consists of the following 10 stellar abundances are used: [Fe/H], [Mg/Fe], [Al/Fe], [Si/Fe], [Ca/Fe], [Ti/Fe], [Cu/Fe], [Zn/Fe], [Y/Fe], and [Ba/Fe]
- Results:** LGC+LMDS shows cleaner separation of substructures in the 2D abundance-space than the original LMDS and t-SNE



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Summary

Key idea

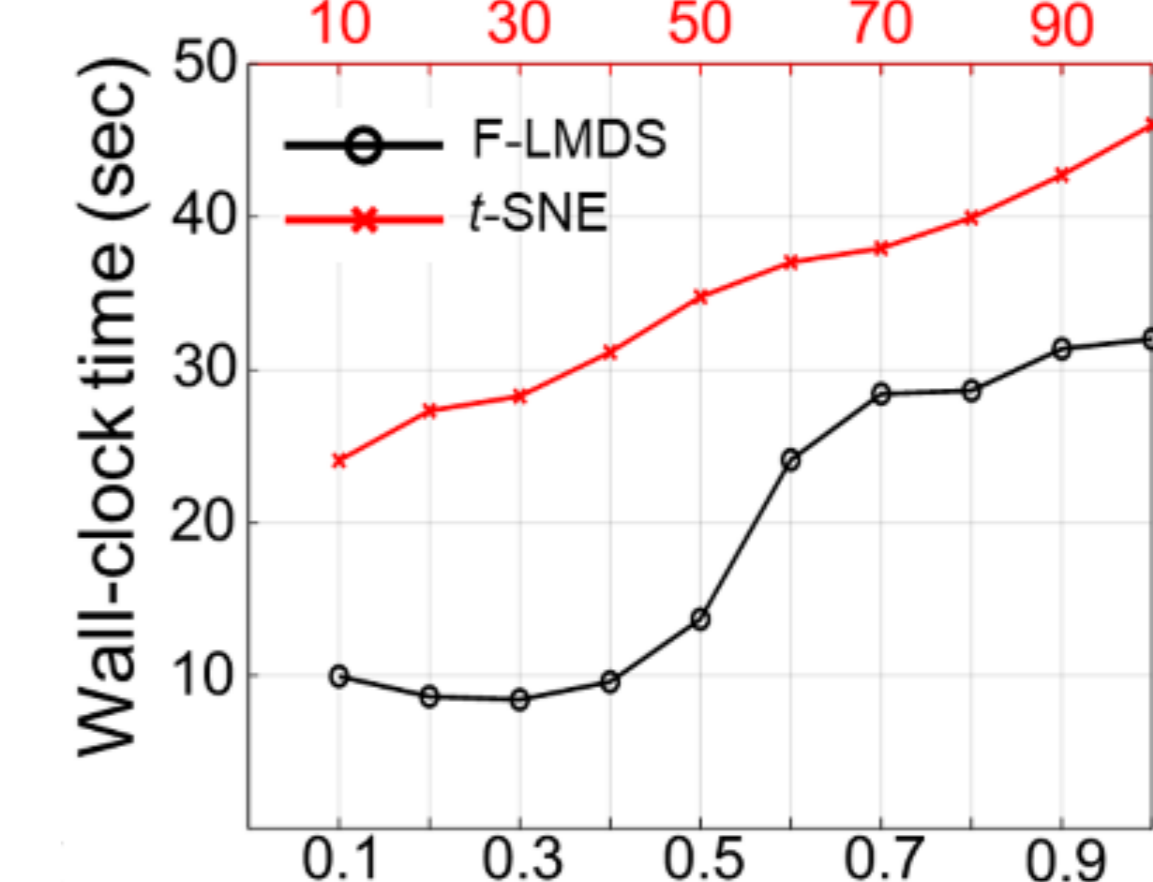
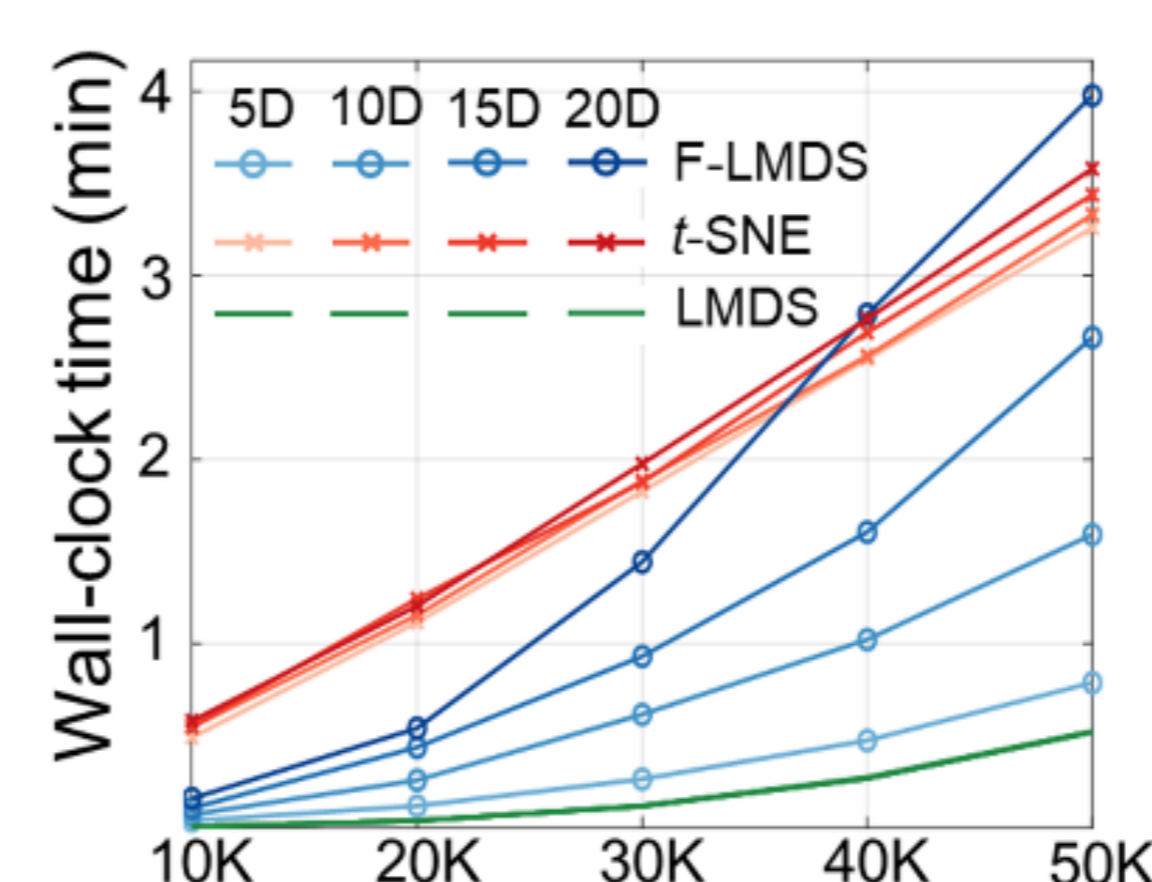
Filter the high-dimensional data so that potential clusters are well separated even after dimensionality reduction

Method

- Estimate density using Epanechnikov kernel [7-8]
- Shift points upstream in kernel density gradient, resulting in cluster contraction [9]
- Perform LMDS [1]

Advantages

- Clusters are **well separated** after the projection by preprocessing the data with local-based gradient clustering
- Predictable** outcome with one parameter
- More **computationally scalable** than t-SNE, in terms of wall-clock time



Future Work

- A more sophisticated analysis of the different substructures gained from the LGC+LMDS results using GALAH DR2