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A MACHINE LEARNING APPROACH FOR INVESTIGATING SPATIAL STRUCTURES BETWEEN SPECTRAL LINE SOURCES: FORMALDEHYDE ABSORPTIONS VERSUS METHANOL MASERS

Abstract

We present fascinating ideas on using machine learning algorithms to study connections in spatial distributions between observed spectral line sources. The method has been illustrated using observations of 4.8 GHz formaldehyde absorptions and 6.7 GHz methanol masers in the Galaxy. Both spectral line features have been well-observed in close associations with galactic star-formation regions, and we initiate this study to understand spatial connections between them. We have implemented the K-means unsupervised clustering algorithm after using a modification of other machine learning practices to identify optimal number of structures in the galactic distributions of the observations. We found very close associations and interwoven spatial distributions in 25 of the 28 clusters identified in the work; formaldehyde absorptions were observed in all of the methanol maser clusters, and methanol masers were observed in all (but 3) of the formaldehyde clusters, an indication that the two lines are closely related.