

A t-SNE and UMAP Based Neural Network Image Classification Algorithm

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Abstract : Both t-SNE and UMAP are brand new state of art tools to predominantly preserve the local structure that is to group neighboring data points together, which indeed provides a very informative visualization of heterogeneity in our data. In this research, we develop a t-SNE and UMAP base neural network image classification algorithm to embed the original dataset to a corresponding low dimensional dataset as a preprocessing step, then use this embedded database as input to our specially designed neural network classifier for image classification. We use the fashion MNIST data set, which is a labeled data set of images of clothing objects in our experiments. t-SNE and UMAP are used for dimensionality reduction of the data set and thus produce low dimensional embeddings. Furthermore, we use the embeddings from t-SNE and UMAP to feed into two neural networks. The accuracy of the models from the two neural networks is then compared to a dense neural network that does not use embedding as an input to show which model can classify the images of clothing objects more accurately.

Keywords : t-SNE, UMAP, fashion MNIST, neural networks

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