

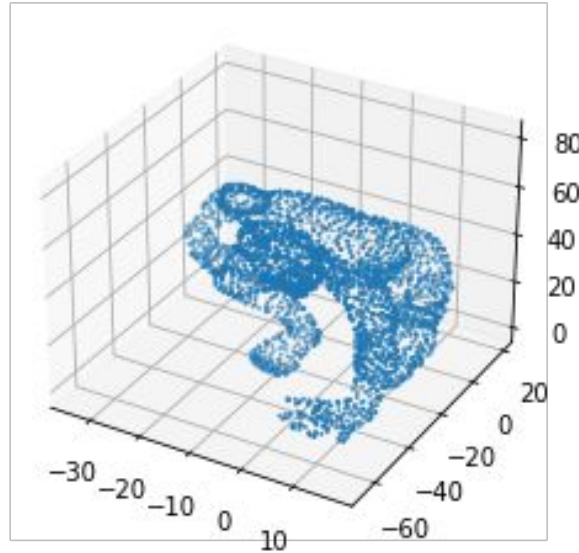


Applying the Mapper to the david7 shape

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About the data



- 3d shape data
- Worked with the file david7.vert

Methods

- Applied the Mapper using three projections: PCA with 1 component, l2-norm, projection onto the xy-plane
- Used various clustering methods: KMeans with $n=2$ clusters, Gaussian mixture with $n=2,3,5$ components, spectral clustering with $n=2,3,5$ clusters, and DBScan with $\epsilon=5$, min. samples=3
- Used default of 10 number of hypercubes throughout
- Attempted to use the networkx package to perform graph matching on the graphs produced by the Mapper with different projections and clustering choices



- SpectralClustering, KMeans produced best approximations at $n=2$ clusters, became more weakly connected for larger n ; DBScan produced best approximations at $\epsilon=5$, more weakly connected as ϵ decreased
- PCA produced more strongly connected graphs than l_2 -norm projection
- Although graphs with same number of nodes, edges were produced, none of the graphs were isomorphic to each other with different choice of clustering or different choice of projection, all else held equal

Discussion

- The Mapper represented the properties of the david7 figure as expected, including number of connected components, higher density of torso over limbs reflected in node weights, and additional edges representing where the figure self-contacts
- Lessons: get familiar with networkx package for graphs in Python, learn properties of different projections
- Next steps: Use a graph-matching algorithm on Mapper output with different choices of clustering and projections that does matching of non-isomorphic graphs (maybe exploiting spectral properties of the graph)
 - See if this algorithm matches the correct elements of the figure
- Next steps: Adjust number of covering hypercubes used in the Mapper