Capivara: A Spectral-based Segmentation Method for IFU Data Cubes
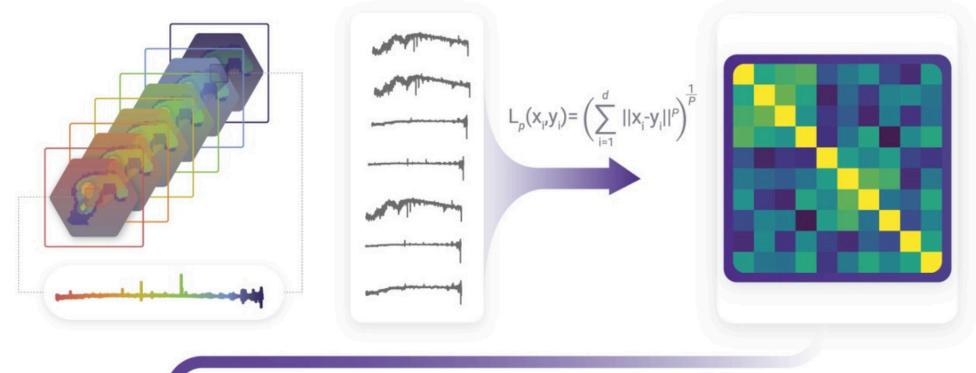
Rafael S. de Souza [1,2]* Luis G. Dahmer-Hahn,[3]† Shiyin Shen,[3] Ana L. Chies-Santos,[4] Mi Chen,[3]
P. T. Rahna,[5] Renhao Ye,[3] Behzad Tahmasebzadeh [6]

[1] Centre for Astrophysics Research, University of Hertfordshire, College Lane, Hatfield, AL10 9AB, UK
[2] Instituto de Astronomia, Geofísica e Ciências Atmosféricas, USP, Rua do Matão 1226, 05508-090, São Paulo, Brazil
[3] Shanghai Astronomical Observatory, Chinese Academy of Sciences, 80 Nandan Rd., Shanghai 200030, China
[4] Instituto de Física Universidade Federal do Rio Grande do Sul Av. Bento Gonçalves 9500 Porto Alegre, R.S. 90040-060, Brazil
[5] Centro de Estudios de Física del Cosmos de Aragón (CEFCA), Plaza San Juan 1, 44001 Teruel, Spain
[6] Department of Astronomy, University of Michigan, 1085 S. University Ave., Ann Arbor, MI 48109, USA

Spectro–based segmentation method.

- The model reads an IFU data cube composed of multiple wavelength channels.
- Hierarchical clustering is then performed on the dissimilarity matrix computed from pairwise distances between all spectra within the cube.
- Once the groups are assigned, the data is back-transformed into a 2D matrix where each group represents spectra with similar features.

$$L_p(x_i, y_i) = \left(\sum_{i=1}^{d} ||x_i - y_i||^p \right)^{\frac{1}{p}}$$

Hierarchial Clustering