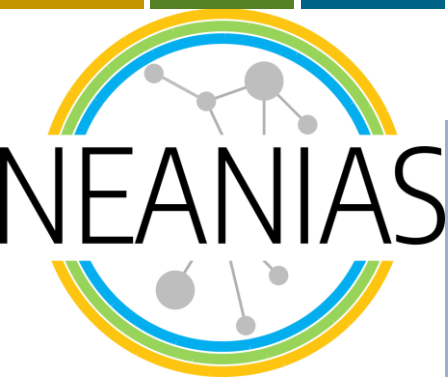NEANIAS space webinar series:
Latent Space Explorer

Unsupervised Data Pattern Discovery on the Cloud

Giuseppe Vizzari and Thomas Cecconello

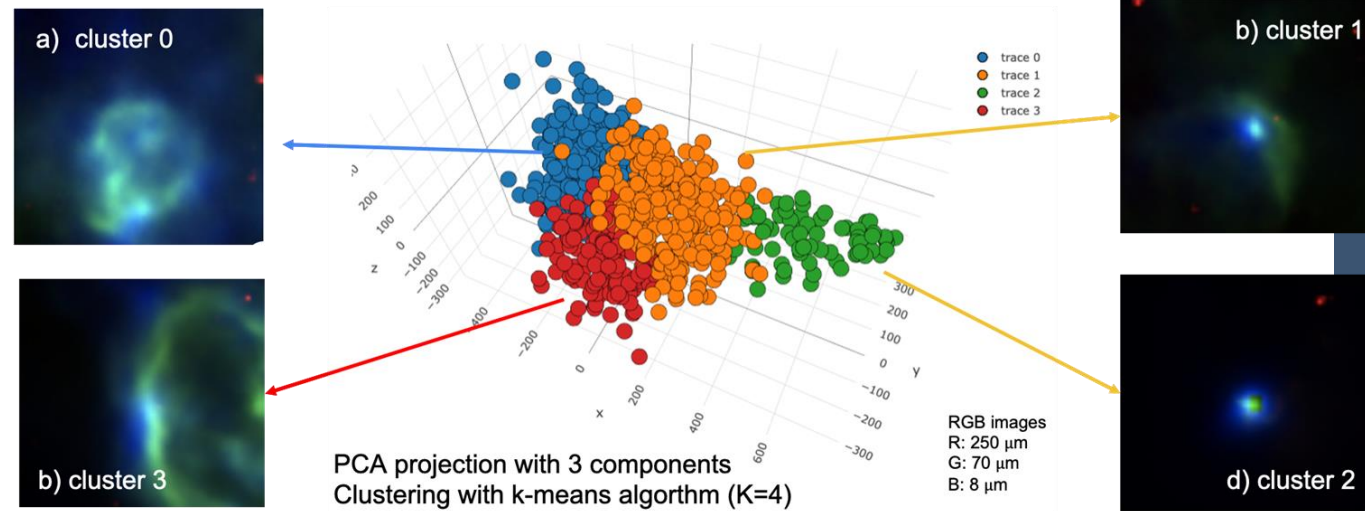University of Milano-Bicocca

Service goals and functionalities

➢ Discovery of new knowledge by analysing emerging patterns in datasets of multi-spectral images
- Let unsupervised machine learning extract features for you
- Present results in a visual way, in the form of a 2D or 3D latent space map
- Leverage expert knowledge to analyse the output, interpret and analyse it to evaluate the emerging patterns and, in case, formalize new classification schemes and knowledge

➢ Explore the dataset through the "lenses" of the latent space
- Find potential outliers and duplicates
- Evaluate potential misclassifications
- Detect pre-processing issues

➢ Evaluate your RL models
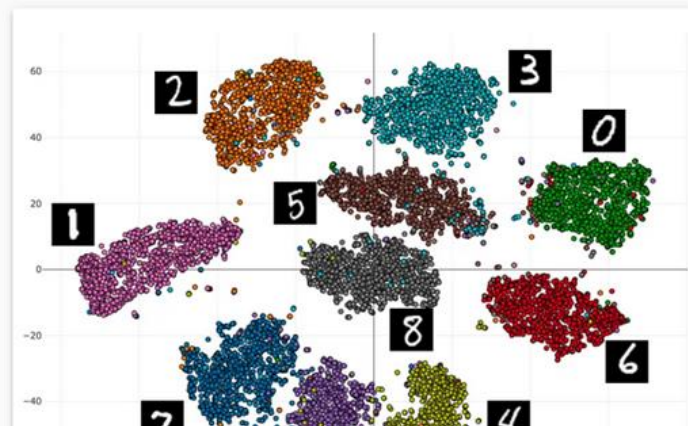- Find bias(es)
- Perform feature analysis

a) cluster 0

b) cluster 3

trace 0
trace 1
trace 2
trace 3

b) cluster 1

d) cluster 2

PCA projection with 3 components
Clustering with k-means algorithm (K=4)

RGB images
R: 250 μm
G: 70 μm
B: 8 μm

Demo

References:

- Sarmiento, R., Knapen, J. H., Sánchez, S. F., & and others. (2021). Capturing the physics of MaNGA galaxies with self-supervised Machine Learning. *The Astrophysical Journal, 921*(2), 177.

- Castellano, G., & Vessio, G. (2022). Understanding Art with AI: Our Research Experience*. AIxIA 2021 Discussion Papers, co-located with the the 20th International Conference of the Italian Association for Artificial Intelligence (AIxIA2021),* CEUR Workshop Proceedings vol. 3078, pp. 92-98

- Cecconello, T., Puerari, L., & Vizzari, G. (2022). Unsupervised Data Pattern Discovery on the Cloud. *AIxIA 2021 Discussion Papers, co-located with the the 20th International Conference of the Italian Association for Artificial Intelligence (AIxIA2021)*, CEUR Workshop Proceedings vol. 3078, pp. 108-120

- Cecconello, T., Bordiu, C., Bufano, F., Puerari, L., Riggi, S., Schisano, E., Sciacca, E., Maruccia, Y., & Vizzari, G. (2022). Latent Space Explorer: Unsupervised Data Pattern Discovery on the Cloud. In proceedings of ADASS XXXI conference, to be published in ASP Conference Series. *arXiv:*https://doi.org/10.48550/arXiv.2204.13933

- Upcoming submission to SoftwareX journal

Resources links:

- https://lse.neanias.eu

- https://gitlab.neanias.eu/s3-service/latent-space-explorer/generator
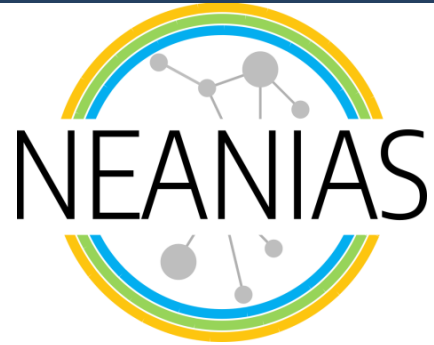
Novel EOSC Services for Emerging Atmosphere, Underwater & Space Challenges

Thanks!
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Questions?

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