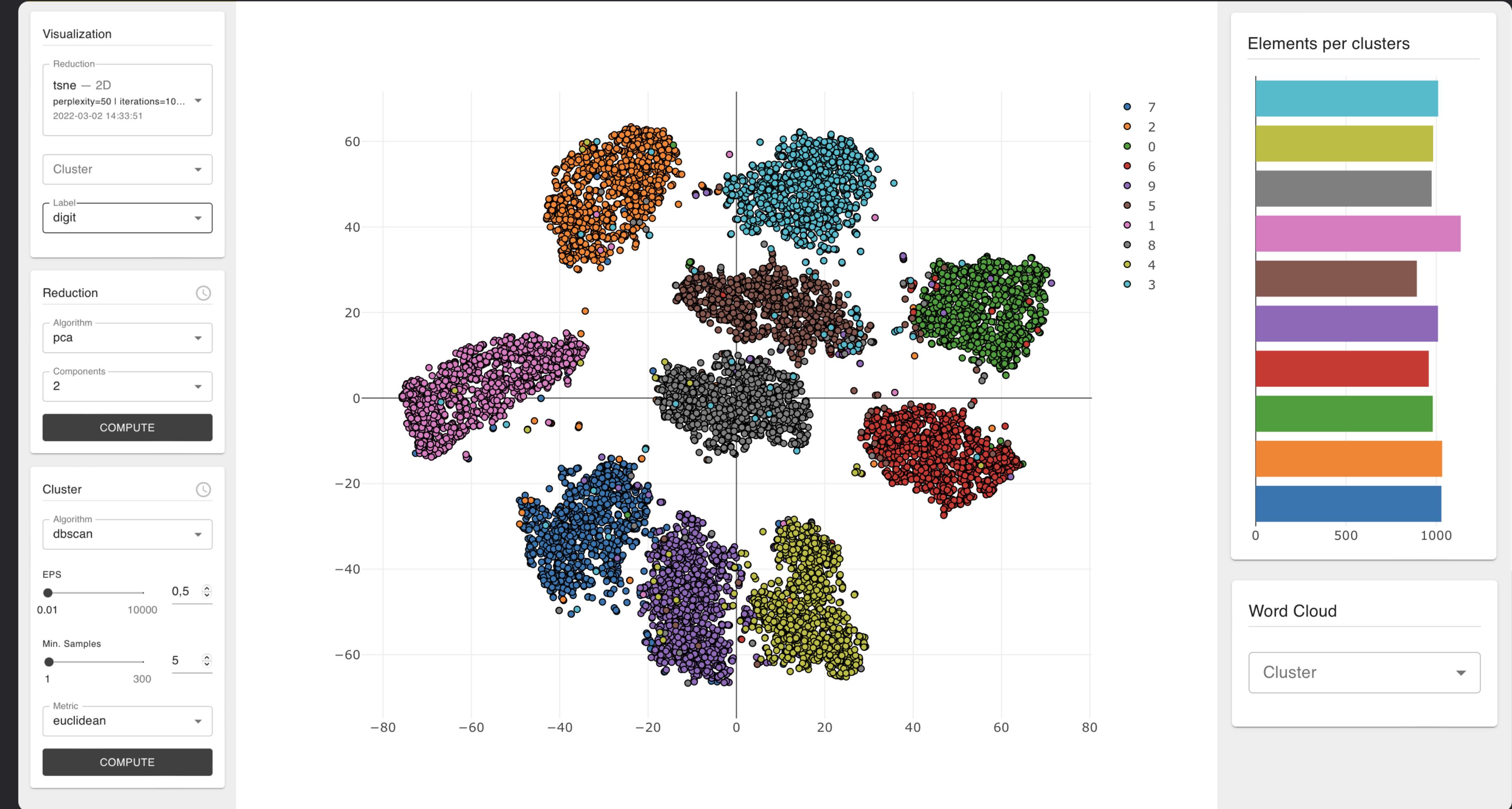


Latent Space Explorer

Valutazione dell'usabilità e riprogettazione dell'interfaccia utente

Relatore: Prof. Giuseppe Vizzari
Co-relatore: Dott. Thomas Cecconello

Tesi di Laurea Magistrale di:
Carmine Rodolfo Tagliafierro
Matricola n. 862569



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Latent Space Explorer

NEANIAS

**Guida la co-progettazione e la fornitura di servizi tematici innovativi,
derivanti da risorse e pratiche di ricerca avanzate in tre settori principali:**



ricerca subacquea



ricerca atmosferica



ricerca spaziale

Analisi di dataset di immagini
attraverso metodi di
apprendimento automatico
non supervisionato.



Welcome to Latent Space Explorer

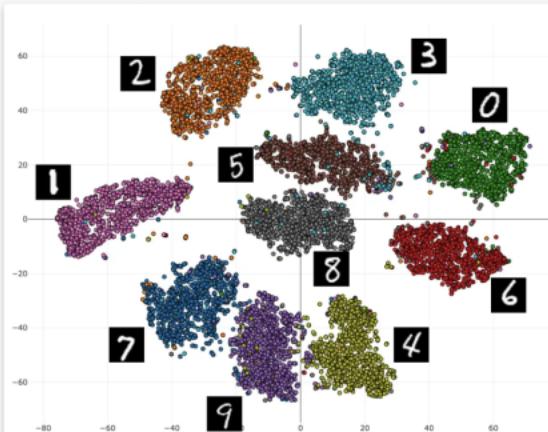
Latent Space Explorer (LSE) support analysis of image datasets via unsupervised machine learning methods. It allows to extract a compact representation from data by representation learning models (e.g. autoencoders). The information extracted can be then visualized using the projector. The latter allows visualizing the data in a 2D or 3D space in an interactive fashion. The system then allows performing clustering algorithms to detect potentially relevant ways to group data and to support the definition of novel classification schemes.

You could find an overview of the service in the [intro video](#)

In order to use the tool please follow the [documentation](#)

If you want to play with the projector on some demo experiments you will find those on your experiment page

[GO TO EXPERIMENTS PAGE](#)

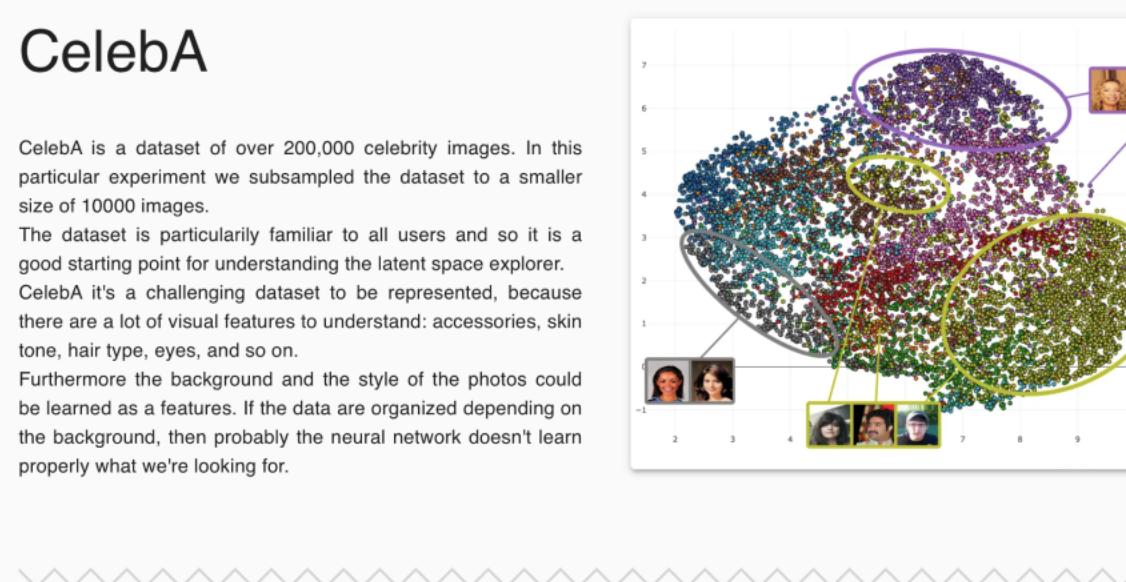
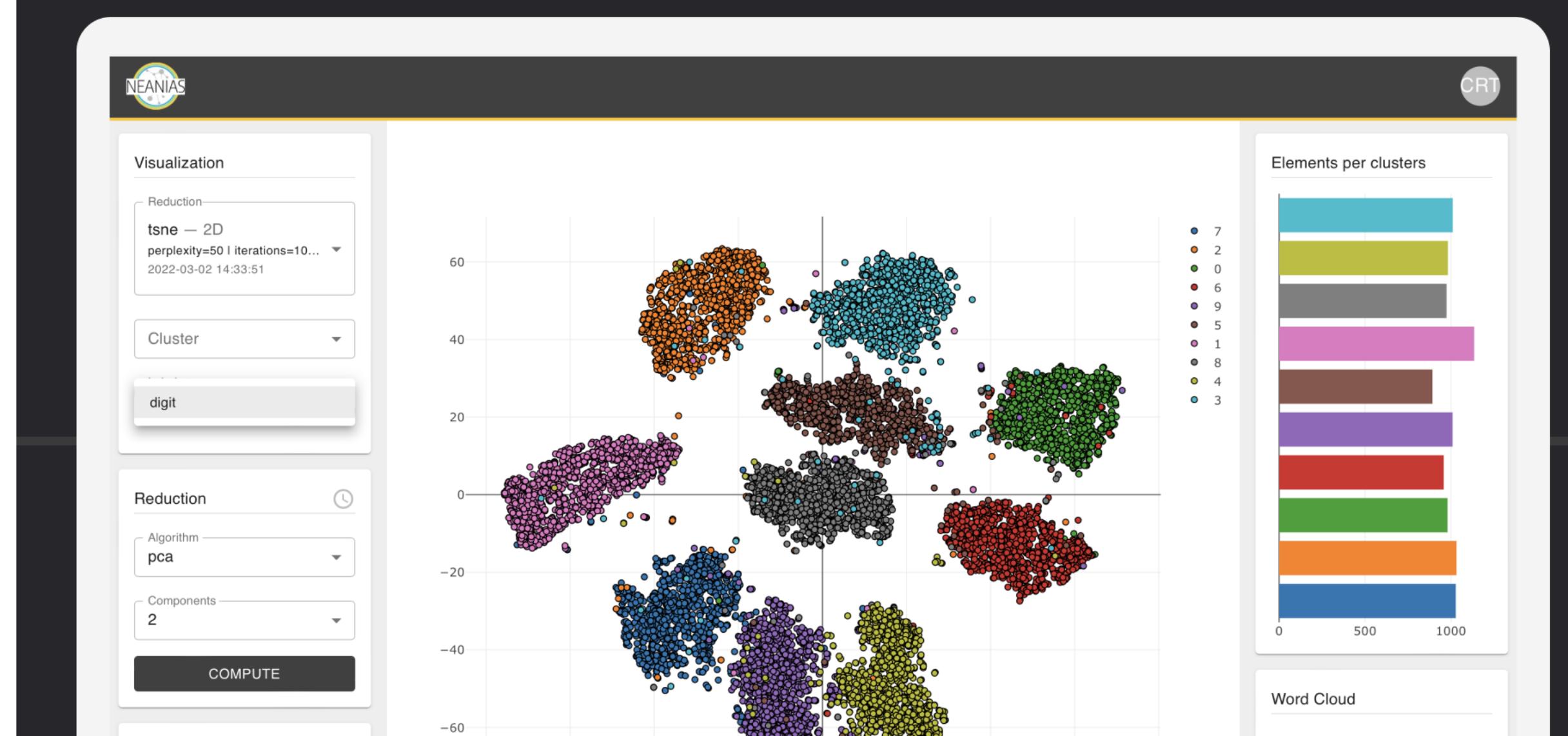


MNIST

MNIST is a classic dataset for image classification. It consists of 28x28 grayscale images of handwritten digits. Analysing the dataset using the latent space explorer allows to have a structured overview of the content of the dataset. Clustering methods like dbscan could help to detect outliers and clean the dataset. The analysis could help to understand what the neural network learn from the data and correct hidden bias.

Name	Image size	Channels num.	Preview	Architecture	Filters	Latent dim.	Epochs	Batch size	Delete
demo-celeba-simclr	128 x 128	3	{"r":0,"g":1,"b":2}	simclr	[64,128,256]	128	3000	128	
demo-eurosat-autoencoder	64 x 64	13	{"r":3,"g":2,"b":1}	cae	[64,128,256]	128	3000	128	
demo-eurosat-simclr	64 x 64	13	{"r":3,"g":2,"b":1}	simclr	[64,128,256]	128	3000	128	
demo-mnist-autoencoder	28 x 28	1	{"r":0,"g":0,"b":0}	cae	[32,64]	8	10000	1024	
mnist-10k	28 x 28	1	{"r":0,"g":0,"b":0}	cae	[32,64]	8	10000	1024	

5 experiments



2

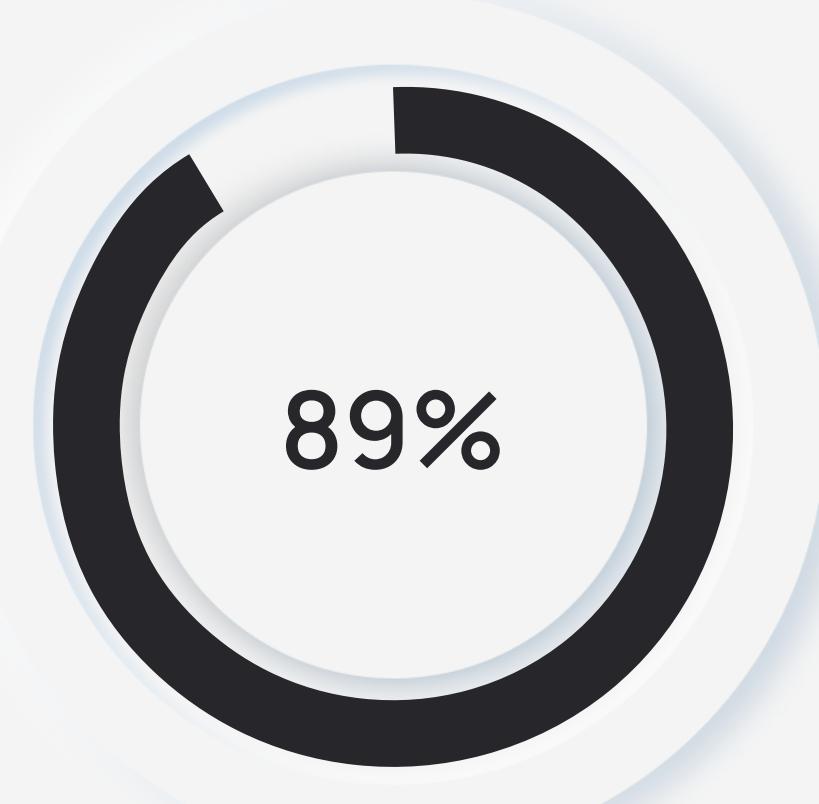
Usability Testing



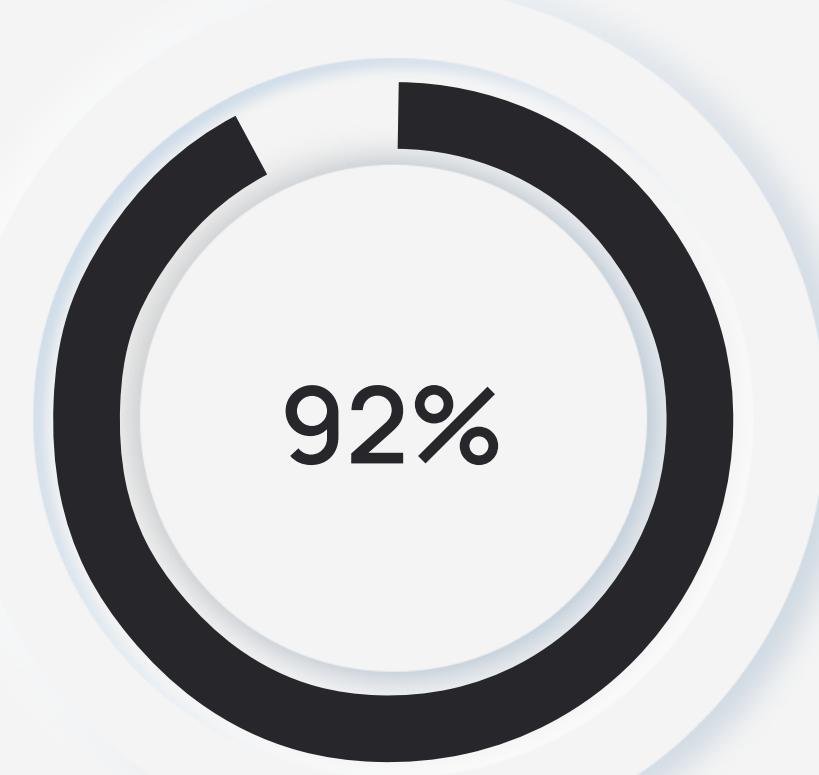
6
utenti

4 + 2
task

3
video

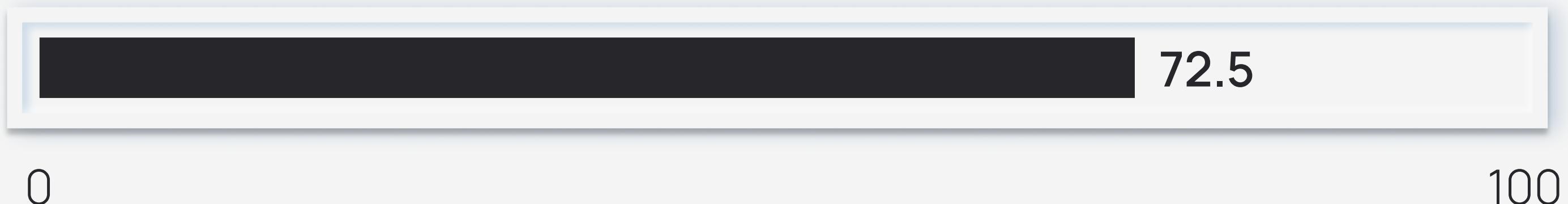


esperti di ML

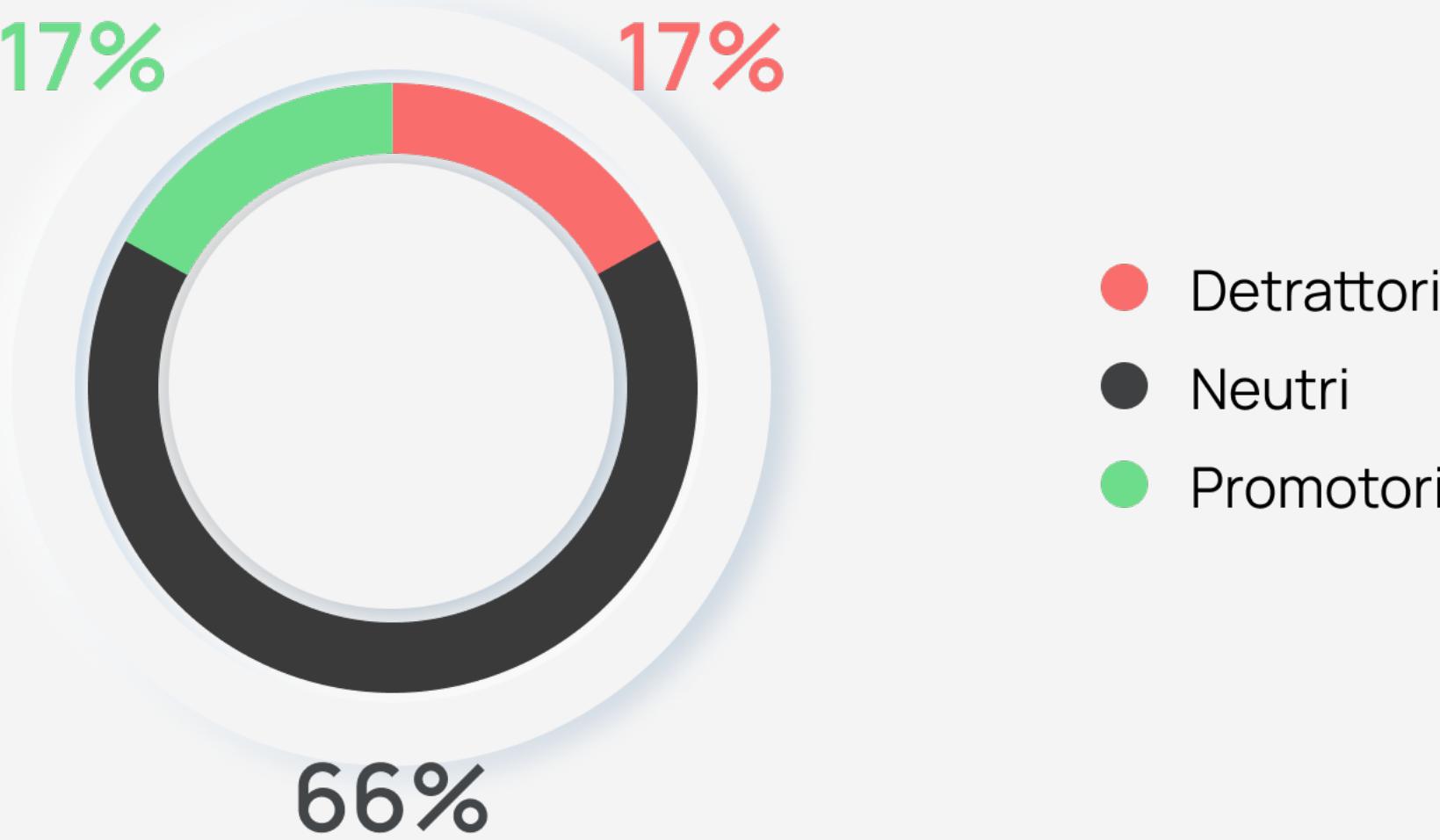


non esperti

SUS



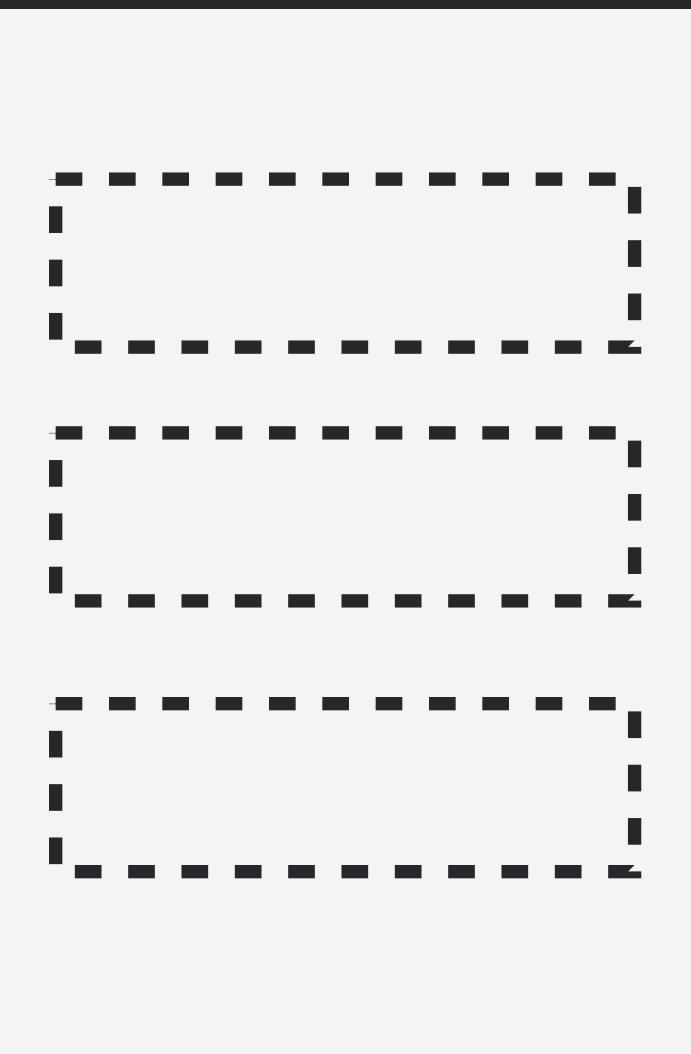
NPS



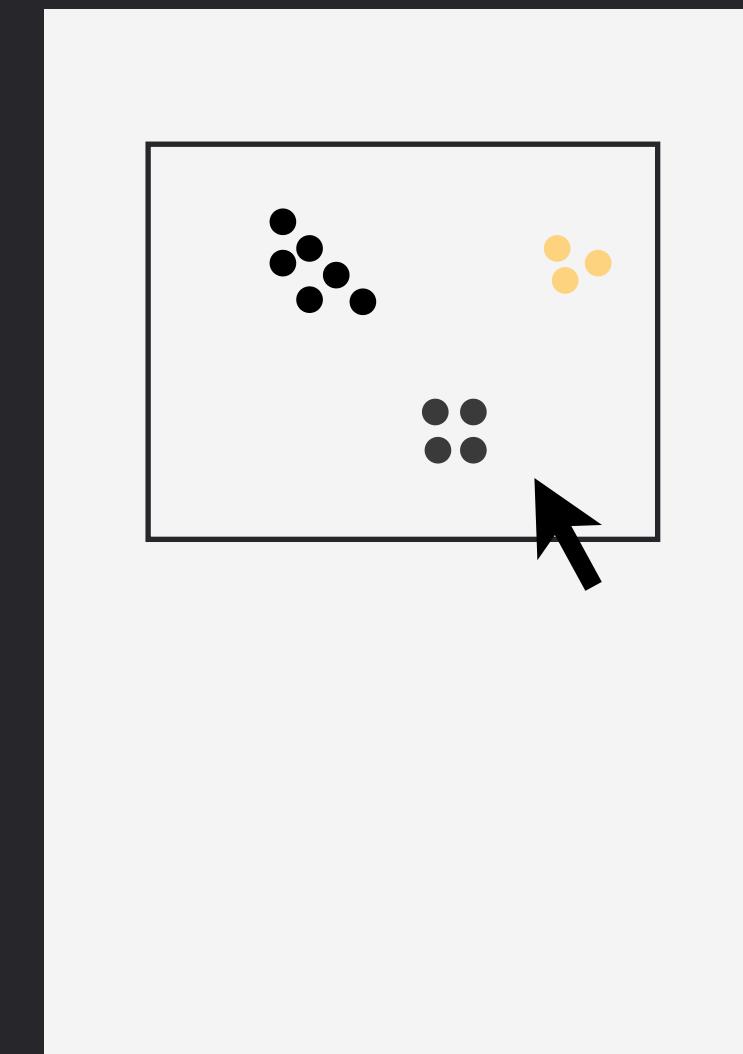
Documentazione



Navigazione



Interazione



3

Re-design e sviluppo

Home

Latent Space Explorer
Analysis of image datasets via unsupervised machine learning methods.



[Get started](#) [Go to Experiments list](#)

What We Do
LSE allows to extract a compact representation from data by representation learning models (e.g. autoencoders). The information extracted can be then visualized using the projector. The latter allows visualizing the data in a 2D or 3D space in an interactive fashion. The system then allows performing clustering algorithms to detect potentially relevant ways to group images and to support the definition of novel classification schemes.

List of experiments

Experiment	Description
MNIST	MNIST is a classic dataset for image classification. It consists of 28x28 grayscale images of handwritten digits. Clustering methods like t-SNE could help to detect outliers and clean the dataset.
CelebA	CelebA is a dataset of over 200,000 celebrity images. In this particular experiment we subsampled the dataset to a smaller size of 10000 images. There are a lot of visual features: accessories, skin tone, hair type, eyes, and so on.
EuroSAT	EuroSAT is a collection of images captured by European Space Agency satellites using multiple instruments. Images has a shape of 64x64 pixels and those present more than 7 standard RGB channels.

In order to use the tool please follow the documentation...



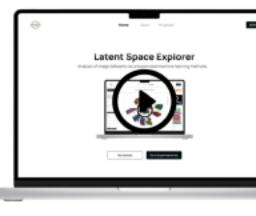
Basic Manual & Advanced Manual
Here you find the first steps to use the application.
[Read more →](#)

Experiments list
If you want to play with the projector on some demo experiments you will find those on your experiment list.
[Go to experiments list](#)

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Docs

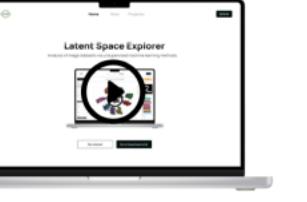
Basic Manual
Scroll down the page to view the steps to follow. If you need more help check the video.
[Download Basic Manual](#)



[Video tutorial](#)

Access to data sharing service +
Login to the service +
Choose an experiment +
Projector +

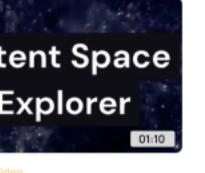
Advanced Manual
After you've explored the basic functionalities of the Latent Space Explorer you could experiment with your own data.
[Download Advanced Manual](#)



[Video tutorial](#)

Creating custom data +
Generate experiment +
Upload custom experiment +

Useful Videos



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Projector

Visualization specifics

- Reduction and cluster selection
- Label selection
- Support multiple algorithms and their respective parameters

Details

- Preview Image
- Dimension per clusters
- WordClouds

Latent Space

- 2D/3D chart
- Cluster visualization
- Label visualization

Basic Manual & Advanced Manual
Here you find the first steps to use the application.
[← Back to Manuals](#)

Experiments list
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Home

In order to use the tool please follow the documentation...

Latent Space Explorer
Analysis of image datasets via unsupervised machine learning methods.



[Get started](#) [Go to Experiments list](#)

What We Do LSE allows to extract a compact representation from data by representation learning models (e.g. autoencoders). The information extracted can be then visualized using the projector. The latter allows visualizing the data in a 2D or 3D space in an interactive fashion. The system then allows performing clustering algorithms to detect potentially relevant ways to group images and to support the definition of novel classification schemes.

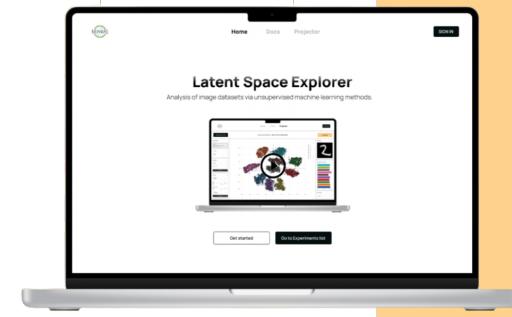
List of experiments

Experiment 1 **MNIST**
MNIST is a classic dataset for image classification. It consists of 28x28 grayscale images of handwritten digits. Clustering methods like dbscan could help to detect outliers and clean the dataset.

Experiment 2 **CelebA**
CelebA is a dataset of over 200.000 celebrity images. In this particular experiment we subsampled the dataset to a smaller size of 10000 images. There are a lot of visual features: accessories, skin tone, hair type, eyes, and so on.

Experiment 3 **EuroSAT**
EuroSAT is collection of images captured by European Space Agency satellites using multiple instruments. Images has a shape of 64x64 pixels and those present more than 3 standard RGB channels.

In order to use the tool please follow the documentation...



Basic Manual & Advanced Manual
Here you find the first steps to use the application.

[Read more →](#)

Experiments list
If you want to play with the projector on some demo experiments you will find those on your experiment list.

[Go to experiments list](#)

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The screenshot shows the NEANIAS website's documentation page. At the top, there is a navigation bar with links for 'Home', 'Docs', 'Projector', and a 'SIGN IN' button. Below the navigation, there is a heading 'Basic Manual'. A note below it says: 'Scroll down the page to view the steps to follow. If you need more help check the video.' There is a link 'Download Basic Manual'. Below this, there is a 'Video tutorial' section featuring a laptop screen displaying the Latent Space Explorer interface. The video player shows a timestamp of 01:10. At the bottom of the page, there is a yellow box containing four items, each preceded by a '+' sign: 'Access to data sharing service', 'Login to the service', 'Choose an experiment', and 'Projector'.

Useful Videos

This section is titled 'Useful Videos' and contains three video thumbnails. The first thumbnail is for a 'Youtube Video' titled 'Latent Space Explorer' with a duration of 01:10. The second thumbnail is for an 'Intro Video' with a duration of 01:45. The third thumbnail is for a 'Basic Manual' with a duration of 01:15. Navigation arrows are located on the left and right sides of the thumbnails.

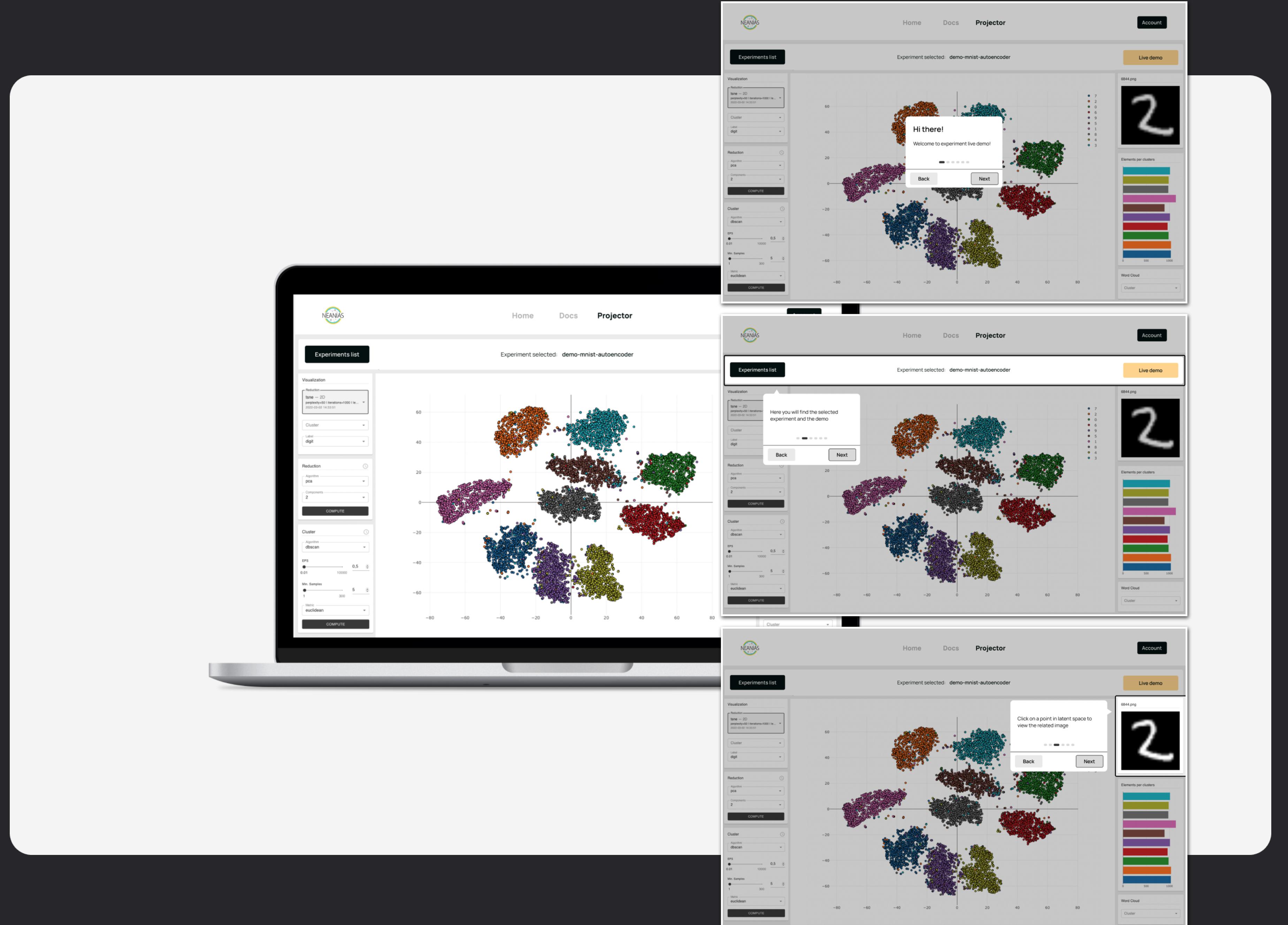
DOCS

The screenshot shows the NEANIAS website's documentation page. It features a 'Video tutorial' section with a laptop screen showing the Latent Space Explorer interface. Below the video player, there is a note: 'After you've explored the basic functionalities of the Latent Space Explorer you could experiment with your own data.' A link 'Download Advanced Manual' is provided. At the bottom of the page, there is a grey box containing three items, each preceded by a '+' sign: 'Creating custom data', 'Generate experiment', and 'Upload custom experiment'.

The screenshot shows the Projector application's interface. At the top, there is a navigation bar with links for Home, Docs, Projector, and a Sign In button. Below the navigation bar, there is a section titled "Visualization specifics" with a bulleted list: Reduction and cluster selection, Label selection, and Support multiple algorithms and their respective parameters. To the right of this section is a "Details" box with a bulleted list: Preview Image, Elements per clusters, and Word Cloud. A central feature is a 2D scatter plot titled "Latent Space" showing data points clustered into several groups. Below the scatter plot, there are two callout boxes: "Basic Manual & Advanced Manual" (yellow background) and "Experiments list" (black background). The "Basic Manual & Advanced Manual" box contains text about finding first steps and has links for "Back to Manuals" and "Go to experiments list". The "Experiments list" box contains text about playing with demo experiments and also has a "Go to experiments list" link. At the bottom of the page, there is a footer with copyright information: LSE © 2022 Neanias Space Team Powered by Sphinx 4.2.0 & Alabaster 0.7.12, and social media icons for Facebook, Twitter, YouTube, and LinkedIn.

Projector

Projector



The image shows three devices displaying the Latent Space Explorer (LSE) website. The top device is a desktop monitor showing a video player with a thumbnail of the LSE interface. Below the video player are two buttons: "Get Started" and "Go to Experiments list". The middle device is a tablet showing the same video player and buttons. The bottom device is a smartphone showing the same video player and buttons. All three devices have a header with the NEANIAS logo, navigation links for "Home", "Docs", "Projector", and a "SIGN IN" button. The main title "Latent Space Explorer" and subtitle "Analysis of image datasets via unsupervised machine learning methods." are visible on all screens. A "What We Do" section is present on the tablet and smartphone screens, providing a brief description of the LSE's function.

NEANIAS

Home Docs Projector SIGN IN

Latent Space Explorer

Analysis of image datasets via unsupervised machine learning methods.

Get Started Go to Experiments list

NEANIAS Home Docs Projector SIGN IN

Latent Space Explorer

Analysis of image datasets via unsupervised machine learning methods.

Get Started Go to Experiments list

What We Do LSE allows to extract a compact representation from data by representing learning models (e.g. autoencoders). The information extracted can be visualized using the projector. The latter allows visualizing the data in a 2D or 3D space in an interactive fashion. The system then allows performing clustering algorithms to detect potentially relevant ways to group images as to support the definition of novel classification schemes.

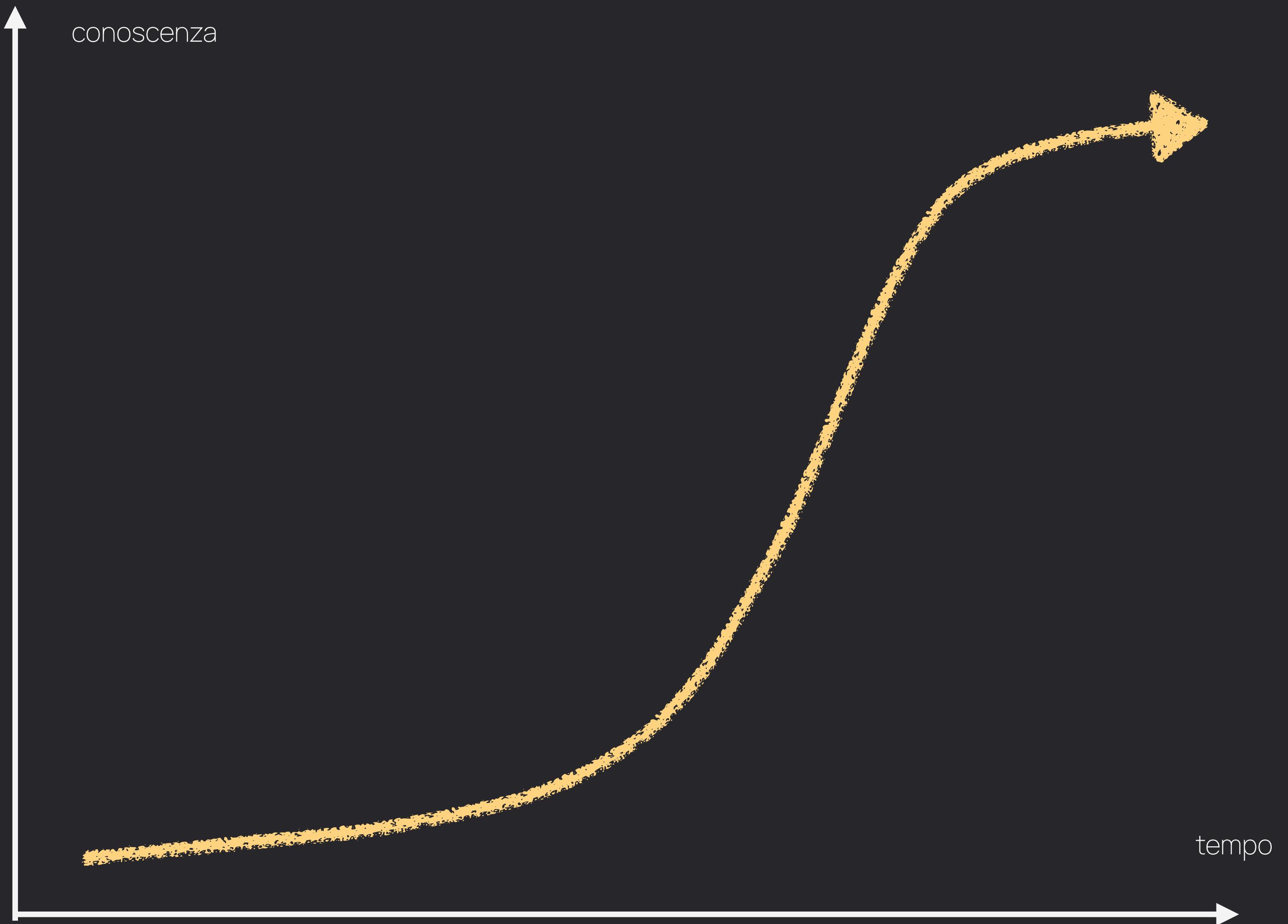
NEANIAS

Latent Space Explorer

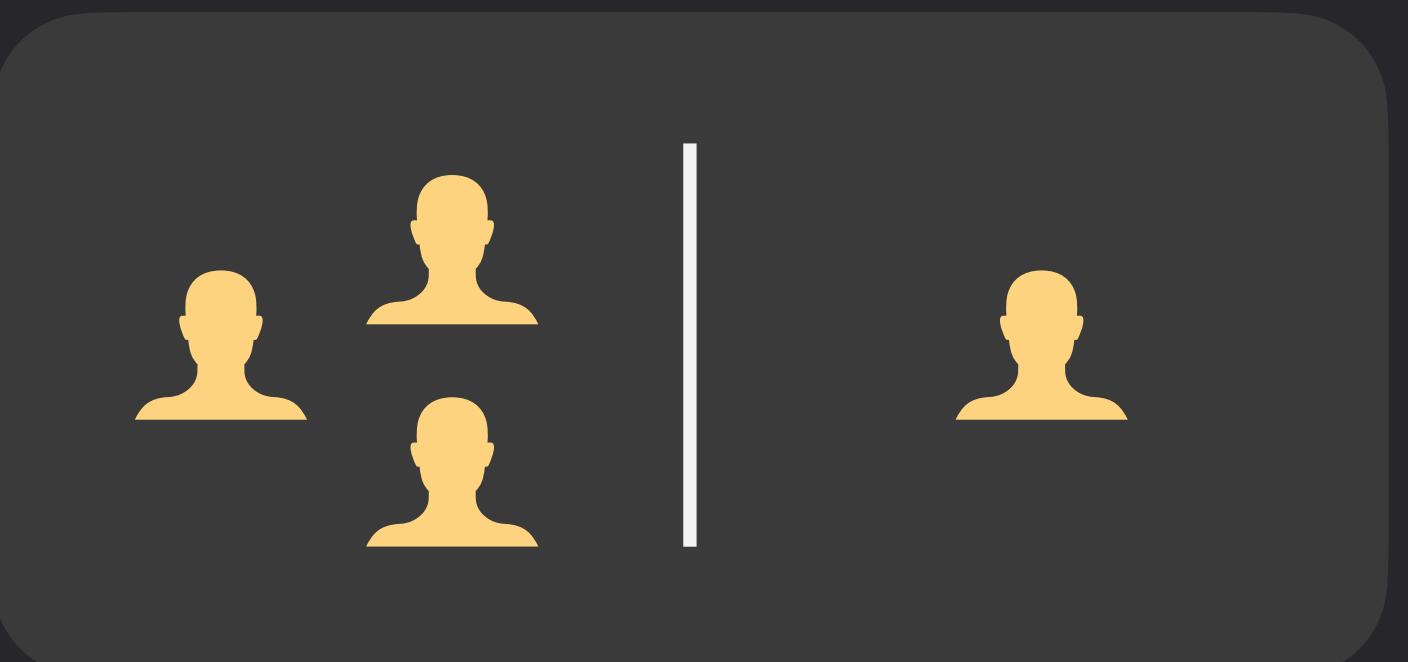
Analysis of image datasets via unsupervised machine learning methods.

Get Started Go to Experiments list

Considerazioni finali



- Esperti di dominio
- Test di usabilità
- Task specifici sul projector



Grazie per l'attenzione