GANAesthetic :

An experience of interactively exploring aesthetically pleasing images and incorporating the human perception of beauty to discover aesthetic latent dimensions

Despite the fact that climate change is becoming increasingly dangerous and prevalent, there is still a lack of public engagement. This can be explained by the fact that the media portrays climate change as an abstract concept. The message can be more effectively communicated through visual art because it is more likely to invoke emotional responses in individuals. By including human perception and rating data, the generative adversarial neural network (GAN) produces better image output.

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I. Introduction

The project Landshapes by Frederik Ueberschar shows aesthetically pleasing satellite images generated by StyleGAN2-ADA in order to evoke climate fascination through beautiful images [1].

StyleGAN models offer "unsupervised separation of high-level attributes from stochastic variation in the gener- ated images, and enables intuitive scale-specific mixing and interpolation operations" [2].

II. Objective

The research questions is : *How can human rating data help improve GAN/Transformer output? (with datasets of Satellite images or Google Street View images)*

This research aims to find methodologies that incorporate human rating data and its perception of beauty in order to improve quality and aesthetic of images outputted by GAN.
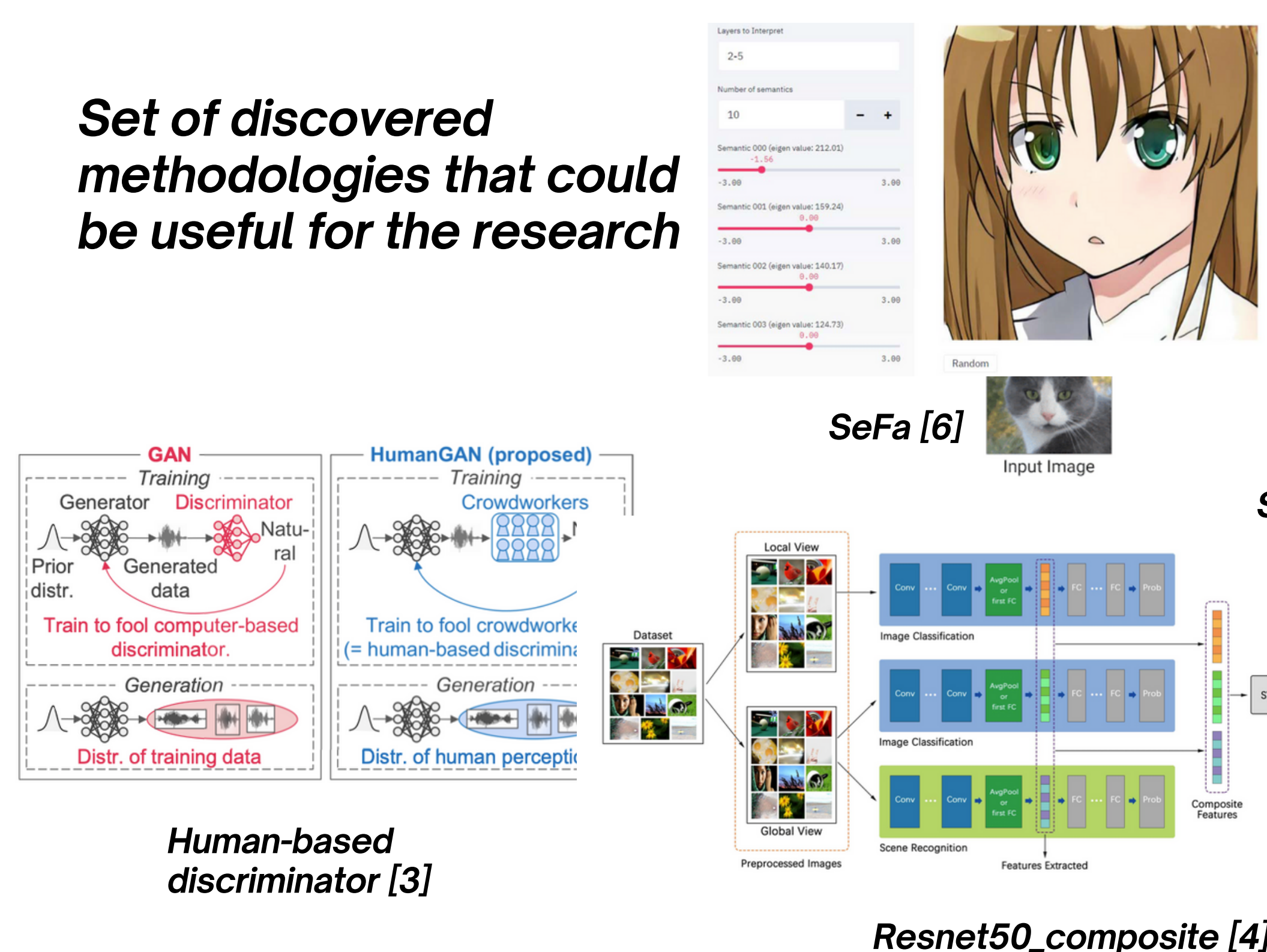
III. Methodology

GANAesthetic pipeline

I. Gathering satellite images for creating a dataset

II. Adversarial training with StyleGAN2

III. Creating image interative editor with GANSpace + Gradio and running on Google Collab with GPU

IV. Running experiments and studies

IV. Analysis

- GANSpace is an unsupervised technique, that uses PCA to identify important latent directions.
- Gradio offers an easy and fast way to create an app for demo of machine learning models with nice and friendly interface.
- HugginFace offers to create an interactive image editor online.
- With UI sliders, scientific experiments can be conducted. For example, discovering aesthetic semantic representations of latent dimensions.

Set of discovered methodologies that could be useful for the research

Human-based discriminator [3]

**SeFa [6]**

StyleEx [5]

Resnet50_composite [4]

After performing literature studies and exploring set of existing approaches. The most relevant methodology for the study is to create interactive UI with the sliders. Thus, creation of GANAesthetic

Development of the system that provides interactive exploration of aesthetic satellite imagery and discovering beautiful regions in latent spaces
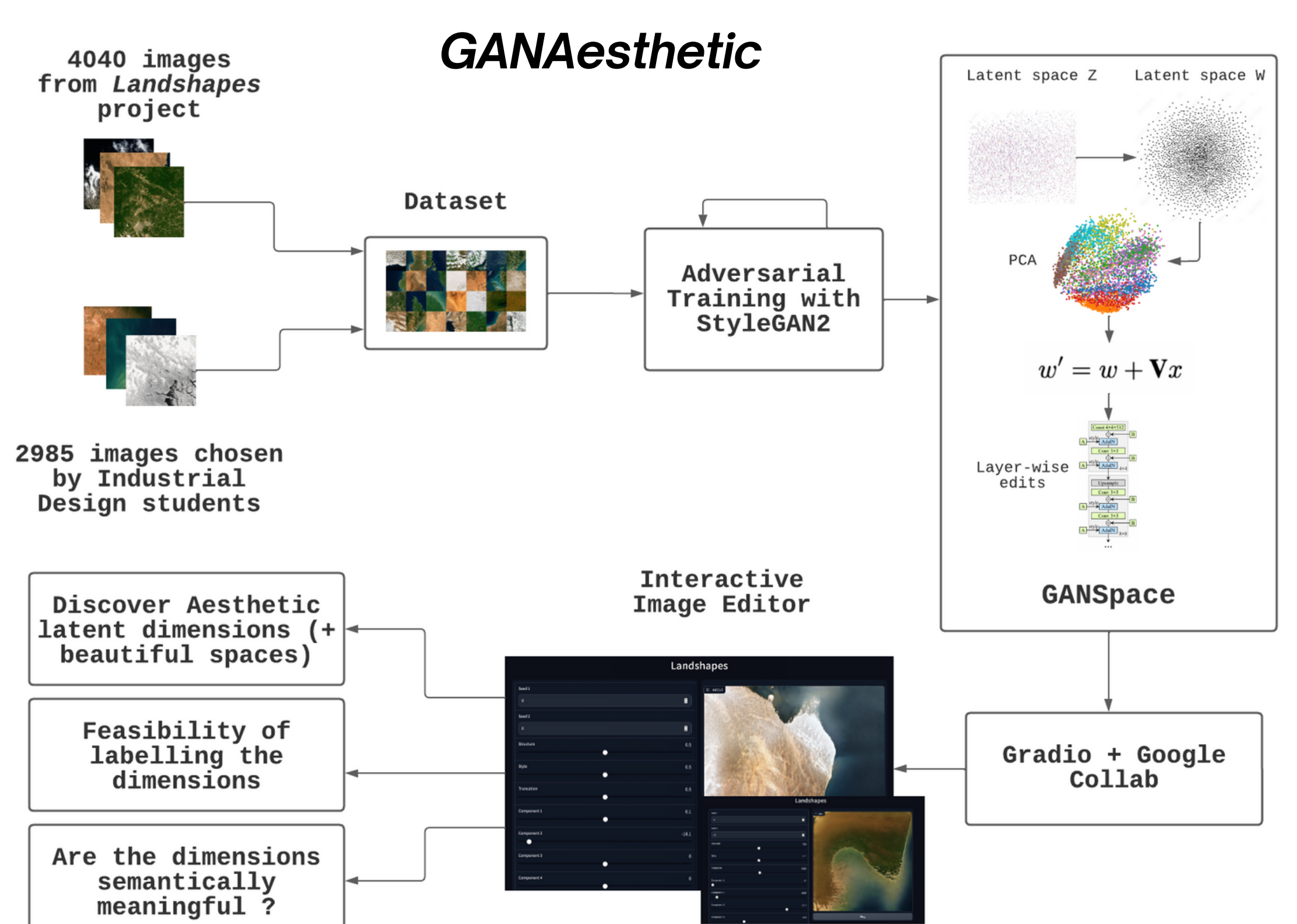

V. Results/Findings

- Created an UI where users can move the sliders in order to edit the synthesized images from StyleGAN2. The generation takes 10 seconds on HuggingFace and on Google Collab around 1 second.
- Trained StyleGAN2 with FID score of 11.5706.
- The experiment of discovering aesthetic dimensions was conducted with 56 participants. It has shown that certain dimensions and factors such as water mass are more preferred and pleasing to the eyes than the others. Increased number of sliders resulted in more mental exhaustion
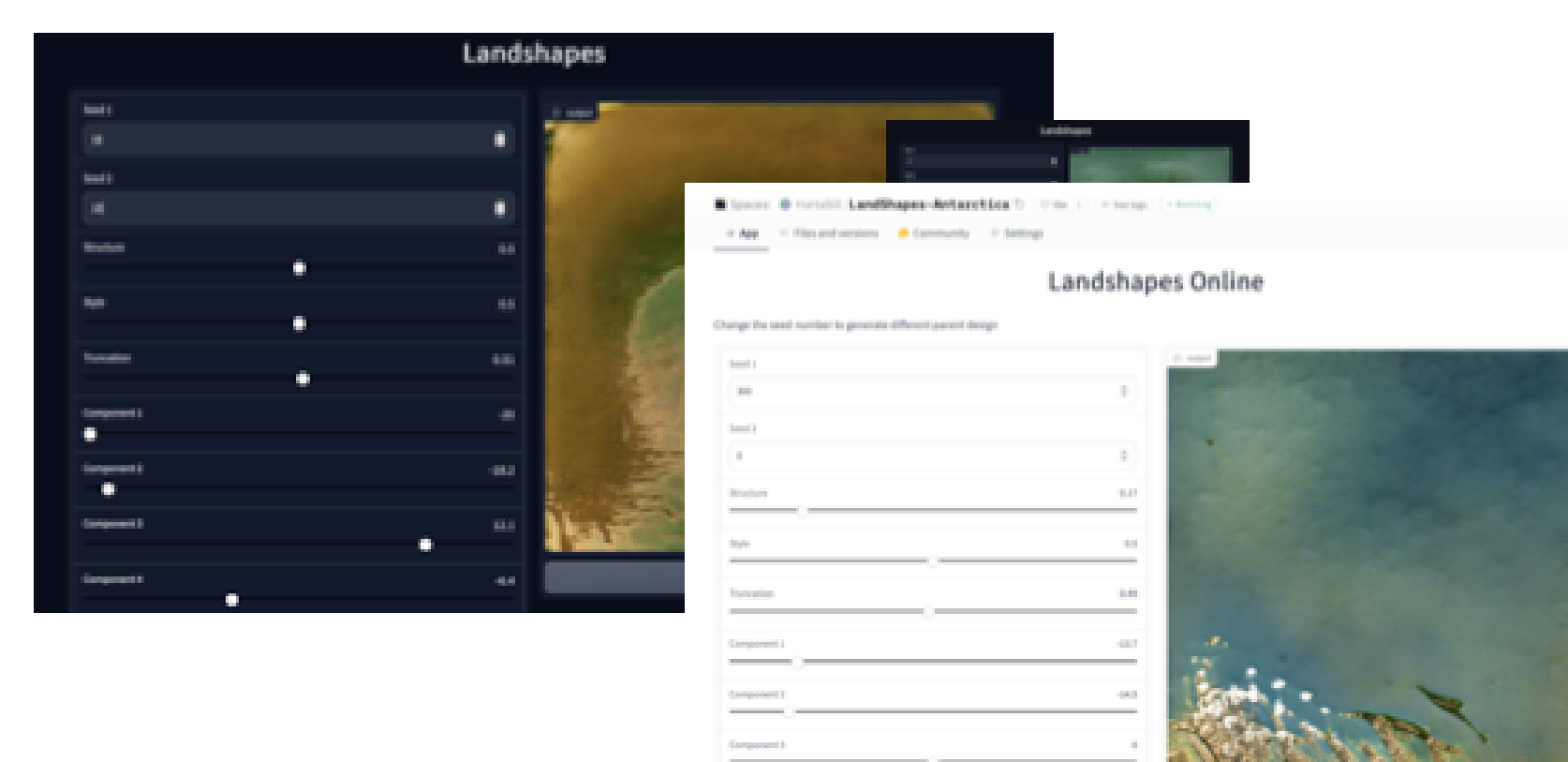
Interactive Image Editor with Gradio and GANSpace
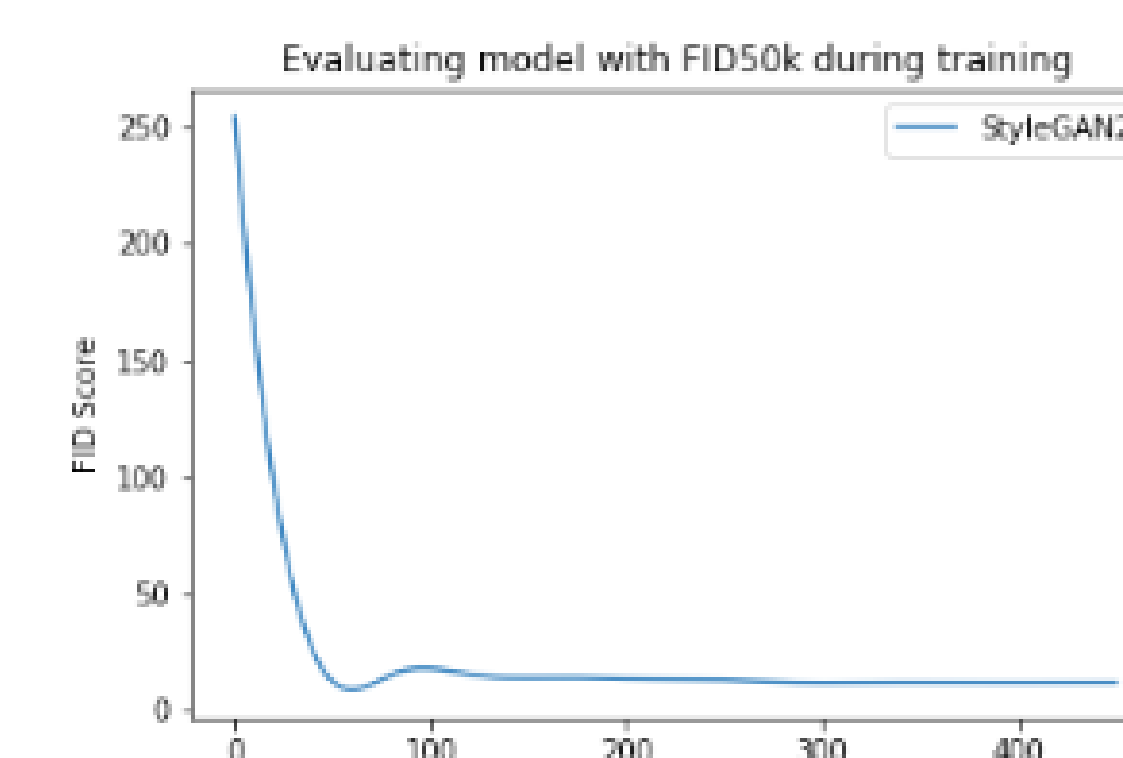
Training performance of StyleGAN2

	COASTLINE	FOREST/DESERT	ARCTIC
c_0	9	41	4
c_1	17	29	6
c_2	7	8	17
c_3	31	3	20
c_4	16	28	24
c_5	7	4	24
c_6	18	2	8
c_7	8	21	4
c_8	6	12	11
c_9	18	5	14
c_{10}	9	5	11
c_{11}	5	6	6
c_{12}	10	1	4
c_{13}	4	0	11

Results of the experiment of discovering aesthetic dimensions

VI. Conclusion

The GANAesthetic was shown in this paper to be successful and has a large potential for future scientists and designers to perform experiments and to study semantic representations or discover beautiful regions in perceptual spaces.

Future work will include implementing and carrying out Gibb's sampling with people in order to identify ranges of coordinates in each dimension that represent aesthetic values or semantic representations of the dimensions such as color, contrast, geometrical modification, etc. Or performing resource surface methodology (RMS).

Related Literature

[1] Ueberschär Frederik, AI for Experience: Designing with Generative Adversarial Networks to evoke climate fascination, 2021

[2] Tero Karras, Samuli Laine, and Timo Aila. A style- based generator architecture for generative adversarial networks, 2018.

[3]Kazuki Fujii, Yuki Saito, Shinnosuke Takamichi, Yukino Baba, and Hiroshi Saruwatari. Humangan: gen- erative adversarial network with human-based discrimi- nator and its evaluation in speech perception modeling, 2019.

[4] Xin Fu, Jia Yan, and Cien Fan. Image aesthetics assess- ment using composite features from off-the-shelf deep models. In 2018 25th IEEE International Conference on Image Processing (ICIP), pages 3528–3532, 2018.

[5] Oran Lang, Yossi Gandelsman, Michal Yarom, Yoav Wald, Gal Elidan, Avinatan Hassidim, William T. Free- man, Phillip Isola, Amir Globerson, Michal Irani, and Inbar Mosseri. Explaining in style: Training a gan to explain a classifier in stylespace, 2021.

[6] Yujun Shen and Bolei Zhou. Closed-form factorization of latent semantics in gans, 2020.