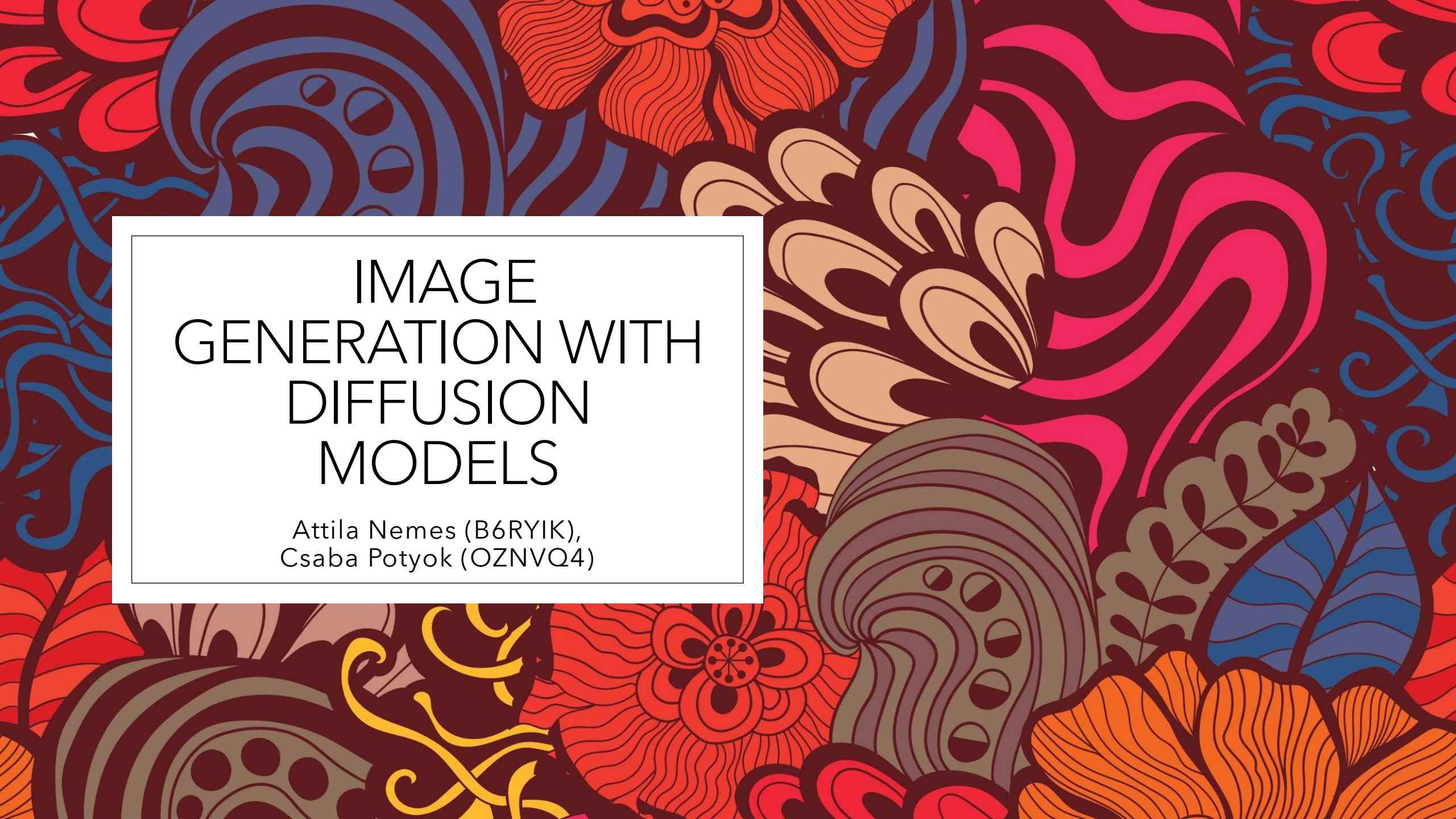

IMAGE GENERATION WITH DIFFUSION MODELS

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Agenda

- review of literature (tutorial video watching)
- acquisition and preparation of datasets (Flowers102, CelebA)
- baseline model (VAE)
- designing and training a DDPM model
- evaluation of the results
- creating an AI service

Datasets

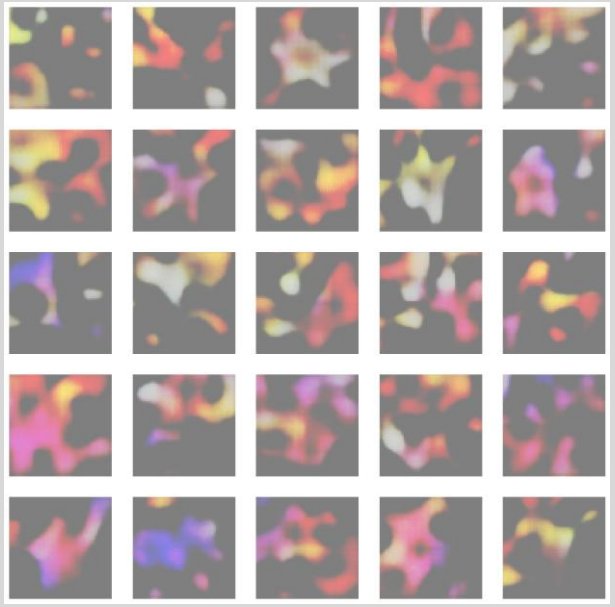
Flowers102 (~30k images)

CelebA (~200k images)

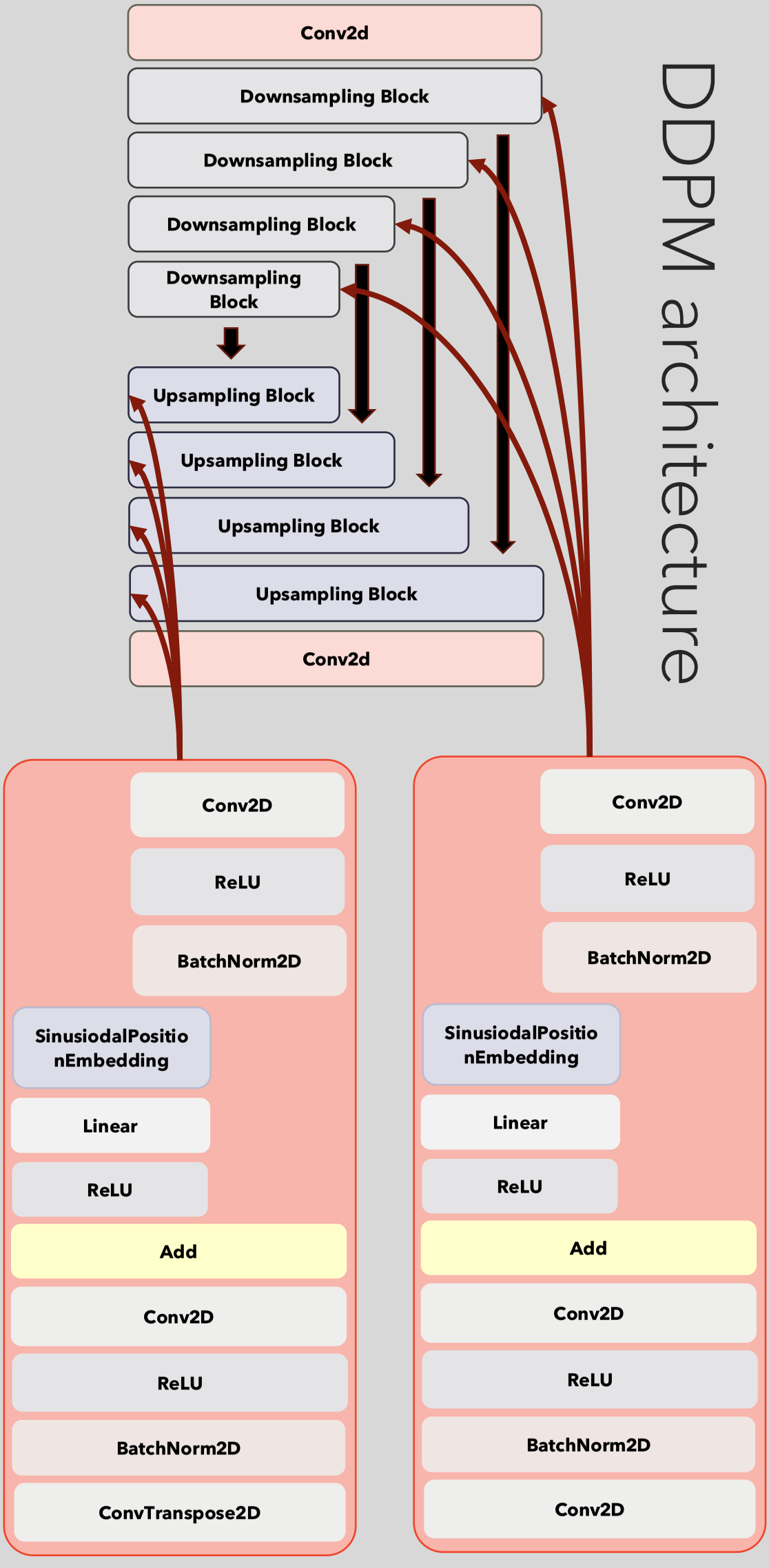
(source: https://huggingface.co/datasets/nielsr/CelebA-faces)

Baseline model

- simple VAE
- 10 epoch training
- no hyperparameter optimization



DDPM architecture



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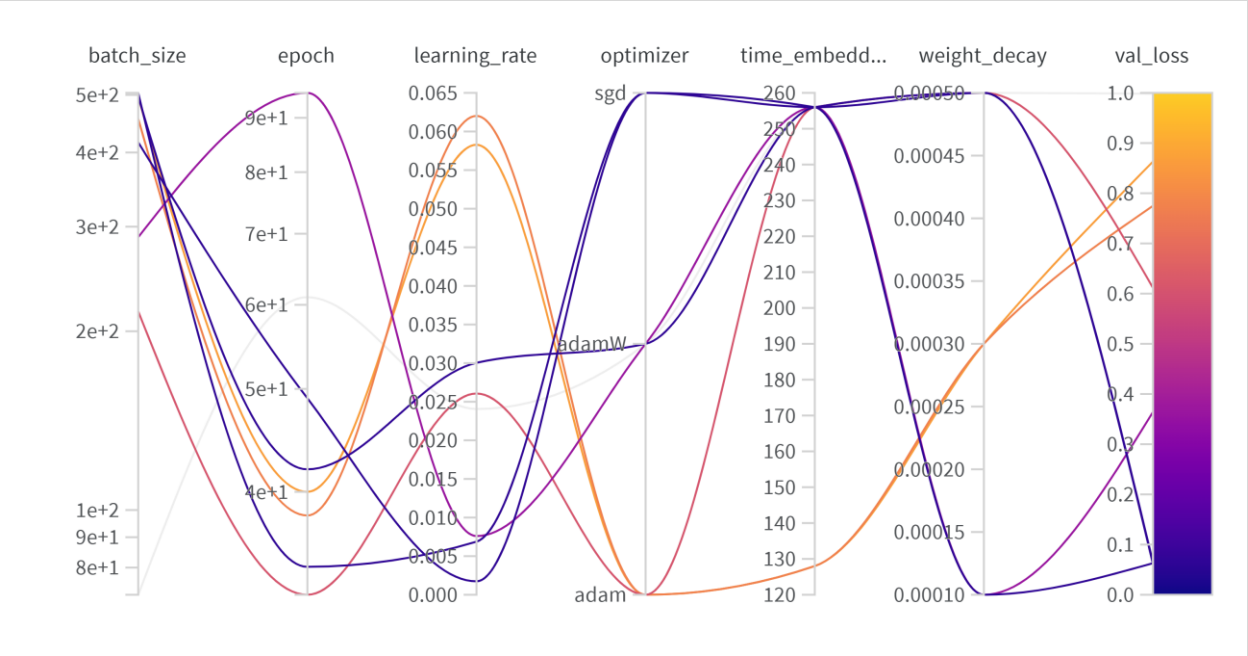
Training models

- using Pytorch + Ligthning
- LightningModule for pipeline
- Diffusion model
- running on Komondor

Hyperparameter optimization



- using wandb
- Bayesian hyperopt
- for both datasets
- running on Komondor

Evaluation of models

model	FID	IS mean	IS std	loss
1	60,68	1,328	0,021	0,057
2	19,33	1,527	0,026	0,059
3	100,41	2,485	0,123	0,055
4	17,958	1,579	0,054	0,062
5	14,353	1,738	0,063	0,065
6	15,57	1,562	0,029	0,077
7	**8,477**	1,628	0,048	0,067
8	25,804	1,7	0,048	0,073

Result on Flowers102

model	FID	IS mean	IS std	loss
1	26,072	1,568	0,006	0,04
2	18,794	1,186	0,003	0,037
3	16,499	1,605	0,008	0,041
4	**16,39**	1,374	0,0048	0,039
5	16,606	1,349	0,003	0,038

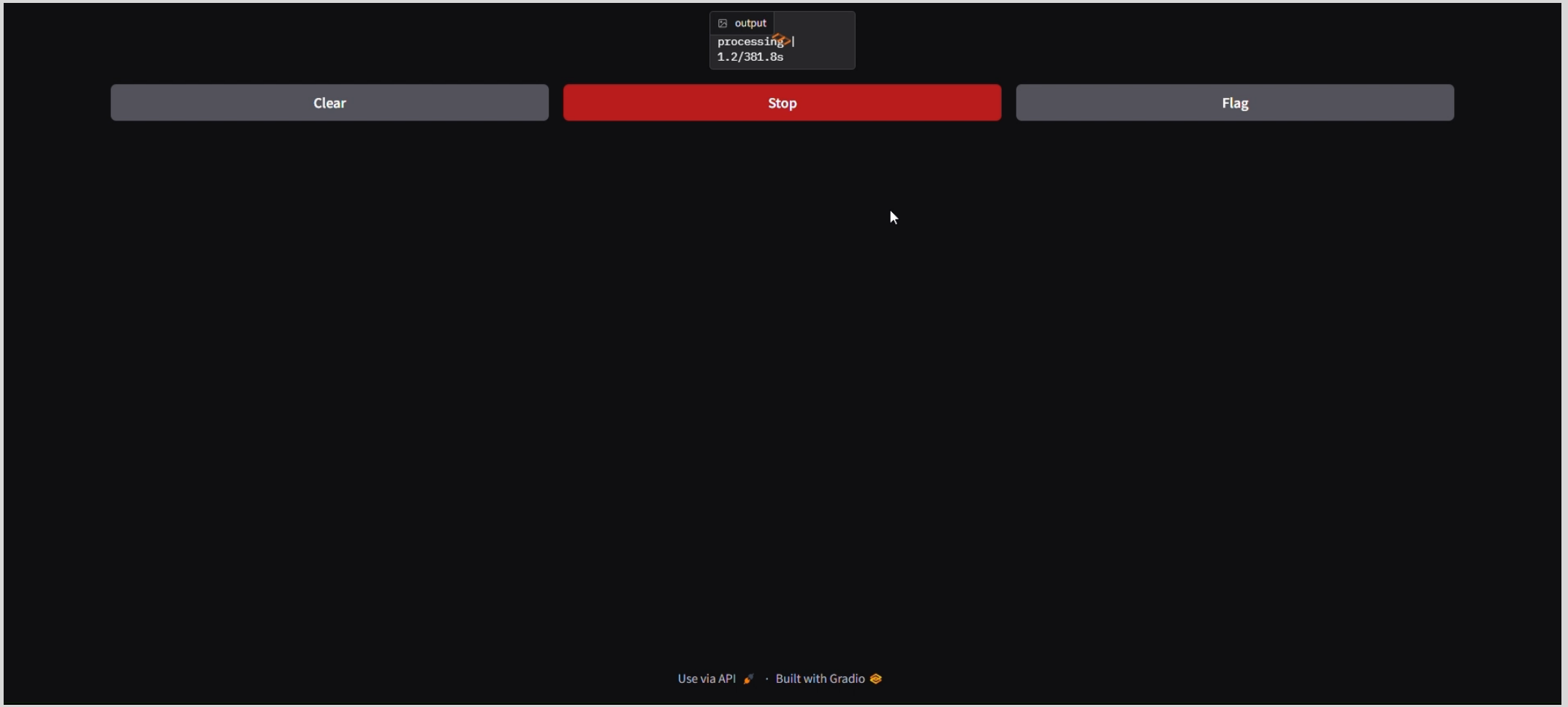
Result on CelebA

Generated images

Best with Flowers102

Best with CelebA

Demo video



2024. 12. 08.