

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski

Introduction
Framework
Experiments
Conclusions

Text to Image generation using GANs, CLIP and evolutionary algorithms.

Techical University of Warsaw

Maciej Domagała, Adam Komorowski

June 19, 2021

Introduction

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski

Introduction

Framework

Experiments

Conclusions

Avocado chair - generated by OpenAI's DALL-E model.



GANs

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski

Introduction

Framework

Experiments

Conclusions

BigGAN

- trained on the ImageNet dataset
- proposed by DeepMind in 2018
- by design, it should generalize well

StyleGAN2

- introduced by Nvidia in 2019
- trained in terms of generating various objects, e.g.cars, faces

CLIP

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski

Introduction

Framework

Experiments

Conclusions

CLIP (Contrastive Language-Image Pre-Training):

- released by OpenAI in January 2021,
- it is a neural network trained on over 400 000 000 (image, caption) pairs,
- main usage is to obtain the most relevant text snippet for given image.

guacamole (90.1%) Ranked 1 out of 101 labels



- ✓ a photo of **guacamole**, a type of food.
- ✗ a photo of **ceviche**, a type of food.
- ✗ a photo of **edamame**, a type of food.
- ✗ a photo of **tuna tartare**, a type of food.
- ✗ a photo of **hummus**, a type of food.

Evolutionary Algorithms

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski

Introduction

Framework

Experiments

Conclusions

Genetic Algorithm

- ...
- ...

Differential Evolution

- ...
- ...

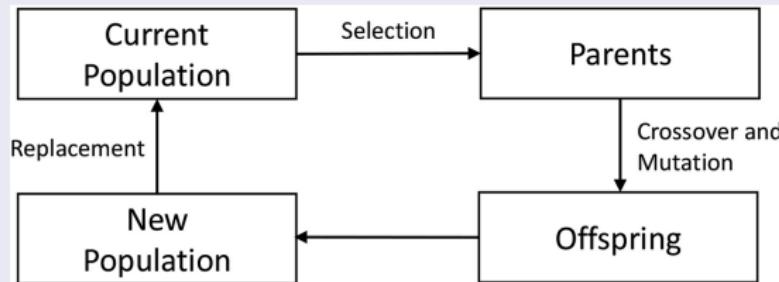
Evolutionary Algorithms

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski

Introduction
Framework
Experiments
Conclusions

Genetic Algorithm

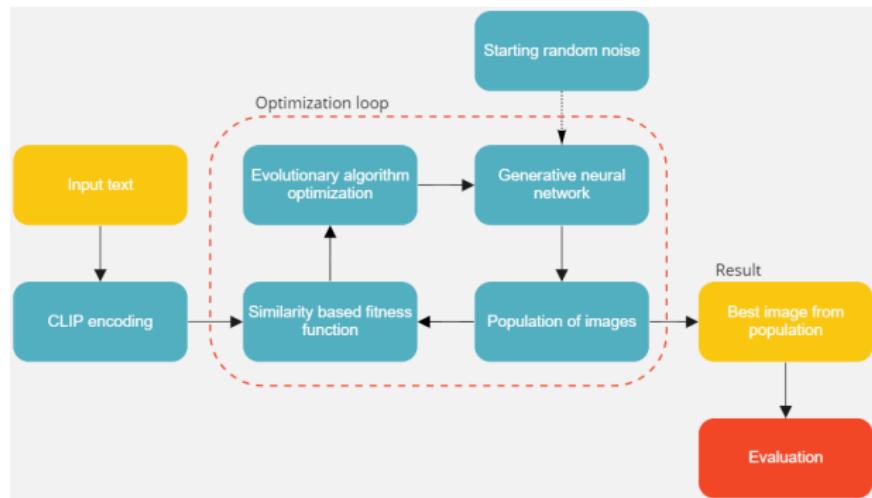


Framework

Text to Image generation using GANs, CLIP and evolutionary algorithms.

Maciej
Domagała,
Adam
Komorowski

Framework



Framework - example

Text to Image generation using GANs, CLIP and evolutionary algorithms.

Maciej Domagała, Adam Komorowski

Introduction

Framework

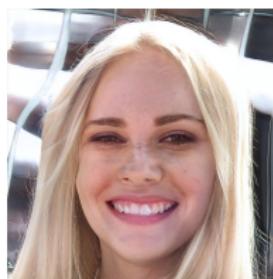
Experiments

Conclusions

- 1 Configuration: StyleGAN2-ffhq, GA algorithm, CLIP, 200 iterations
- 2 Input text: **a blond girl with a smile**
- 3 Batch after 100 iterations:

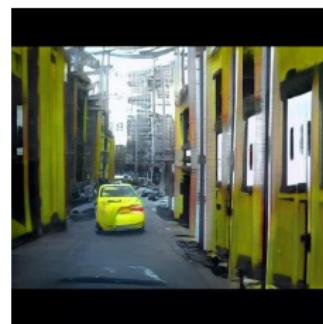


- 4 Final image:



GA vs DE

"A yellow car in the city"



(a) genetic algorithm

(b) differential evolution

Figure: Final images (with best score) produced by both algorithms.

BigGAN vs StyleGAN

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski

Introduction

Framework

Experiments

Conclusions

"Red gothic church"



(a) StyleGAN2-church



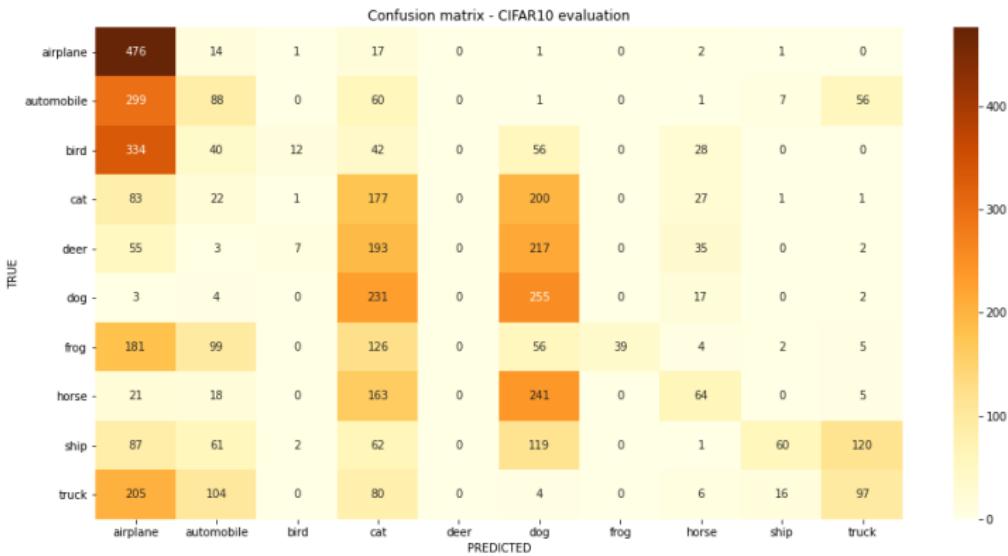
(b) BigGAN

Evaluation - CIFAR10

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski

Introduction
Framework
Experiments
Conclusions



Evaluation - ImageNet

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski

Introduction

Framework

Experiments

Conclusions

Class	Positive	Negative	Accuracy (%)
BANANA	111	401	21.68
CASH MACHINE	124	388	24.22
HAMMER	141	371	27.54
ICE CREAM	3	509	0.59
LLAMA	36	476	7.03
MINISKIRT	220	292	42.97
PIRATE	5	507	0.98
SHOPPING CART	125	387	24.41
WALL CLOCK	146	366	28.52
KERRY BLUE TERRIER	253	259	49.41
TOTAL	1164	3956	22.73

Evaluation - ImageNet - Example

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski

Introduction

Framework

Experiments

Conclusions

Llama

Correct



Incorrect



Conclusions

Text to Image
generation
using GANs,
CLIP
and
evolutionary
algorithms.

Maciej
Domagała,
Adam
Komorowski



Introduction



Framework



Experiments

Conclusions