Boosting the first mile user experience with Machine Learning

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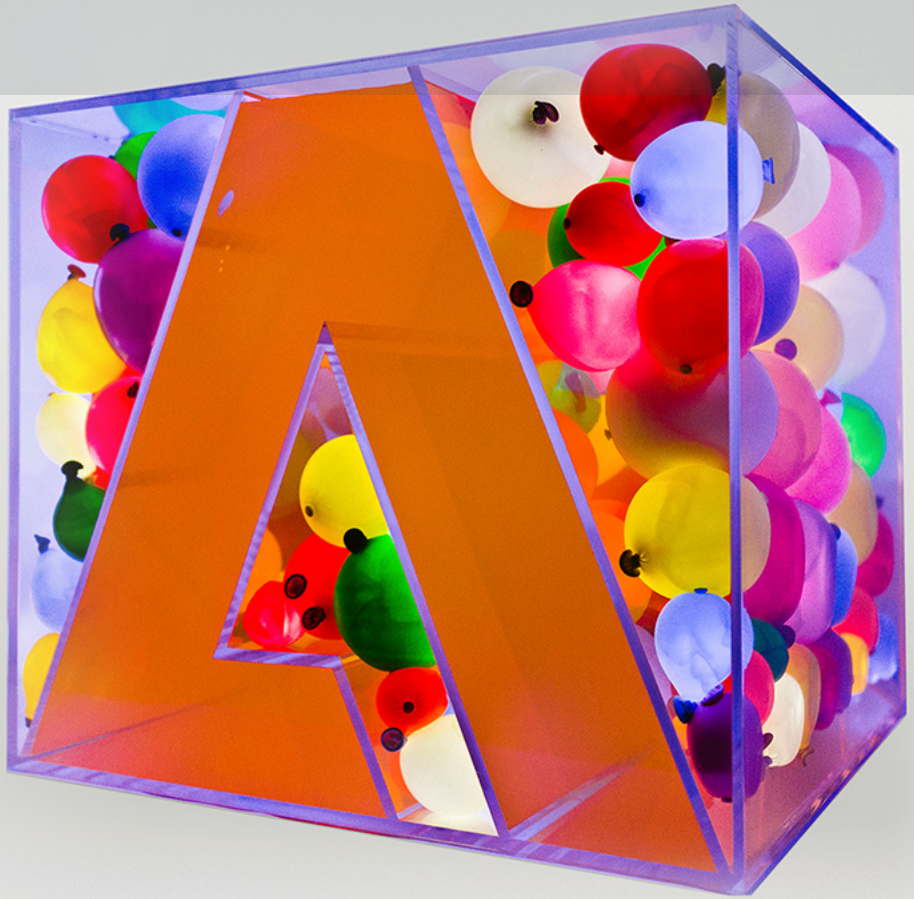
Agenda

1. Team Objective

2. Help users with smart tutorials
   - to generate content
   - to fix the photos
   - to create creative workflows



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Team objective

First Mile Use machine learning to increase engagement of new users in our products.

Beginners

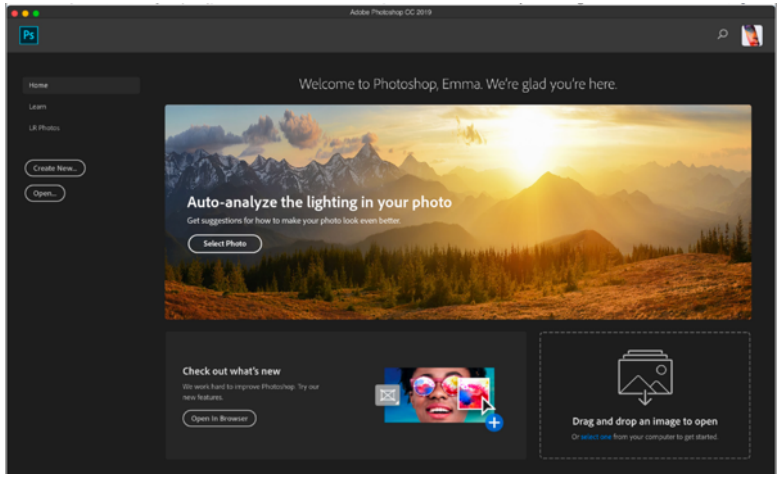
- Some of our beginners have domain expertise, some have some “tool expertise” and a few are net new.
- Some have a goal in mind vs. some just want to explore and learn.

Who are these people?

- Hobbyists playing around / Influencers
- Beginner designers / self learners
- Some marketers (in small businesses)

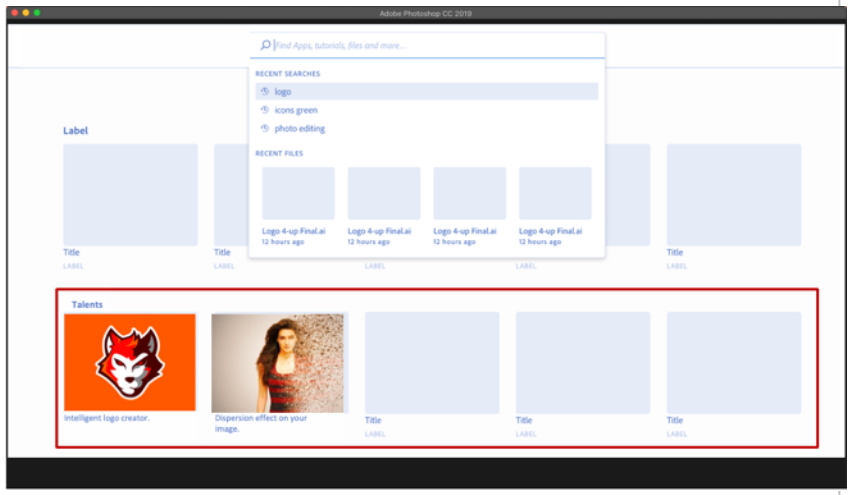
Photography

- Help users get started with learning basic photography concepts (in Ps)
- Help users quickly edit their photos with auto - magic edits.



Creation / search

- help users get started with some tasks on Ps / Ai:
  Logo generation, Collages, Wow effects



Smart tutorials

Before

After

Photo editing
e.g., Fix a photo party

e.g., Focus effect

Adobe

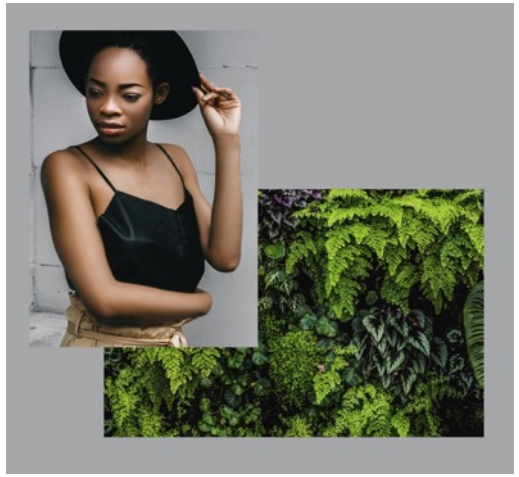
Smart tutorials

Before

After

Photo editing
e.g., Brighten a selection

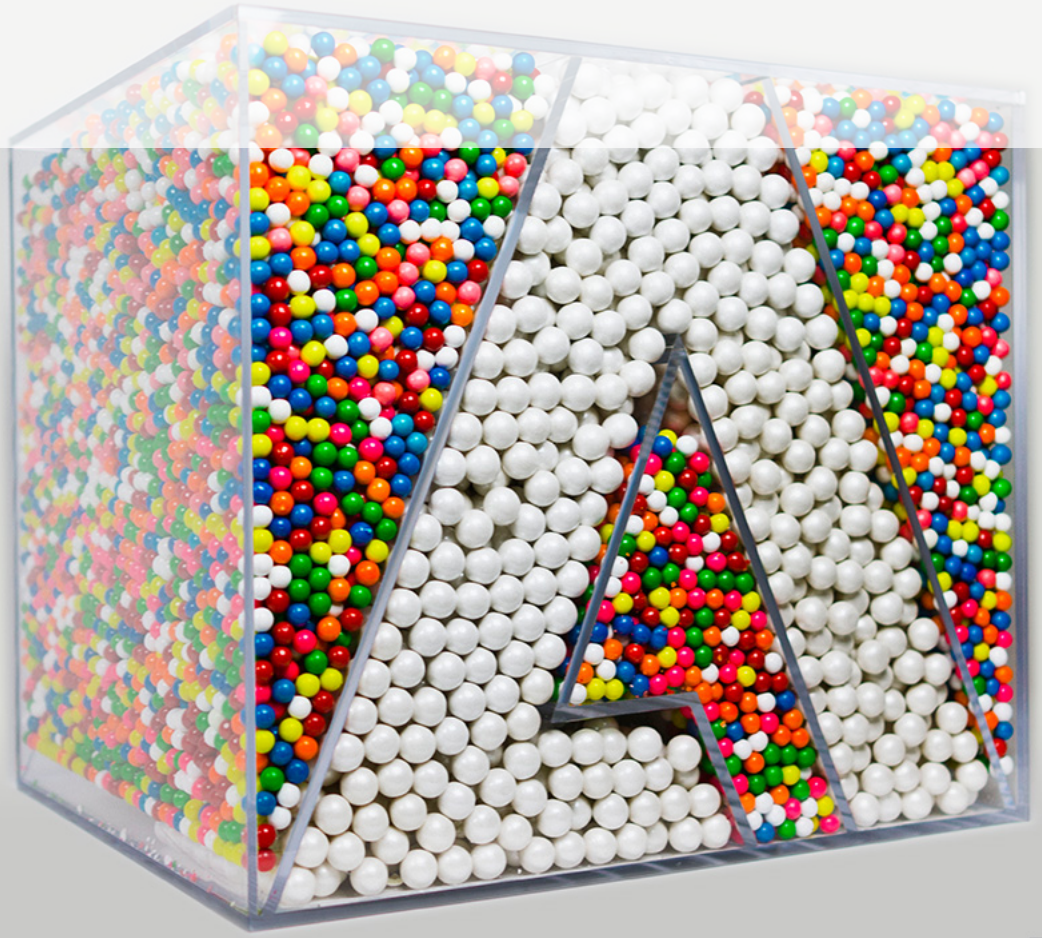
Composing
e.g., Change background



Adobe

Adobe

Help users to create content with GANs



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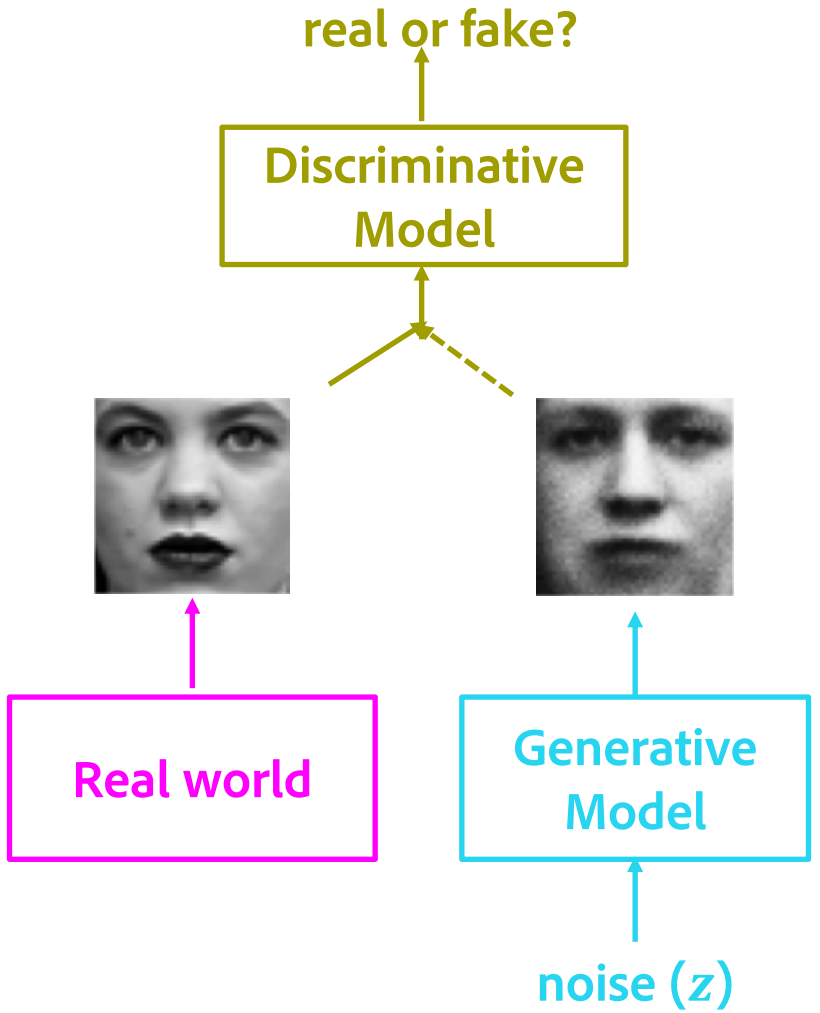
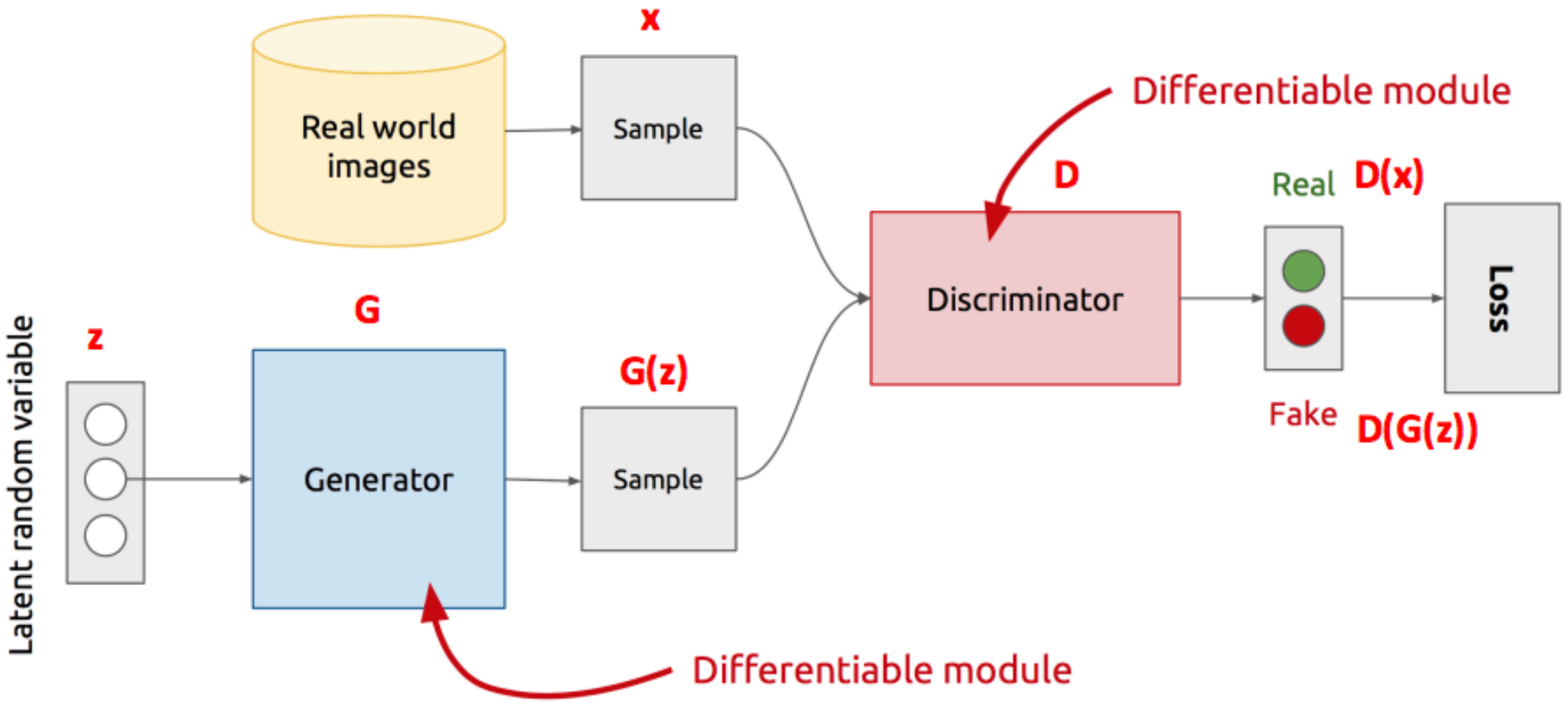
General architecture

- G tries to fool D
- D tries not to be fooled
- Models are trained simultaneously
  - As G gets better, D has a more challenging task
  - As D gets better, G has a more challenging task
- Ultimately, we don't care about the D
  - Its role is to force G to work harder



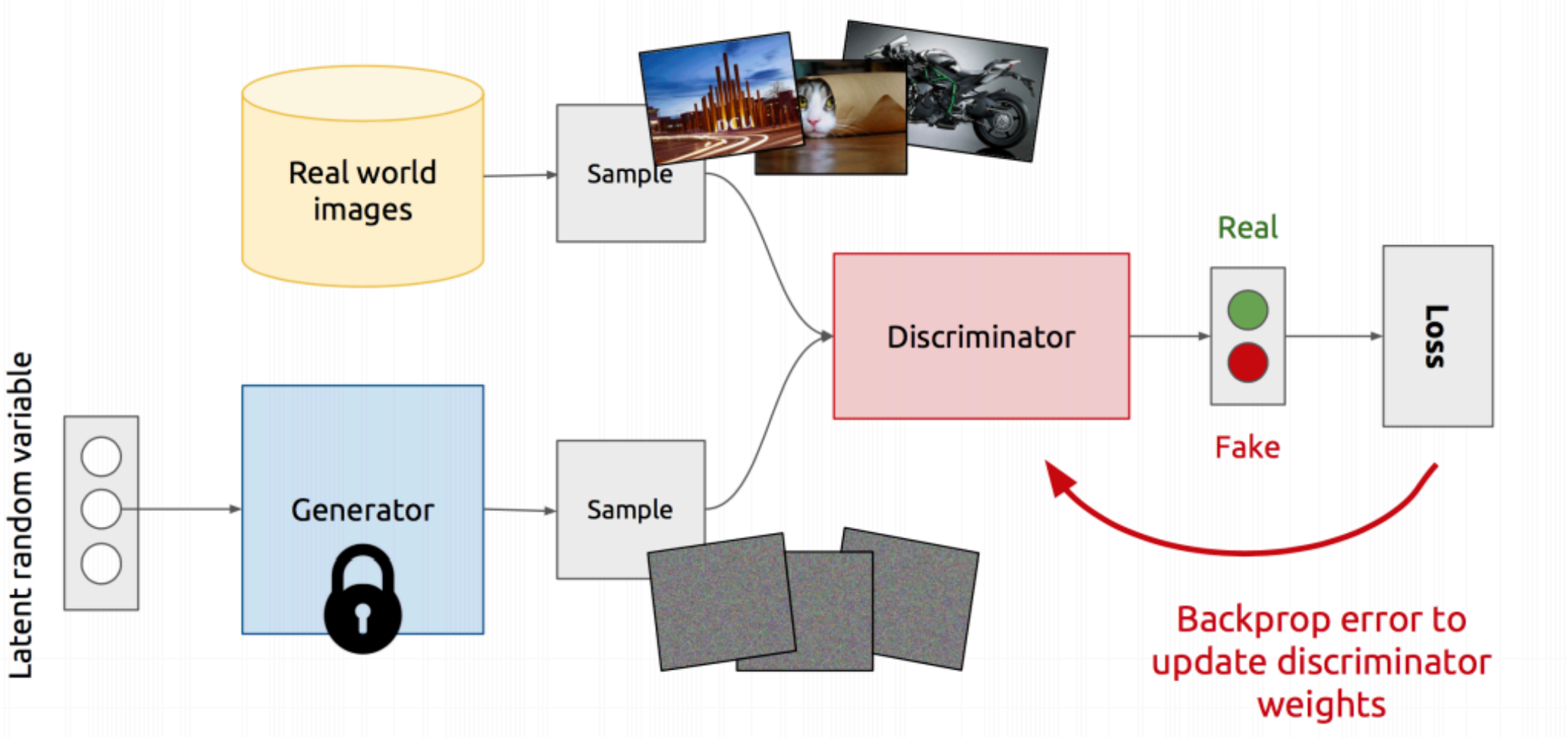
[Goodfellow et al.]

General architecture



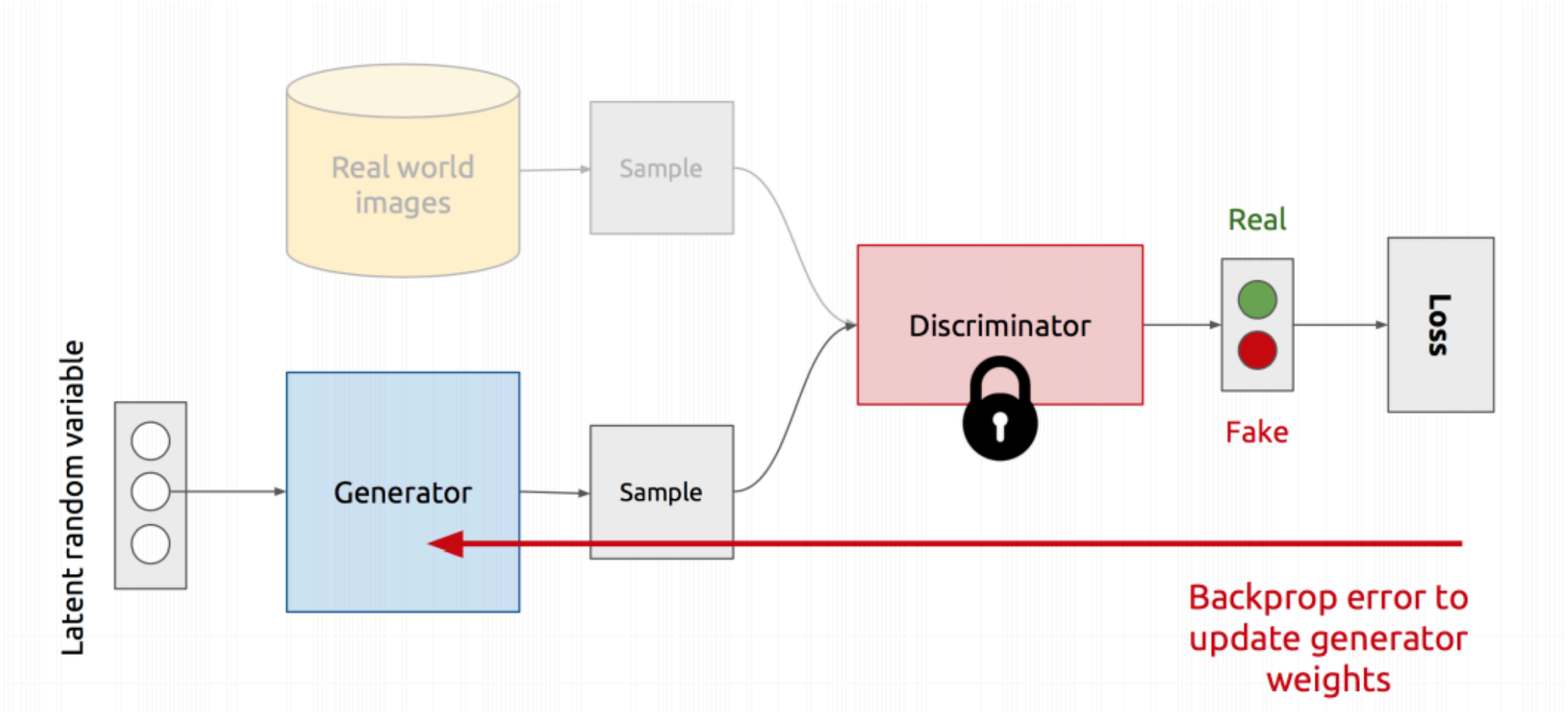
[Goodfellow et al.]

General architecture – Discriminator training



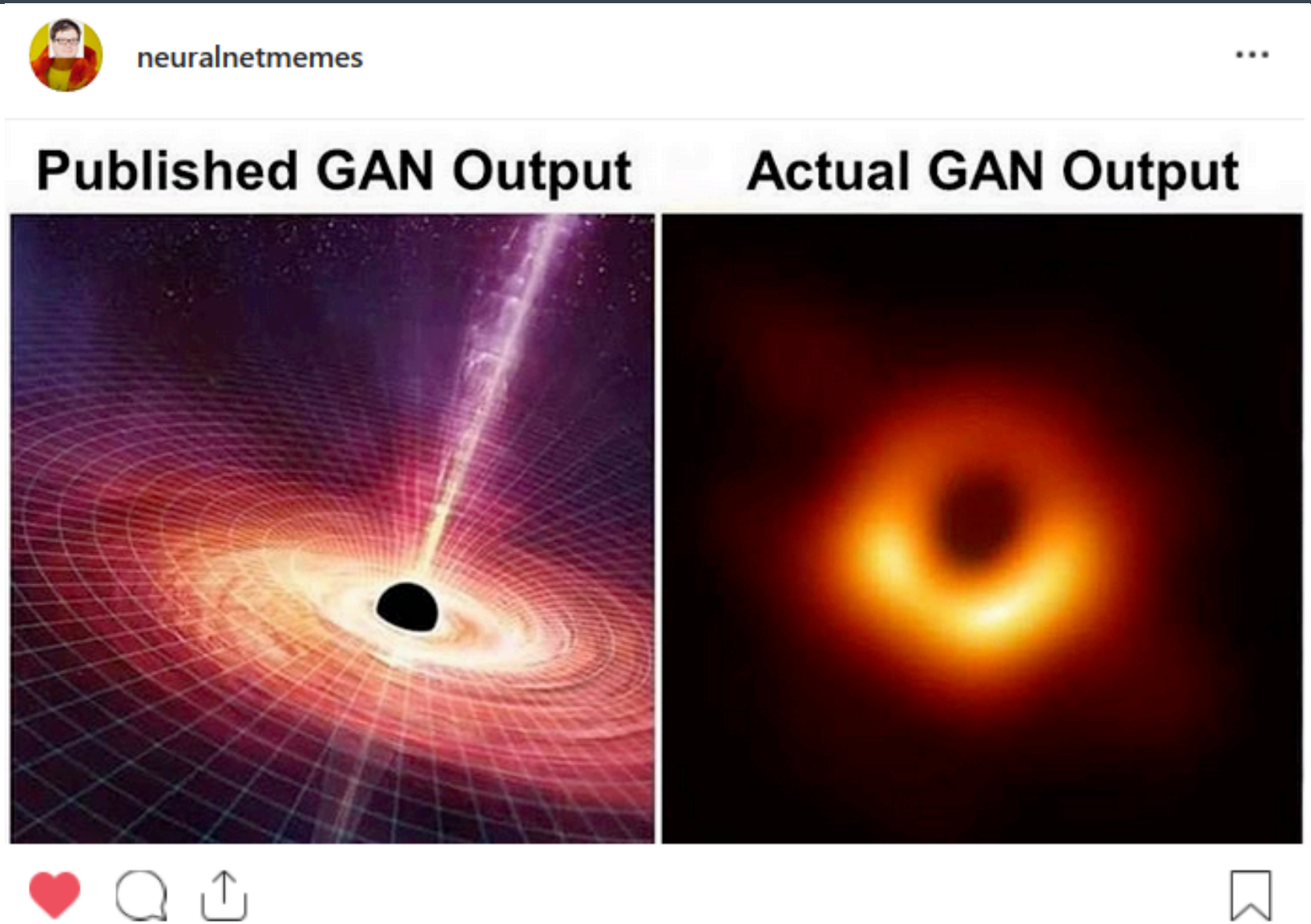
[Goodfellow et al.]

General architecture – Generator training

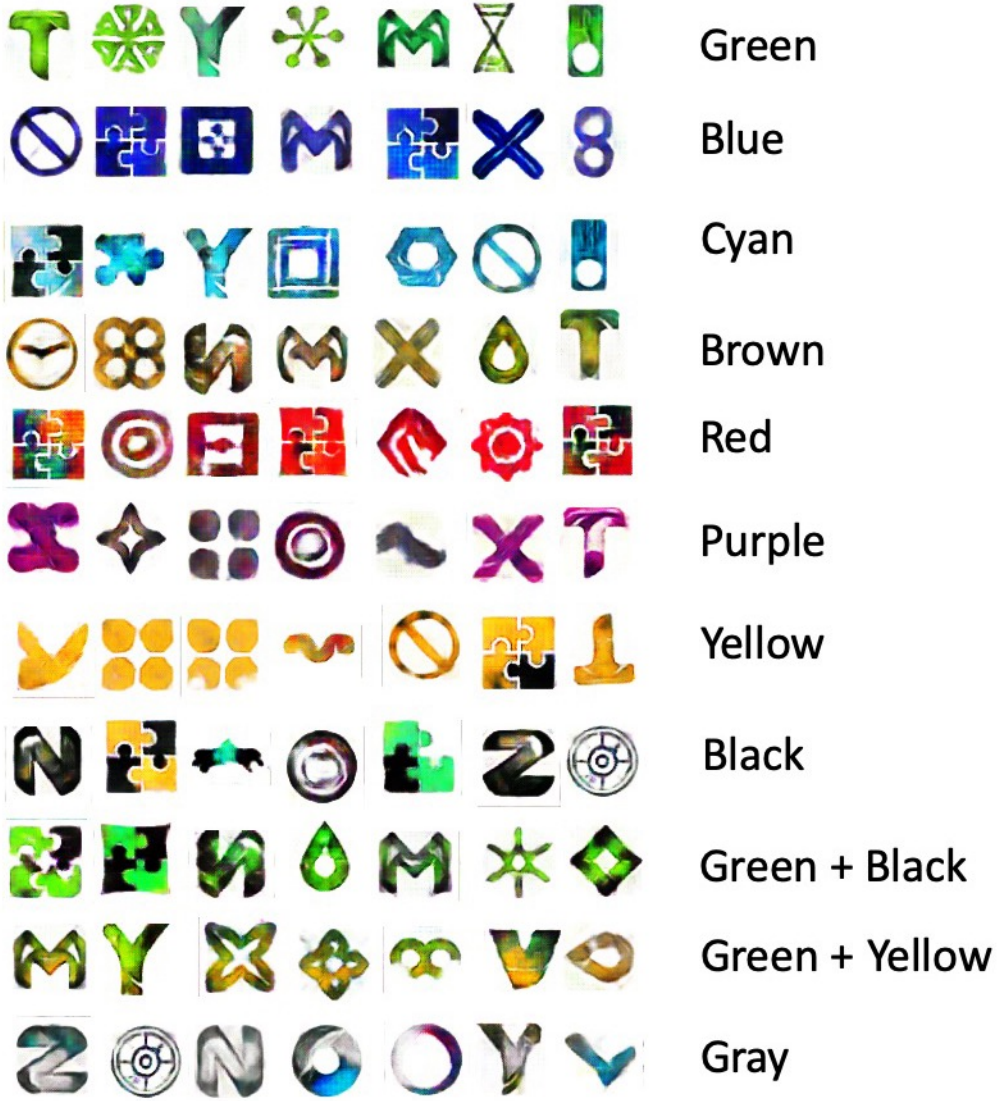


[Goodfellow et al.]

Generative Adversial Networks

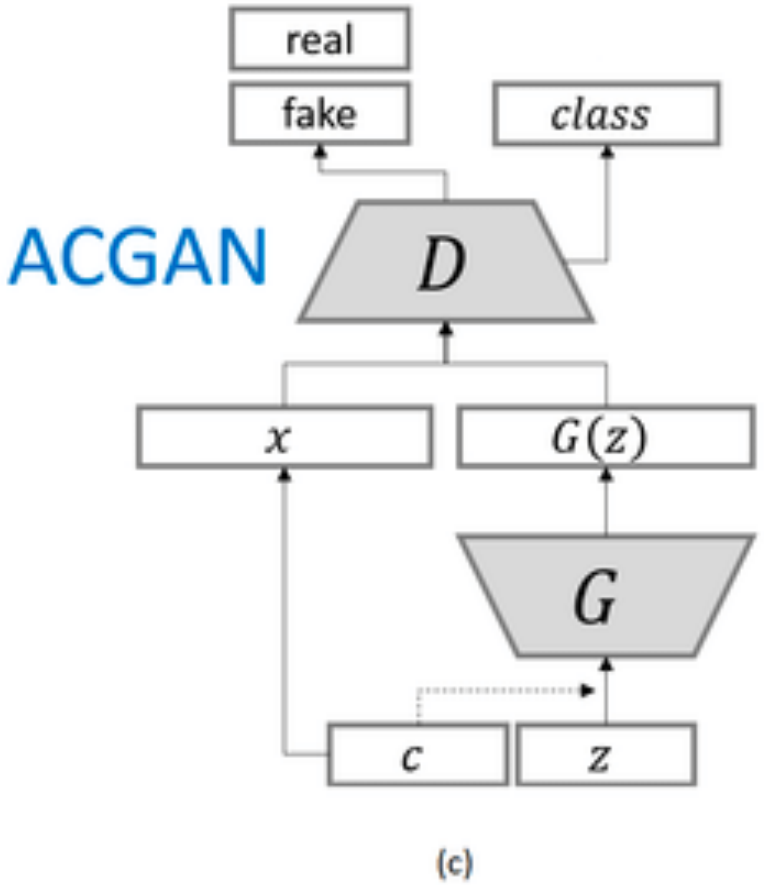


Creating logos with Generative Adversial Networks



Adobe

Creating logos with Generative Adversial Networks



(c)

$$L_D^{WGAN} = E[D(x)] - E[D(G(z))]$$

$$L_G^{WGAN} = E[D(G(z))]$$

$$L_D^{WGAN\_GP} = L_D^{WGAN} + \lambda E[(|\nabla D(\alpha x - (1 - \alpha G(z)))| - 1)^2]$$

$$L_G^{WGAN\_GP} = L_G^{WGAN}$$

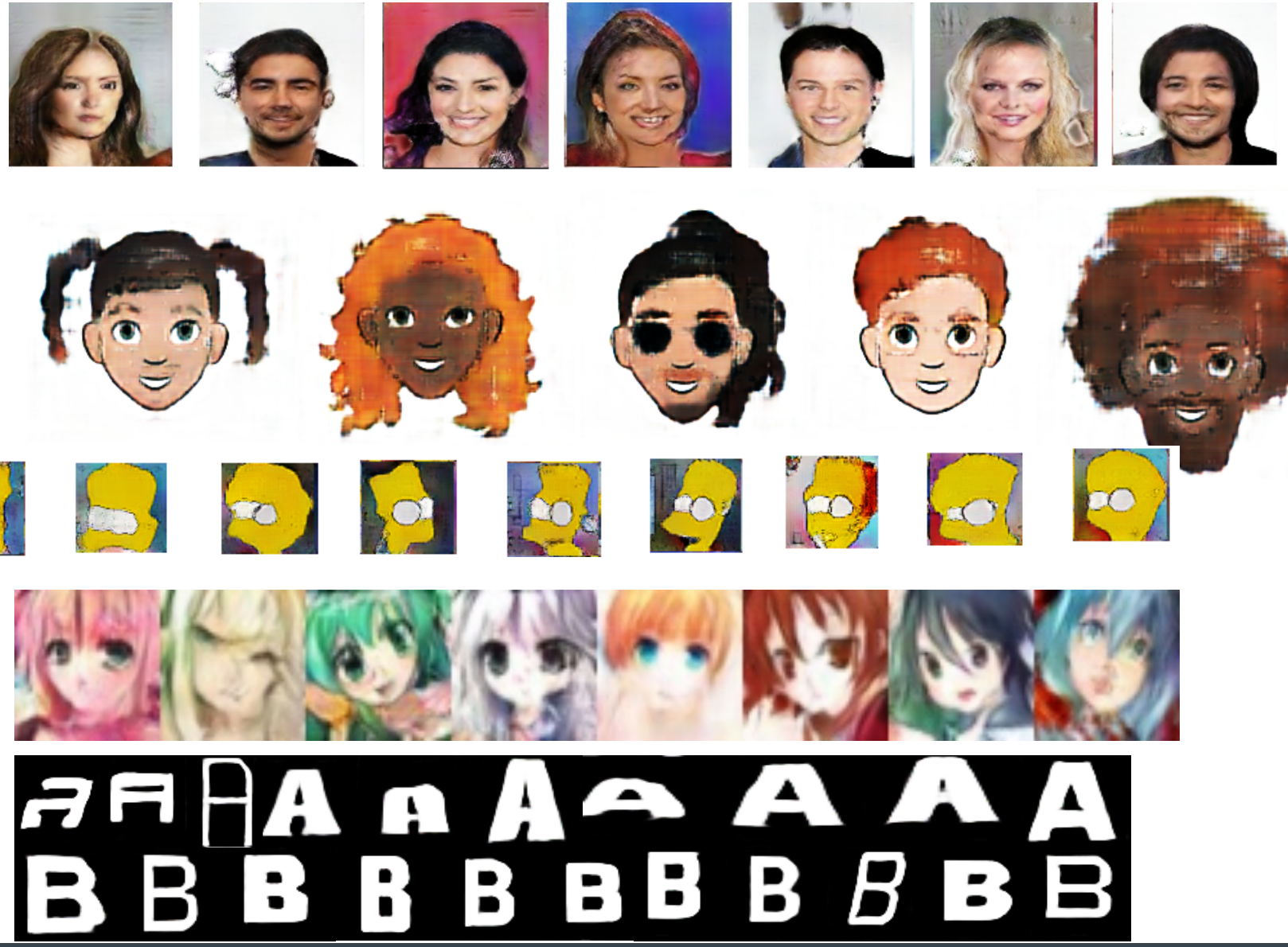
$$L_{D,Q}^{ACGAN} = L_D^{GAN} + E[P(class = c|x)] + E[P(class = c|G(z))]$$

$$L_G^{ACGAN} = L_G^{GAN} + E[P(class = c|G(z))]$$

Universal Shape Style transfer for Logos

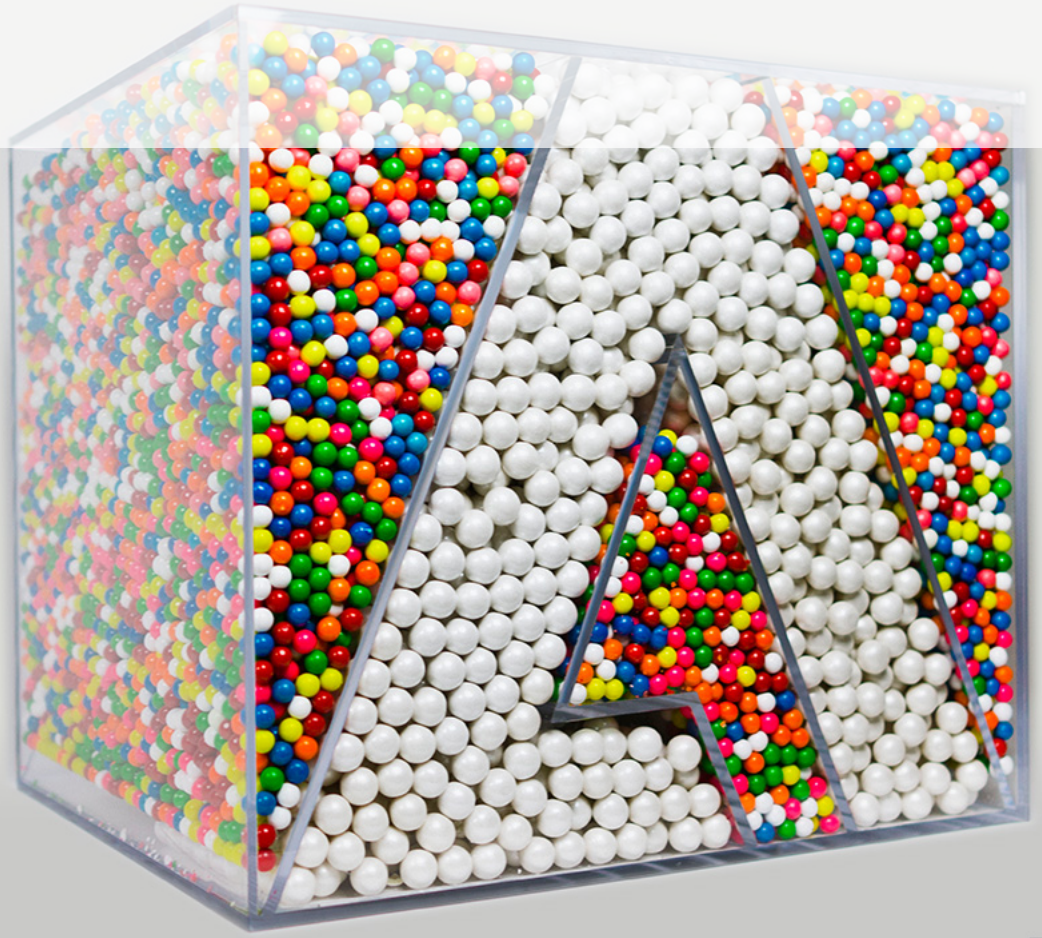
Universal Shape Style transfer for Logos

Other results with Generative Adversial Networks



Adobe

Help users to fix the photos



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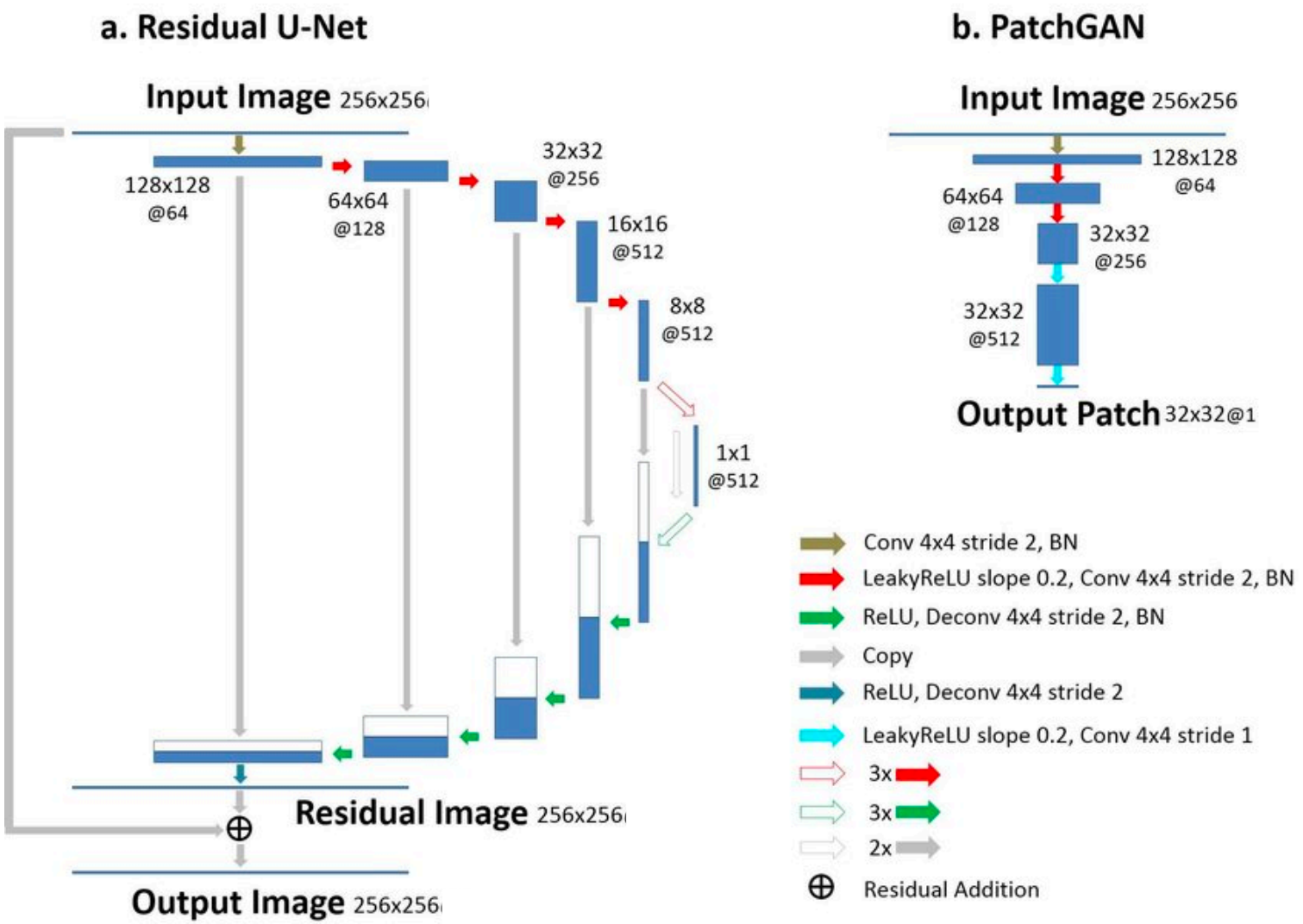
Automatic Image Improvement – General architecture



$$Loss = w_1 L_{Pixel} + w_2 L_{Content} + w_1 L_{edge} + w_1 L_{adversial}$$

Automatic Image Improvement – Noise Removal

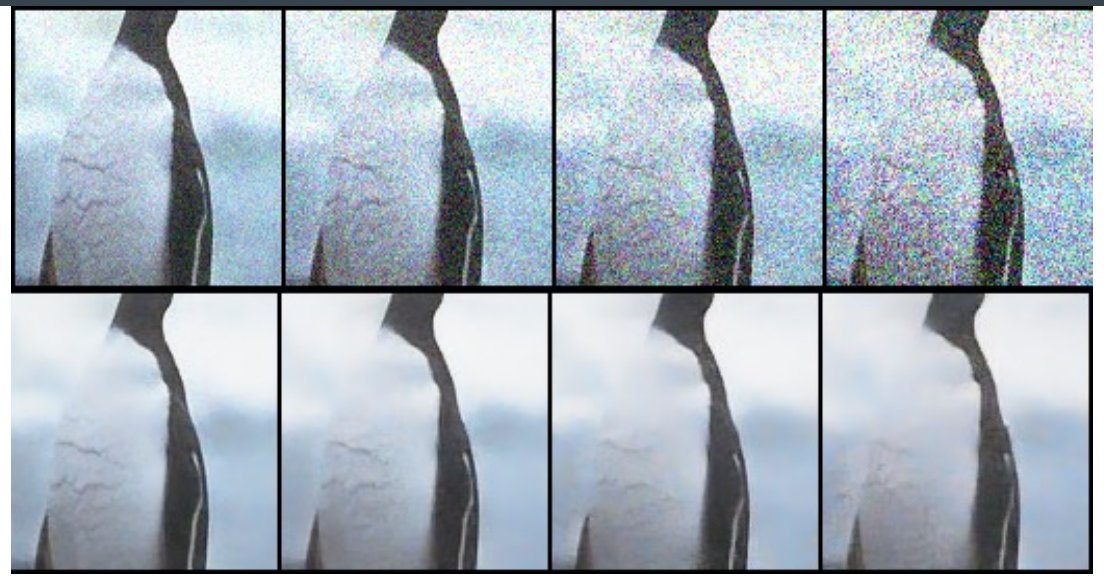
BEFORE

AFTER

BEFORE

AFTER

Automatic image Improvement – noise removal



BEFORE

AFTER

BEFORE

AFTER

Automatic Image Improvement – Color / Brightness Enhancement

Before

After

Automatic Image Improvement – Color / Brightness Enhancement

Before

After

Automatic Image Improvement – Color / Brightness Enhancement

Before

After

Automatic Image Improvement – Color / Brightness Enhancement

Before

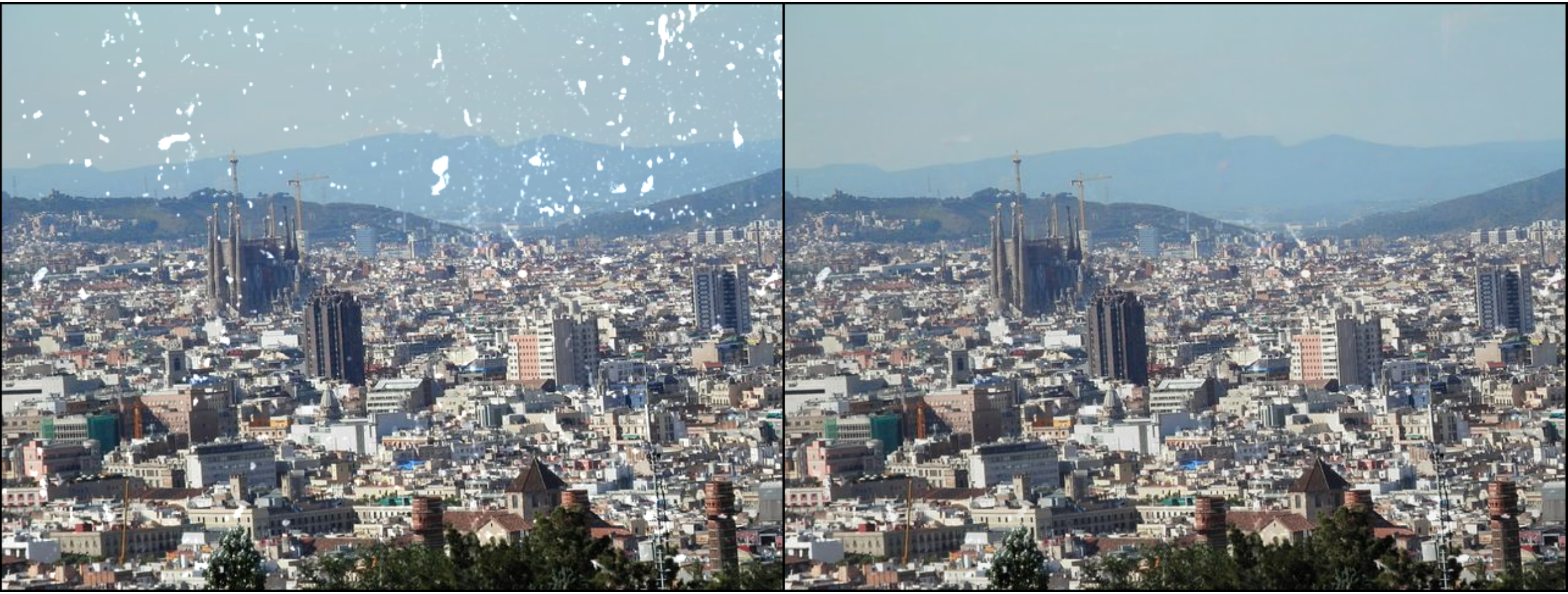
After

Adobe

Automatic Old Photos Improvement – Dust and scratches removal

Before

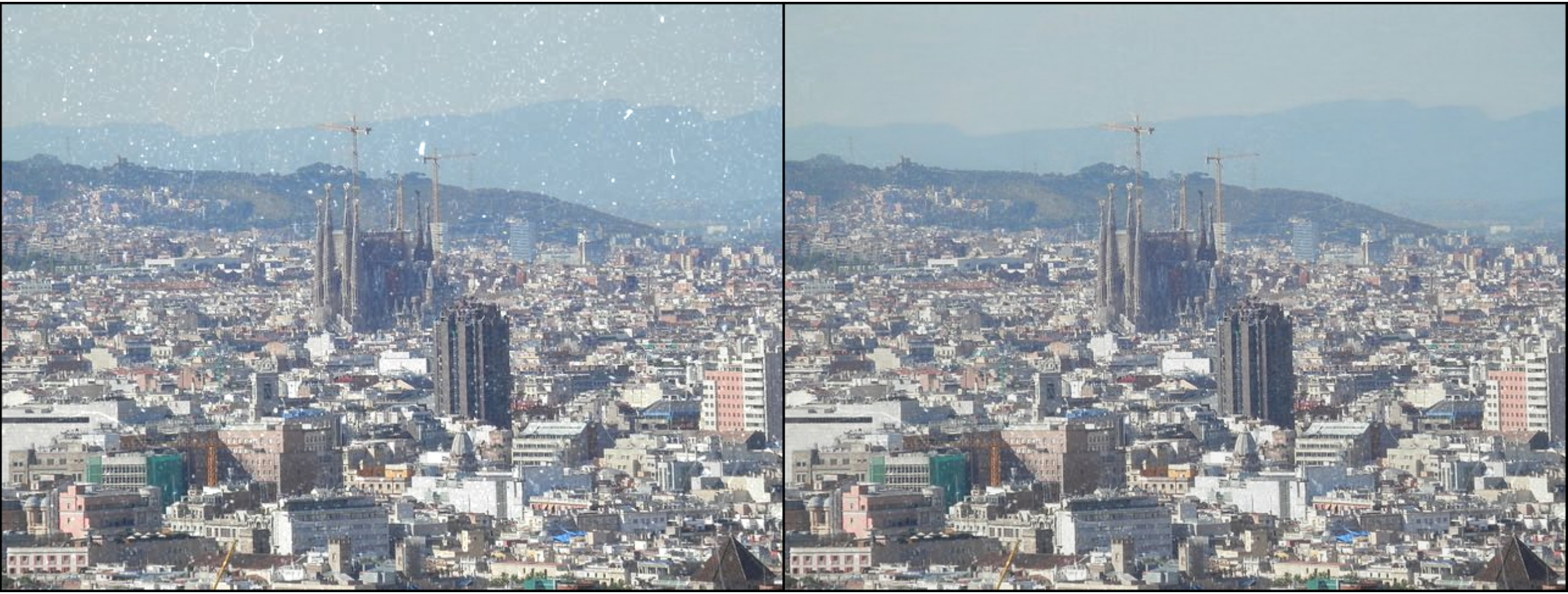
After



Automatic Old Photos Improvement – Dust and scratches removal

Before

After



Automatic Old Photos Improvement – Dust and scratches removal

Before

After

Automatic Image Improvement – Reflection Removal

Before | After | Before | After | Before | After

Automatic Image Improvement – Reflection Removal

Before

After

Before

After

Before

After

Automatic Image Auto-Straightening

How Upright algorithm works

- Generates an image homography using camera calibration algorithms, that estimates vanishing points and lines as well as camera parameters

Automatic Image Auto-Straightening

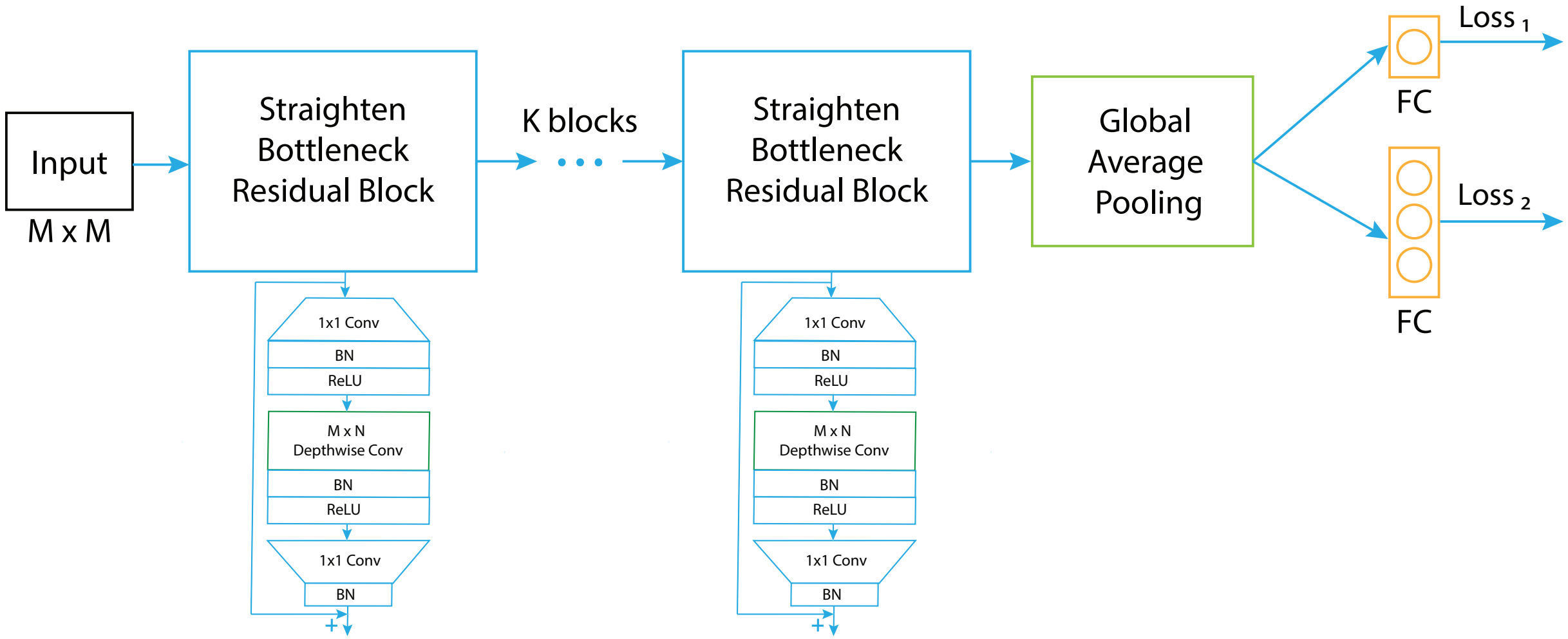
Where is the horizon line in these images?








Proposed algorithm



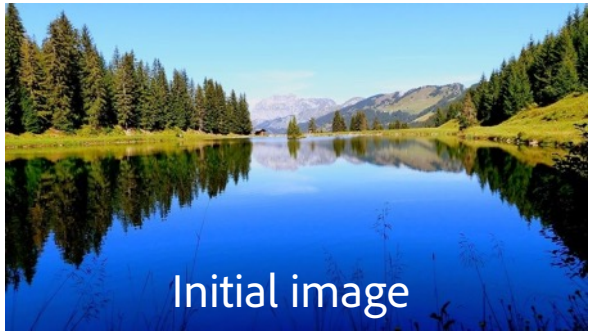
Experimental setup

Evaluation dataset

First dataset consists of 508,859 images retrieved from Pixaray web platform. The images are augmented to various angles starting from -12◦ to 12◦.

Test dataset

The second dataset contains a larger variety of images with angles starting from -25◦ to 25◦. The dataset contains approximately 2,000,000 images.



Results on evaluation dataset

	Angle estimation	
	Accuracy (error is less then 1°)	MAE (degrees)
Mobilenet V2	75.07%	1.04
Densenet 121	77.55%	1.12
Resnet 50	67.75%	1.98
Inception V3	57.26%	1.98
Proposed	**94.36%**	**0.29**

Comparison with State-of-the-Art

	Angle estimation	
	Accuracy (error is less then 1°)	MAE (degrees)
Fischer at al.	57.17%	3.15
Lee at al. (Upright)	39.53%	6.40
Proposed	**92.46%**	**0.62**

Image Auto-Straighten

Ground truth

Rotated image

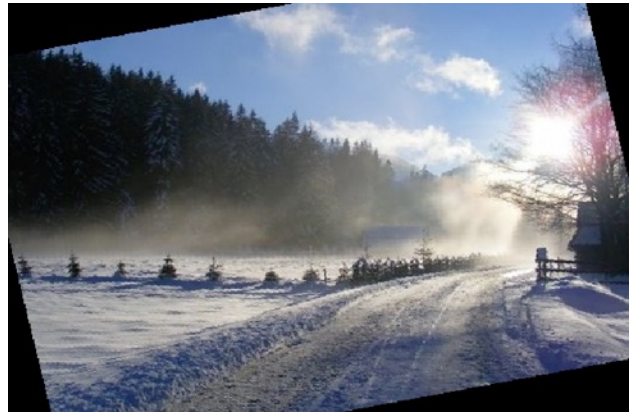
Corrected image

Image Auto-Straighten

Ground truth

Rotated image

Corrected image

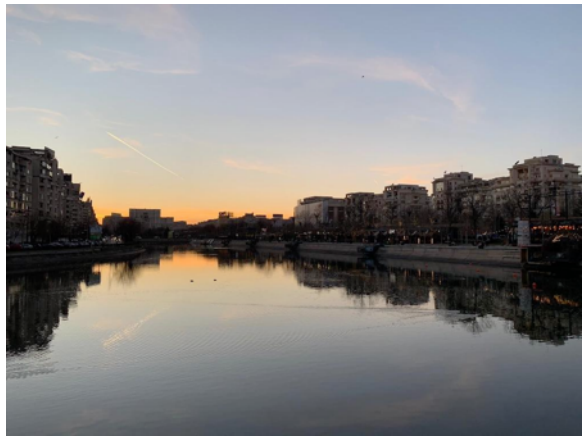


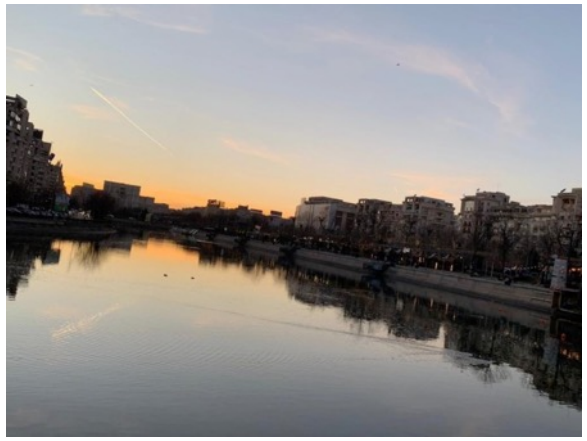
Results on evaluation dataset

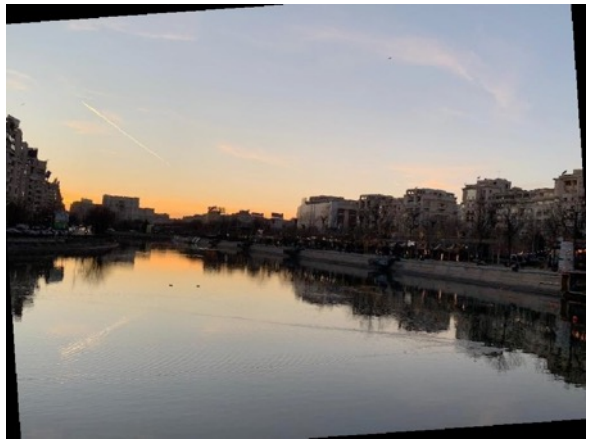
Ground truth

Rotated image

Corrected image

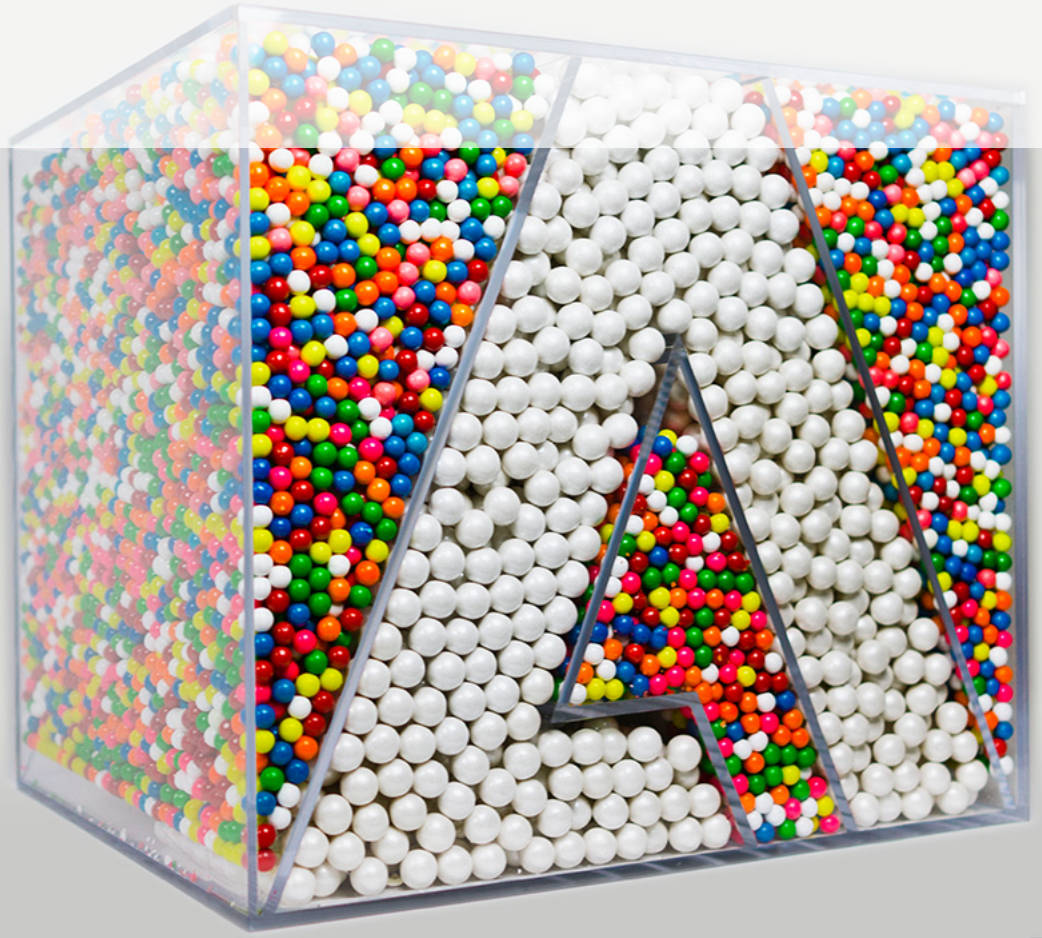






Results on evaluation dataset

Help users to create new content



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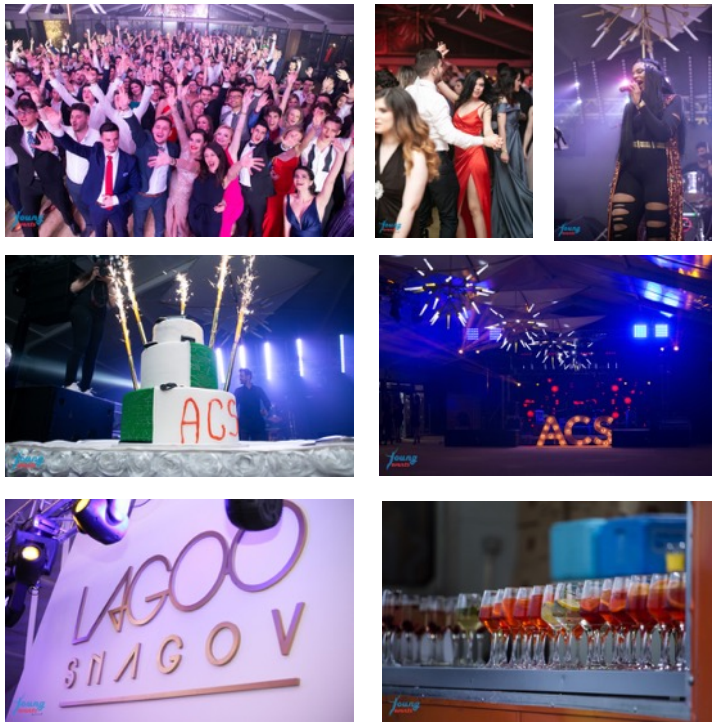
Smart Automated collages



When we start to make a collage we need to:

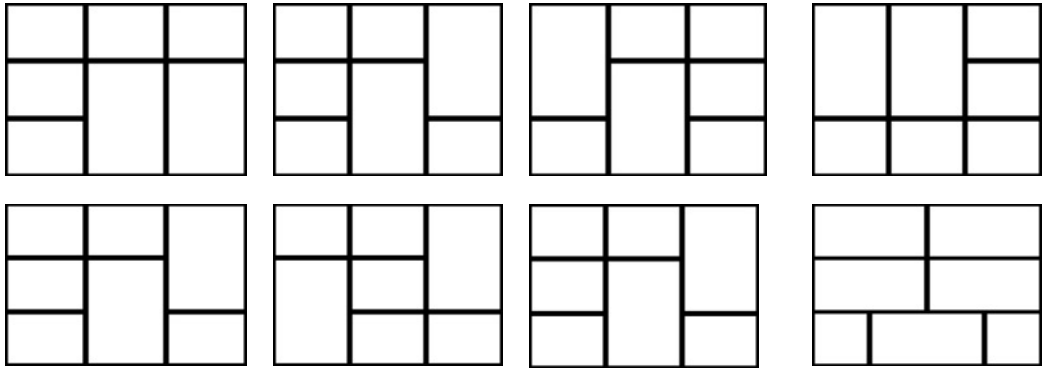
- Take a look on tens / hundreds of templates and generate new collage templates,
- Make crops and straightening for each photo,
- Find a way to mediate the coloring of the photos,
- Choose what templates are the most appropiate for your photos.

Automated collages

When we start to make a collage we need to:

- Take a look on tens / hundreds of templates and generate new collage templates

Constrains: I have a fixed number of photos
I have a desired aspect ratio



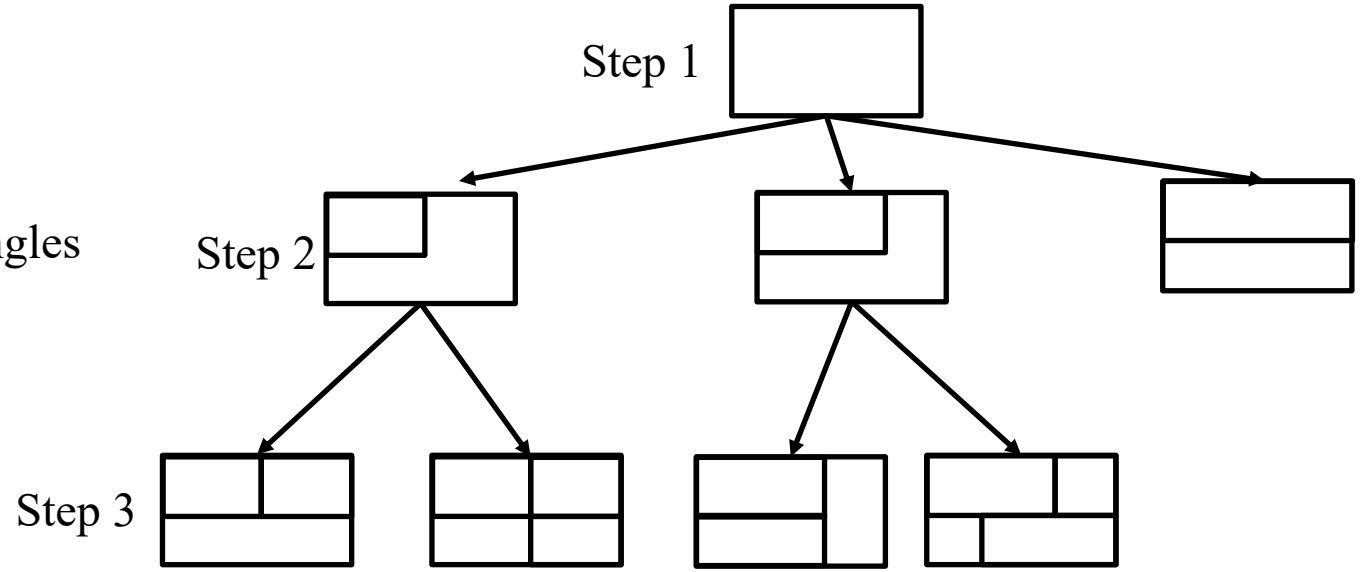
Automated collages

When we start to make a collage we need to:

- Take a look on tens / hundreds of templates and generate new collage templates

Generating rectangle templates

- Start from an empty rectangle
- Try to fill it with different aspect ratios rectangles

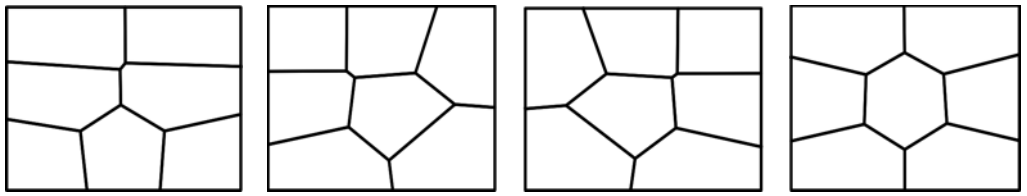


Automated collages

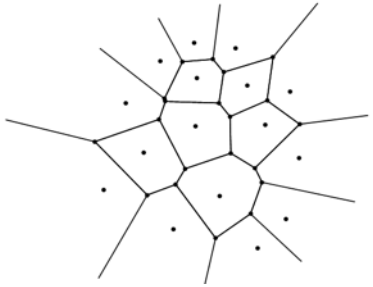
When we start to make a collage we need to:

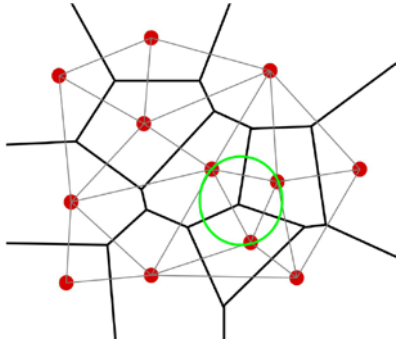
- Take a look on tens / hundreds of templates and generate new collage templates

Constrains: I have fixed number of photos
I have a desired aspect ratio
I don't like rectangles



Solution: Use Voronoi diagrams - polinoms
Use Delaunay diagrams - triangles





Automated collages

When we start to make a collage we need to:

- Take a look on tens / hundreds of templates and generate new collage templates

Question 1: What distance we should use?

L1 Norm distance

L2 Norm distance

L3 Norm distance

L4 Norm distance

Automated collages

When we start to make a collage we need to:

- Take a look on tens / hundreds of templates and generate new collage templates

Question 2: How we should set the initial points

Random

Regular intervals

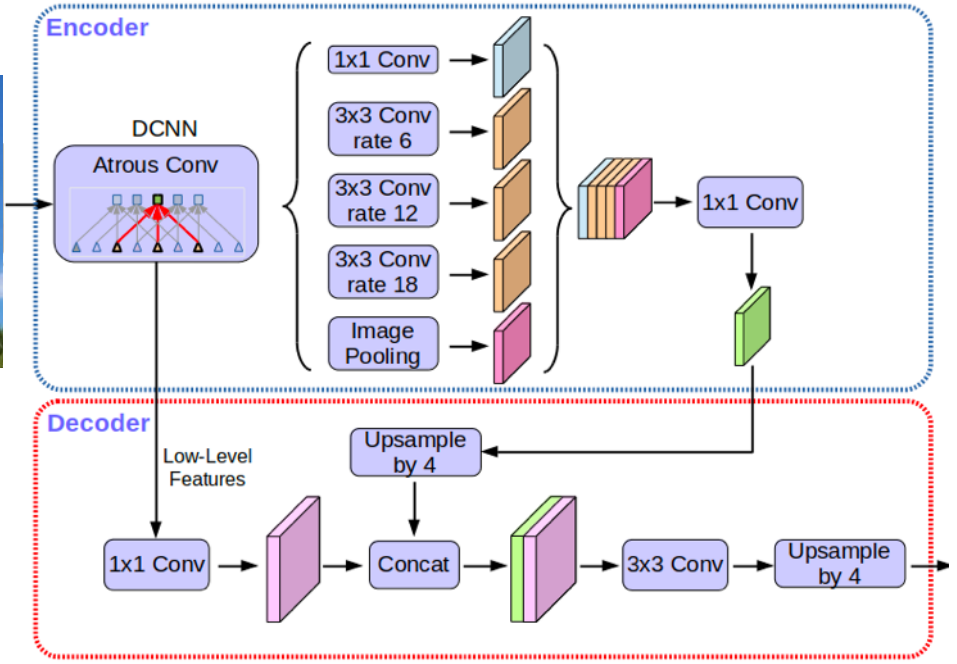
Automated collages

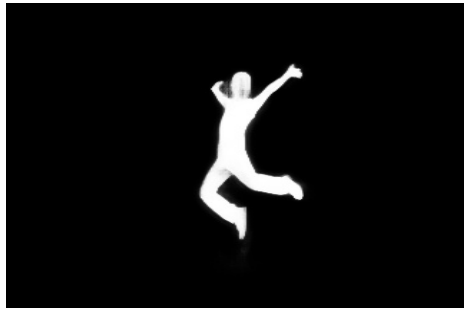
When we start to make a collage we need to:

- Crop each photo

Solution: Use DeepLab V3 to make image segmentation

Run an optimisation algorithm that is able to maximise the ROI regions



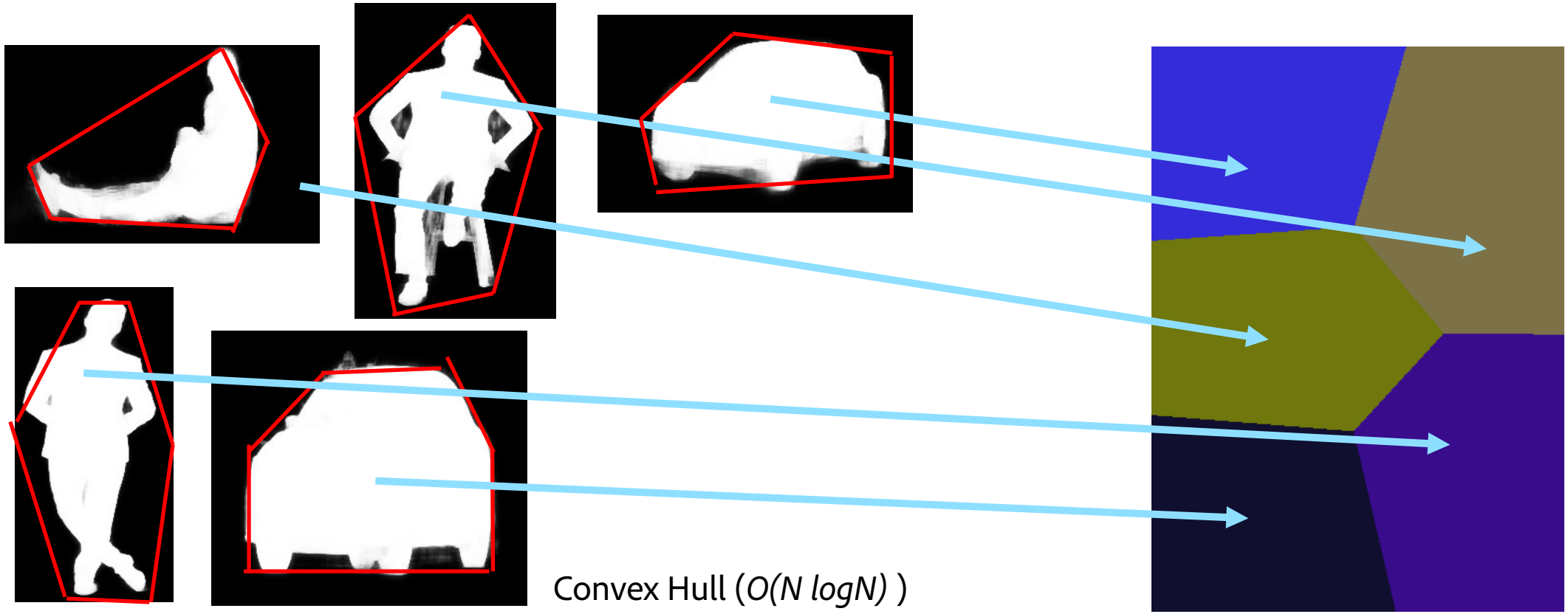


[Chen et al. 2018]

Automated collages

When we start to make a collage we need to:

- Choose what templates are the most appropiate for your photos



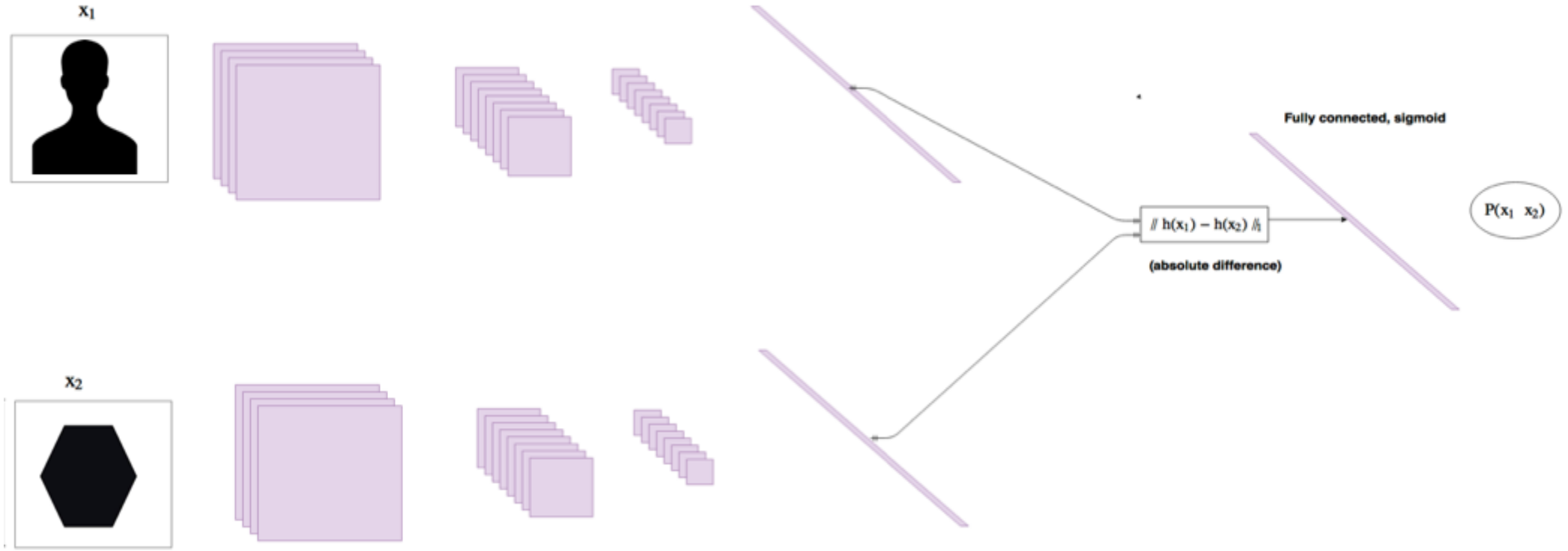
[Sklansky 82]

Automated collages

When we start to make a collage we need to:

- Choose what templates are the most appropiate for your photos

Siamese networks

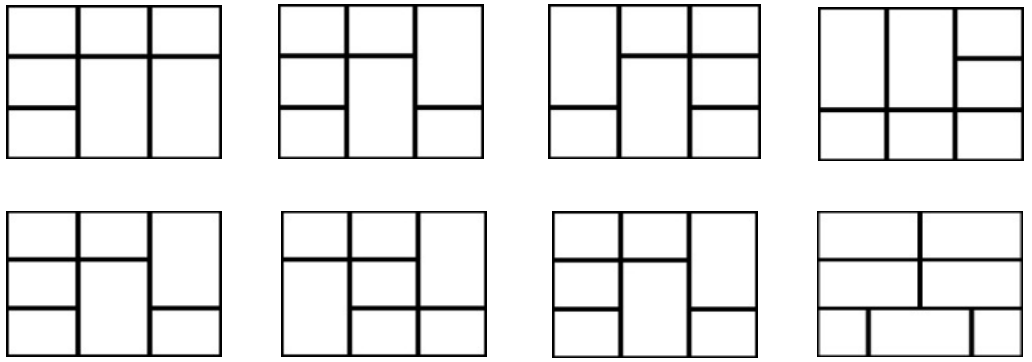


[Koch et al. 2016]

Automated collages

When we start to make a collage we need to:

- Choose what templates are the most appropiate for your photos



The problem represents a combinatorial optimization algorithm that solves the assignment problem in polynomial time

We use Jonker-Volgenant algorithm to solve the problem in O(n3) where n = no of images

Collage Color Mixing

Collage Color Mixing

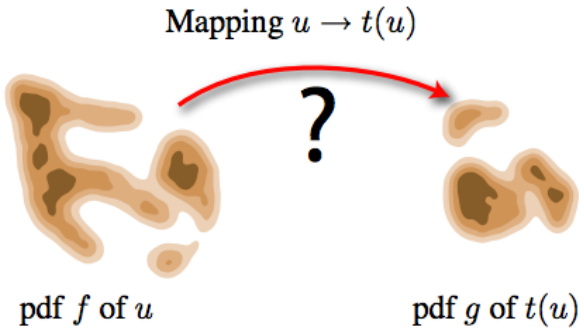
Collage Color Mixing

Automated collages

When we start to make a collage we need to:

- Find a way to mediate the coloring of the photos.

Take one image as reference and apply transfer the color from that image to all images



The problem of colour transfer is to find a continuous mapping C, such that the new colour distribution of the target distribution g.

$$t(u) = T(u - \mu_u) + \mu_v$$
$$T\Sigma_u T^T = \Sigma_v$$

Use Monge's optimal transportation problem to solve the equation:

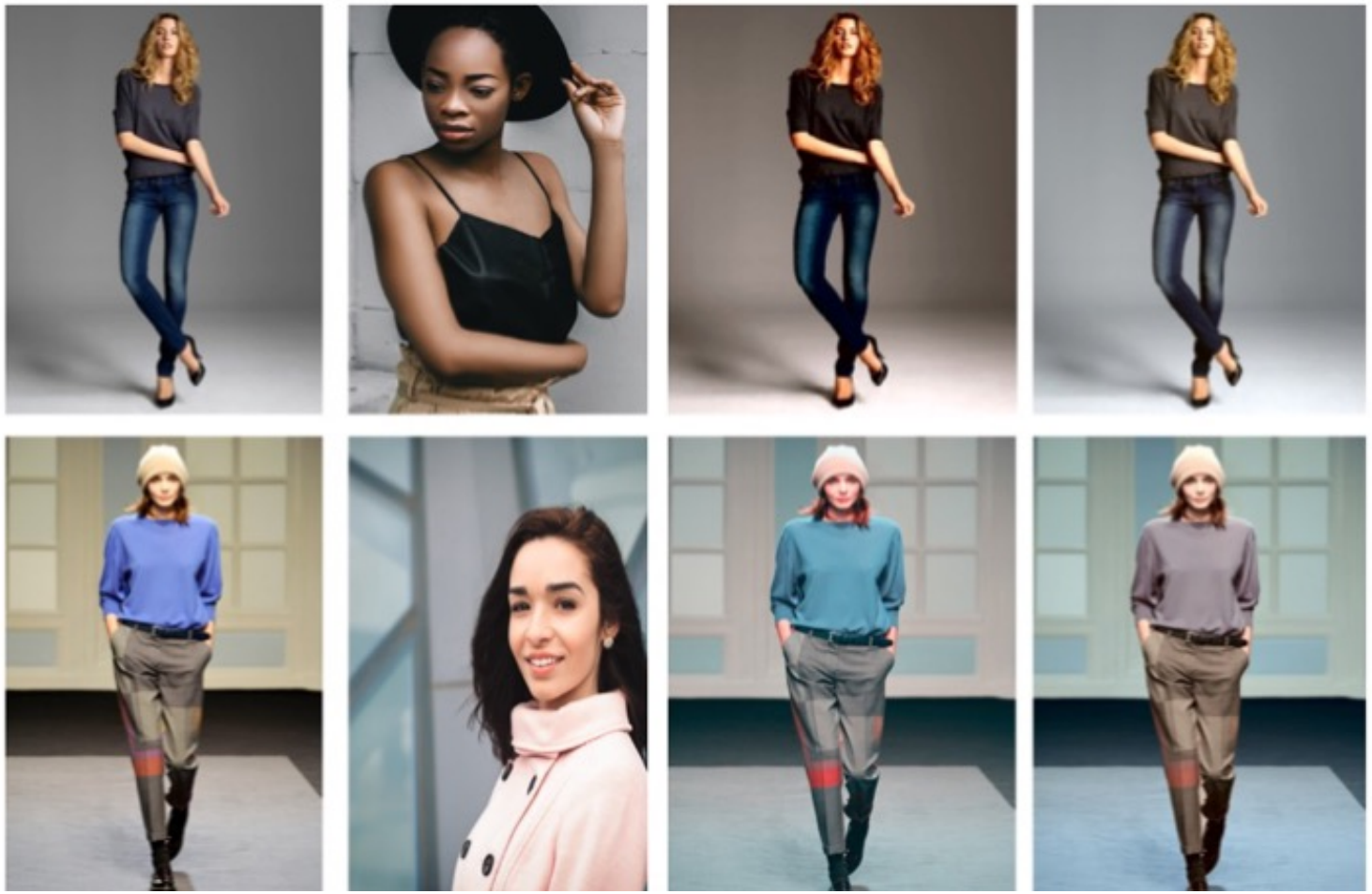
$$T = \Sigma_u^{-1/2} \left(\Sigma_u^{1/2} \Sigma_v \Sigma_u^{1/2} \right)^{1/2} \Sigma_u^{-1/2}$$

[Pitie, Kokaram 2008]

Automated collages

When we start to make a collage we need to:

- Find a way to mediate the coloring of the photos.



Collage proposals

Collage proposals


3 images


5 images


8 images


10 images


15 images


20 images


3 images


5 images


7 images


10 images


15 images


20 images


3 images


5 images


8 images


10 images


15 images


20 images

Adobe

Automated collages

Collage proposals

Adobe

Collage proposals

L1 L2 L3 L4

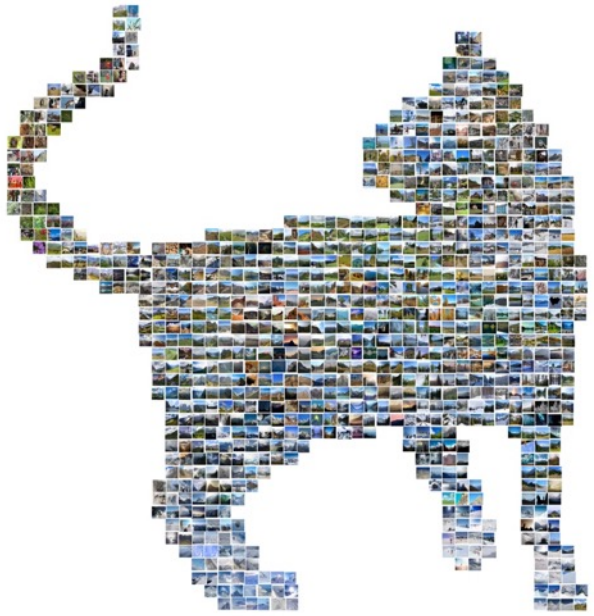
Automated collages

Use case 2

Adobe

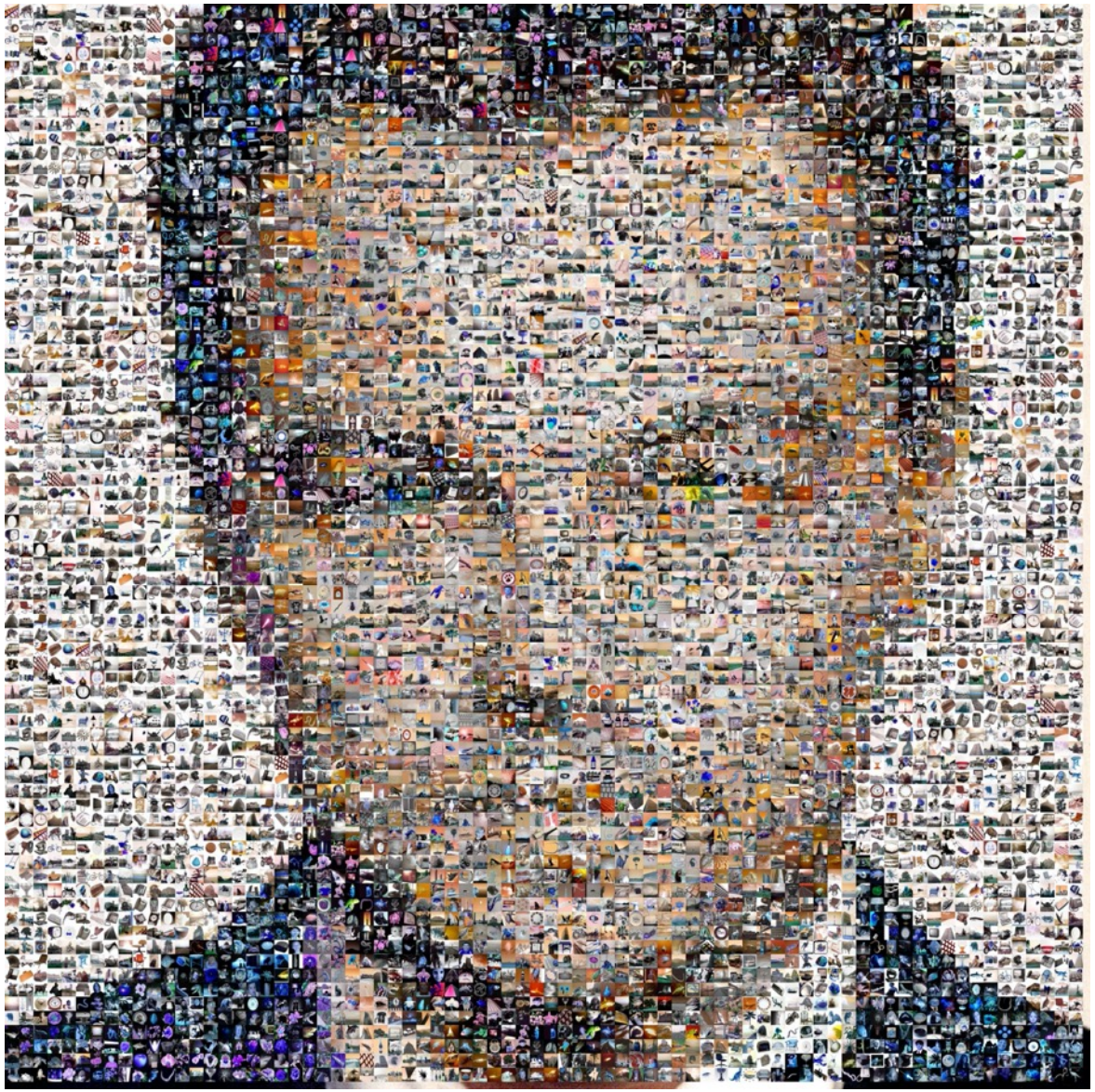
Automated collages

Use case 3



Adobe

Automated mosaic collages

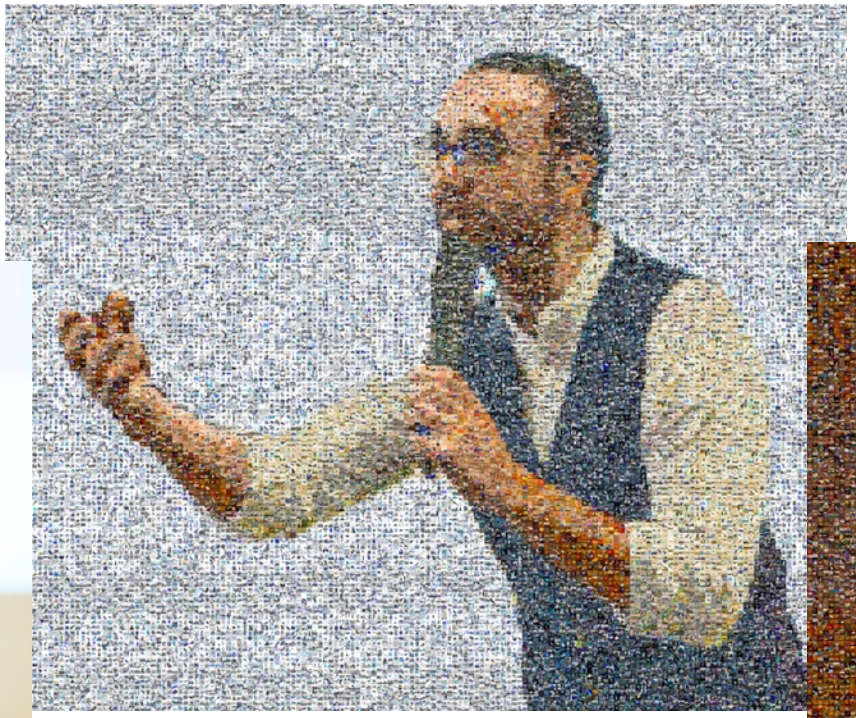


Mosaic Images

Use case no. 1 – Low resolution vs High resolution (200MP image)

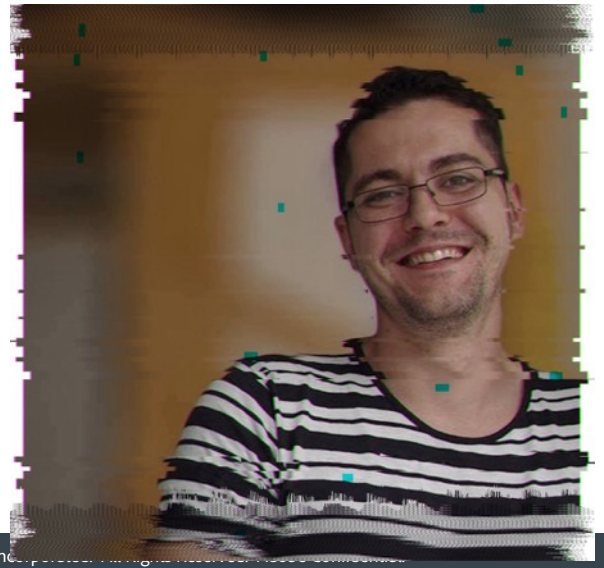
Mosaic Images

Use case no. 2 – Remove background



Wow effects

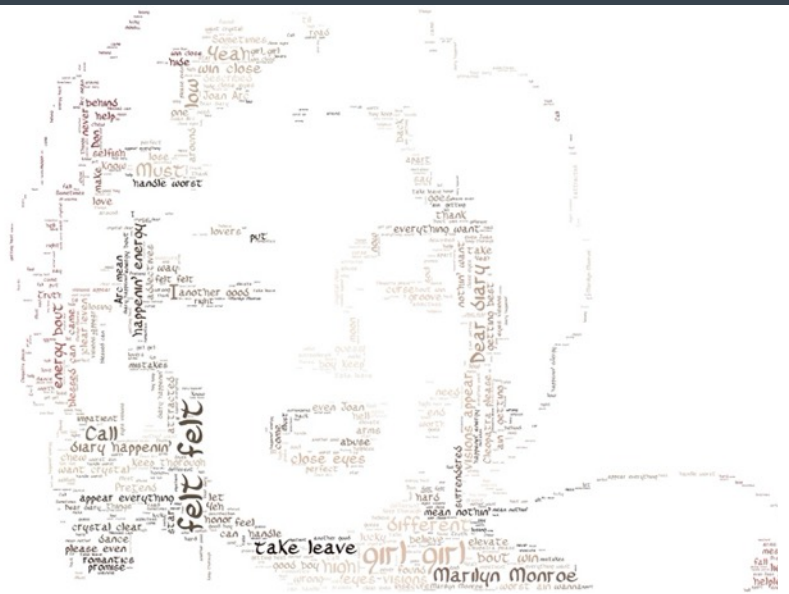
Glich effect

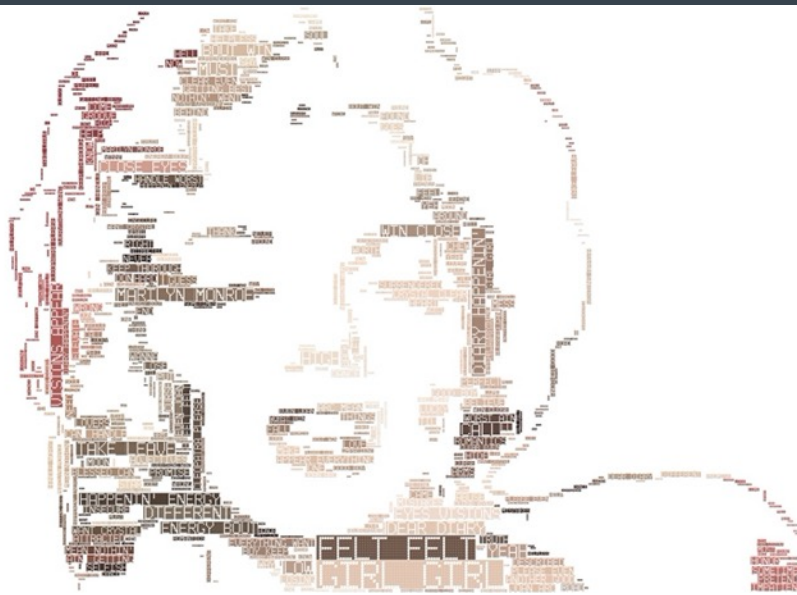


Wow effects

Double exposure effect

Typography Art effects





Typography Art

(1) User input photo

(2) User input text

Marilyn Monroe lyrics

Different, oh yeah, yeah
This one goes out to all the lovers
What can we do? We're helpless romantics
We can not help who we're attracted to
So let's all dance, and elevate each other
Dear diary, it's happenin' again
This energy, like I'm 'bout to win
I just close my eyes and visions appear
She's everything I want, and it's crystal clear
Not even Marilyn Monroe

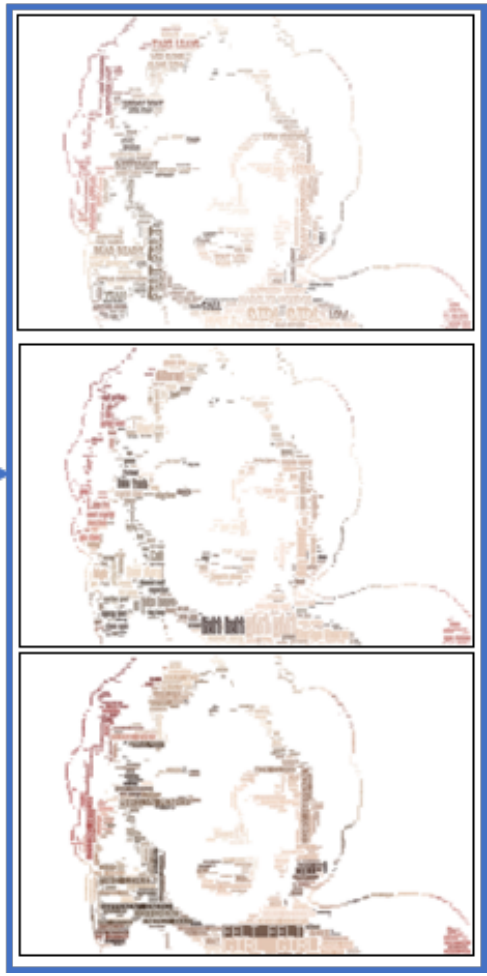
(3) Detect region of interest

(4) Select fonts,
font size range, colours

(5) Extract the shape

(6) Text rendering

(6) Display recommendations



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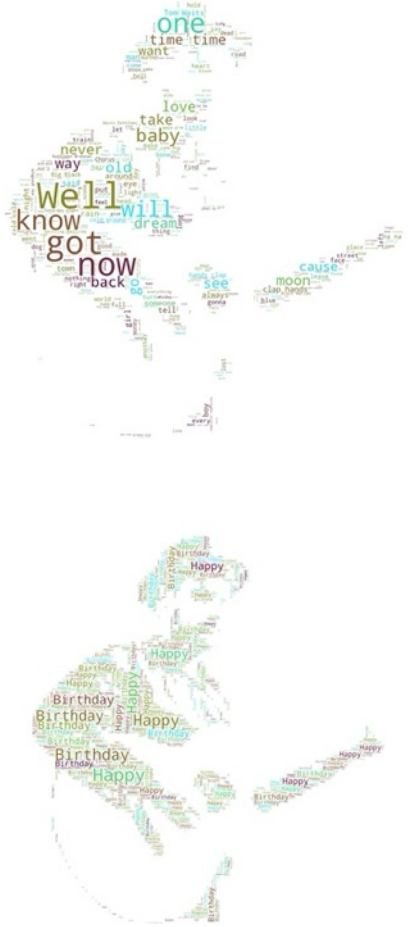
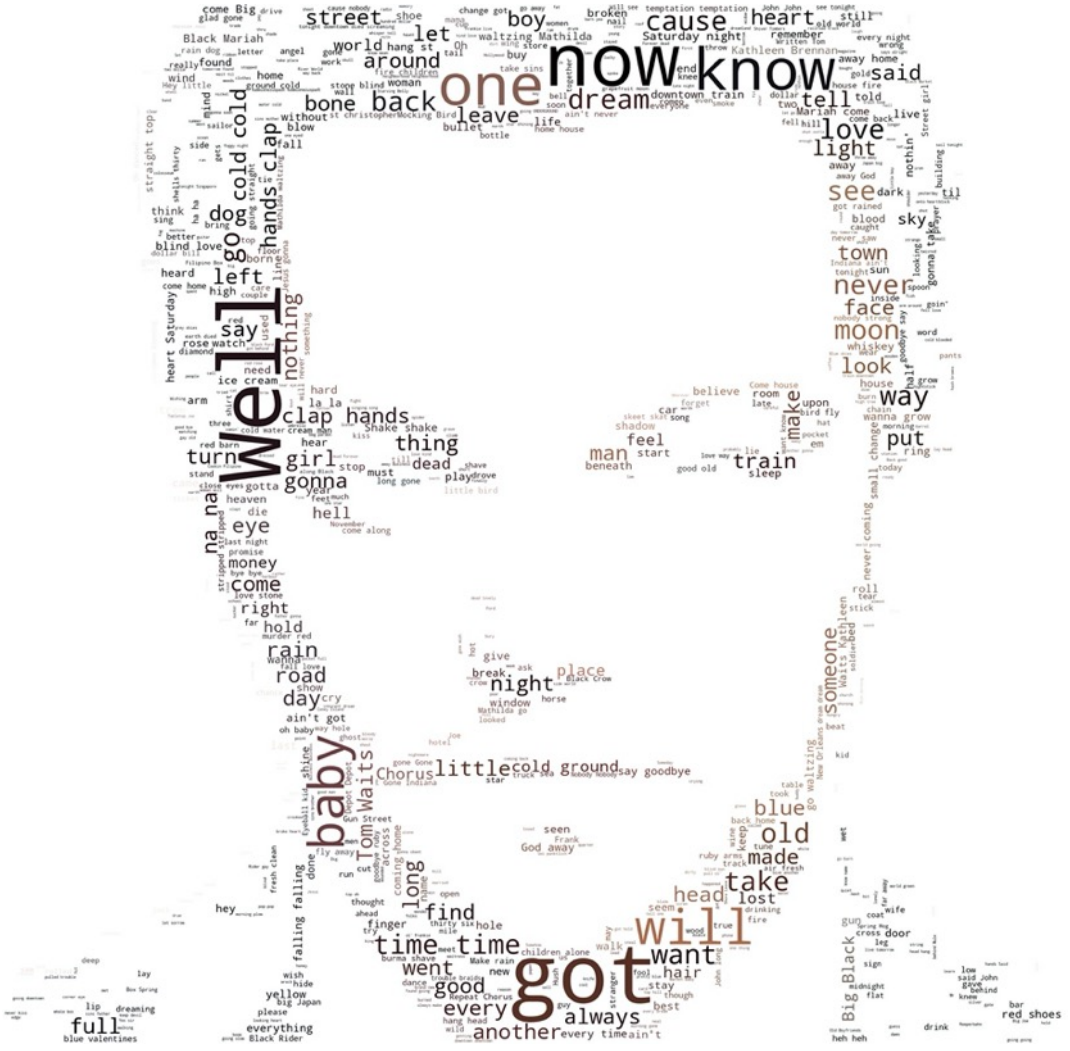
Use case – Banner generation

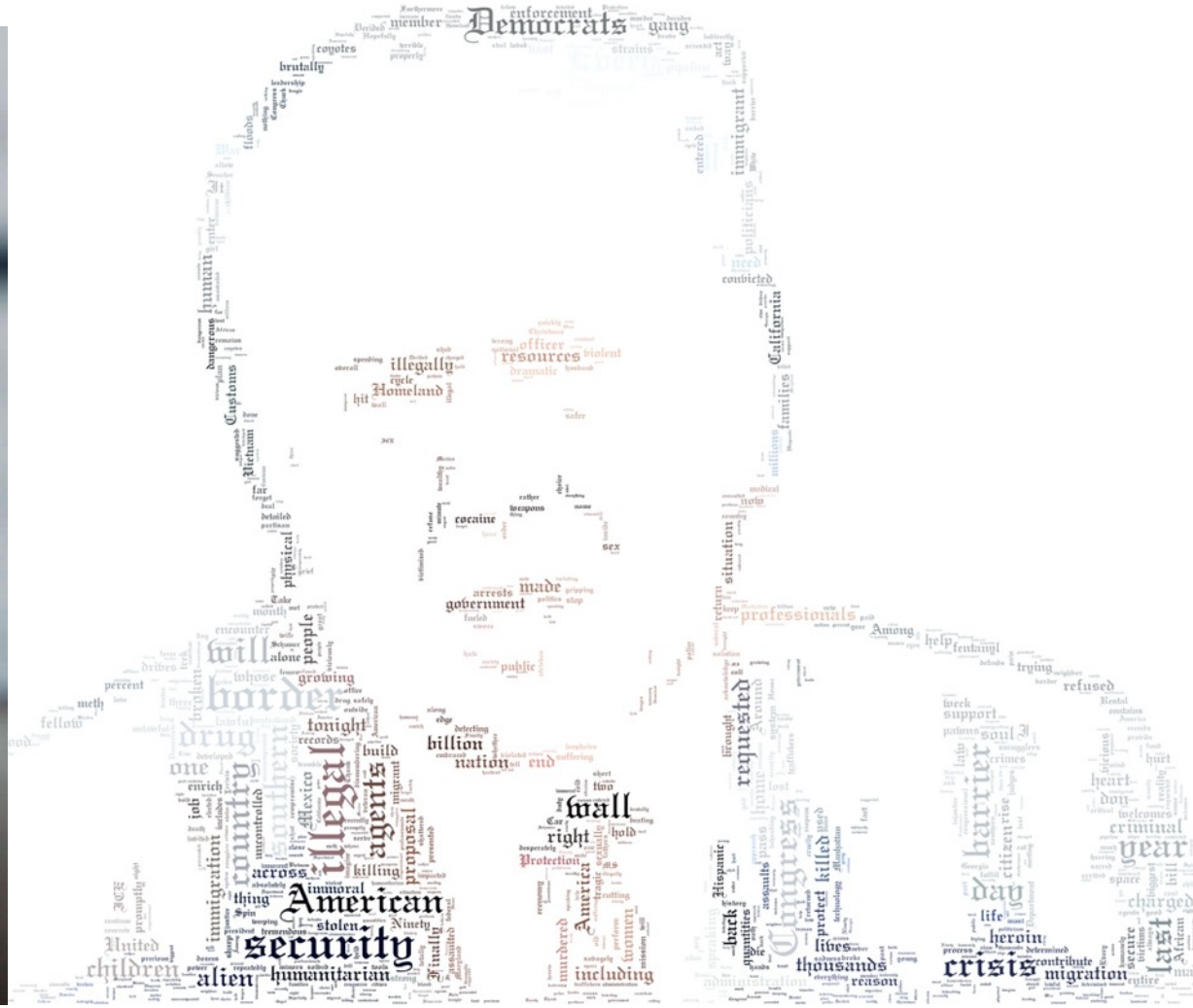


Other examples

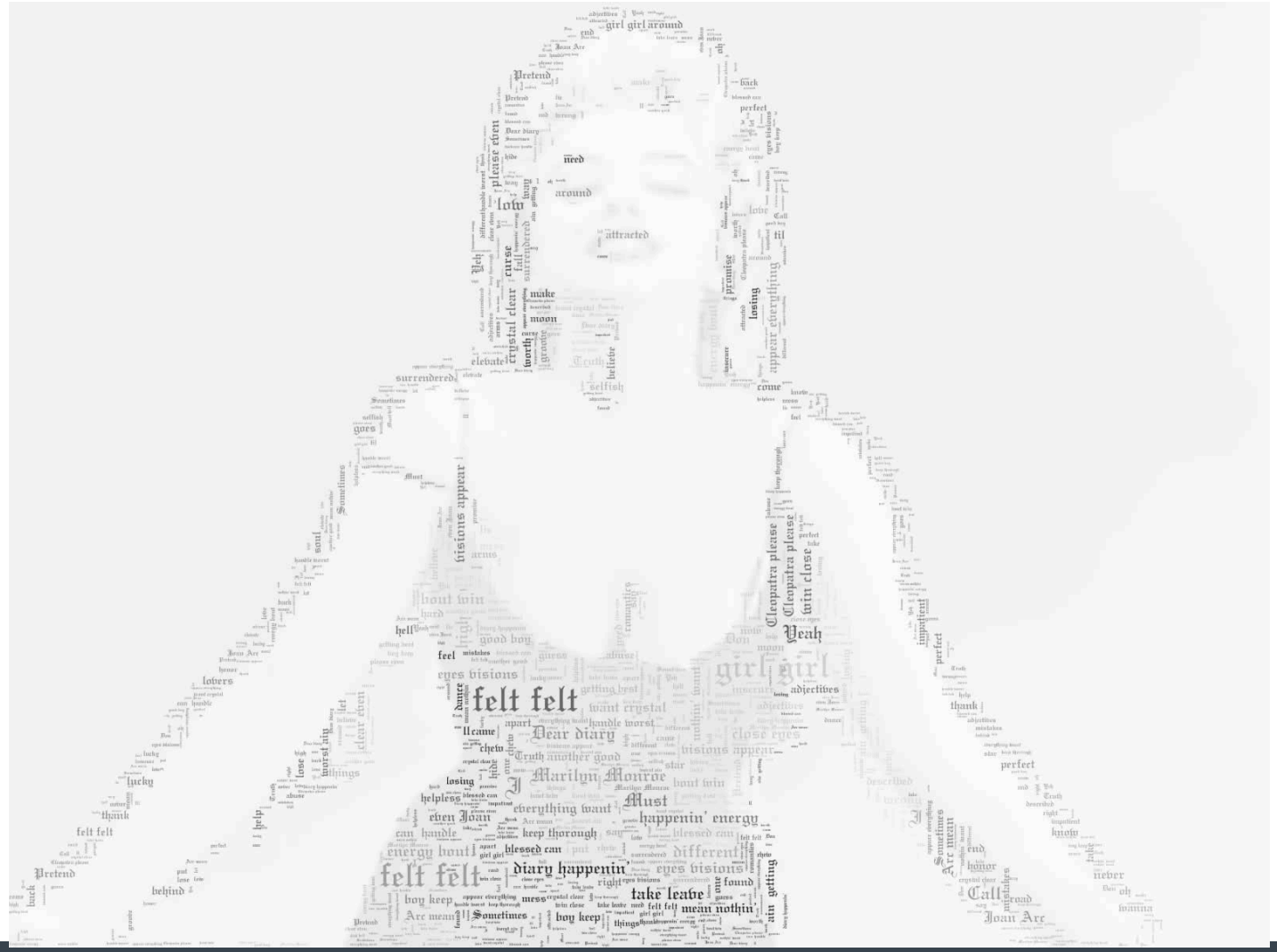


Other examples

Other examples



Video streaming processing – 5fs



First Mile Adobe team

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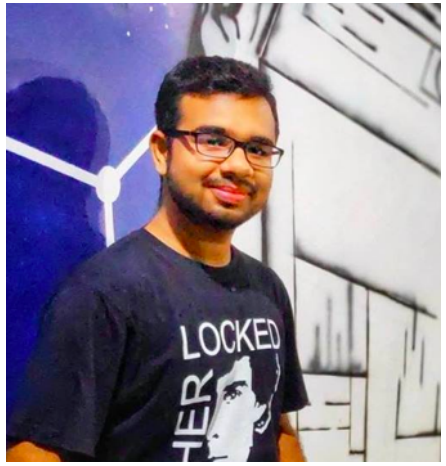

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Thank you!

Questions?


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