



# **ProGAN on Satellite images**

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*Yoann Boget*

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# Why?

*Do we want to generate images?*

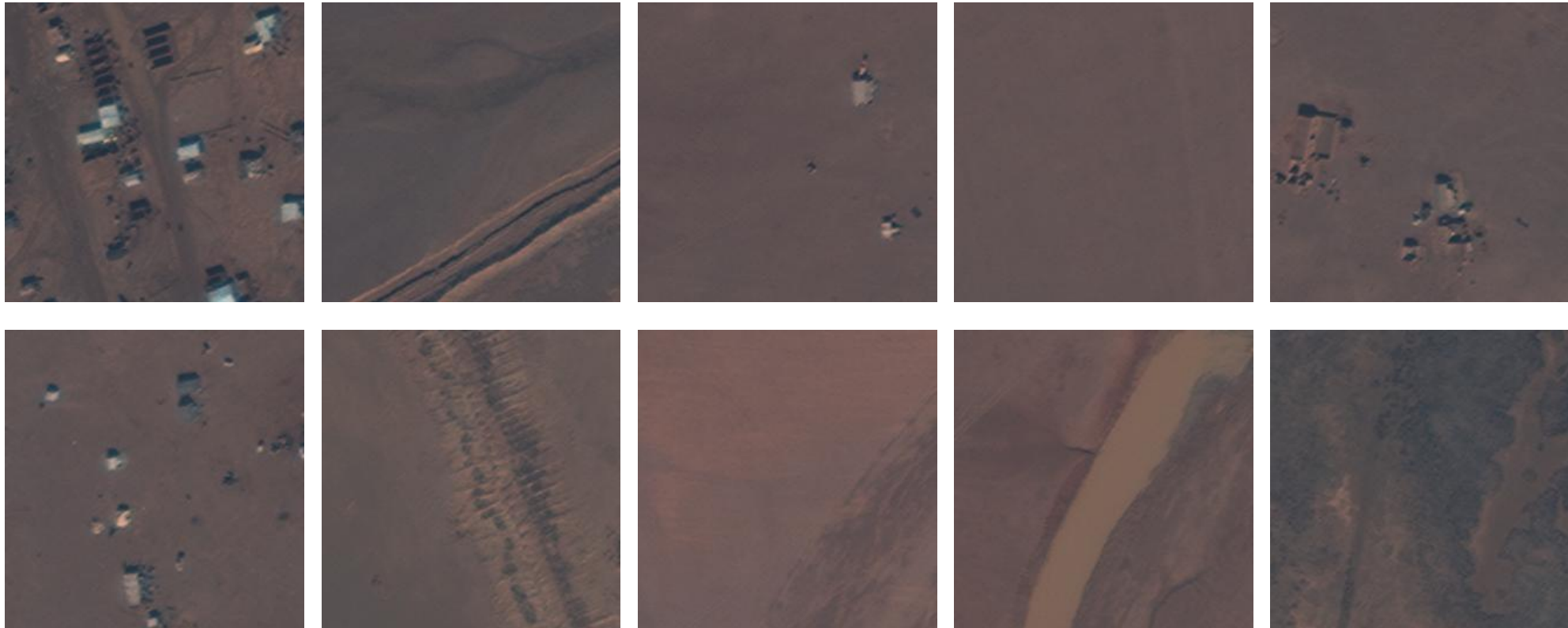
UNOSAT:

- Satellite images for:
  - humanitarian relief,
  - human security,
  - strategic territorial
  - development planning
- Machine learning
  - Crisis & Situational Mapping
  - Damage and Impact Assessment
  - Etc...
- Generating images?
  - Need of large inputs for training
  - Satellite images are expensive



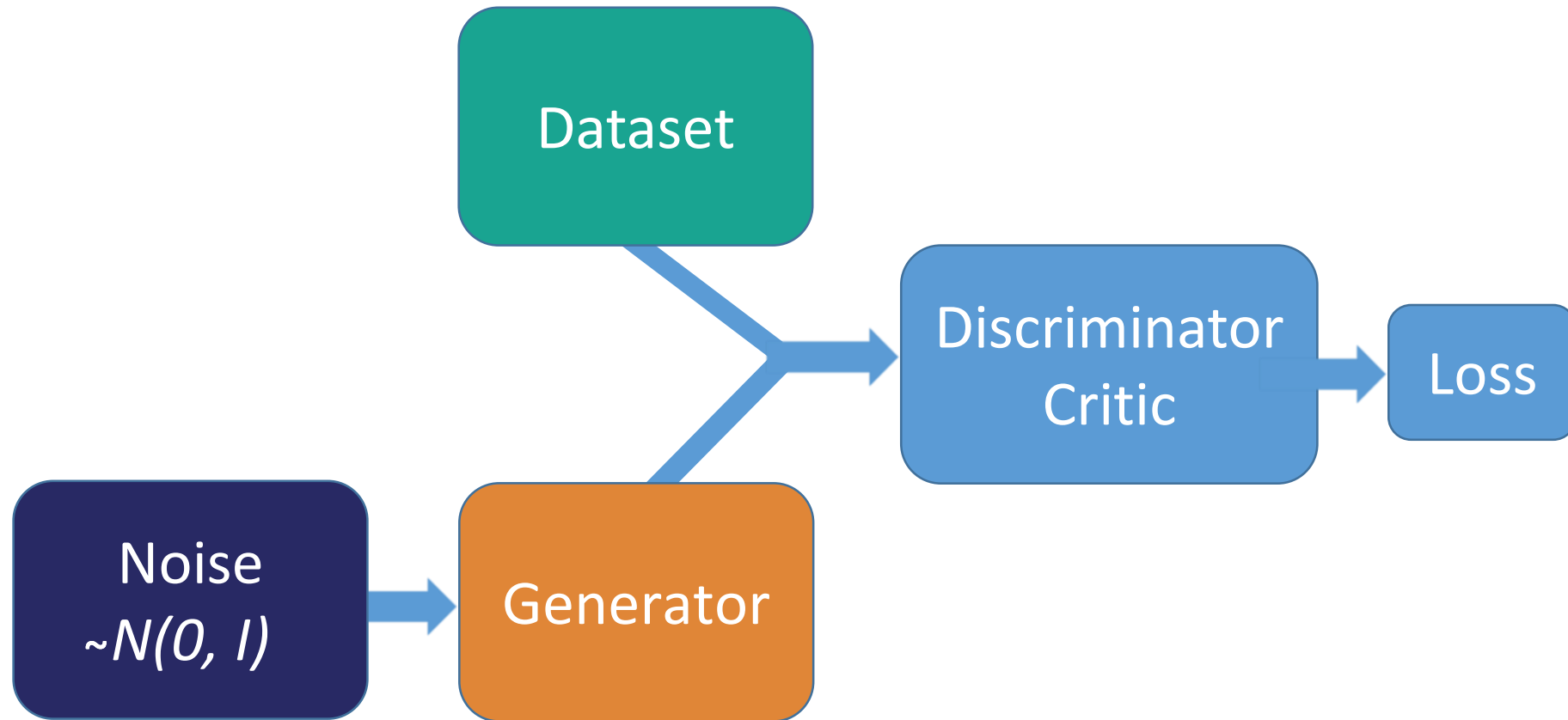
# Rukban desert

*The dataset: around 50k images. Size: 256x256x3*



# 1. Image generation with the ProGAN

# Generative Adversarial Network (GAN)





# ProGAN

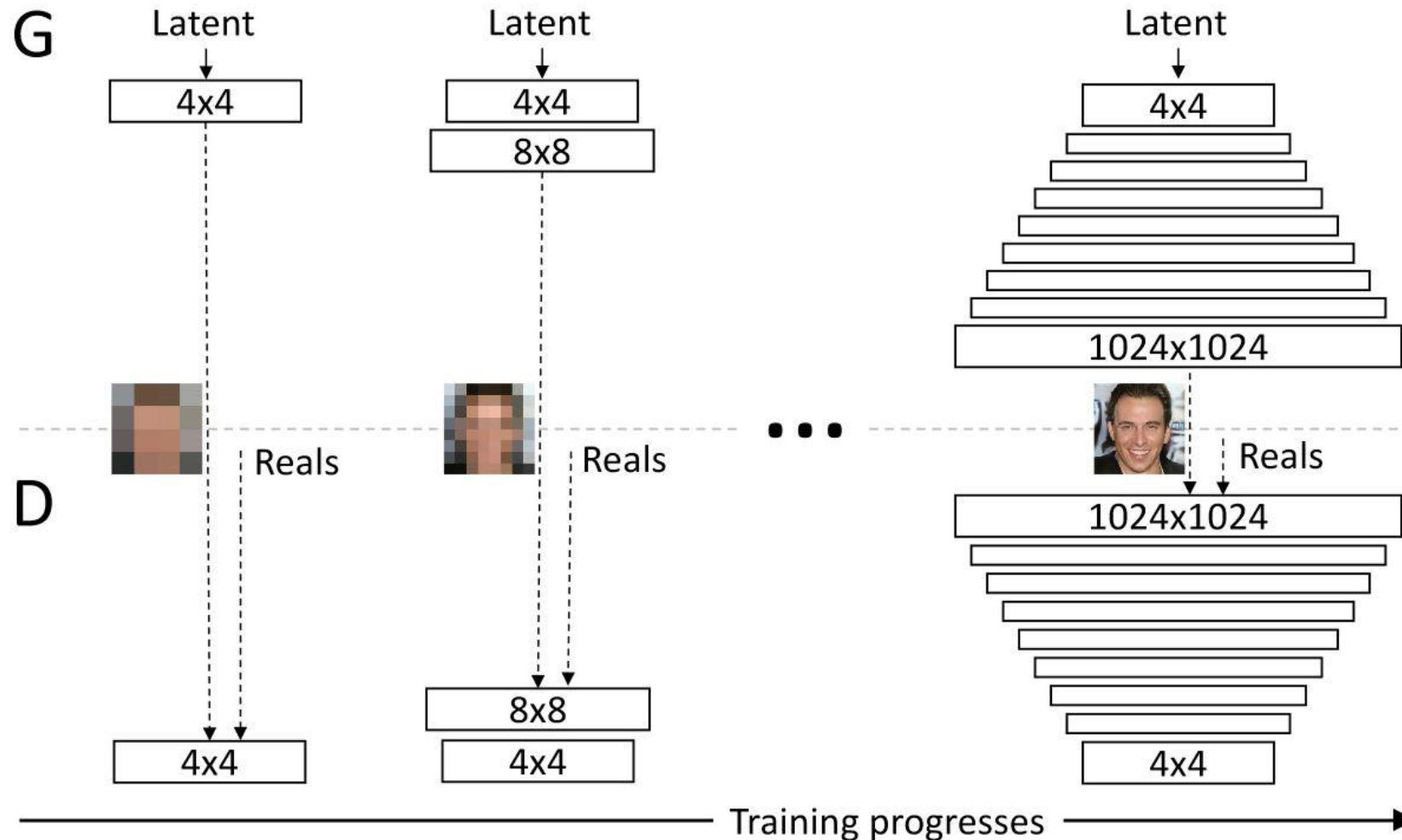
*The state-of-the-art GAN for images*



Tero Karras and *al.*, *Progressive growing of GANs for improved quality, stability and variation*, conference paper at ICLR 2018. Images credit: Nvidia

# ProGAN

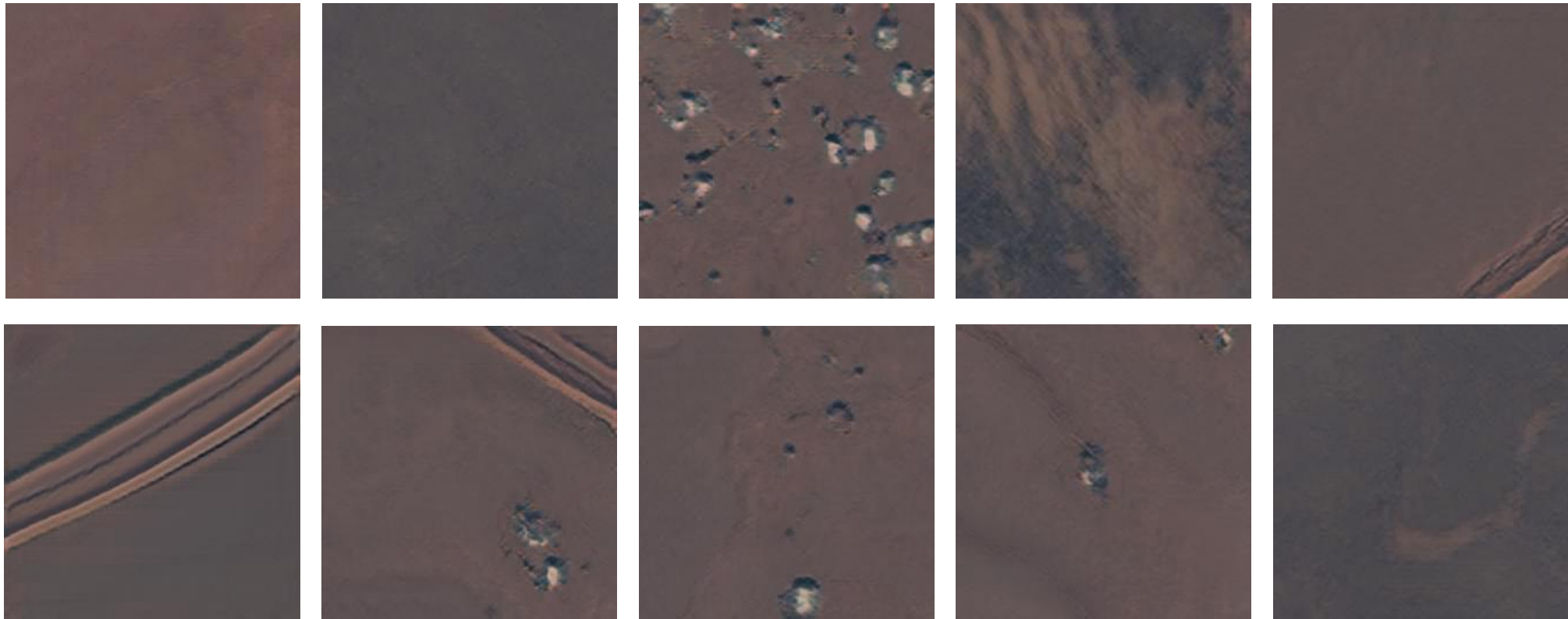
*The state-of-the-art GAN for images*



Tero Karras and *al.*, *Progressive growing of GANs for improved quality, stability and variation*, conference paper at ICLR 2018.

# Generated images

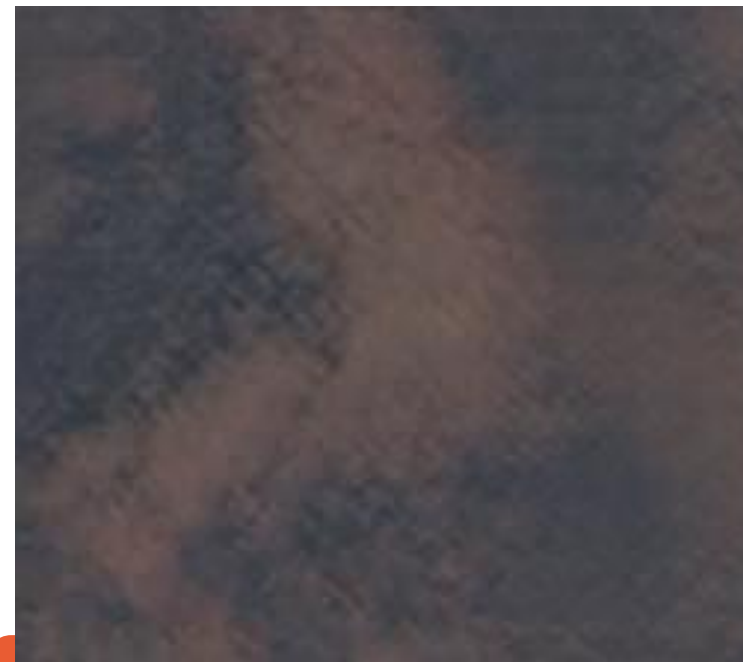
*Size: 256x256x3*





# Generated images

*Size: 1024 x 1024 x 3*



# Fréchet Inception Distance

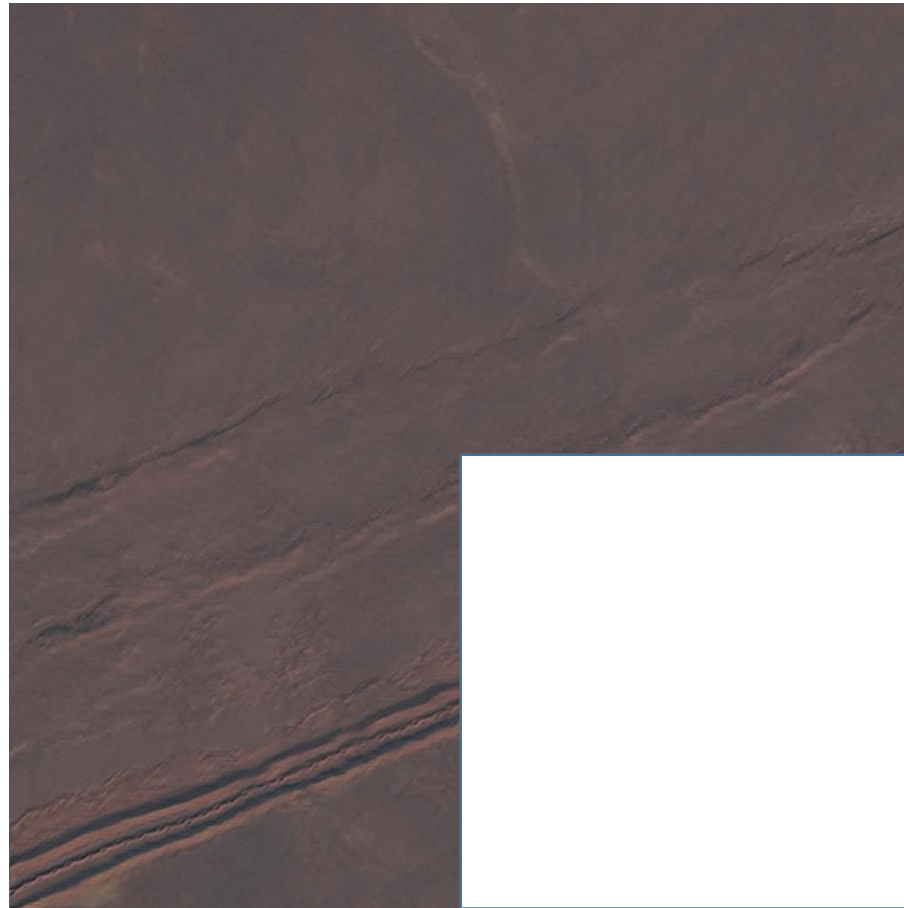
*4 random samples (size 100): 2 from real, 2 from generated data*

Sample 1	Sample 2	FID
Real 1	Real 2	74.6
Generated 1	Generated 2	72.8
Real 1	Generated 1	203.1
Real 1	Generated 2	200.3
Real 2	Generated 1	193.8
Real 2	Generated 2	194.0

## **2. Extend the image with progressive conditional GAN**

## 2. Conditional Progressive GAN

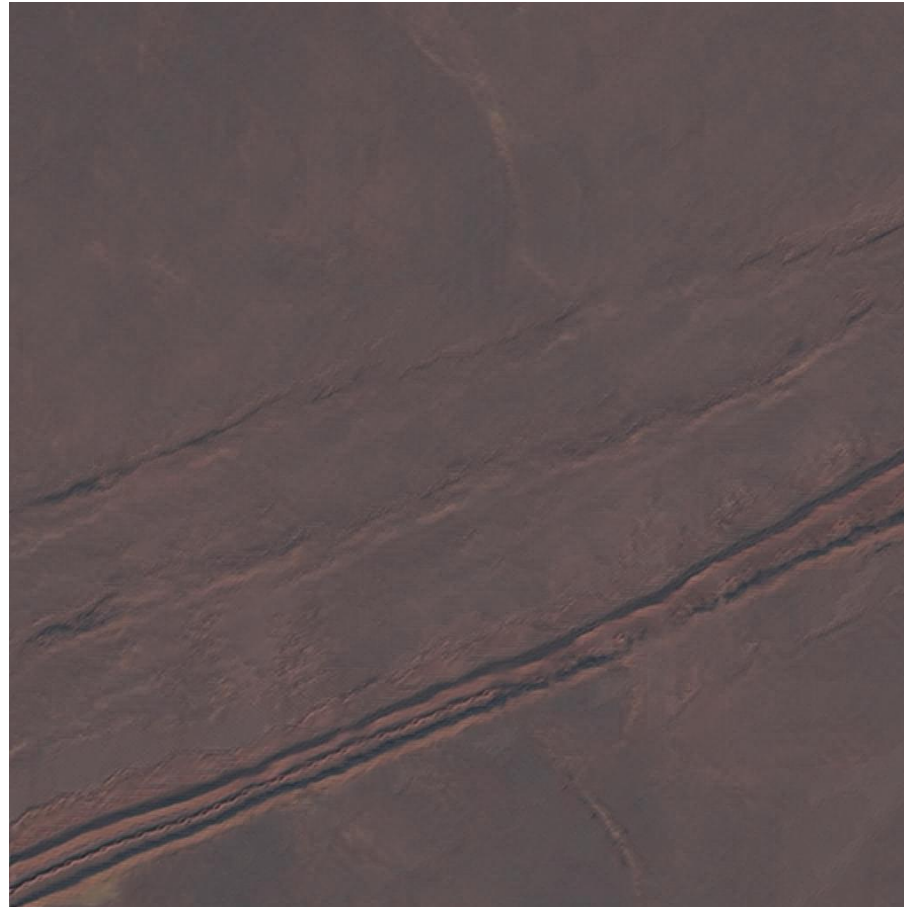
*The aim: we want to generate images depending on previous images*



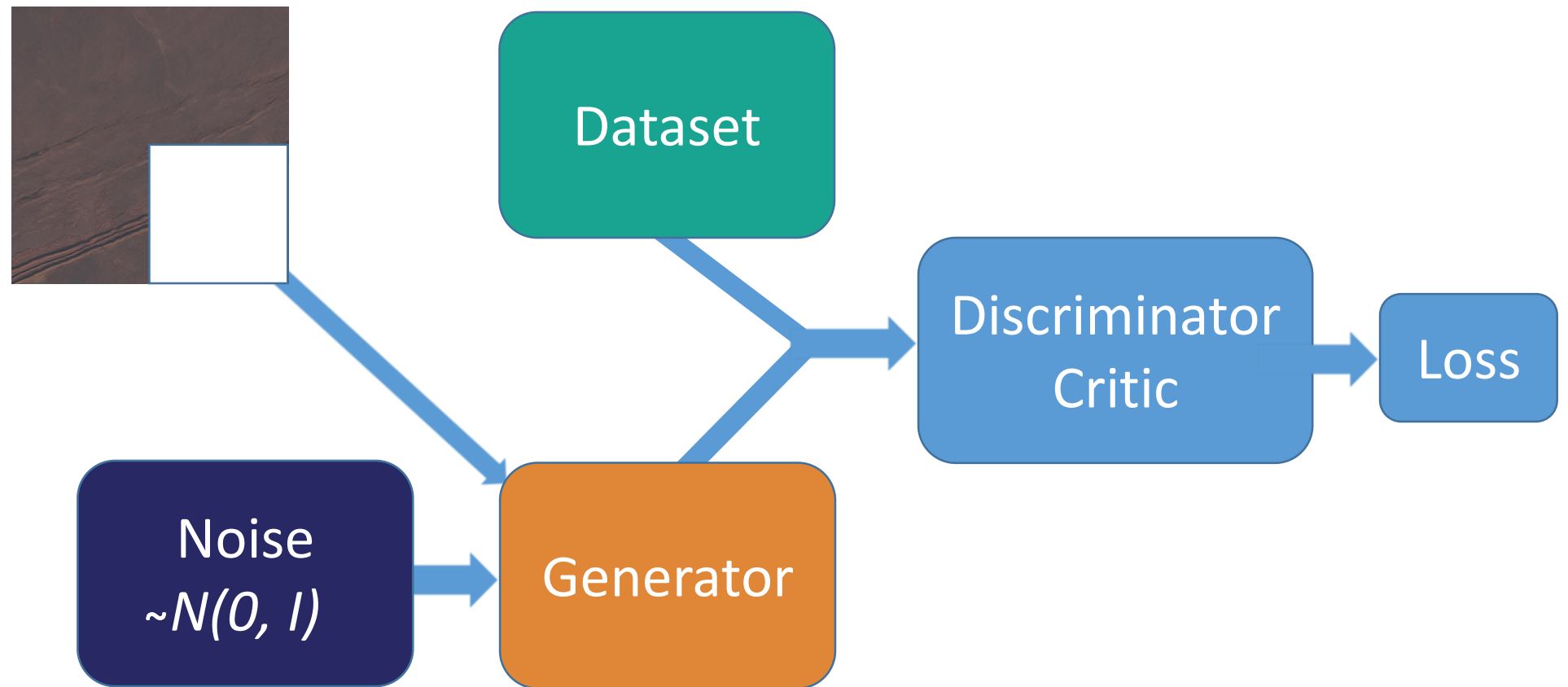


# 3. Conditional Progressive GAN

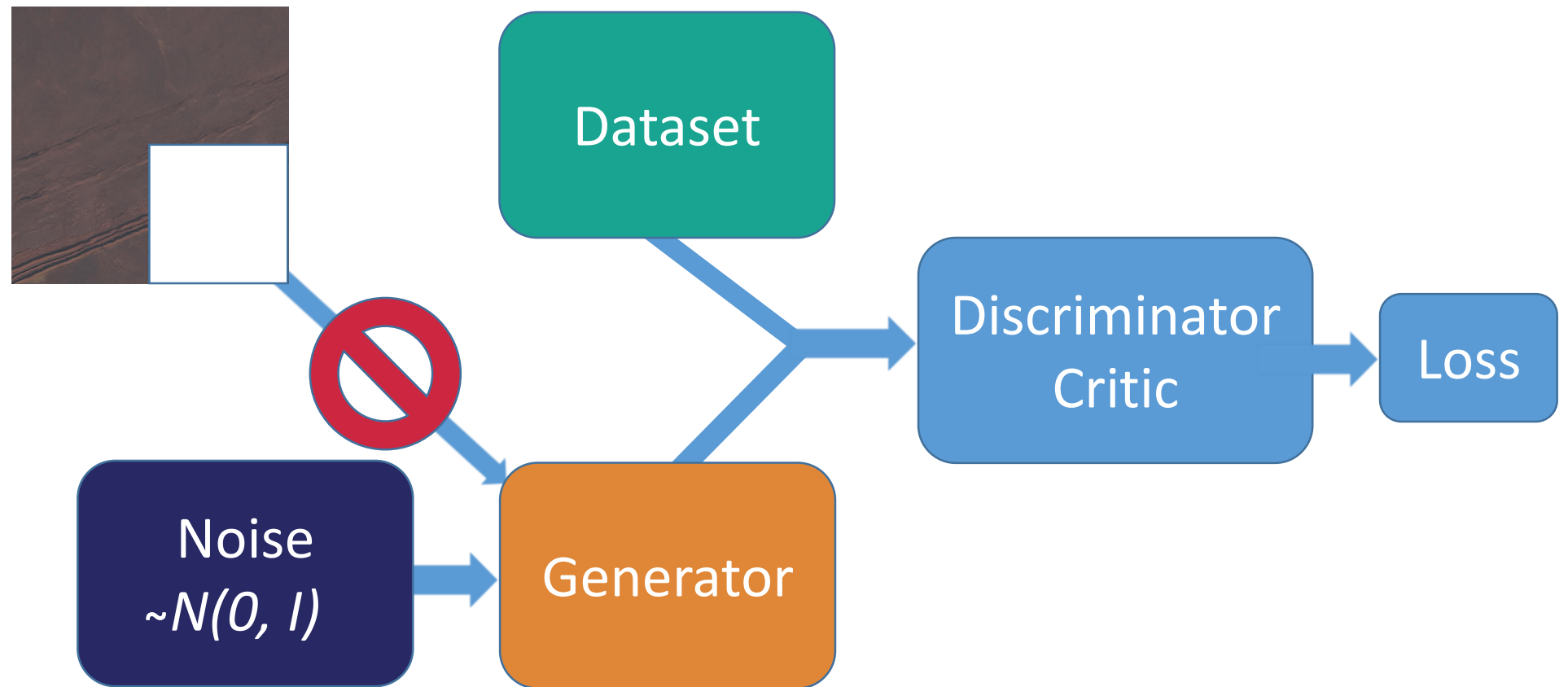
*The aim: we want to generate images depending on previous images*



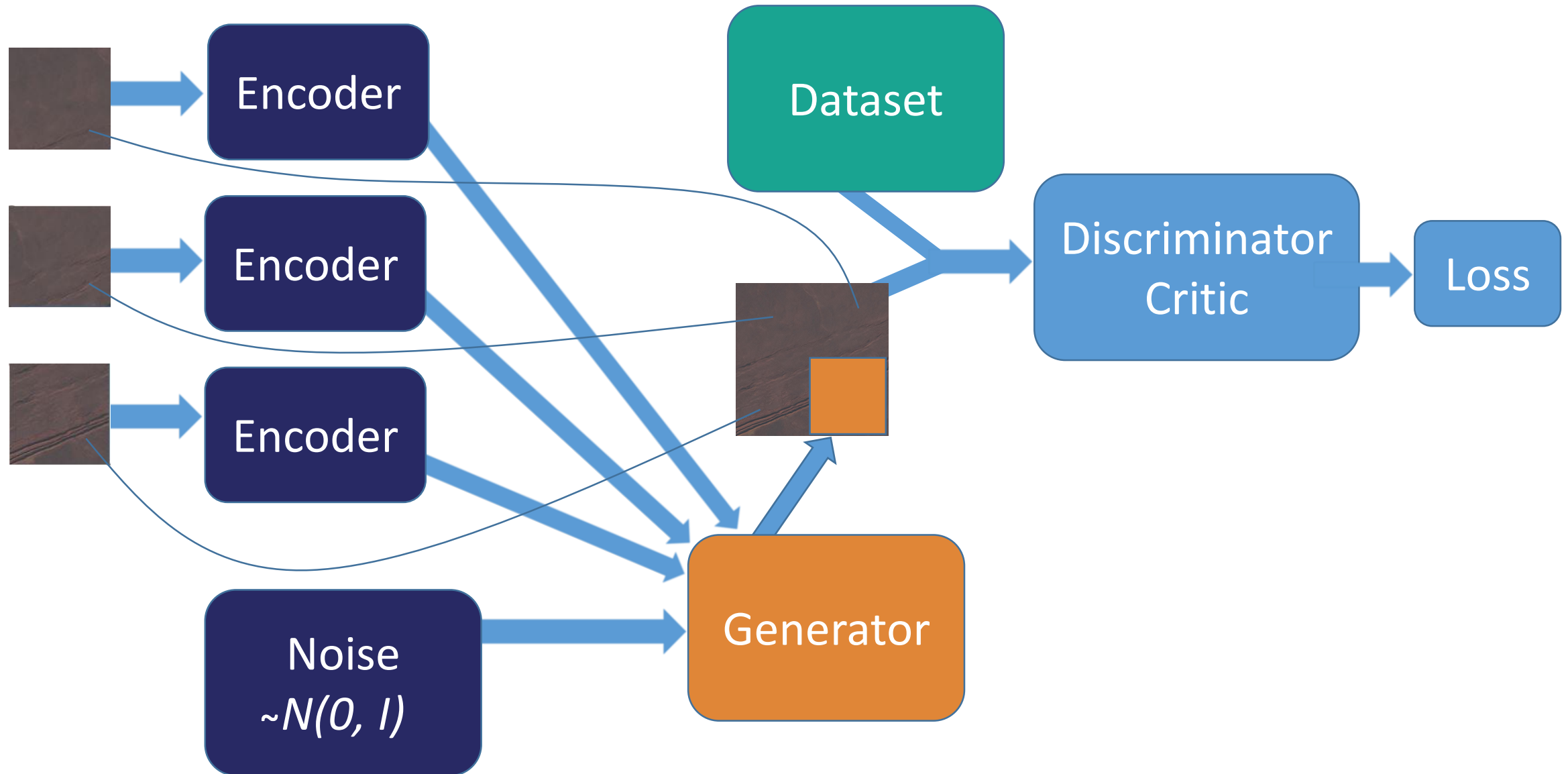
# Progressive Conditional GAN



# Conditional GAN



# Progressive Conditional GAN





# Generated images

*Size: 256x256x3*



# Generated images

*Size: 256x256x3*



# Generated images

*Size: 256x256x3*







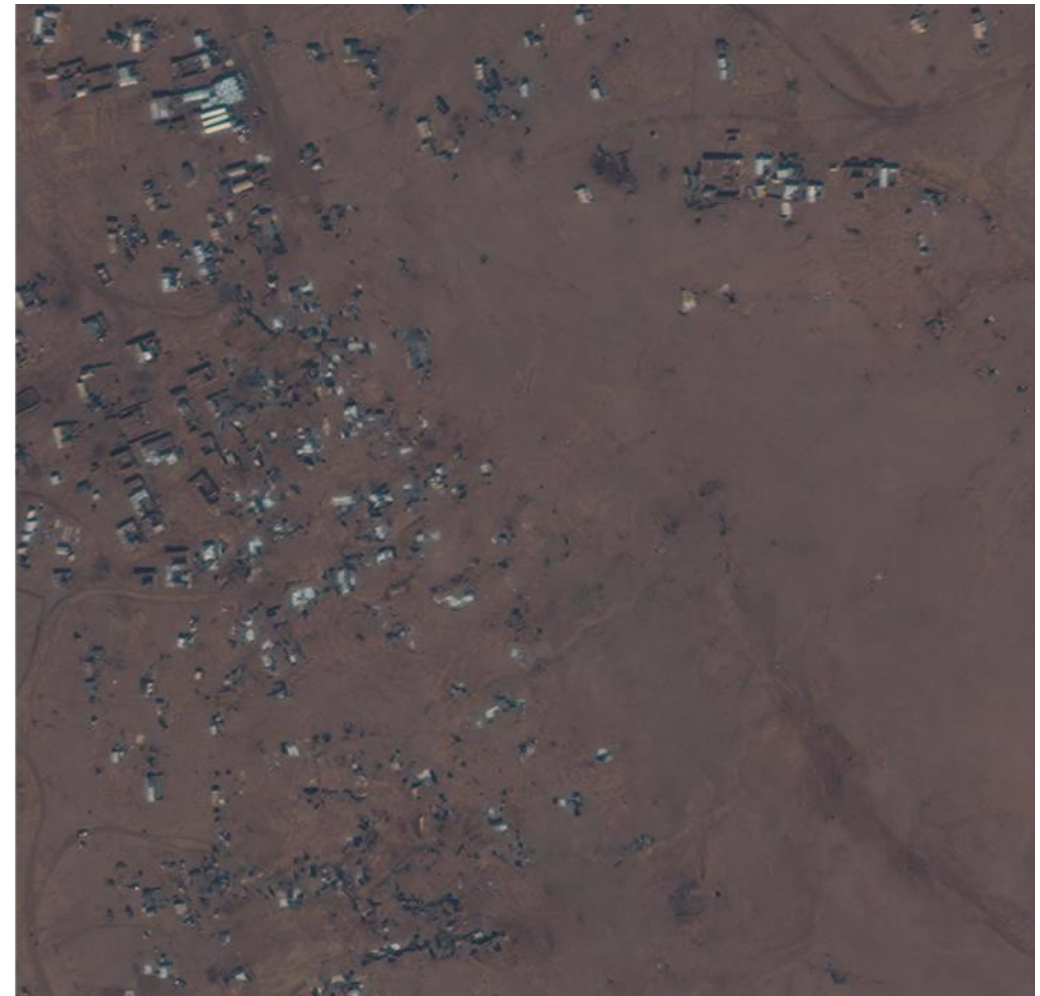
# Generated images

*Size: 256x256x3*



# Generated images

*Size: 256x256x3*



# Work in Progress

## *Progressive GAN on CPU*

- ProGAN running on single CPU nodes
- Optimization of the training on single and multiple CPU nodes



# Thank you

*yboget@gmail.com*