



# Introduction to GANs

Manu Mathew Thomas  
Creative Coding Lab

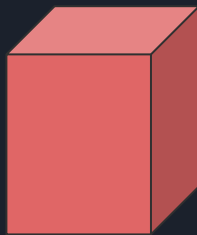
# Previously

Image Classifier



64 x 64 x 3

Conv1



16 kernels

Conv2



16

Conv3



16

FC1



32

FC2



2



Dog

# Previously

Image Generator

Conv1

Conv2

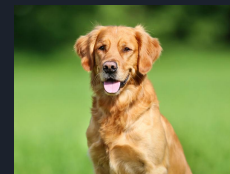
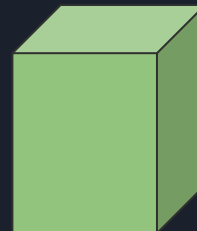
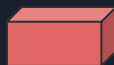
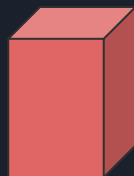
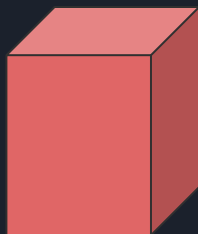
Conv3

Conv4

Deconv1

Deconv2

Deconv3



Encoder

Decoder

# Generative Adversarial Networks

Image Generator

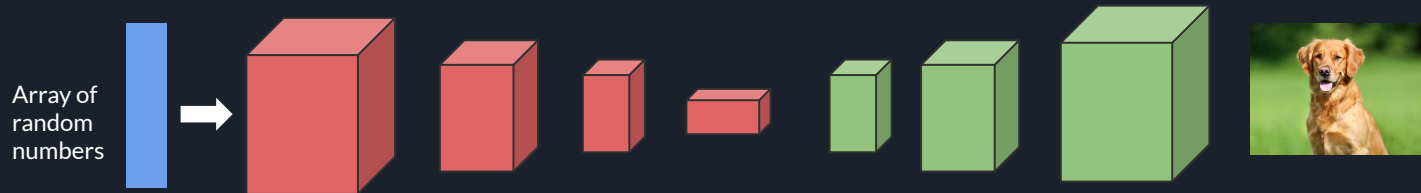
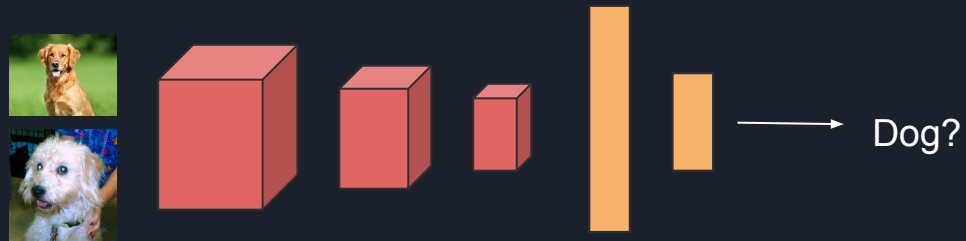
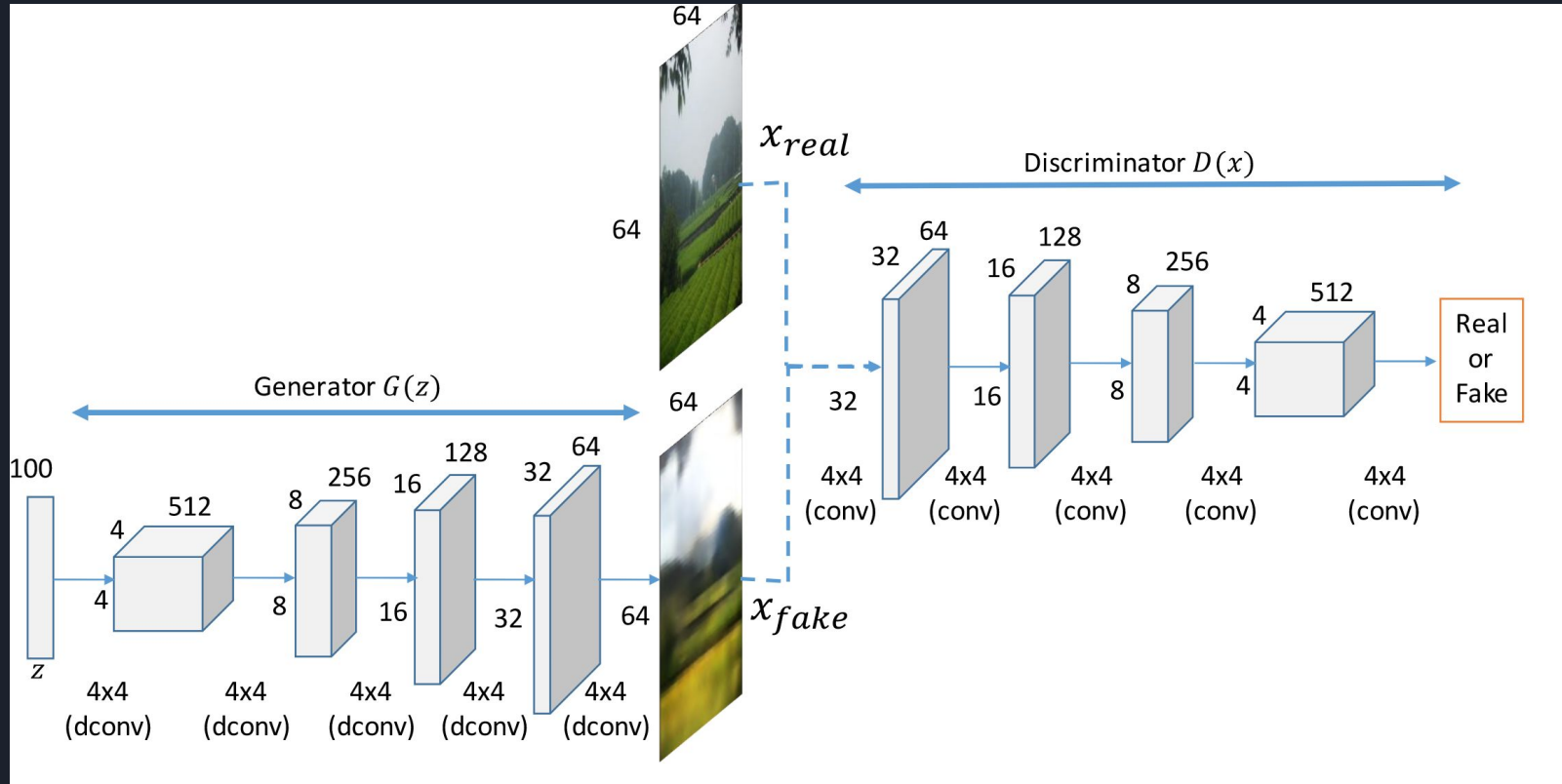


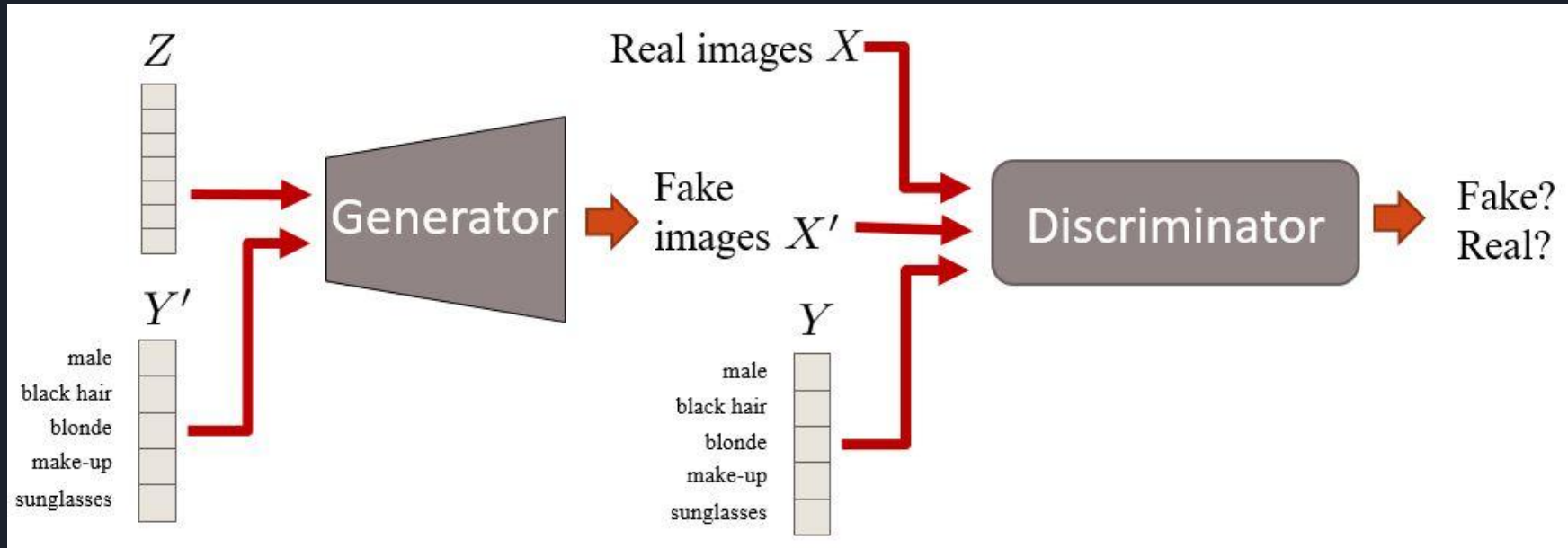
Image Classifier



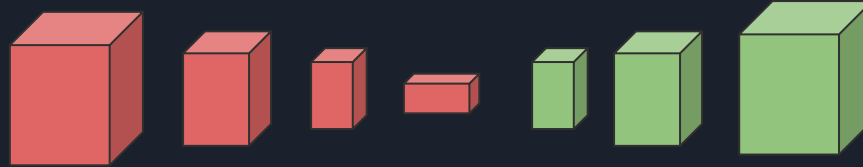
# Generative Adversarial Networks



# Conditional Generative Adversarial Networks



# Conditional Generative Adversarial Networks



Generator

Real



Or



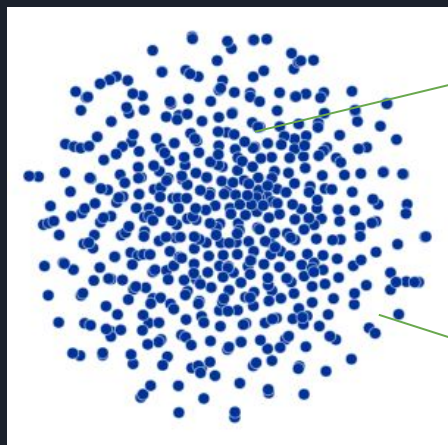
True  
or  
False

Fake



Discriminator

# GAN basics



Distribution of human face images

~12K dimensions

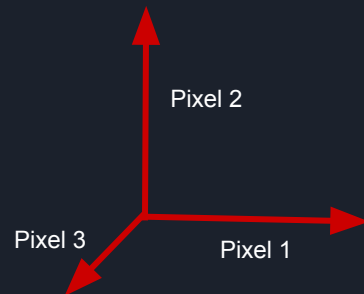
Each image is  $64 \times 64$  pixels = 4096 pixels

3 channels RGB;  $4096 * 3 = 12,288$  pixels

Each pixel is one dimension

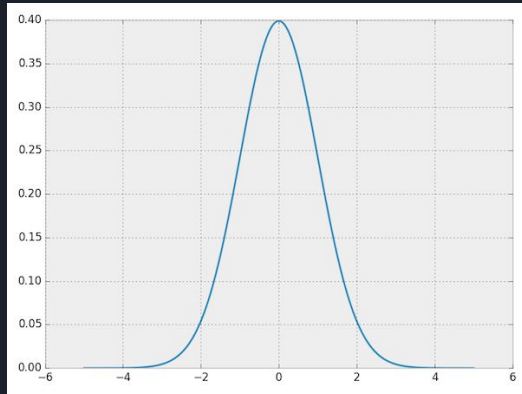
A single point in this distribution corresponds to a vector of 12,288 pixels which can be reshaped to  $64 \times 64 \times 3$

This is a complex distribution and properties are unknown to us





# GAN basics



Gaussian Distribution

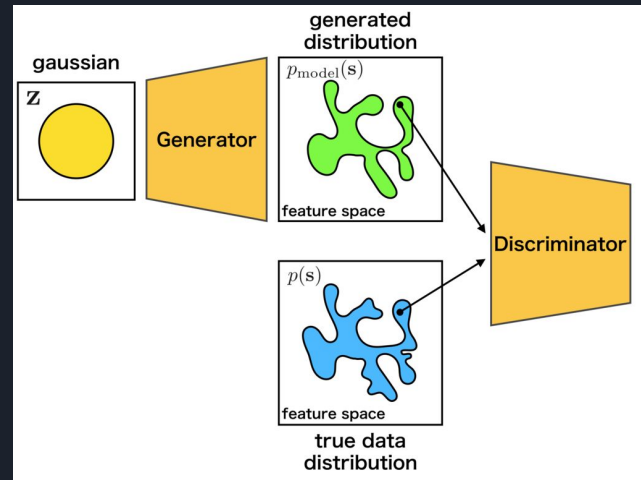
Simple and well-studied distribution

$F(\text{Gaussian noise}) = \text{point in the face image distribution space } (P)$

$F(P) = \text{true or false}$

$F(\text{Gaussian noise})$  is the generator

$F(P)$  is the discriminator



# GAN Denoising



Input



Output



Ground Truth



# GAN Denoising

Input



Output



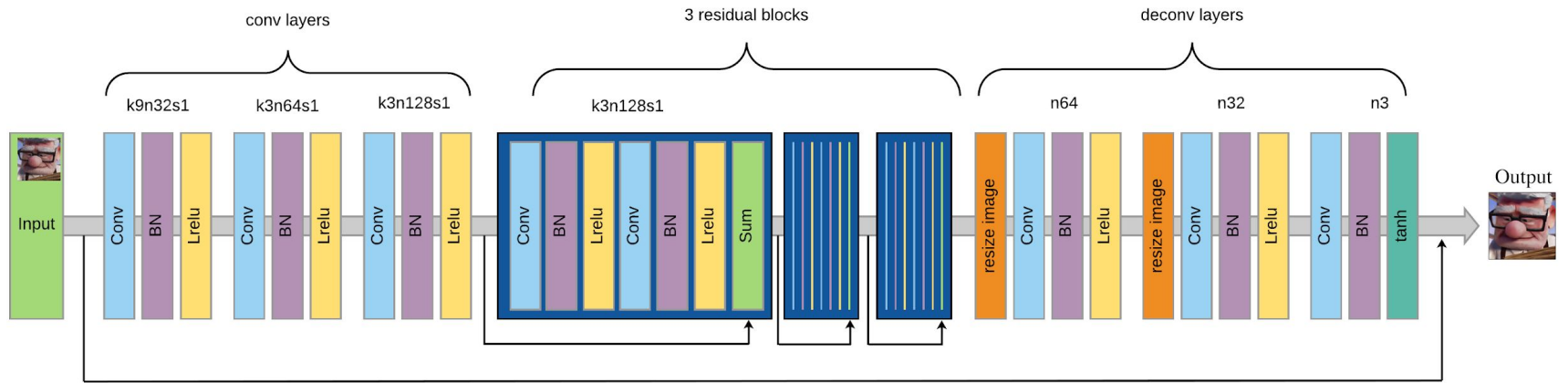
Input



Output

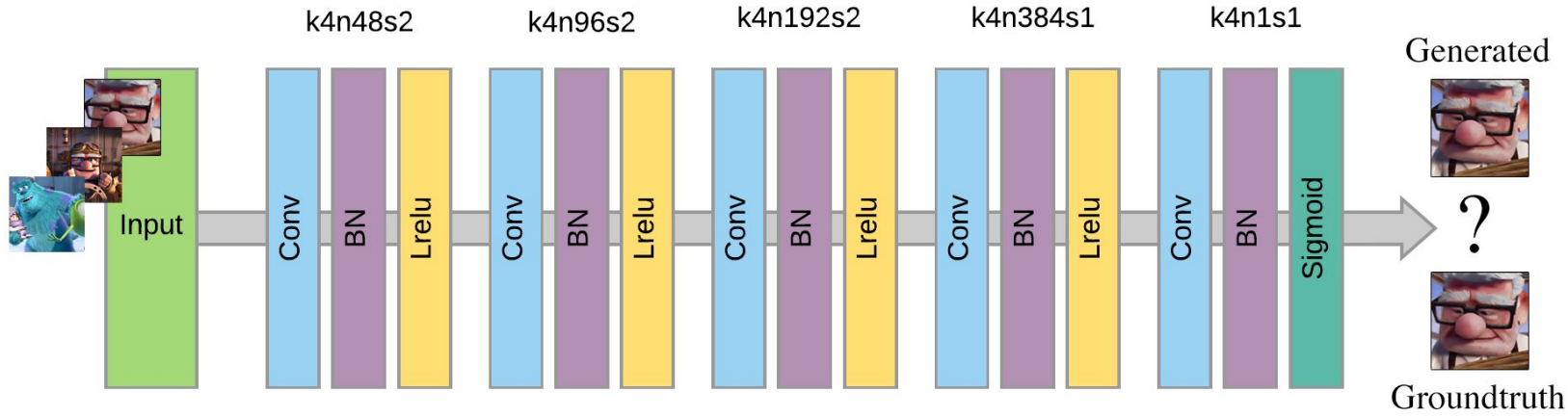


# GAN Denoising



Generator

# GAN Denoising



# Deep Illumination - indirect illumination with GANs

(a) Input buffers



Diffuse map



Depth map

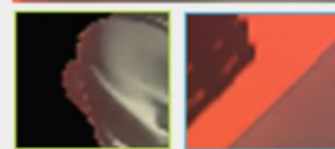
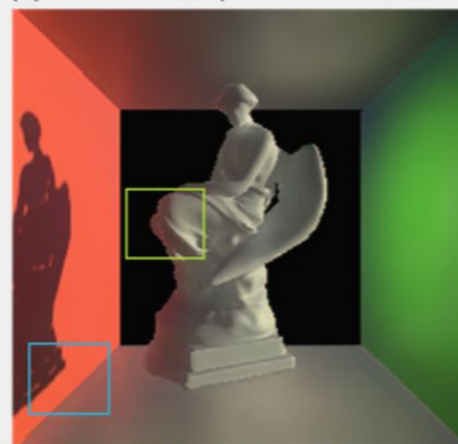


Normal map

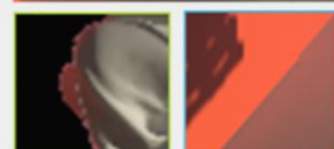
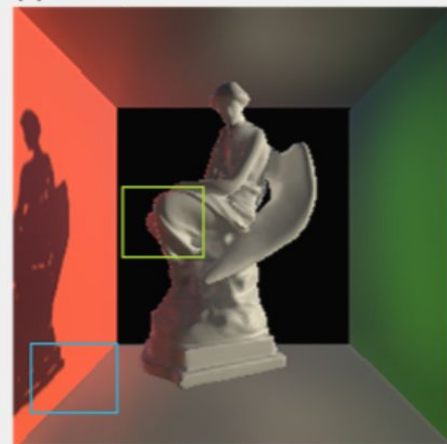


Direct Illumination

(b) Generated output

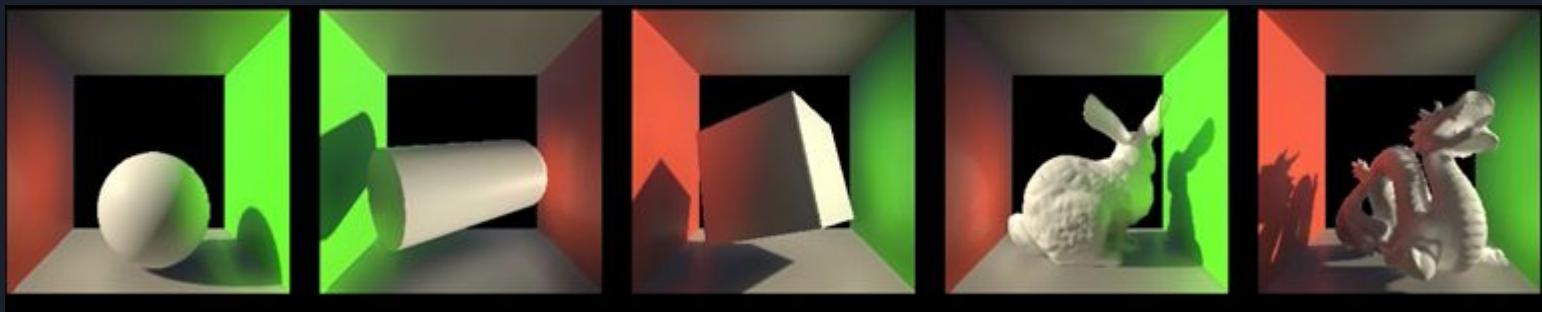


(c) Reference

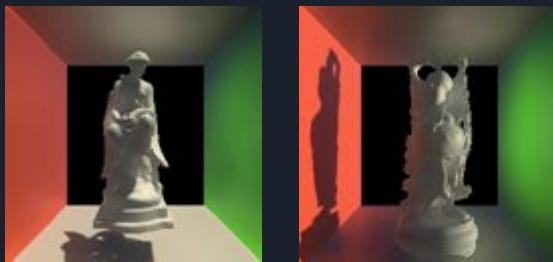


# Deep Illumination - indirect illumination with GANs

Training set



Test set



# Deep Illumination - indirect illumination with GANs



Direct



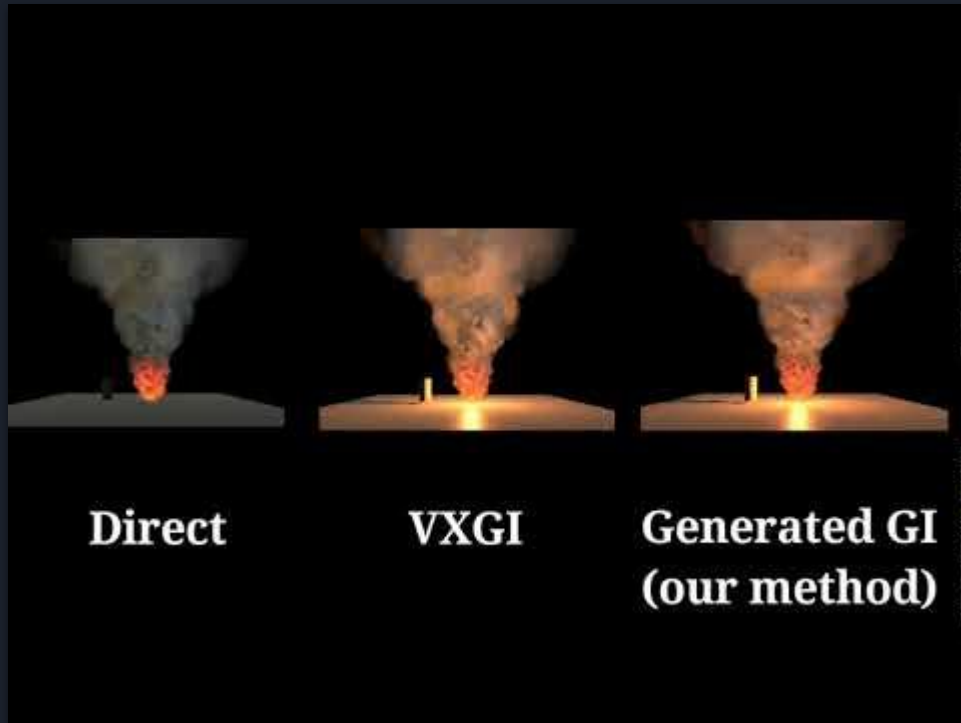
VXGI



Generated GI  
(our method)



# Deep Illumination - indirect illumination with GANs



# Deep Illumination - indirect illumination with GANs

