

# Automated Fashion Design

using

## Generative Adversarial Networks

Master's Thesis Project Presentation

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Under the supervision of

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**Prof. Amit Patra** (Dept. of EE)

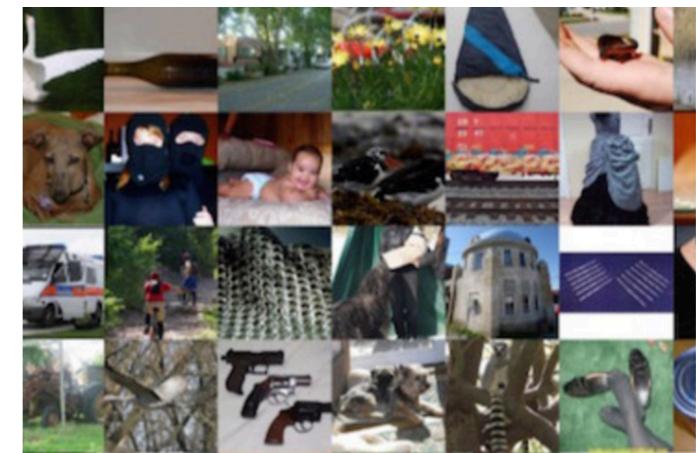
**Mr. Vishnu V. Makkapati** (Myntra Designs Pvt. Ltd.)

# Why Generative Learning?

*“What I cannot create, I do not understand.”*

— Richard Feynman

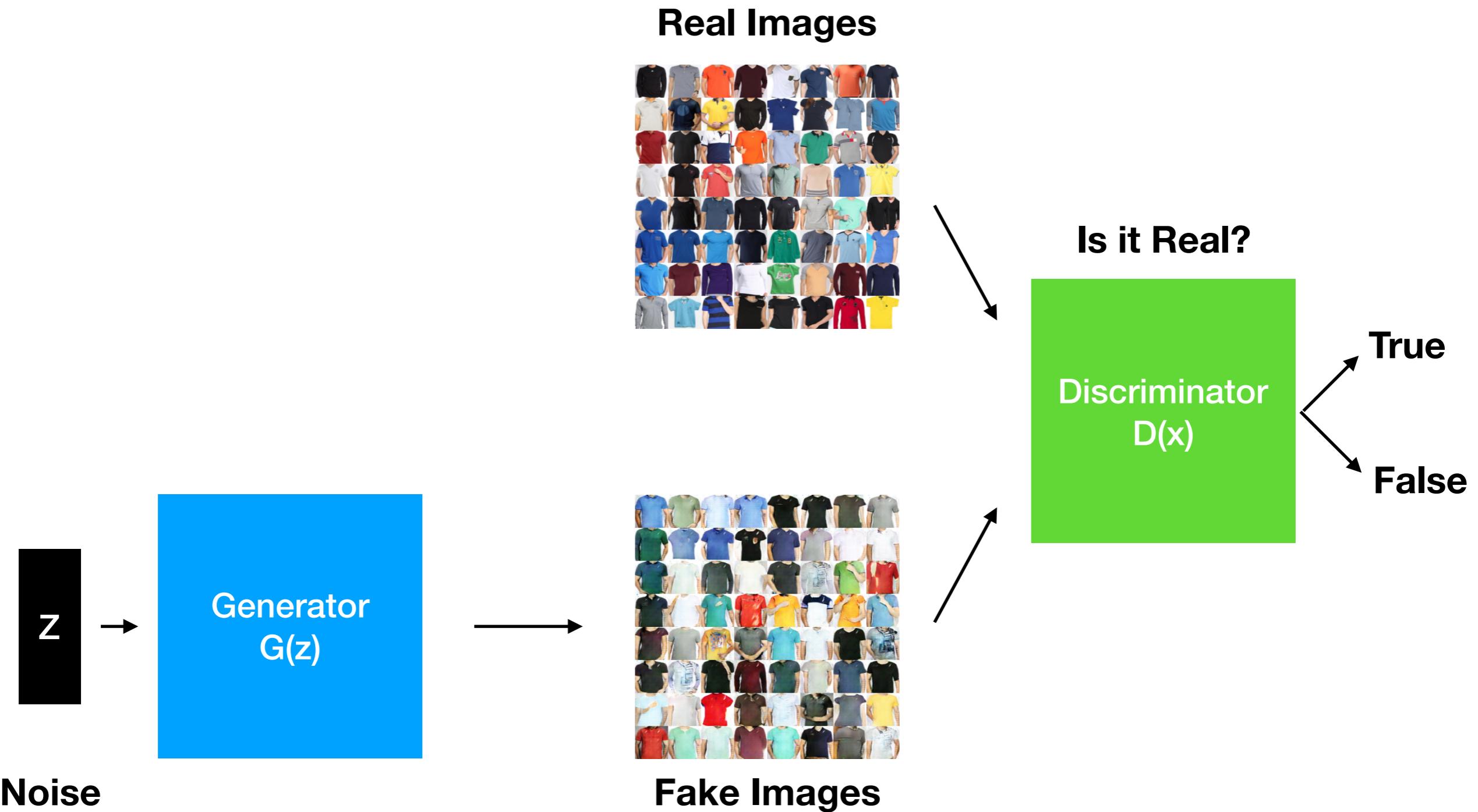
To learn a **model**  
**system**  
**distribution** we must be able to faithfully recreate it



More like these?

# What is a GAN?

Generative Adversarial Network



# Data

**Solids**

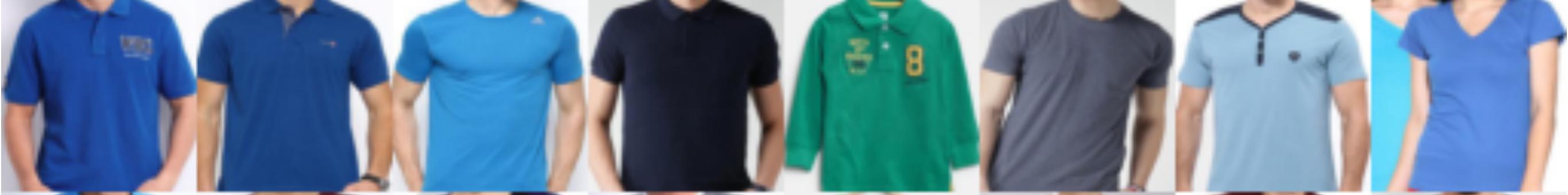


**Stripes**

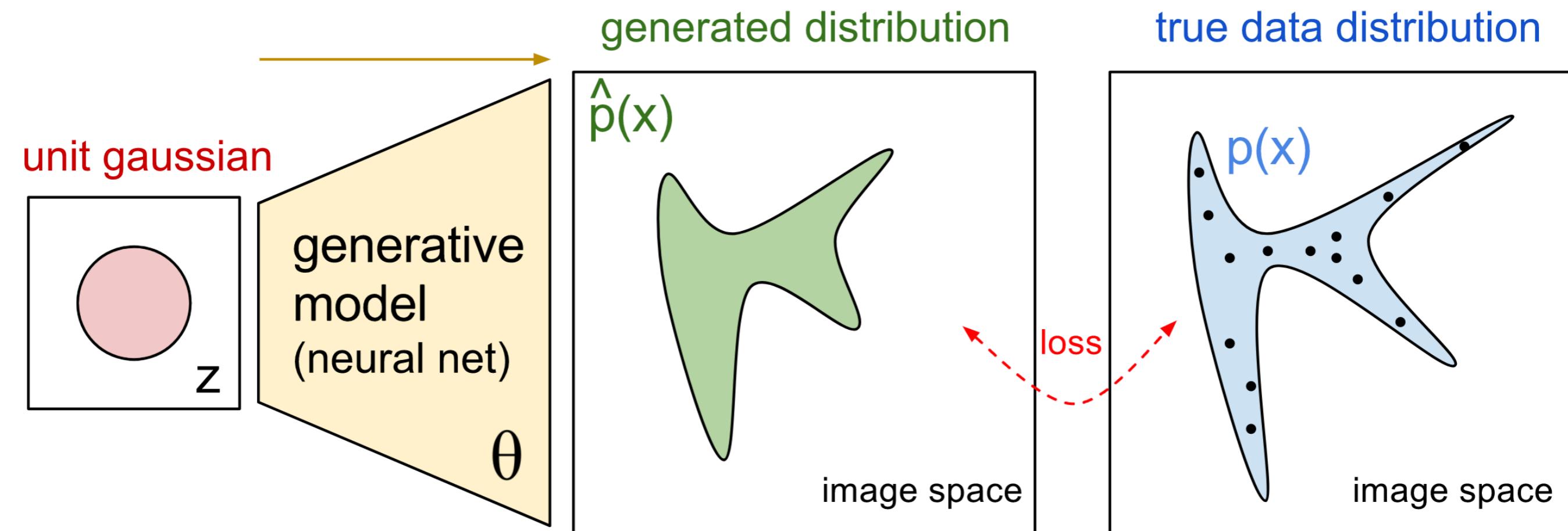


**Checks**



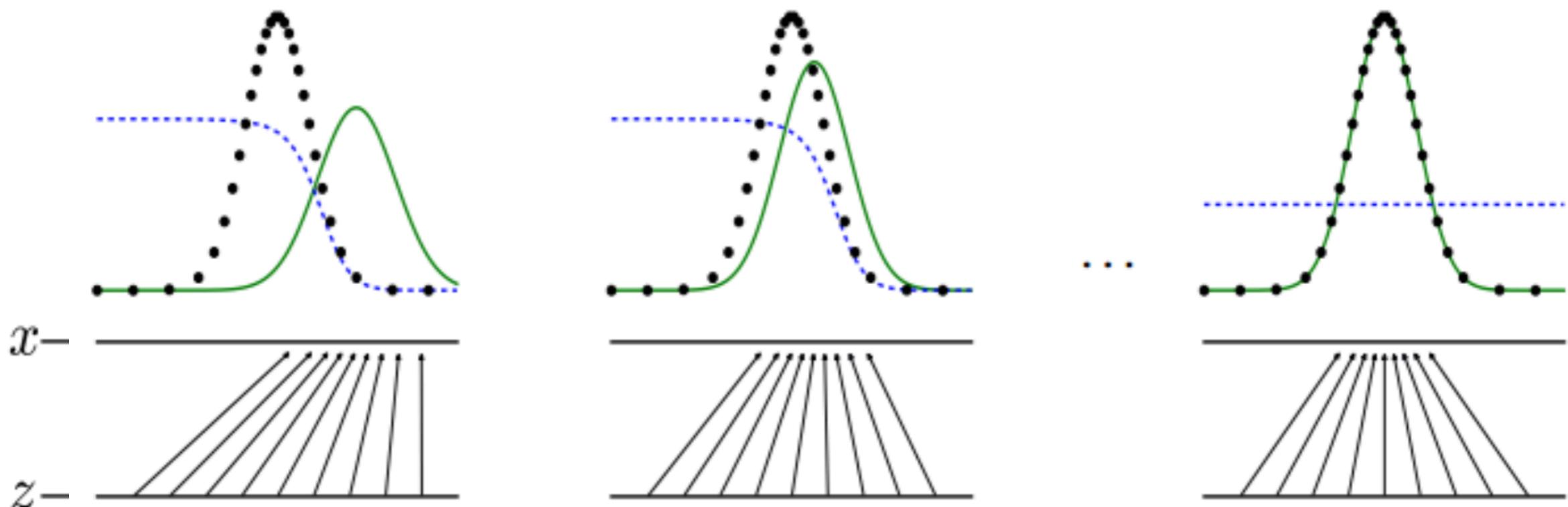


# GAN for Estimation

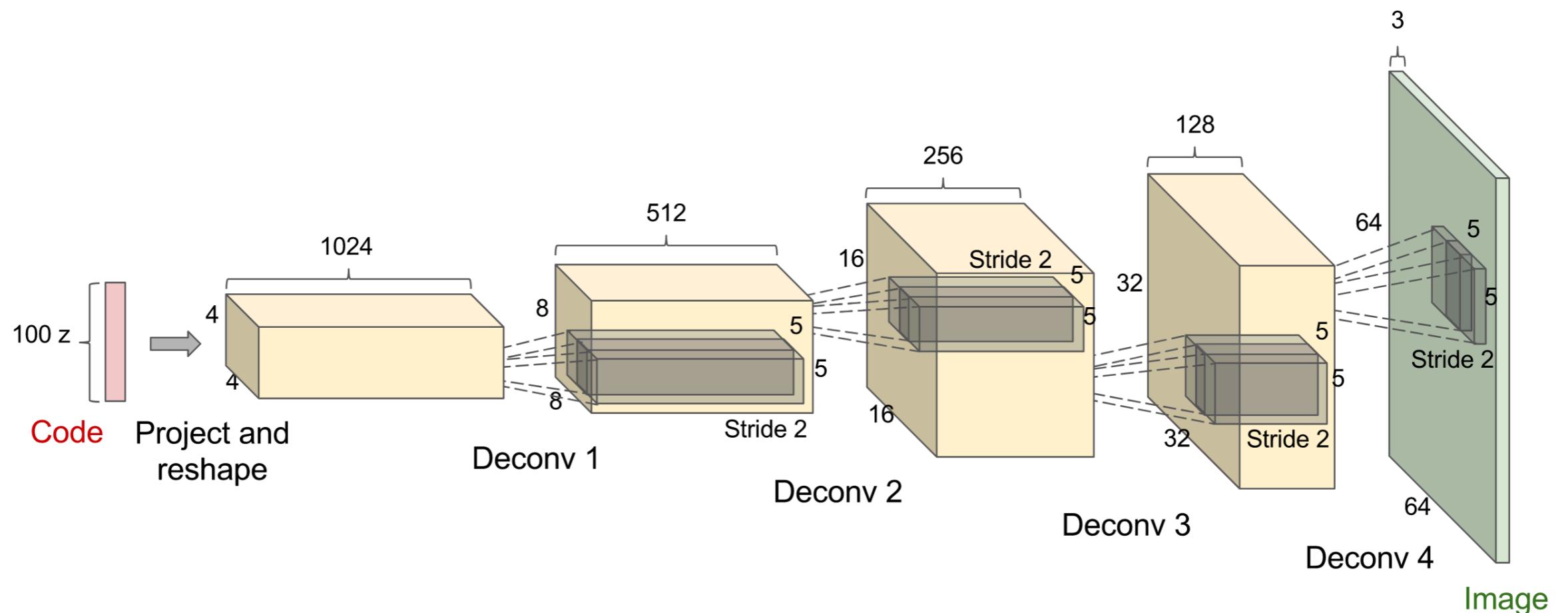


Loss measures KL-Divergence between the distributions

# Estimating Gaussian PDF



# DCGAN's Generator

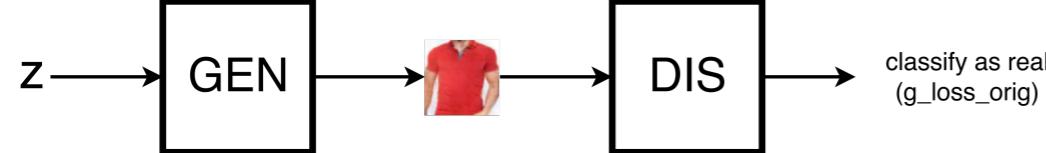


Kim, T.: A tensorflow implementation of deep convolutional generative adversarial networks, <https://github.com/carpedm20/DCGAN-tensorflow>

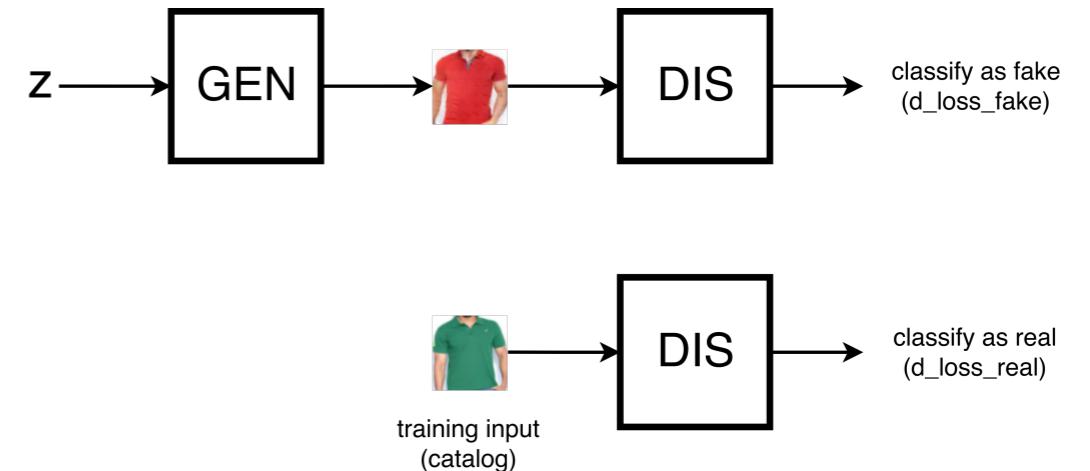
Radford, A., Metz, L., Chintala, S.: Unsupervised representation learning with deep convolutional generative adversarial networks. arXiv preprint arXiv:1511.06434 (2015)

# Traditional Scheme

## Generator Losses

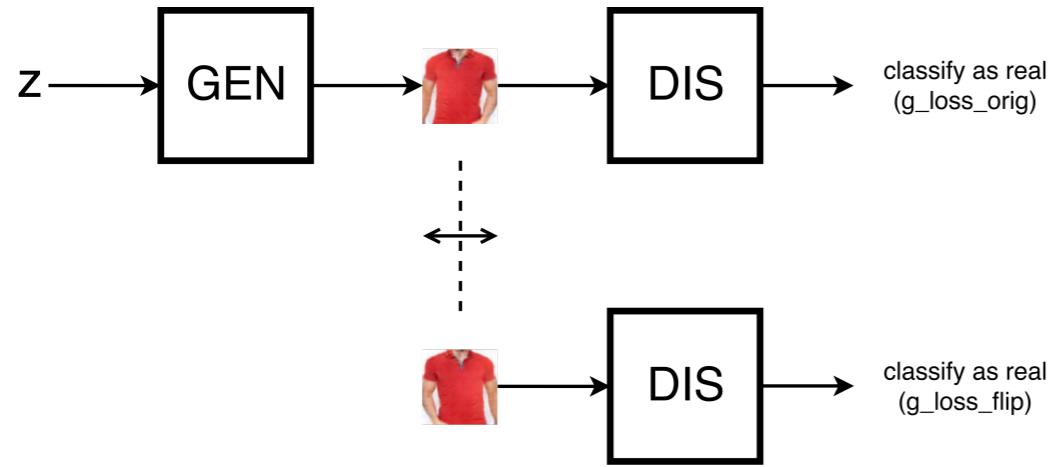


## Discriminator Losses

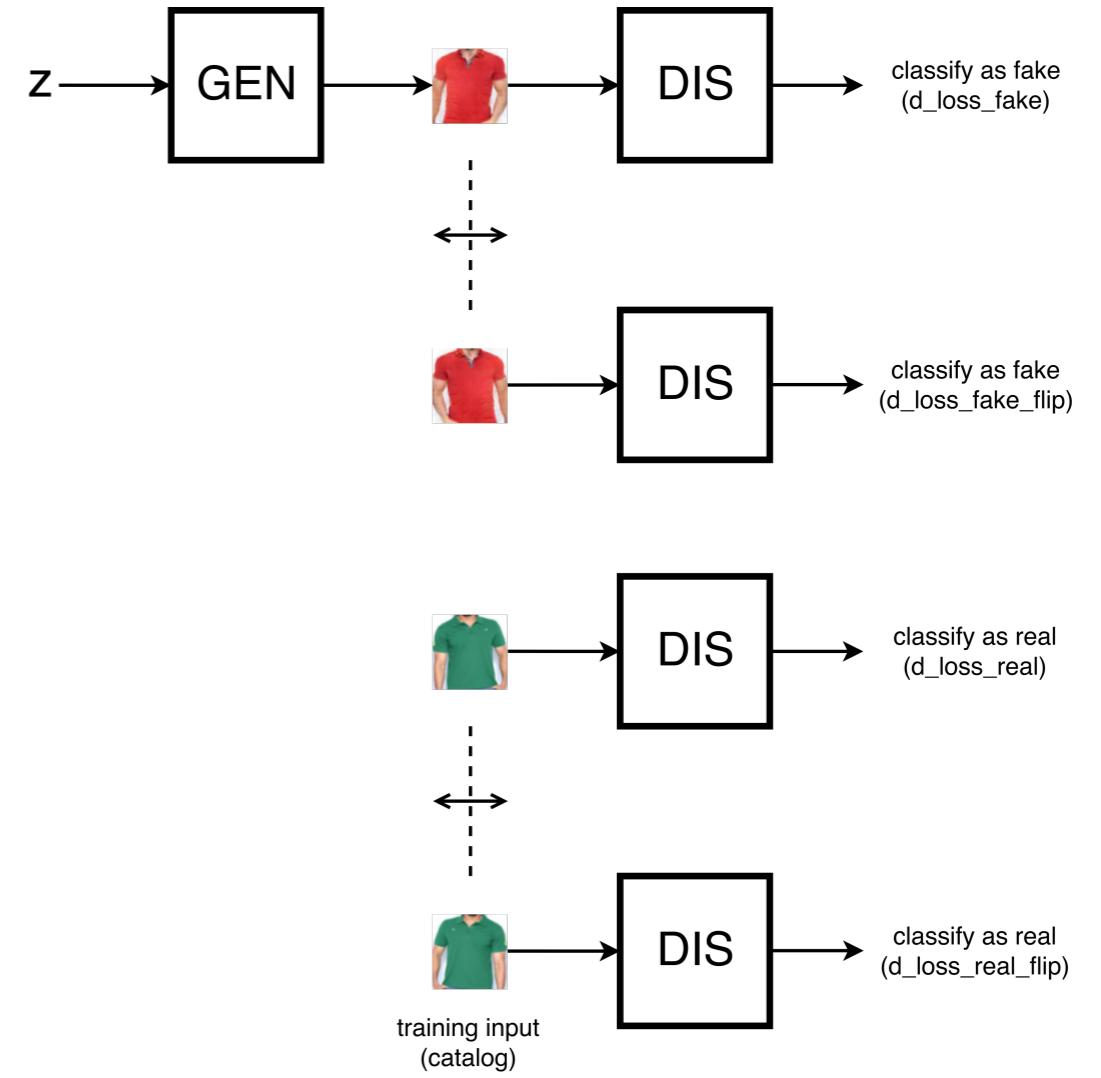


# Symmetry Scheme

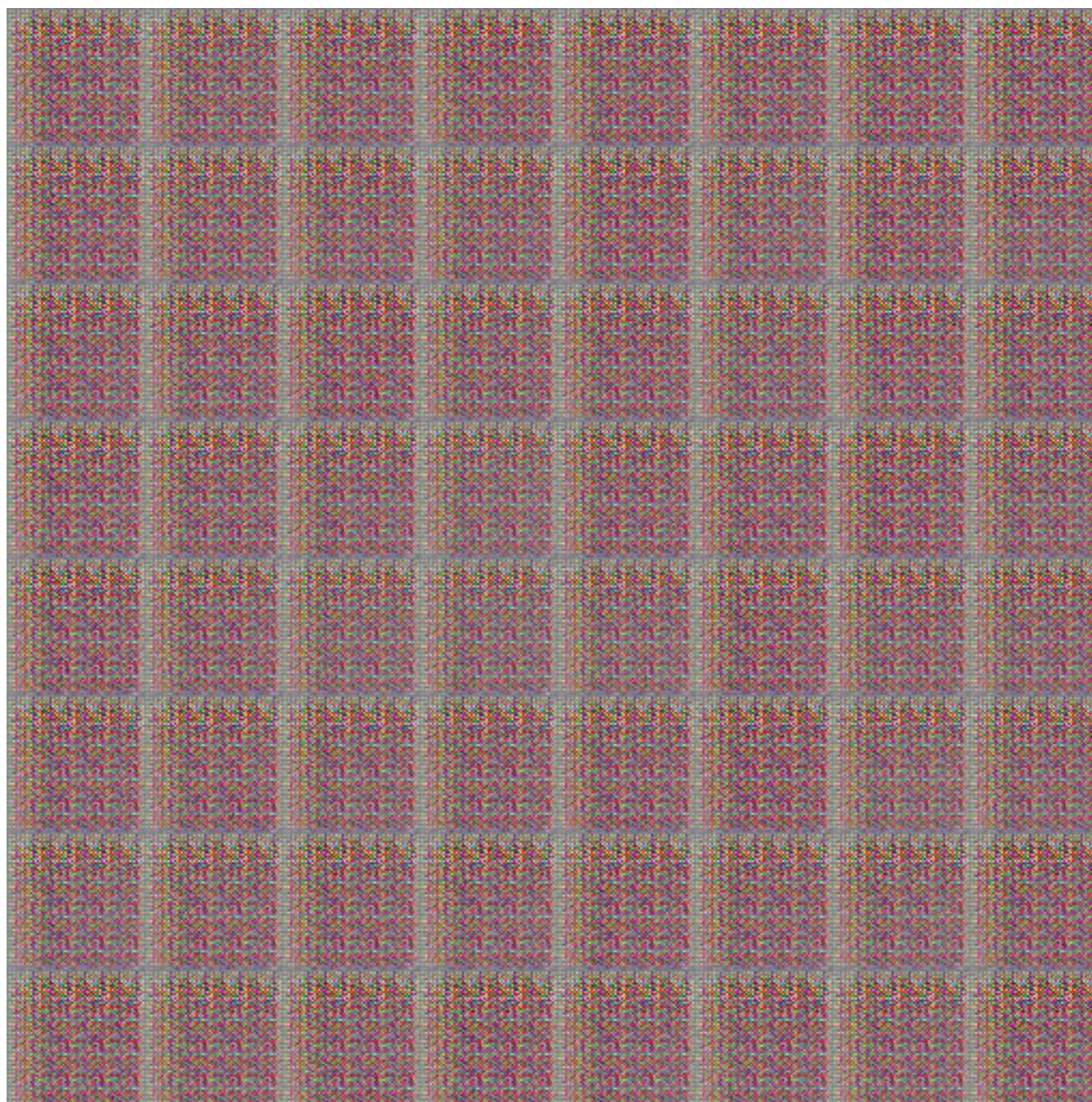
## Generator Losses



## Discriminator Losses



# Learning Process



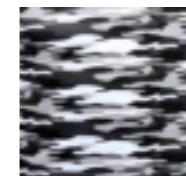
# Stripes Generation



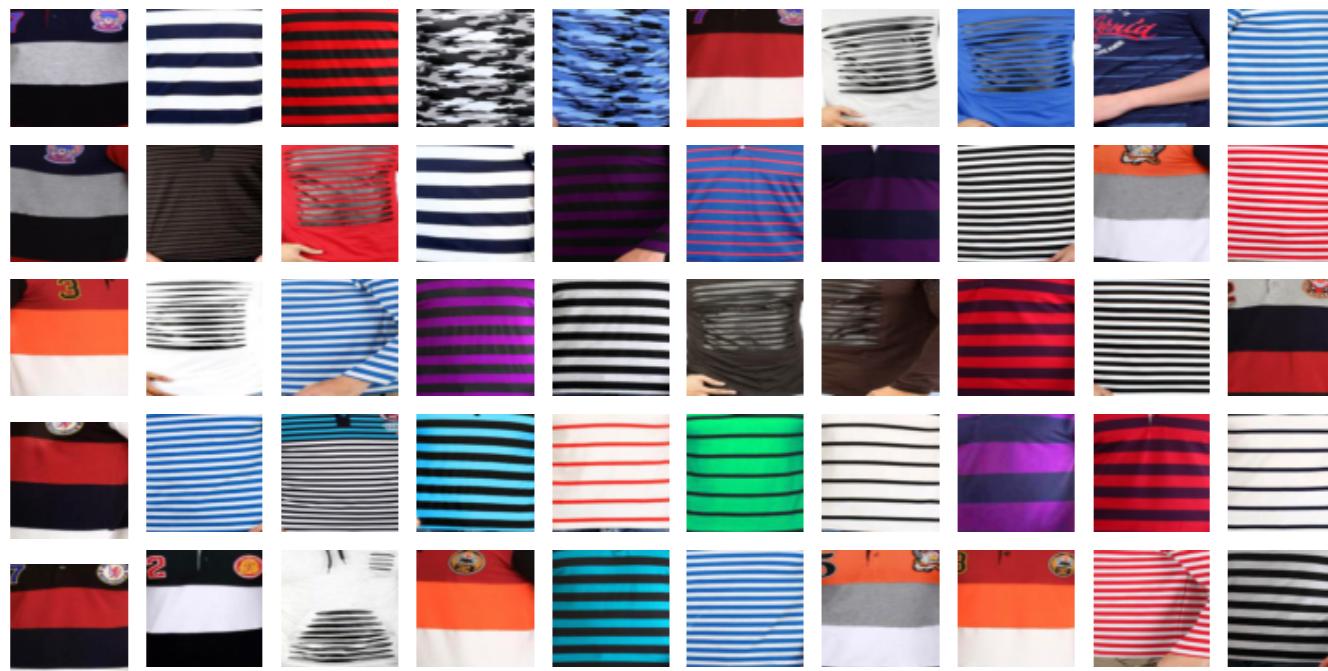
True Stripes

GAN Stripes

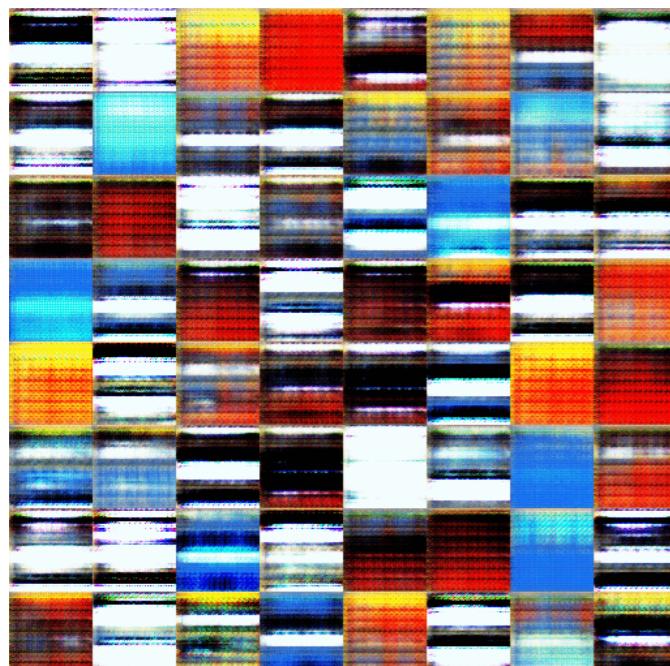
# GAN on Stripe Swatches



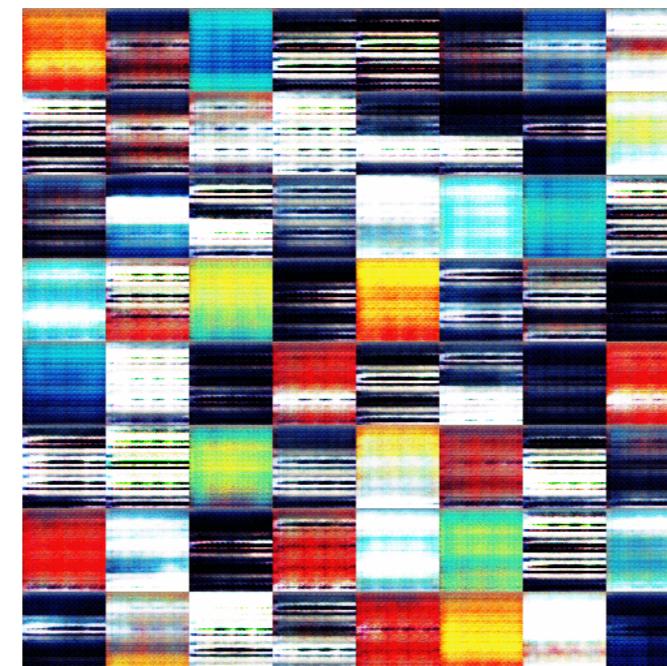
# Experiments on z\_dim



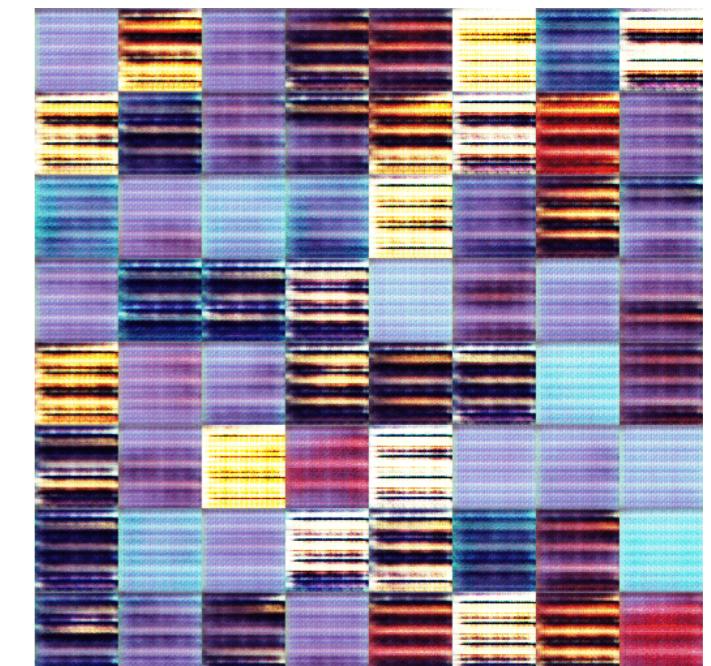
True Data



$z\_dim = 10$

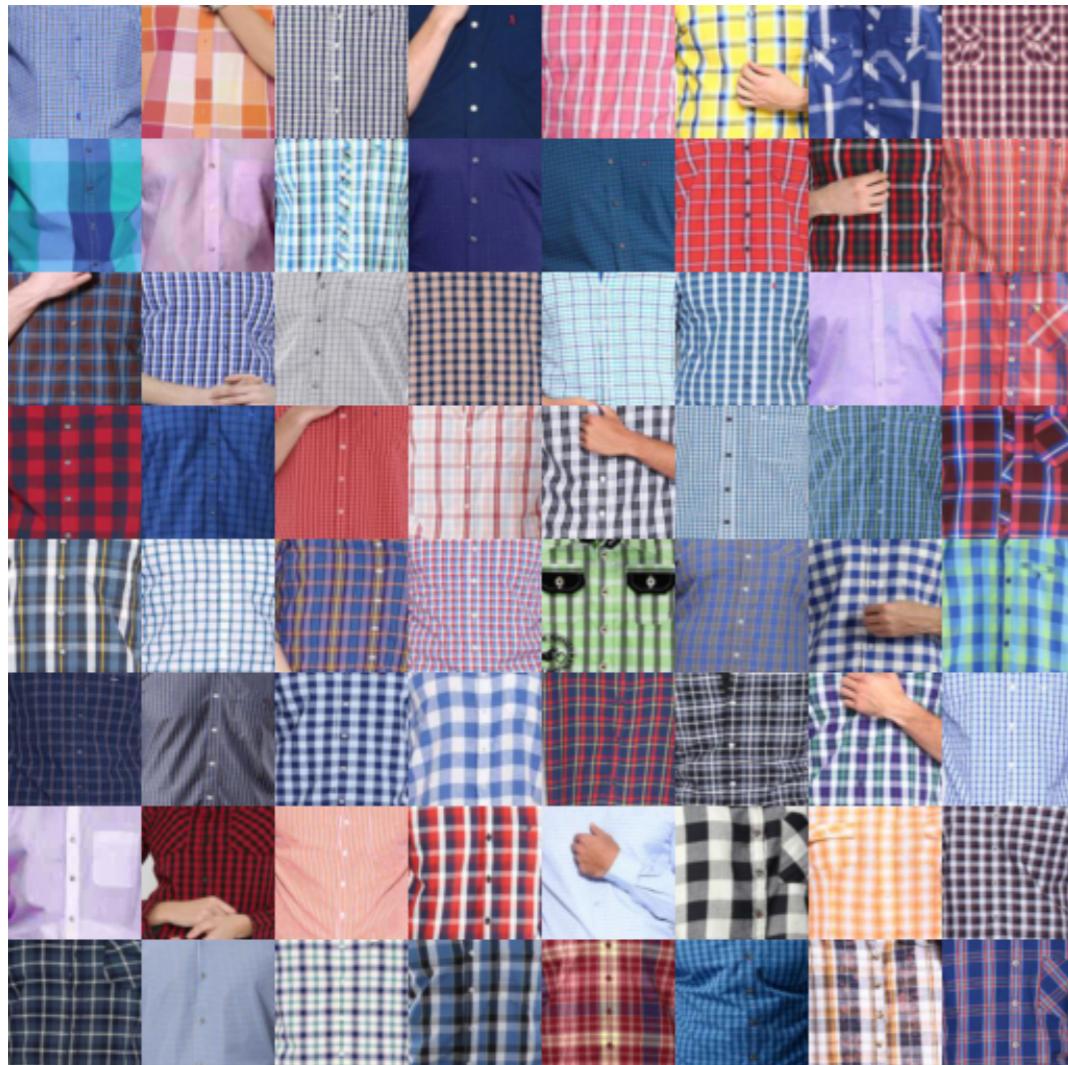


$z\_dim = 50$



$z\_dim = 100$

# GAN on Check Swatches



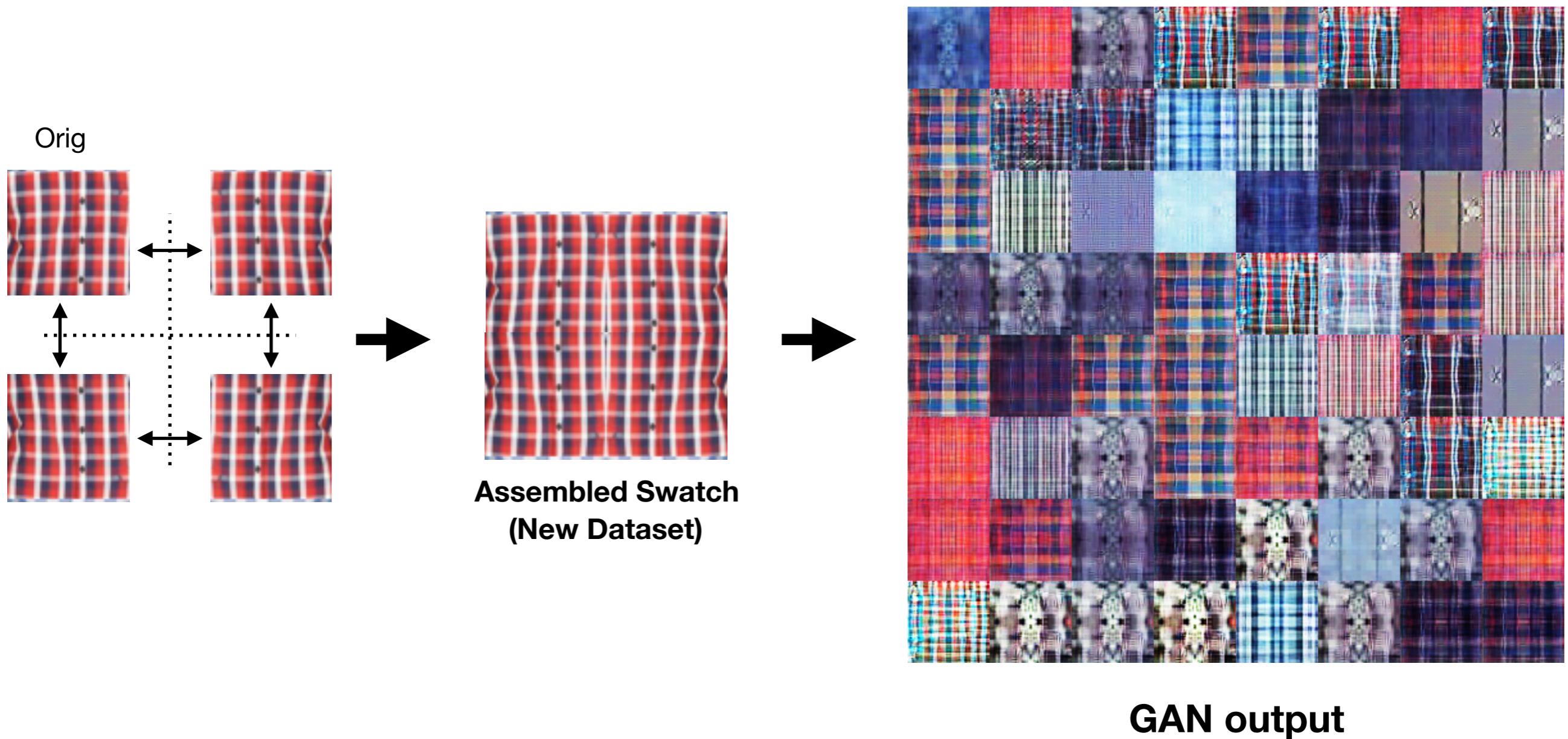
True Swatches



GAN Swatches

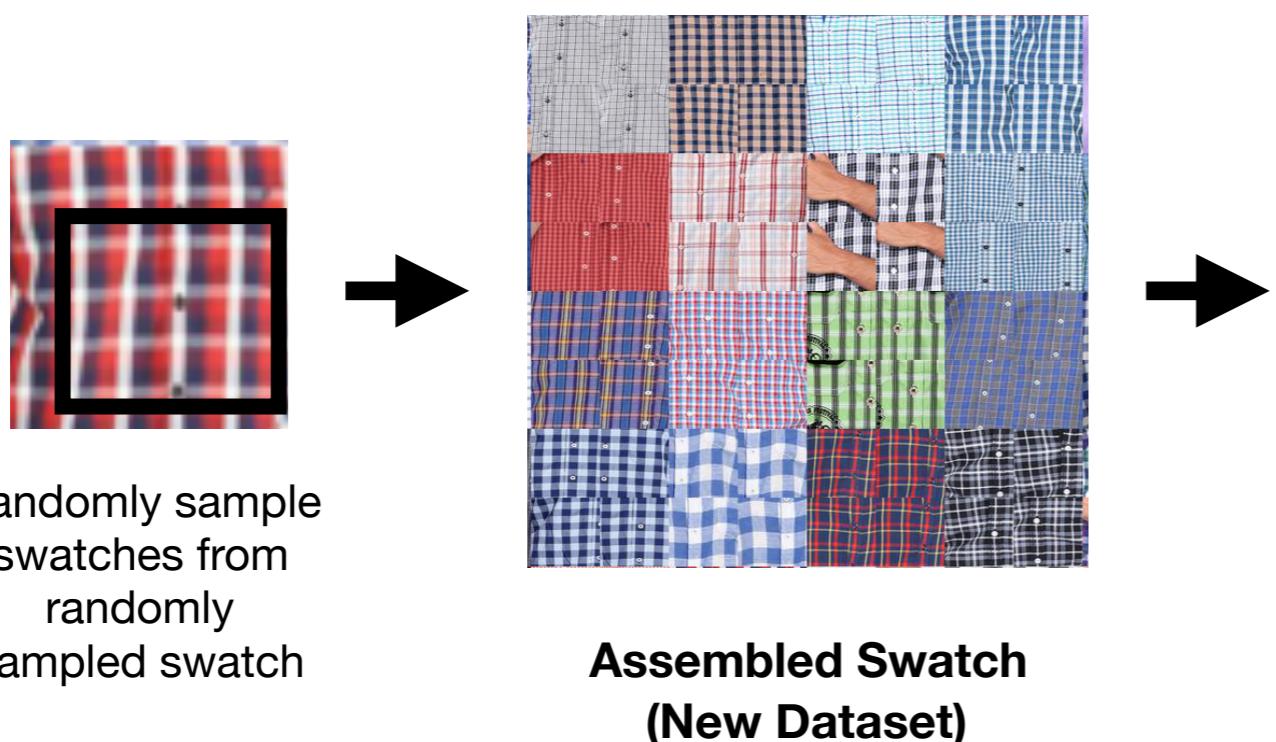
# Incorporating Flip in Swatches

To Learn Symmetry



# GAN for Learning Textures

To Learn Pattern



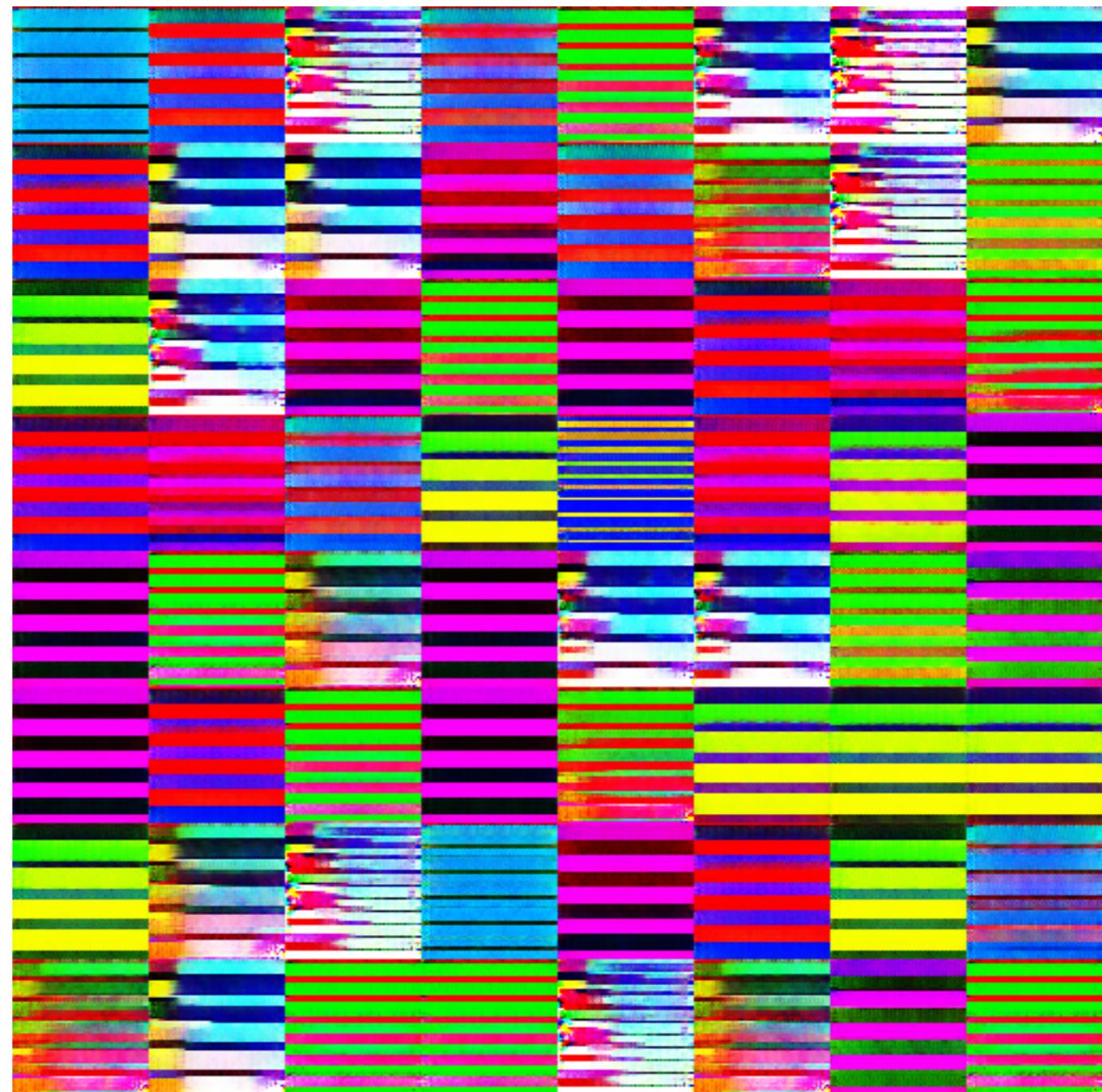
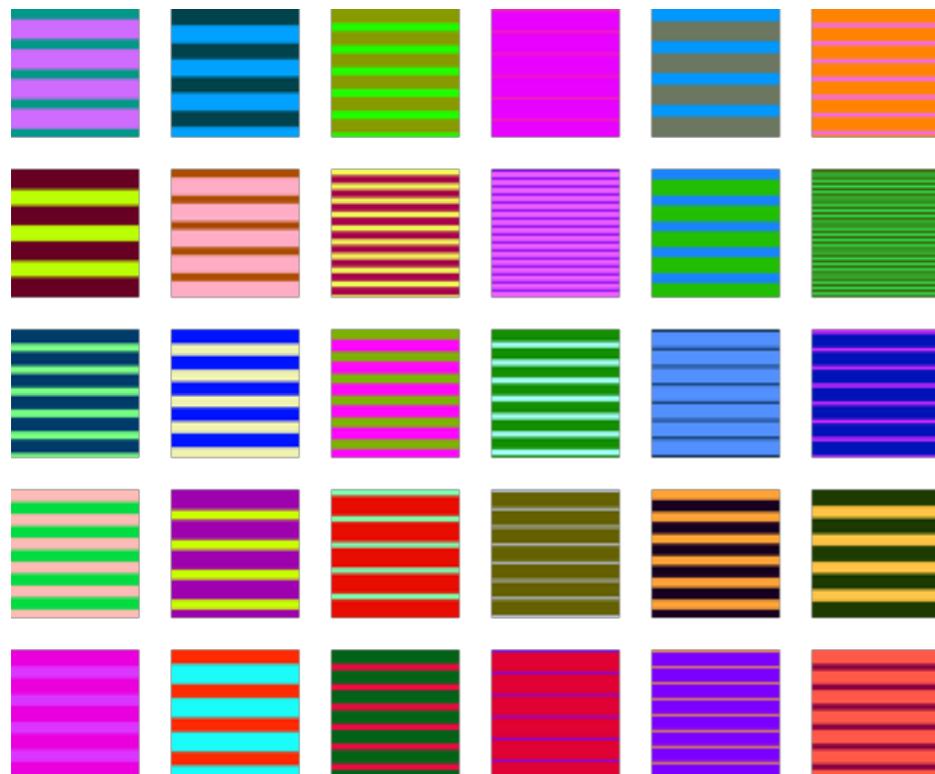
# GAN on Synthetic Data

**Color of stripe\_1:**  $(R, G, B) \sim U^3(0, 255)$

**Width of stripe\_1:**  $W \sim \text{Truncated N}(6, 25); W \in (1, 11)$

**Color of stripe\_2:**  $(R, G, B) \sim U^3(0, 255)$

**Width of stripe\_2:**  $W \sim \text{Truncated N}(6, 25); W \in (1, 11)$



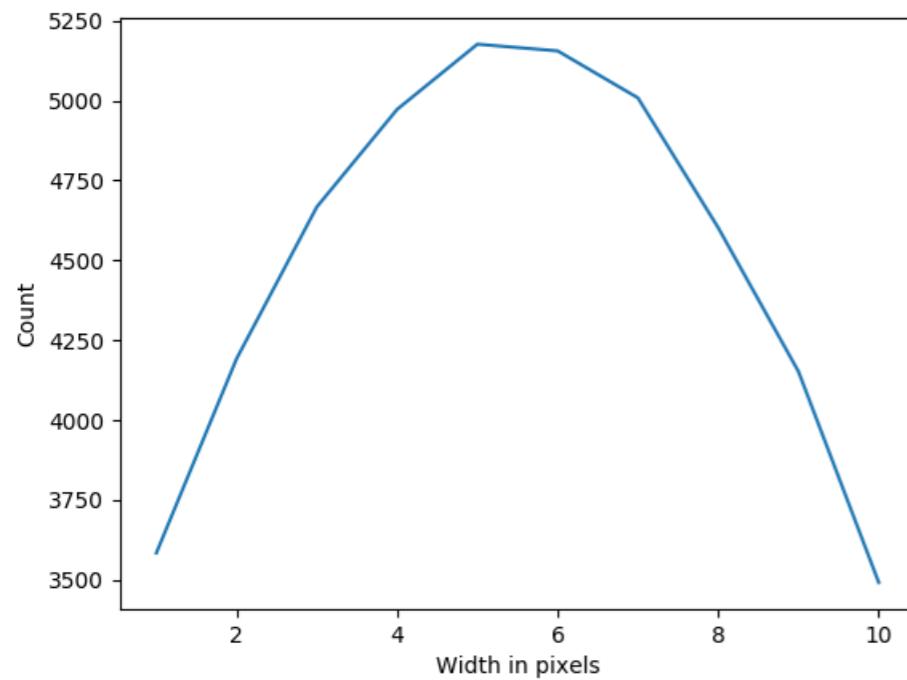
# GAN on Synthetic Data

**Color of stripe\_1:**  $(R, G, B) \sim U^3(0, 255)$

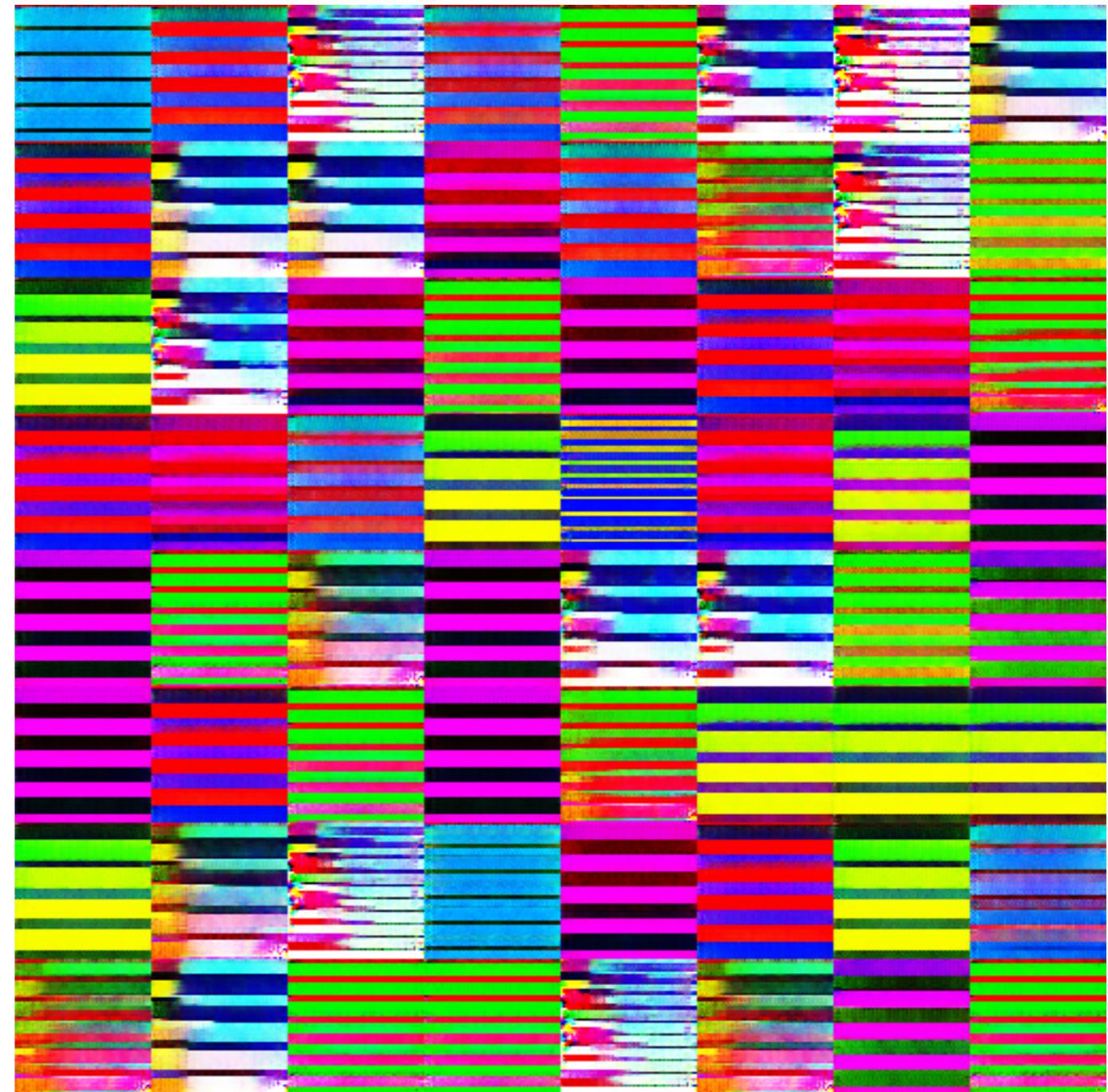
**Width of stripe\_1:**  $W \sim \text{Truncated N}(6, 25); W \in (1, 11)$

**Color of stripe\_2:**  $(R, G, B) \sim U^3(0, 255)$

**Width of stripe\_2:**  $W \sim \text{Truncated N}(6, 25); W \in (1, 11)$



Truncated Normal Distribution



# Vector Algebra of Noise

Mix-and-Match designs using Linear Interpolation on  $z$

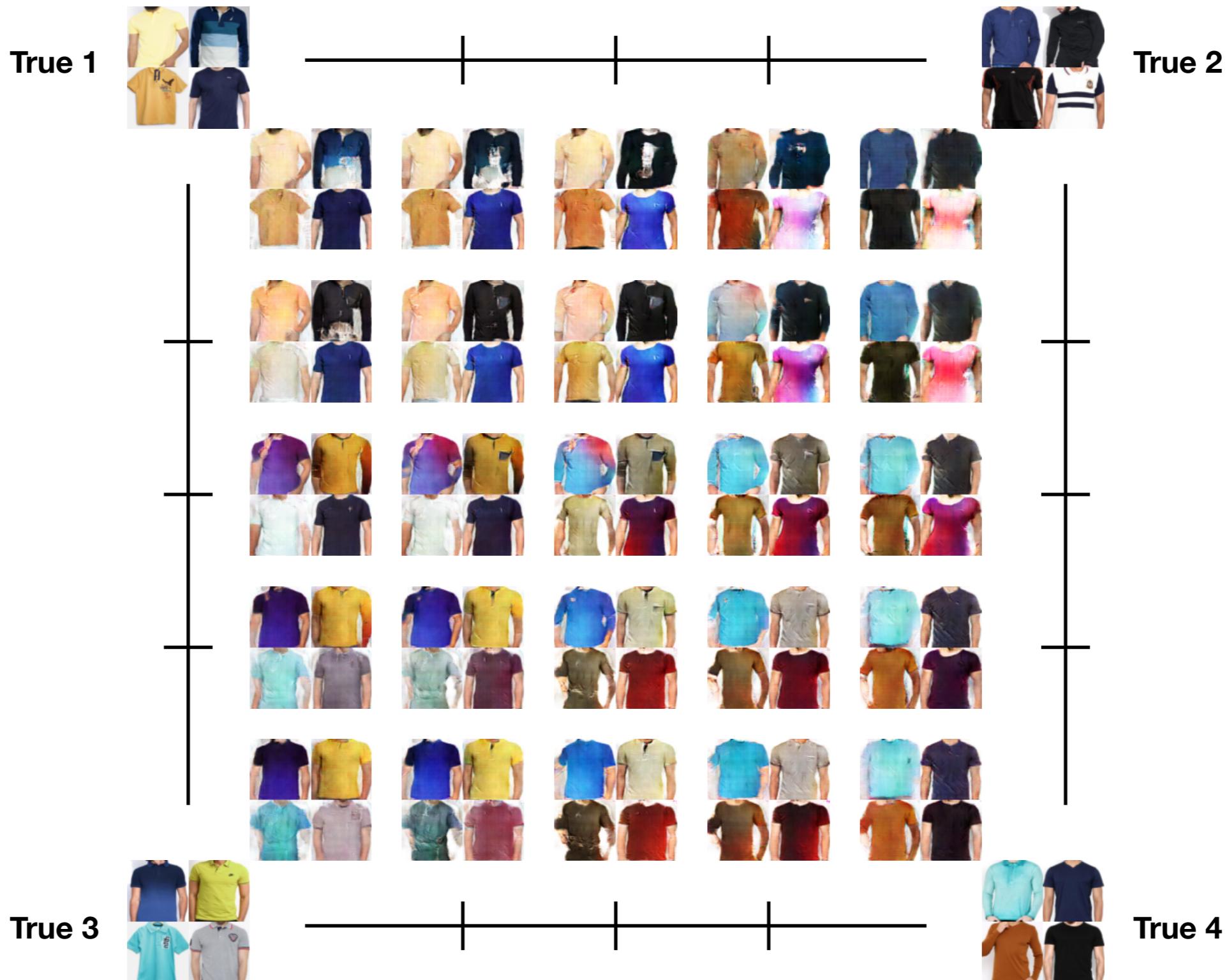


$z_1$

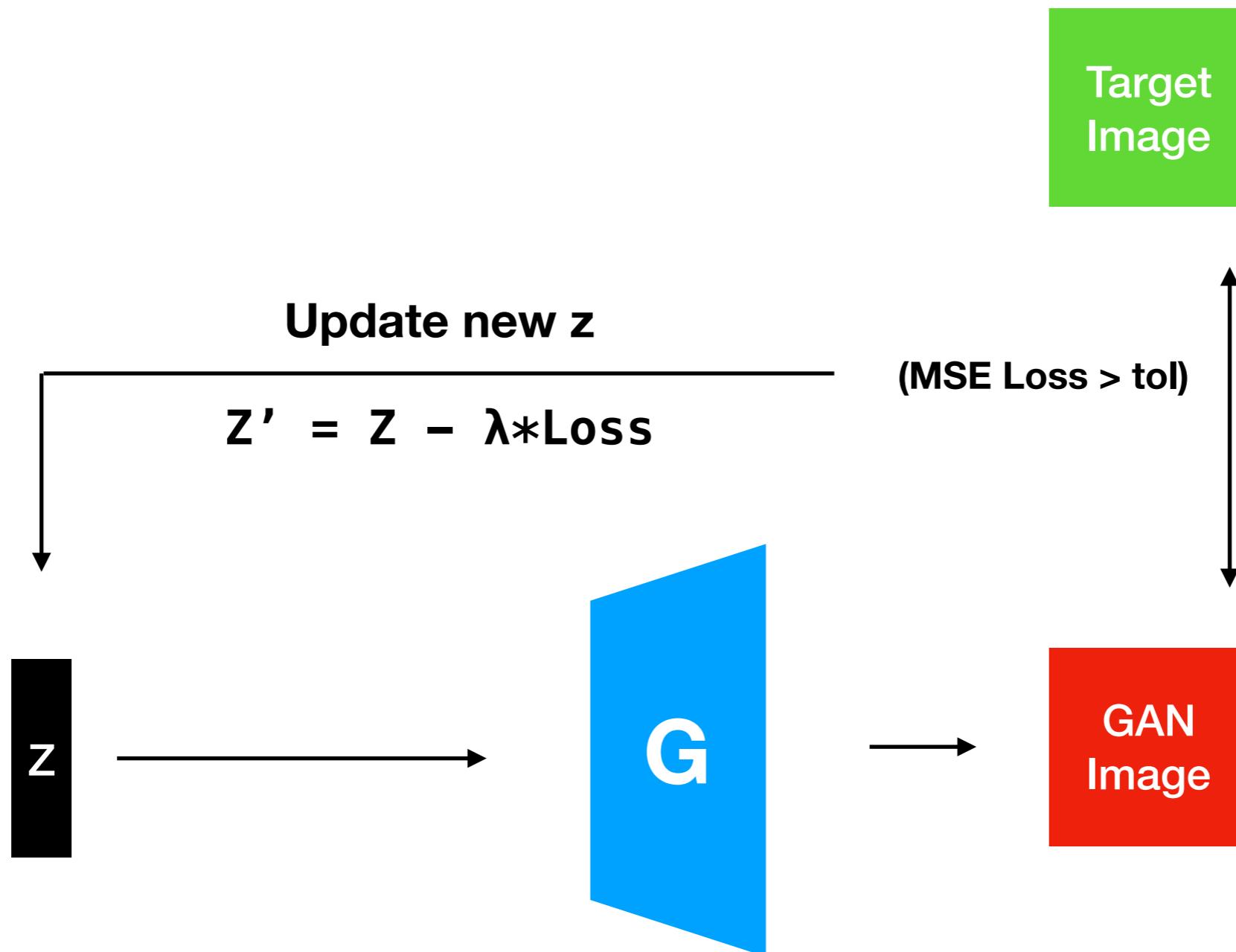
$0.5*z_1 + 0.5*z_2$

$z_2$

## Mix-and-Match designs using Bilinear Interpolation on z



# Estimating a Latent Vector



Random Vector  
from Normal Distribution

Zachary C Lipton and Subarna Tripathi. Precise recovery of latent vectors from generative adversarial networks. arXiv preprint arXiv:1702.04782, 2017

**Thank you.**