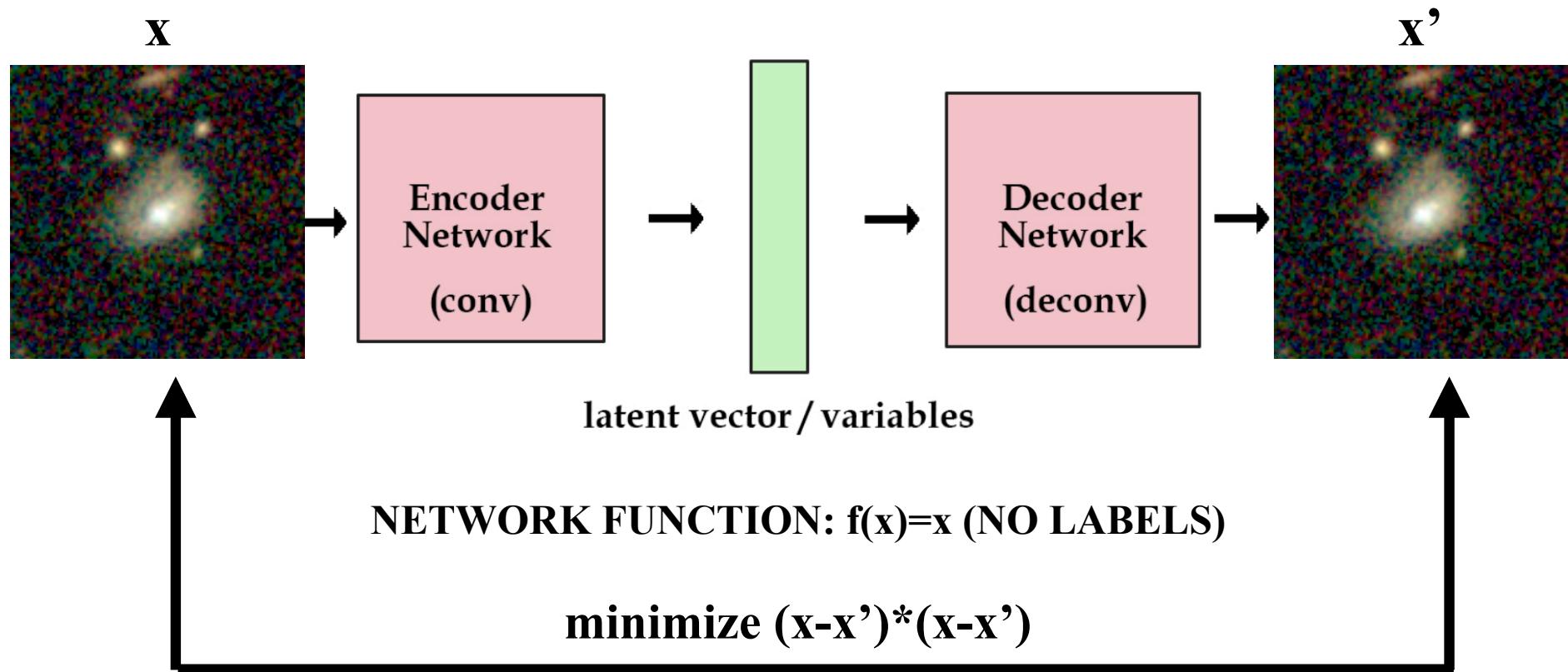
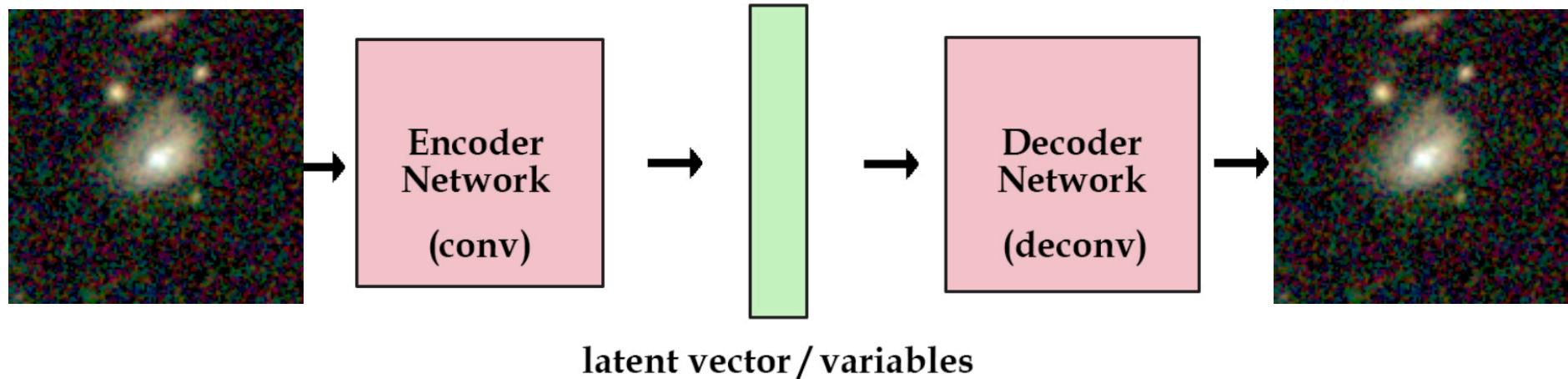


GENERATIVE MODELS

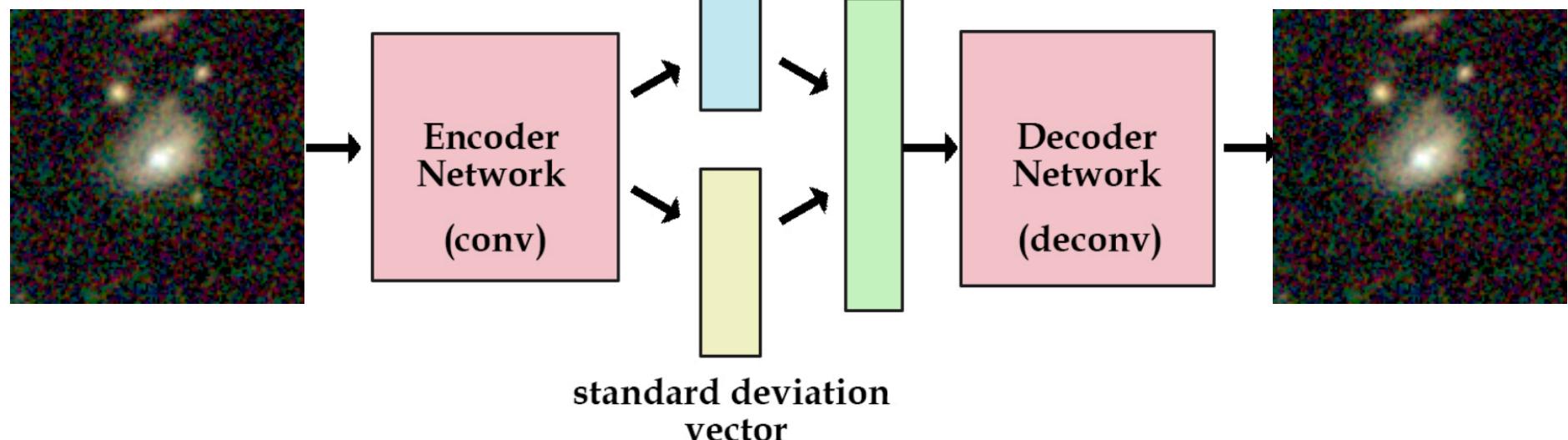
AUTO-ENCODER



AUTO-ENCODER



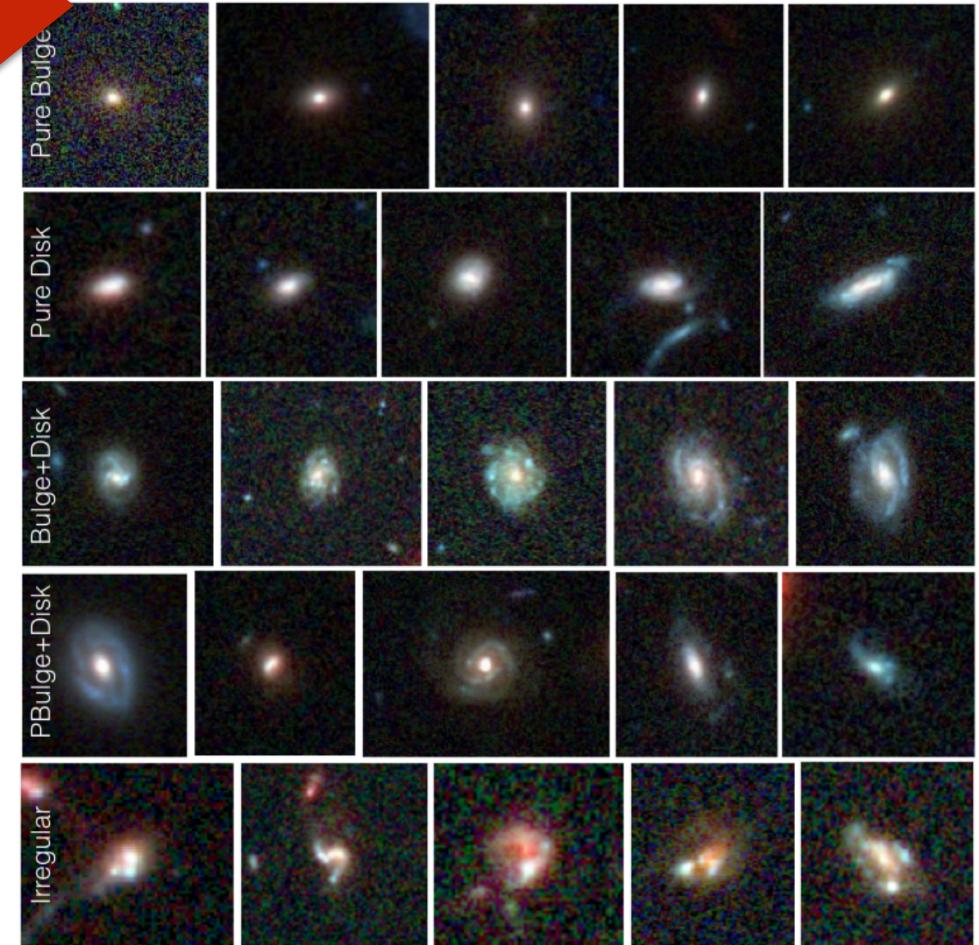
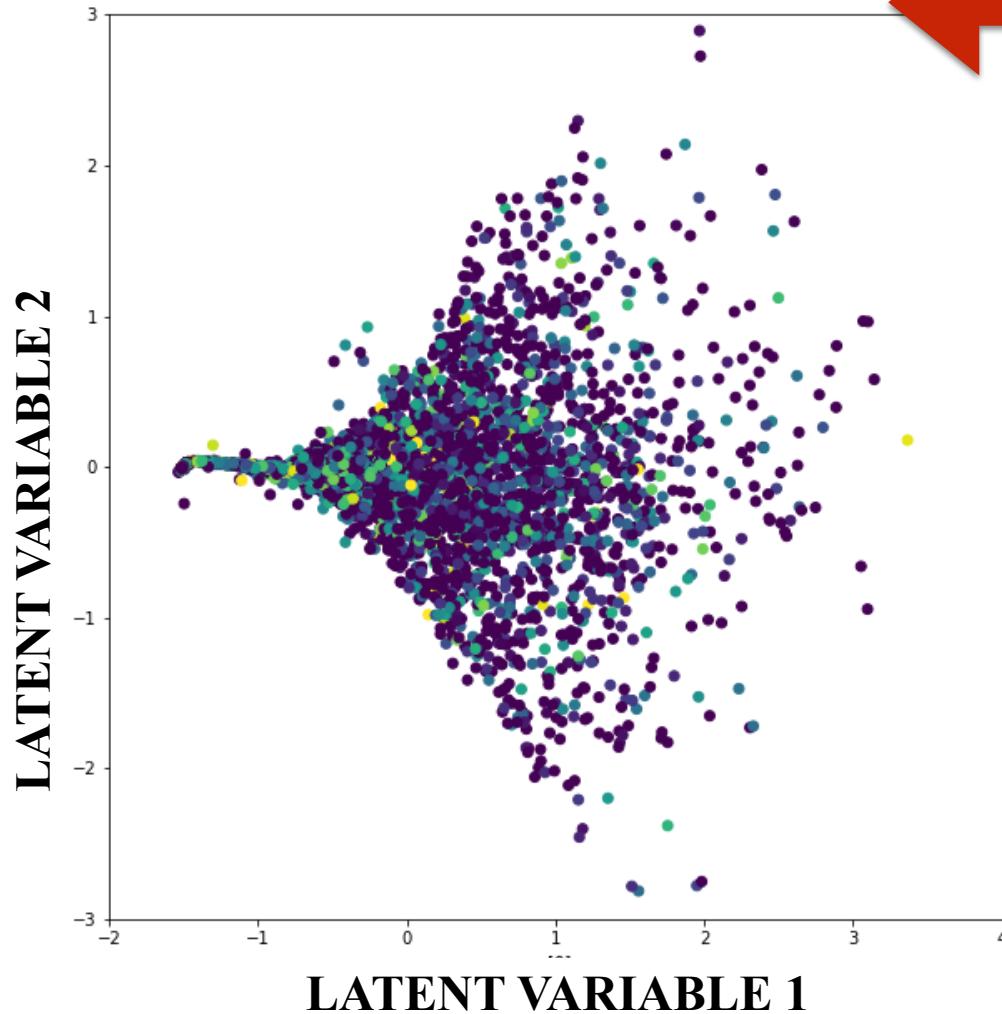
VARIATIONAL AUTO-ENCODER (VAE)



VAE DERIVED LATENT SPACE FOR CANDELS GALAXIES [H BAND]

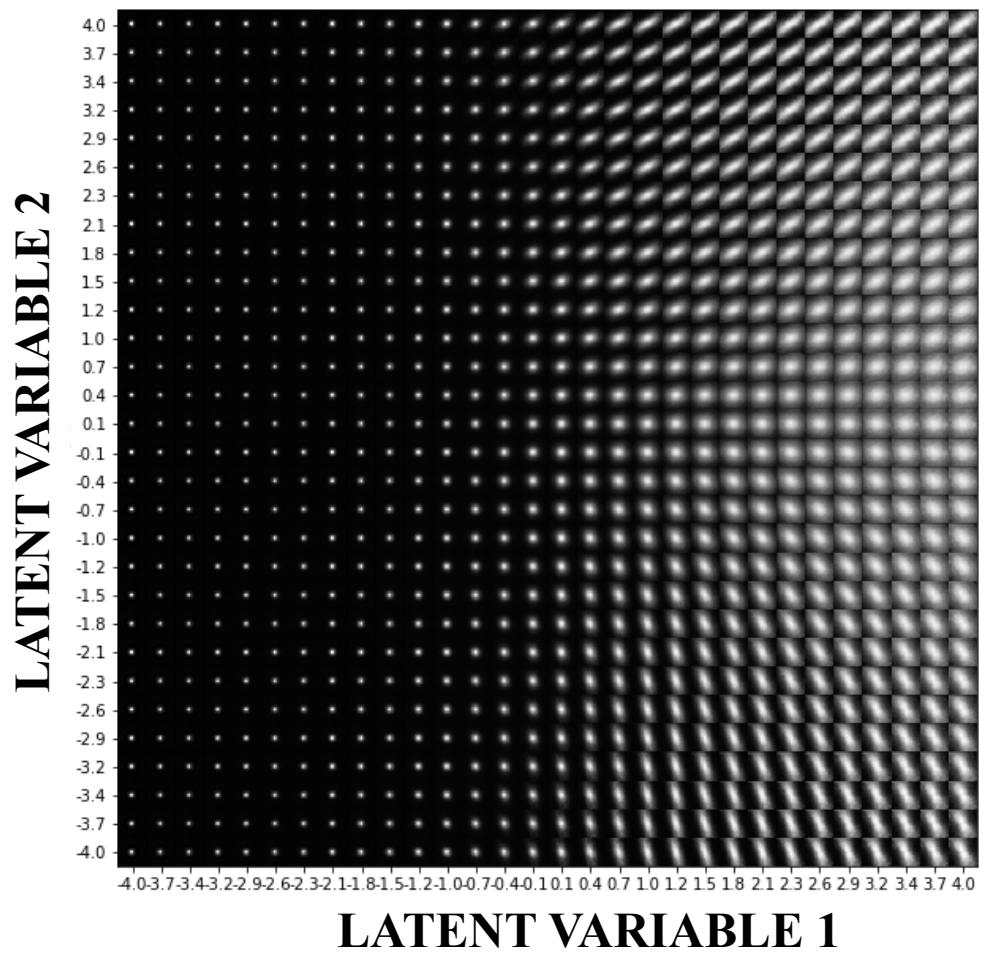
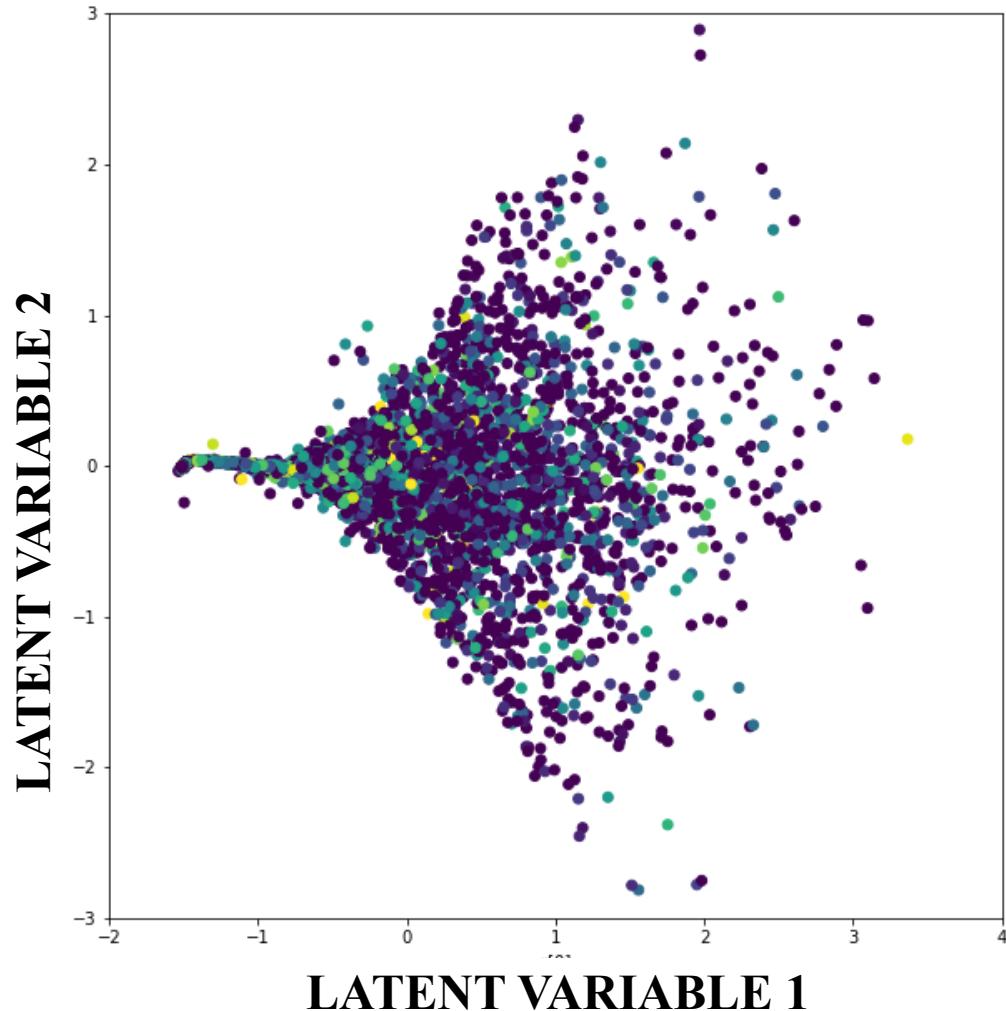
PRELIMINARY!

2 DIMENSIONS

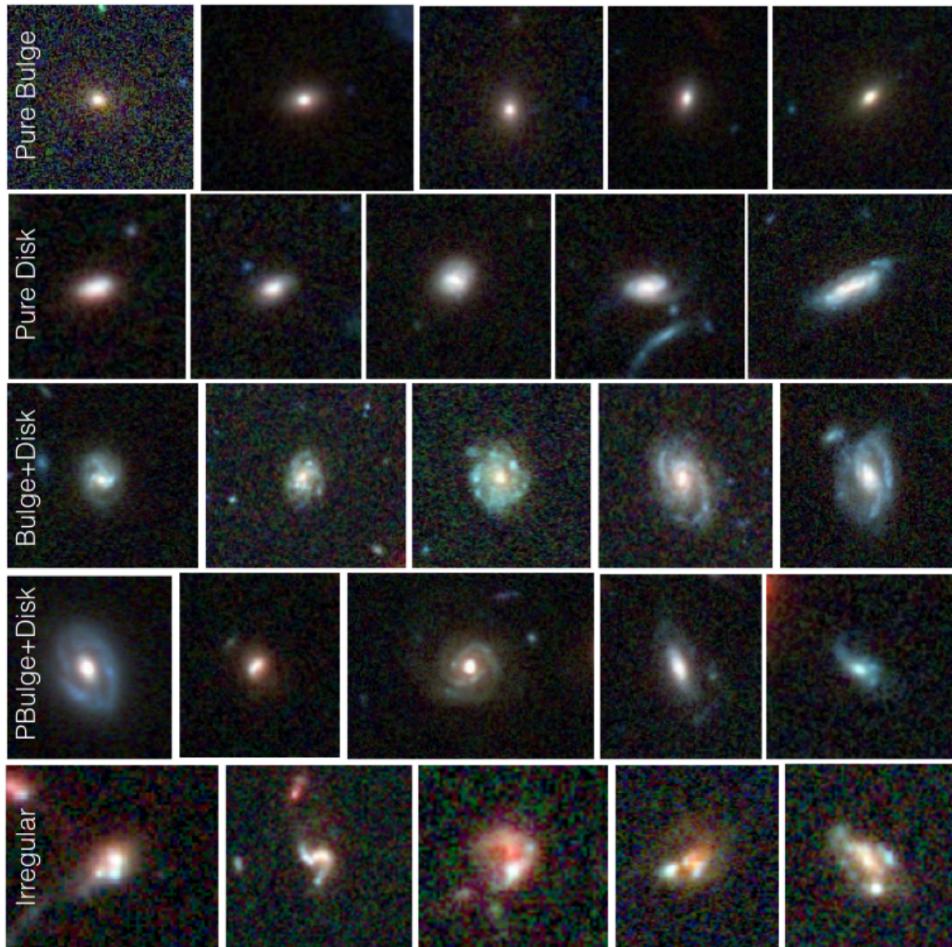


VAE DERIVED LATENT SPACE FOR CANDELS GALAXIES [H BAND]

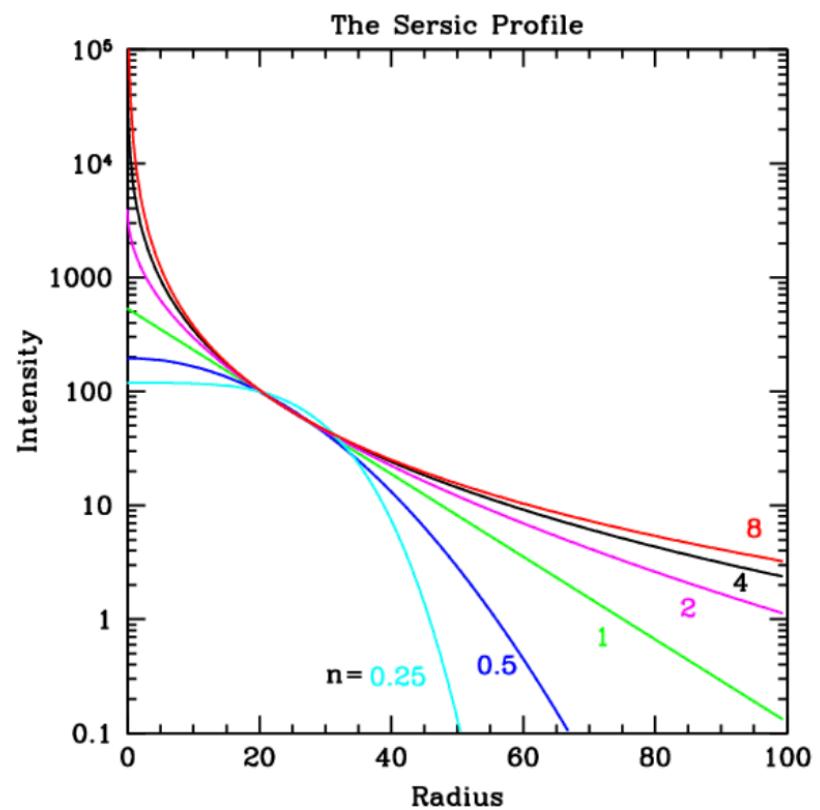
PRELIMINARY!



**INTERPOLATION IN THE LATENT SPACE GENERATES GALAXIES
WITH DIFFERENT PROPERTIES**

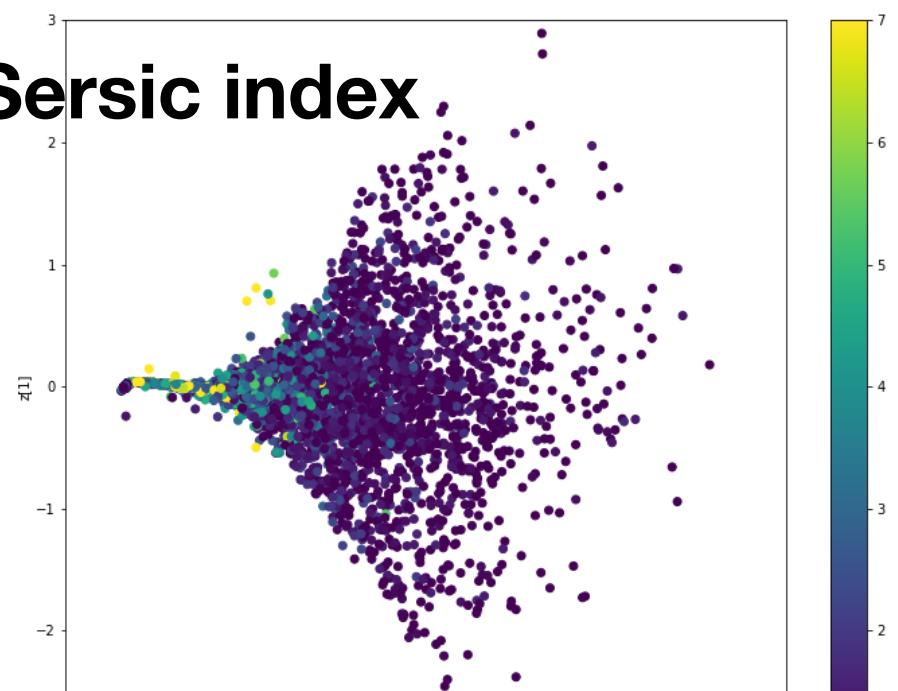


TRADITIONALLY GALAXY
STRUCTURE IS
DESCRIBED WITH AT LEAST 4
PARAMETERS

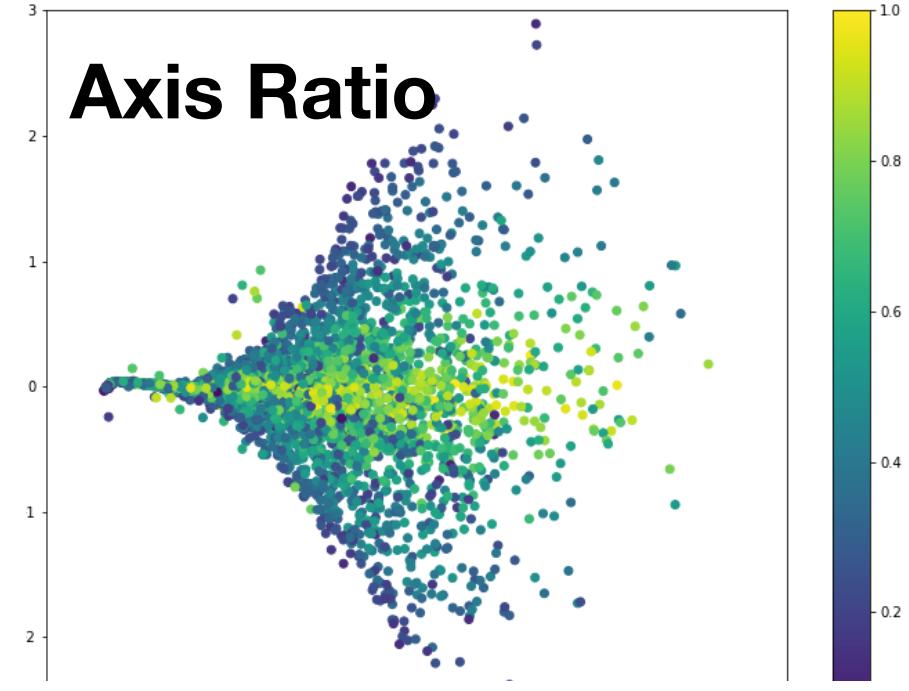


Effective Radius, Sersic Index, Axis-Ratio, Position Angle

Sersic index

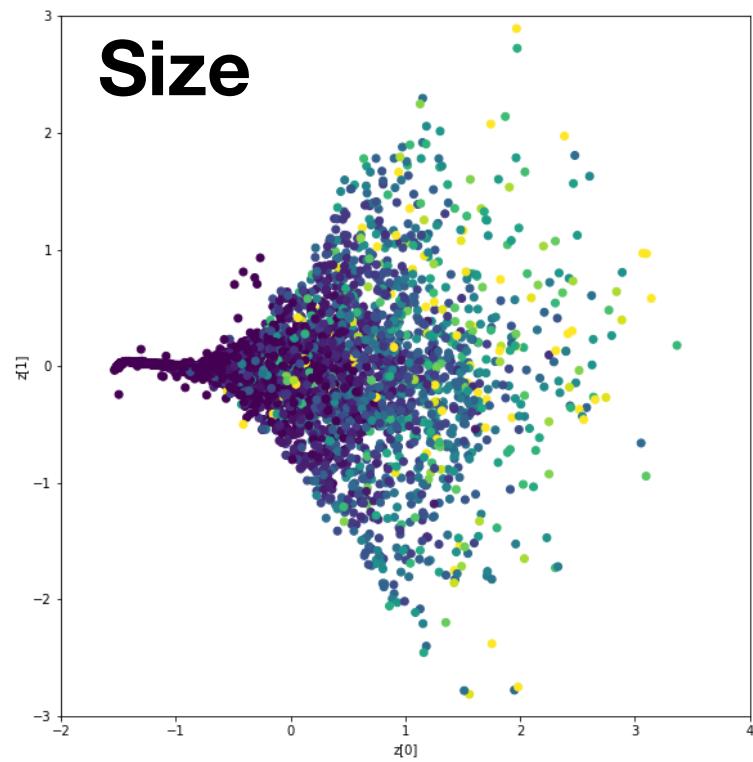


Axis Ratio

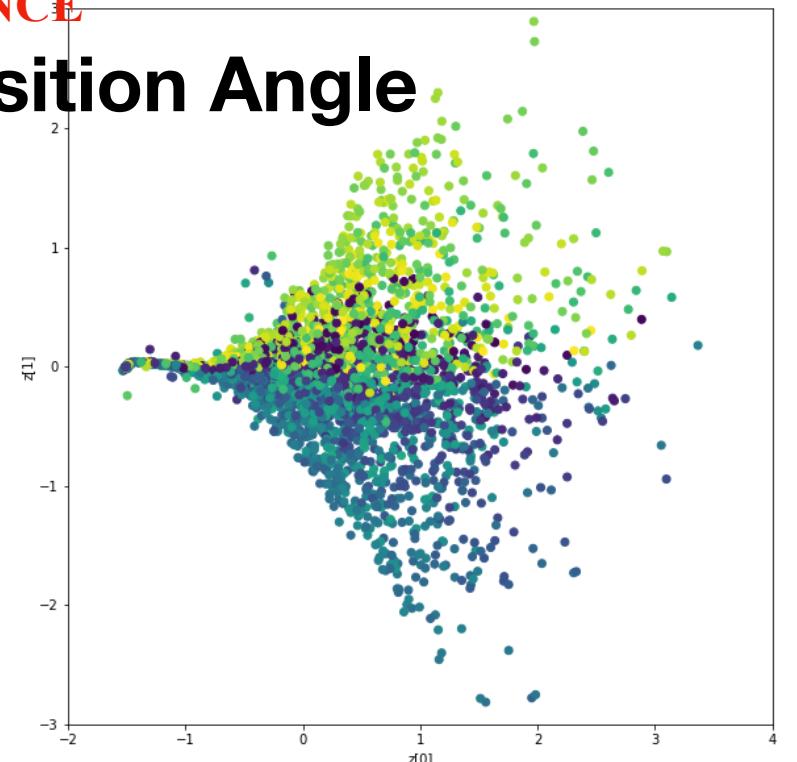


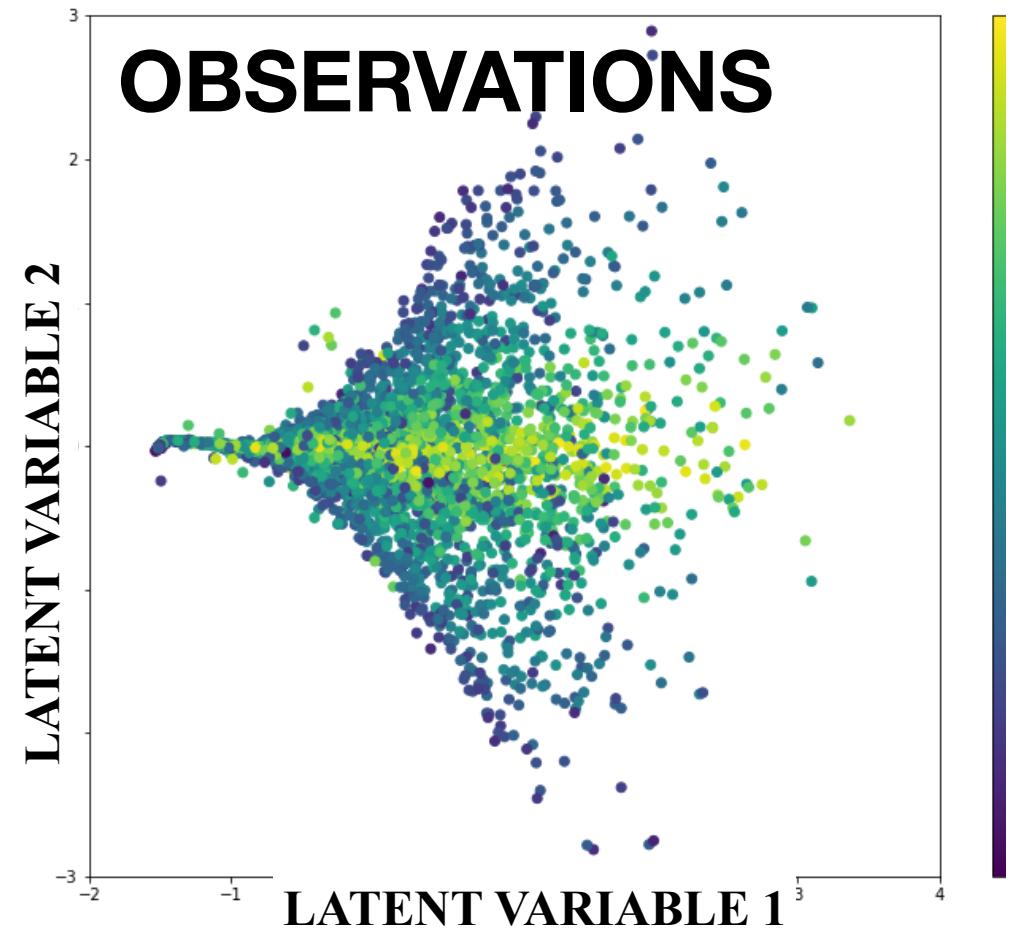
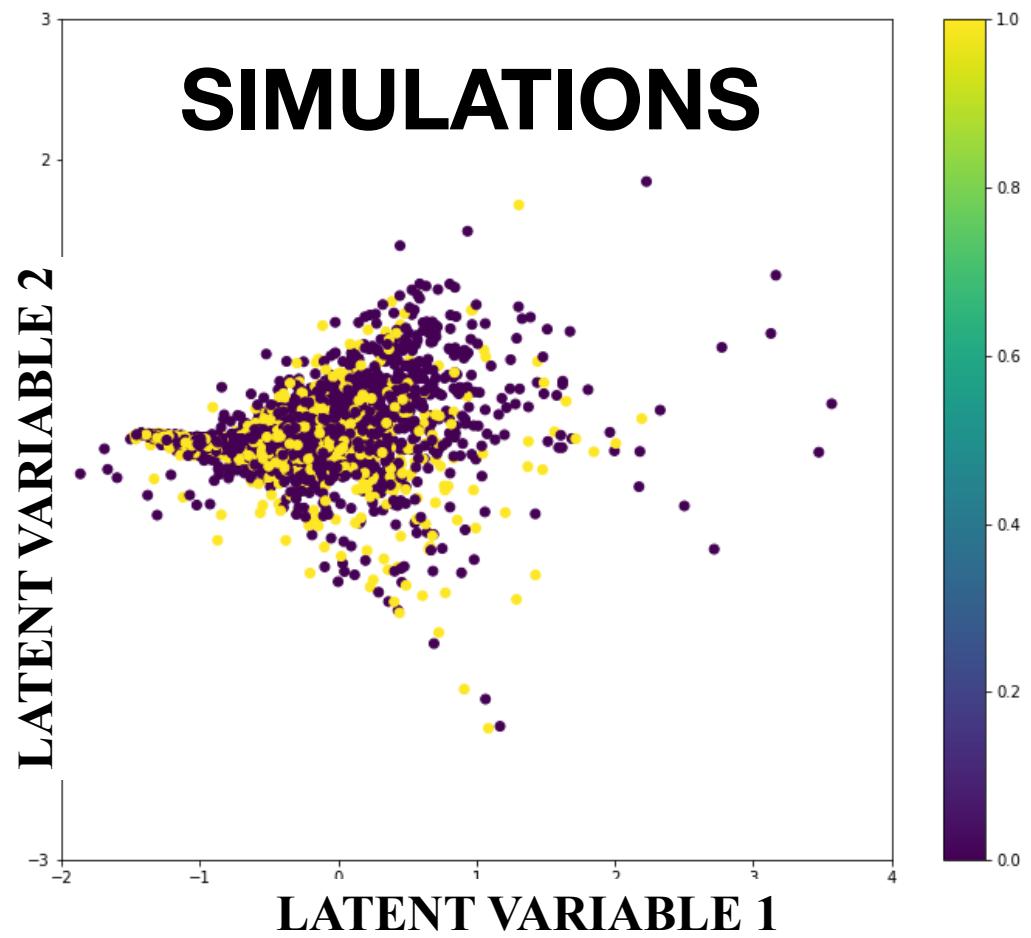
**EXPLORE THE MORPHOLOGICAL DISTRIBUTION OF GALAXIES
AT A GLANCE**

Size

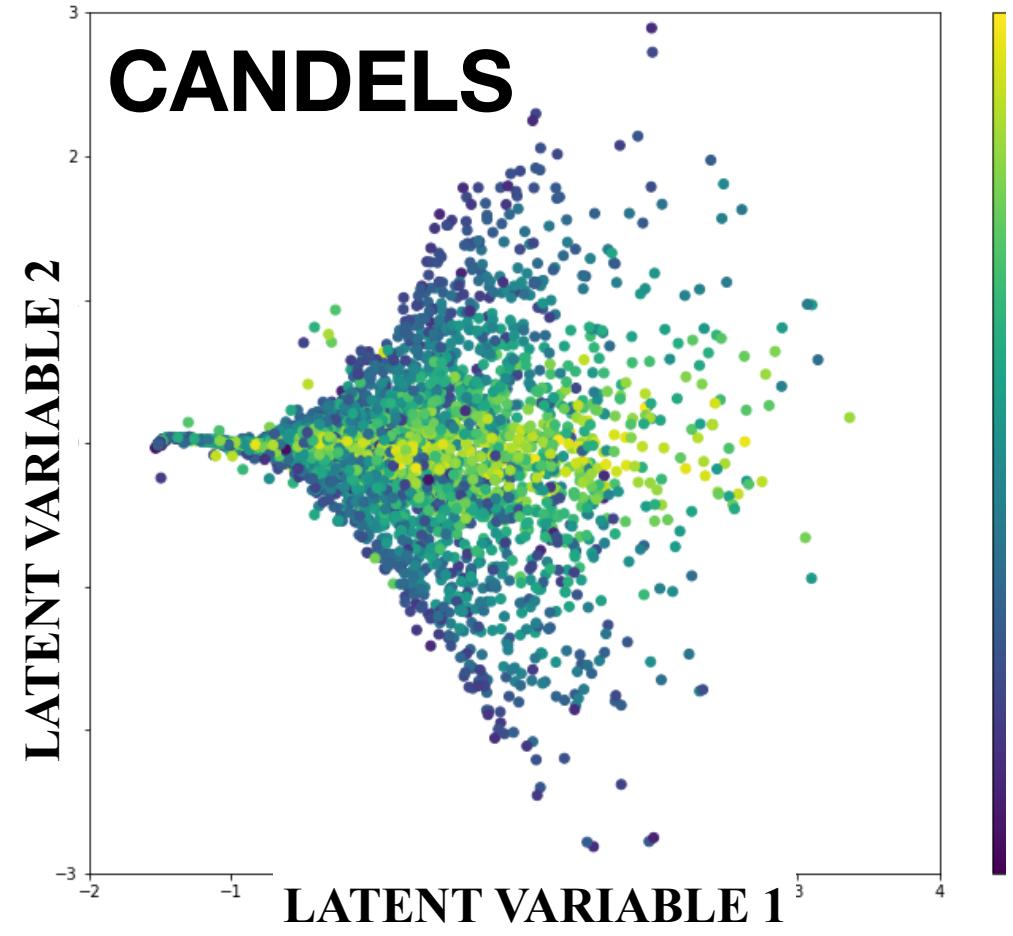
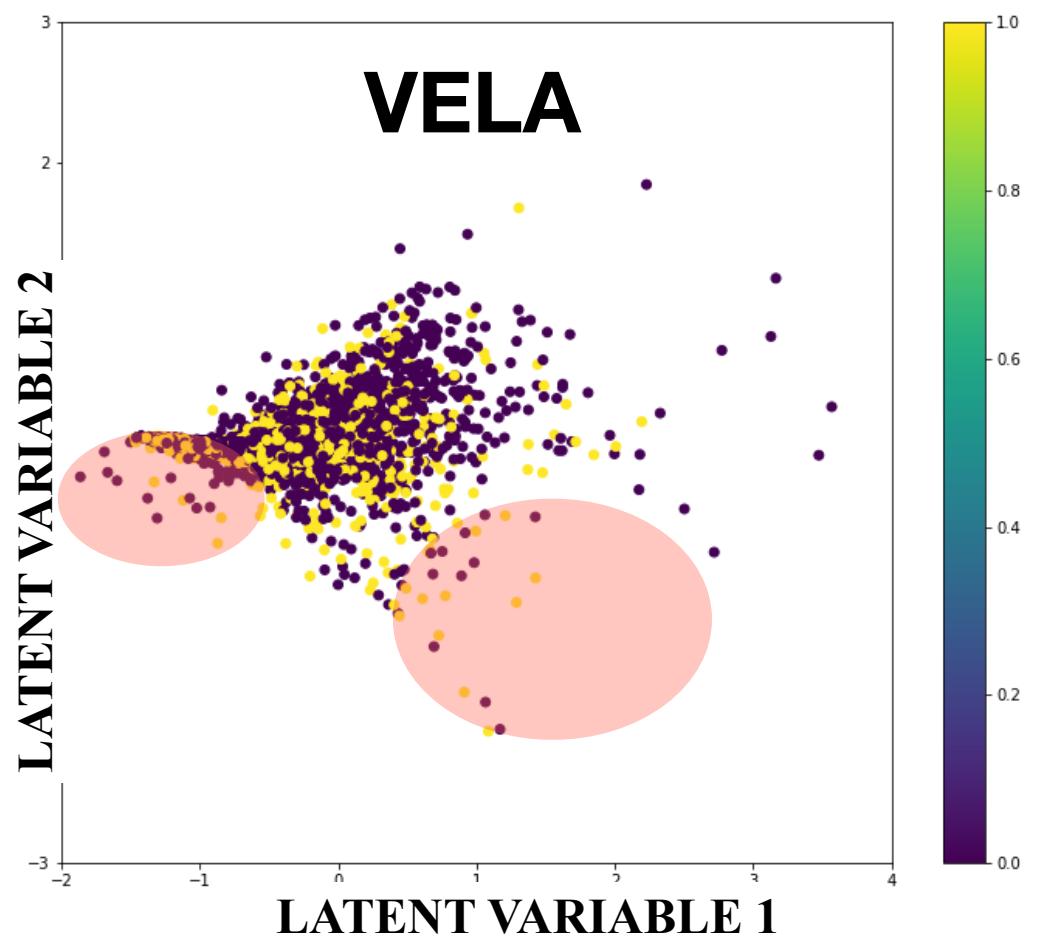


Position Angle



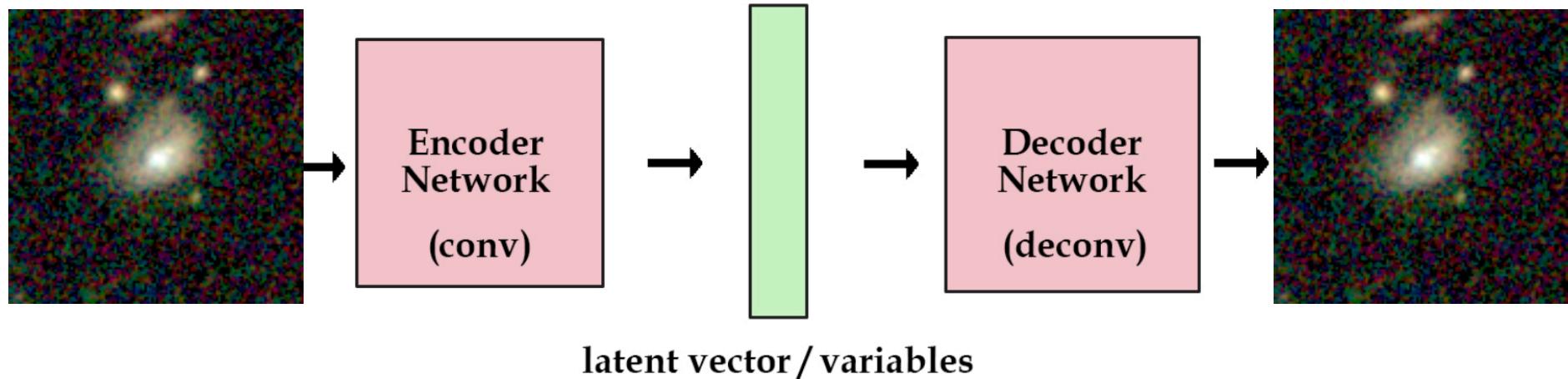


HOW SIMULATIONS POPULATE
THE LATENT SPACE?

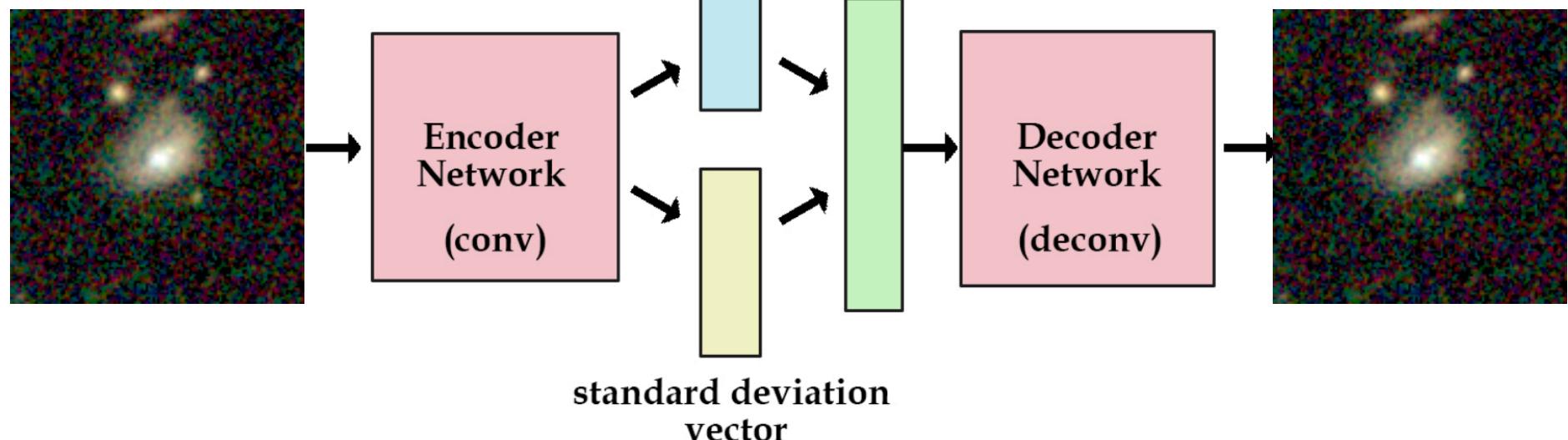


**HOW SIMULATIONS POPULATE
THE LATENT SPACE?**

AUTO-ENCODER



VARIATIONAL AUTO-ENCODER (VAE)



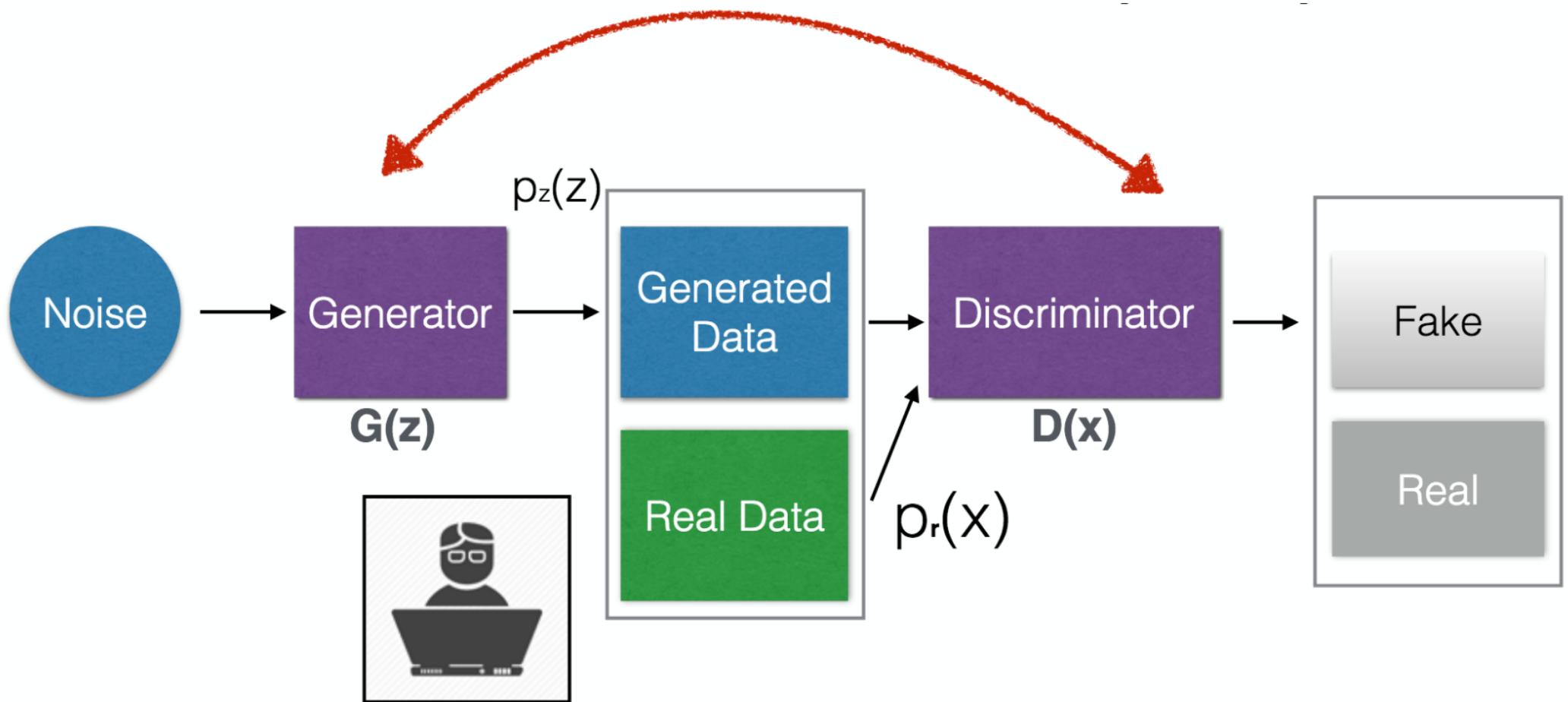
GENERATIVE ADVERSARIAL NETWORKS

(Goodfellow+14)

5570 citation in 4 years!

GENERATIVE ADVERSARIAL NETWORKS

(Goodfellow+14)

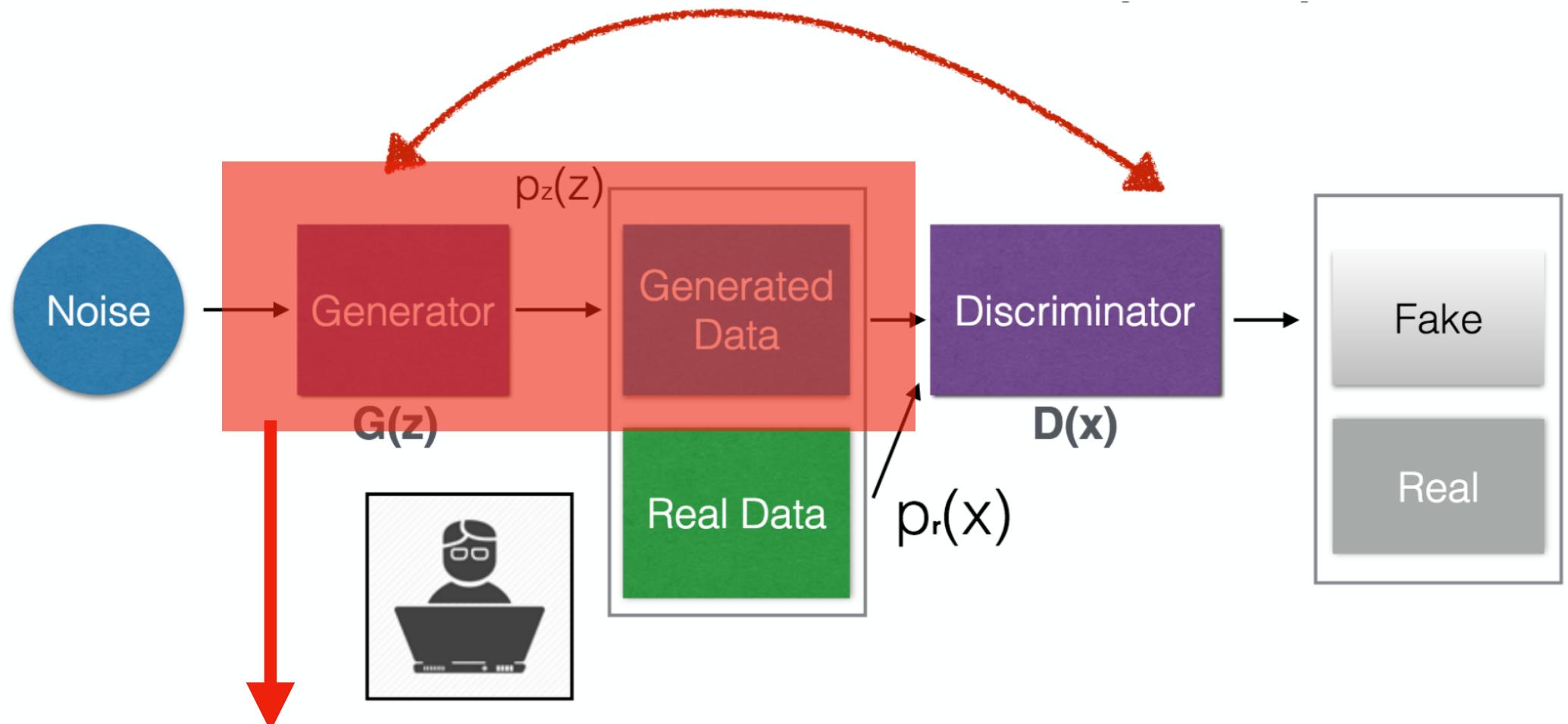


TWO COMPETING NETWORKS

GENERATIVE ADVERSARIAL NETWORKS

(Goodfellow+)

TWO COMPETING NETWORKS

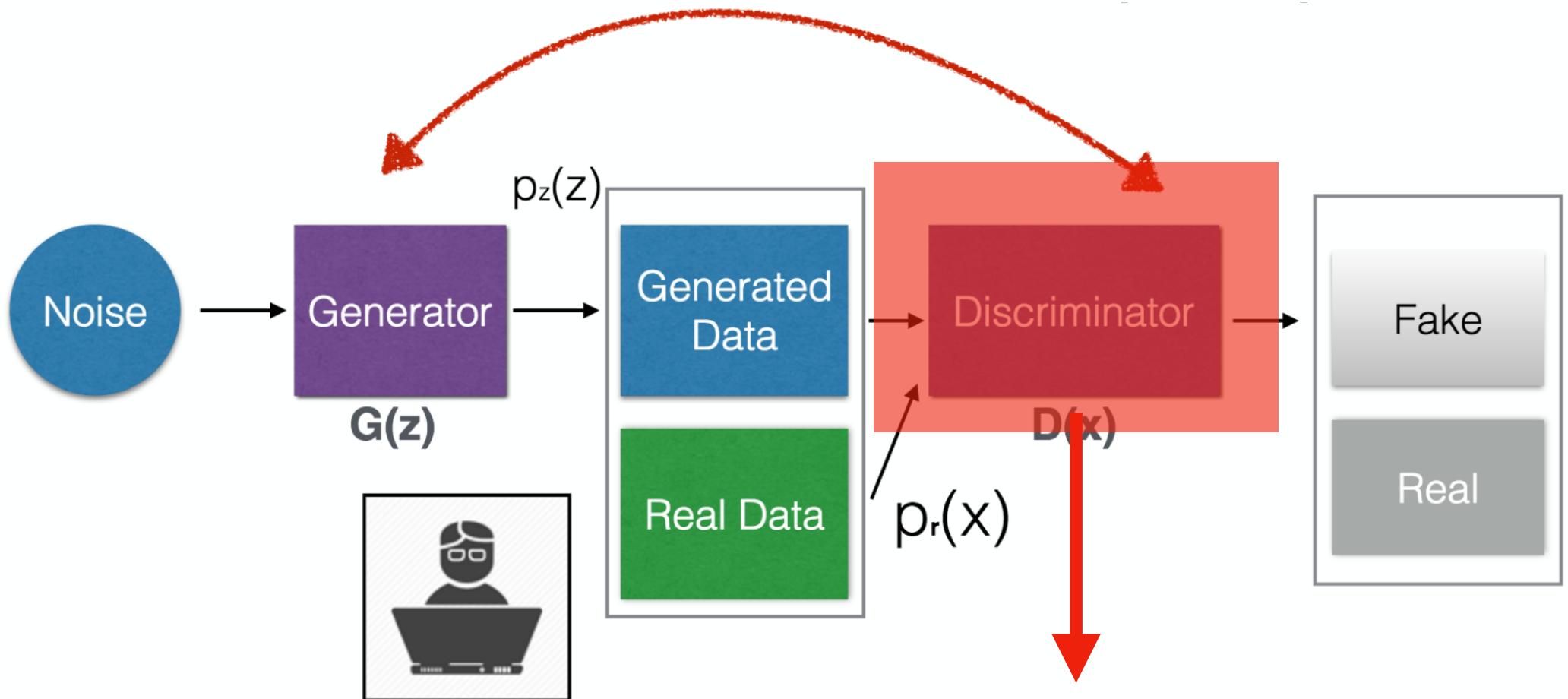


Every 2 iterations the generator
is trained to force the discriminator
to classify as real

GENERATIVE ADVERSARIAL NETWORKS

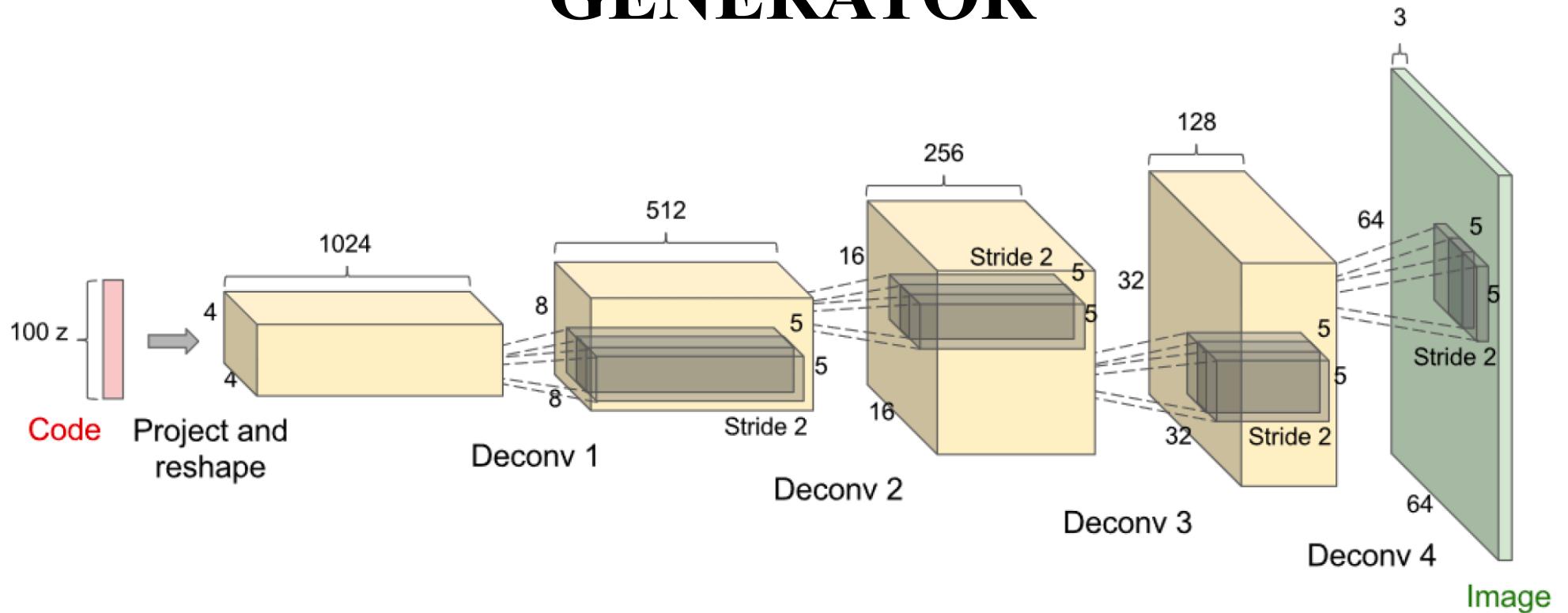
(Goodfellow+)

TWO COMPETING NETWORKS

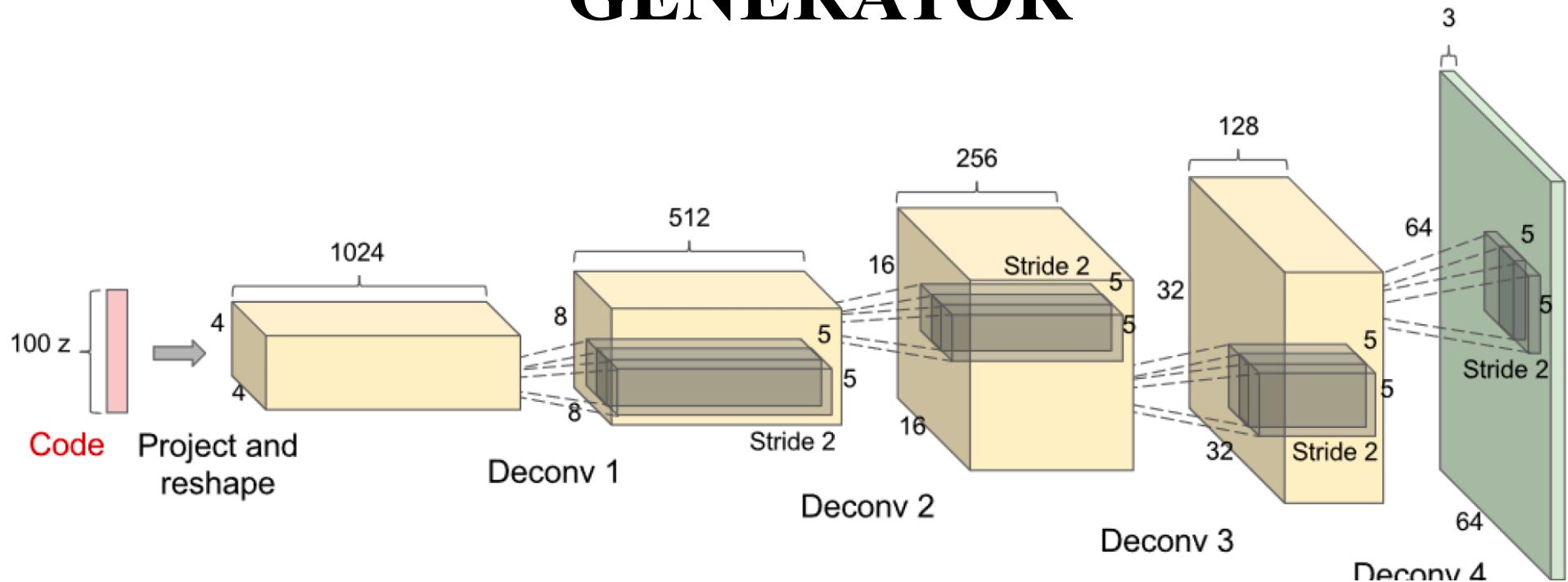


Every 2 iterations the discriminator
is trained to force to distinguish between
real and fake

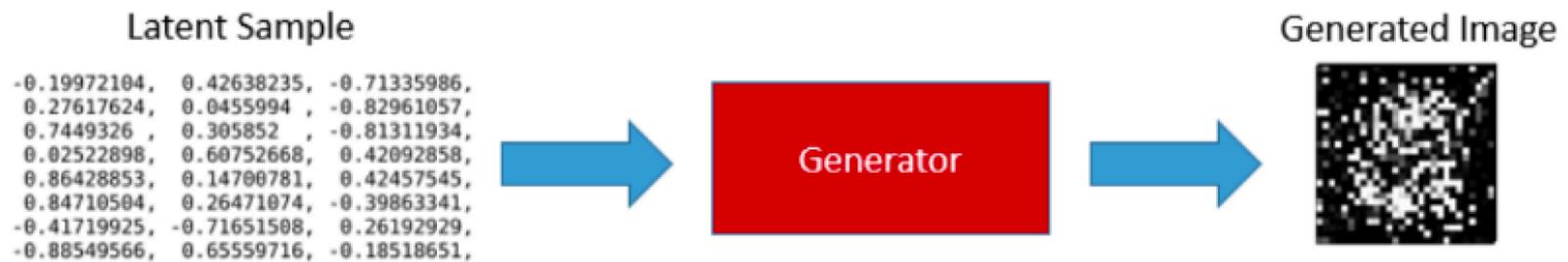
GENERATOR



GENERATOR

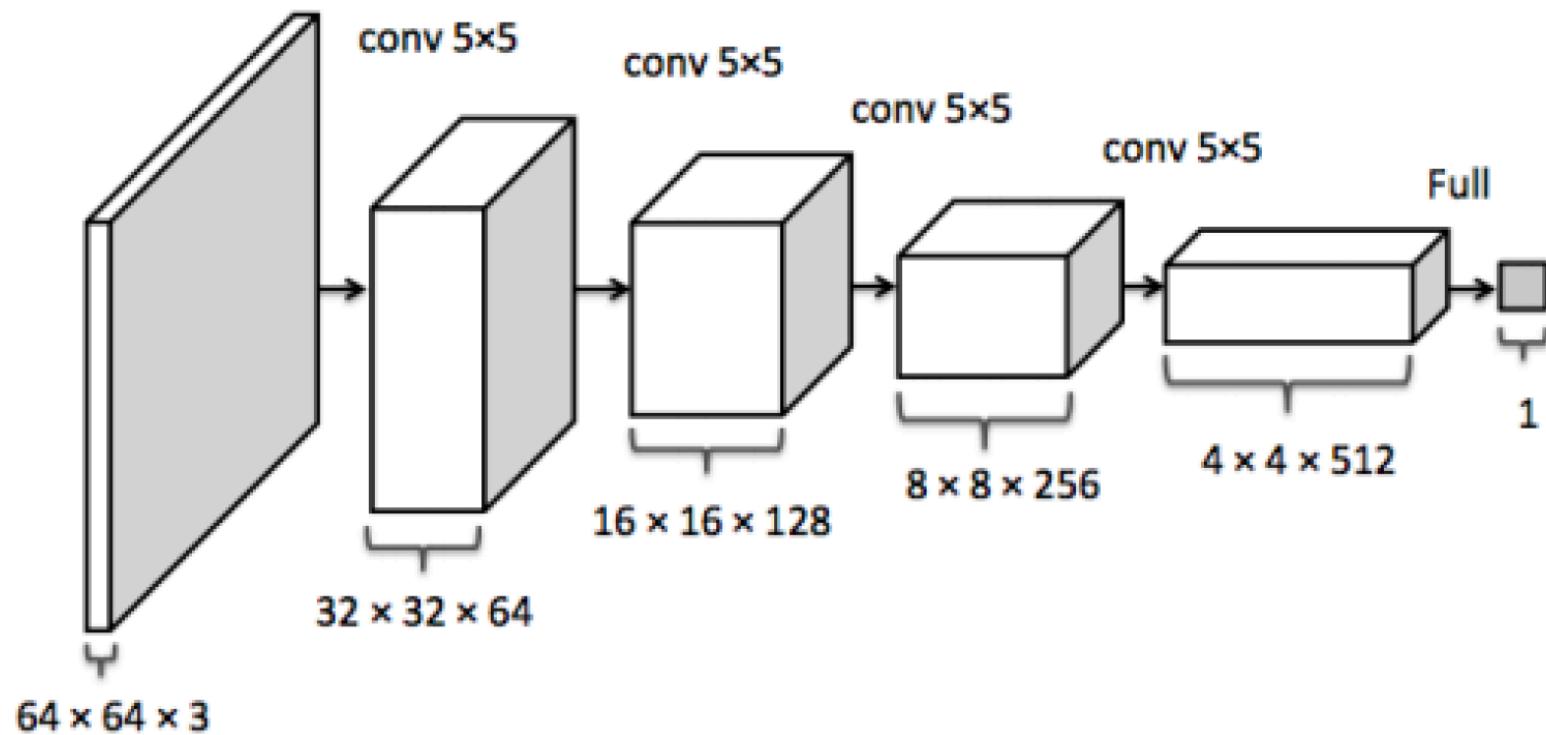


Without training, the generator produces noisy images.

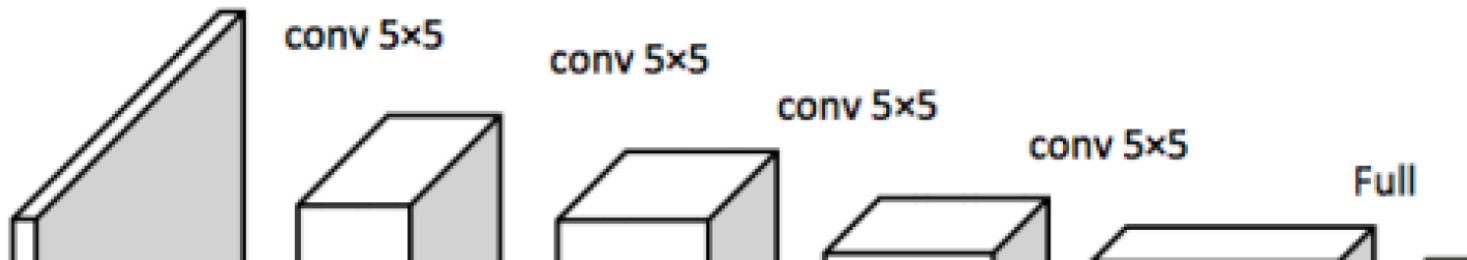


It needs the discriminator to improve.

DISCRIMINATOR



DISCRIMINATOR



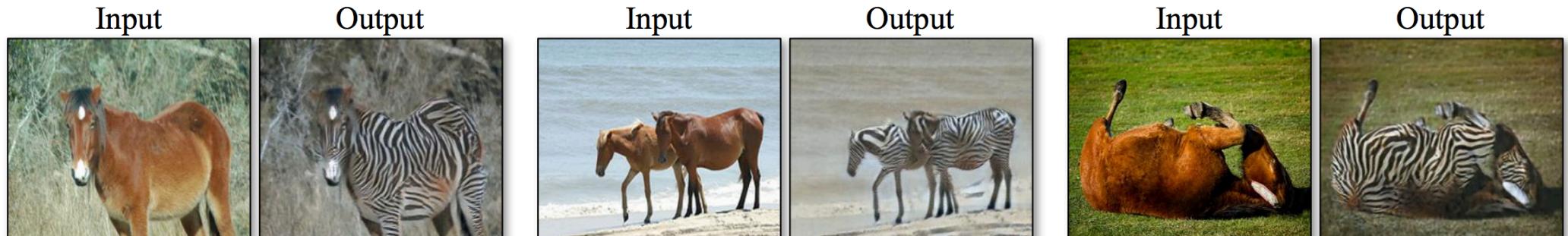
If the input is a real image, the discriminator should classify it as real.



If the input is a generated image from the generator, the discriminator should classify it as fake.



Cycle-GANs



horse → zebra



zebra → horse



winter Yosemite → summer Yosemite

PROGRESSIVE GROWING OF GANs FOR IMPROVED QUALITY, STABILITY, AND VARIATION

Tero Karras

NVIDIA

Timo Aila

NVIDIA

Samuli Laine

NVIDIA

Jaakko Lehtinen

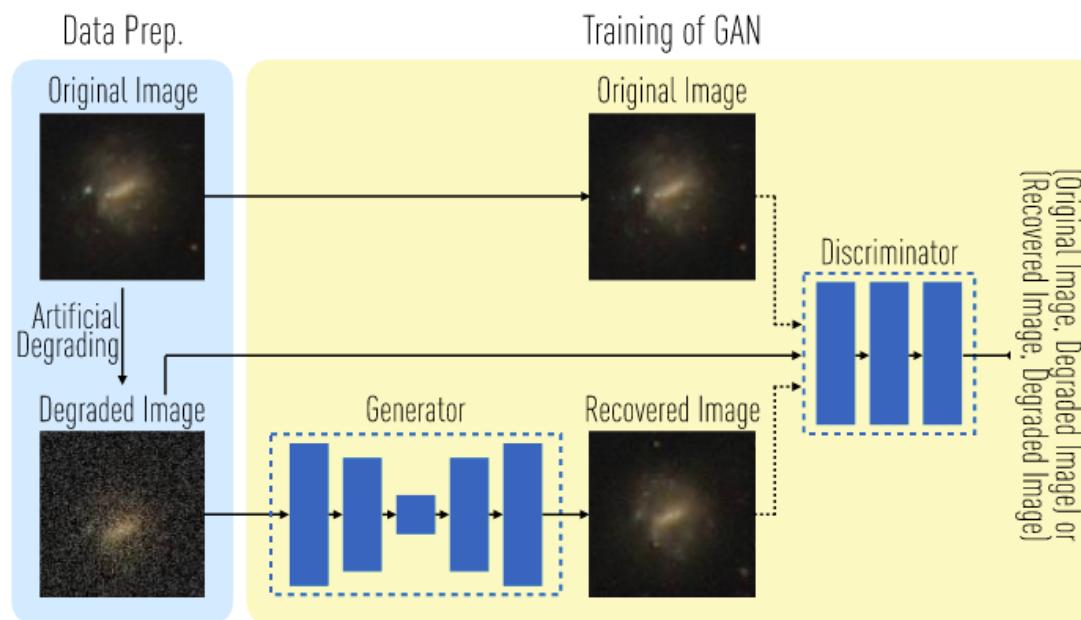
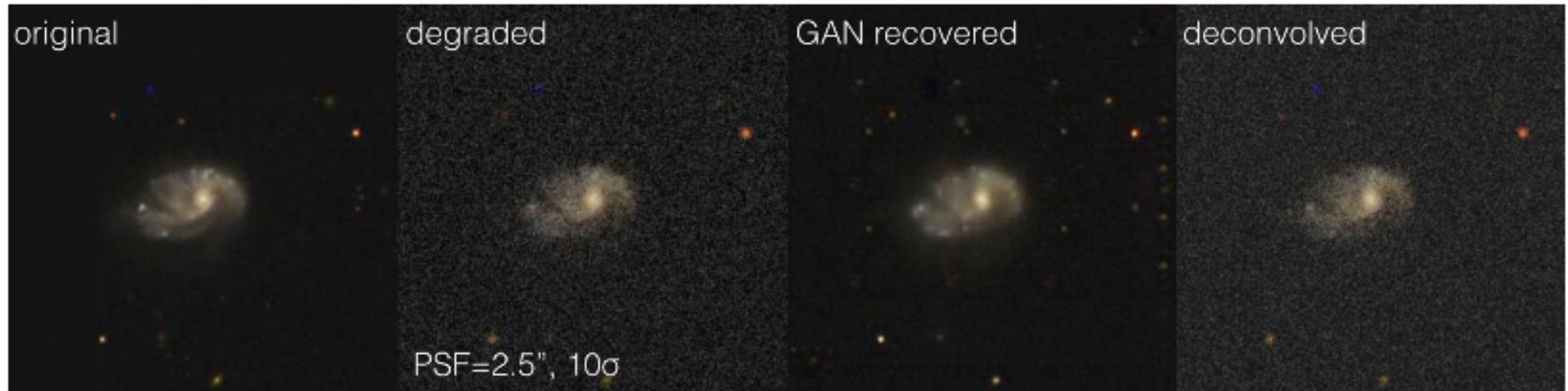
NVIDIA

Aalto University



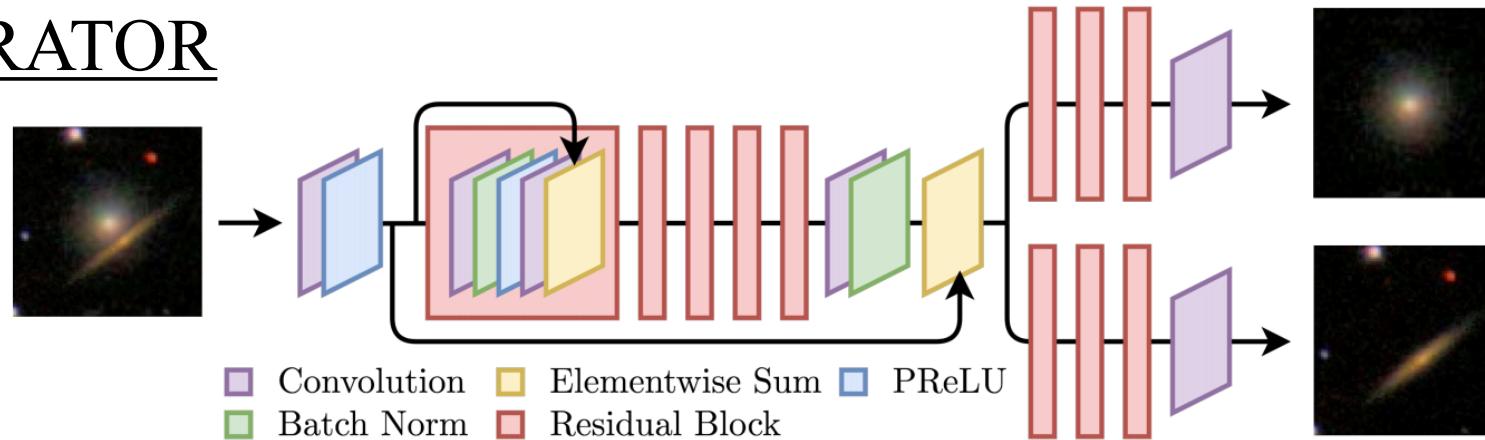


GANs: OTHER APPLICATIONS IN ASTRONOMY



Schawinsky+17

GENERATOR



DISCRIMINATOR

