

Generative Adversarial Networks

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GAN

Generative Adversarial
Networks



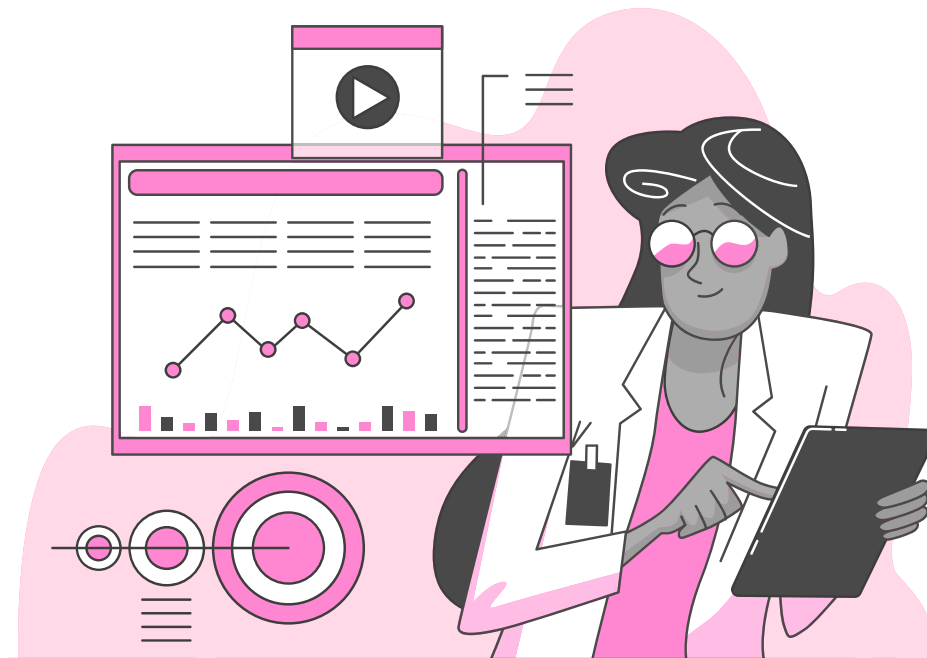
Training Scheme



Training Sequence

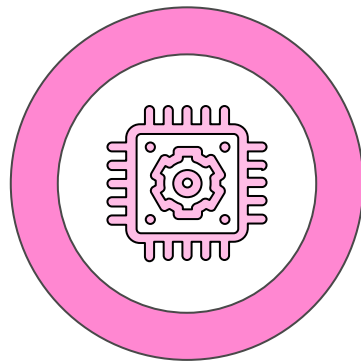


Evaluate Synthetic Data



01 GAN

Generative Adversarial Networks



It generates synthetic data

Two Neural Networks:
Generator & Discriminator

Generative Adversarial Networks

The two networks are
trained against each
other

...



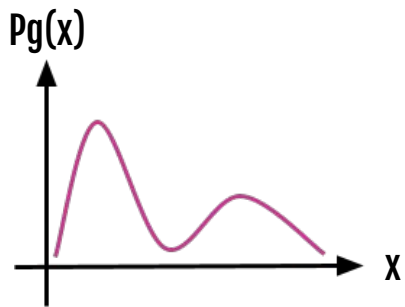
02

Training Scheme



Training Scheme

- $P_g(x)$: Generated data distribution.

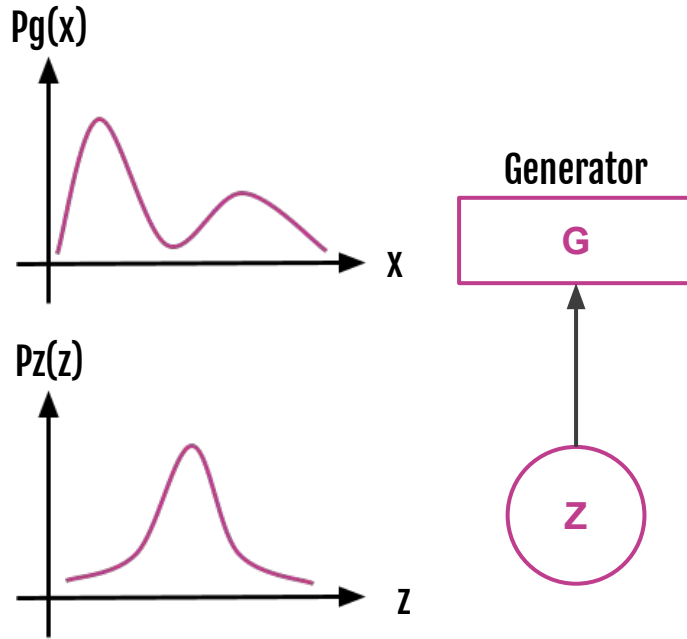


Generator

G

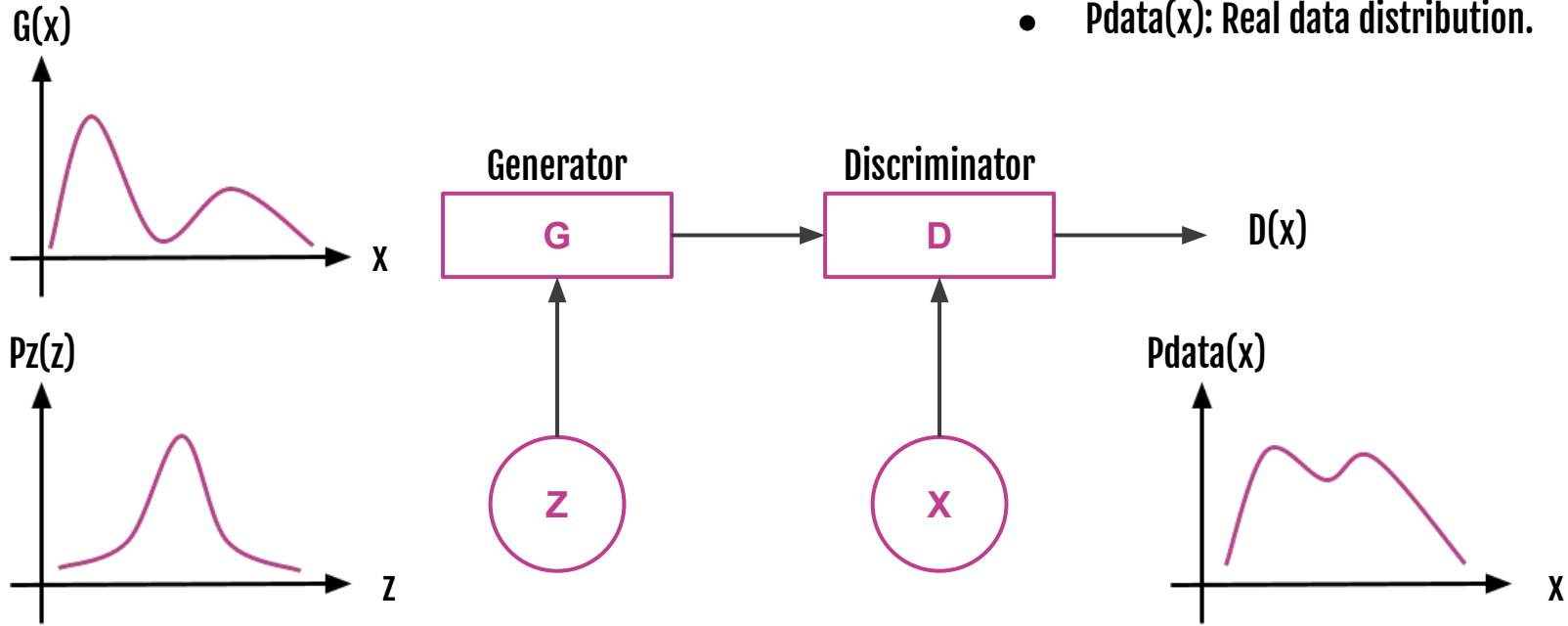
Training Scheme

- $P_g(x)$: Generated data distribution.
- $P_z(z)$: Input noise distribution.



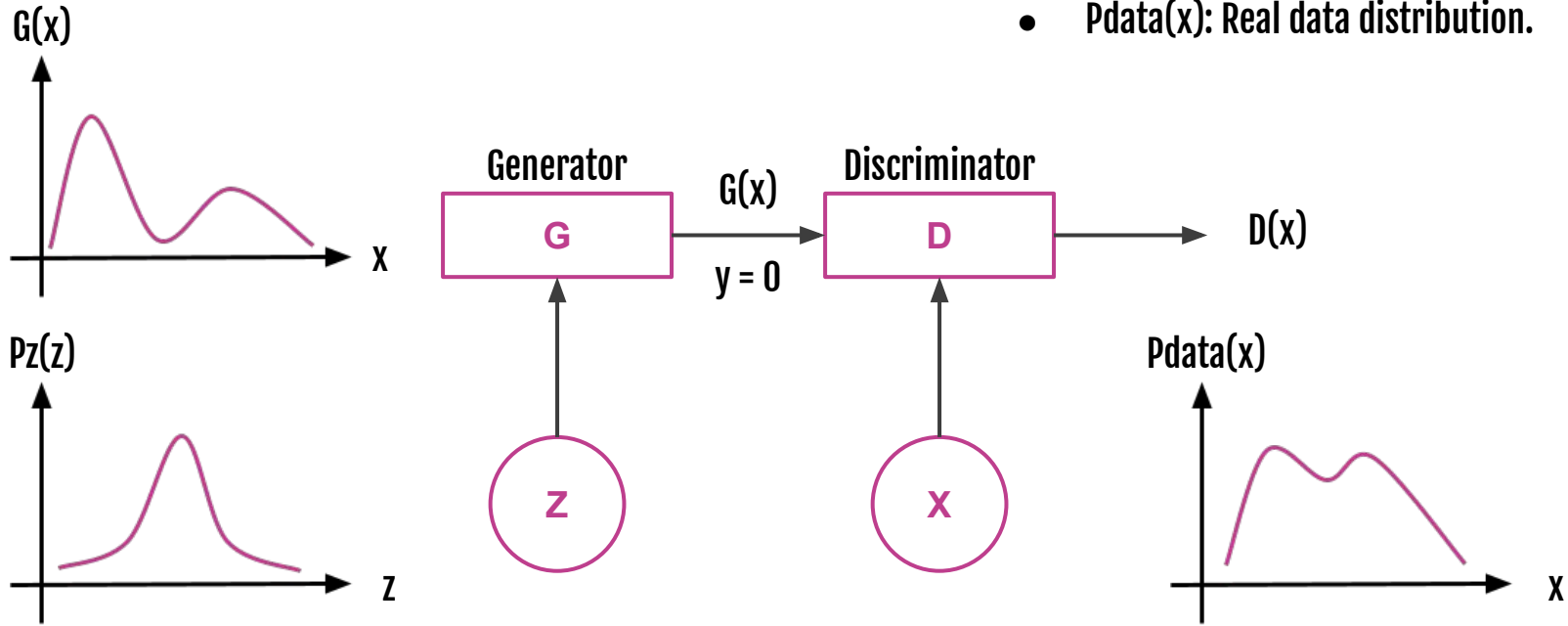
Training Scheme

- $P_g(x)$: Generated data distribution.
- $P_z(z)$: Input noise distribution.
- $P_{data}(x)$: Real data distribution.



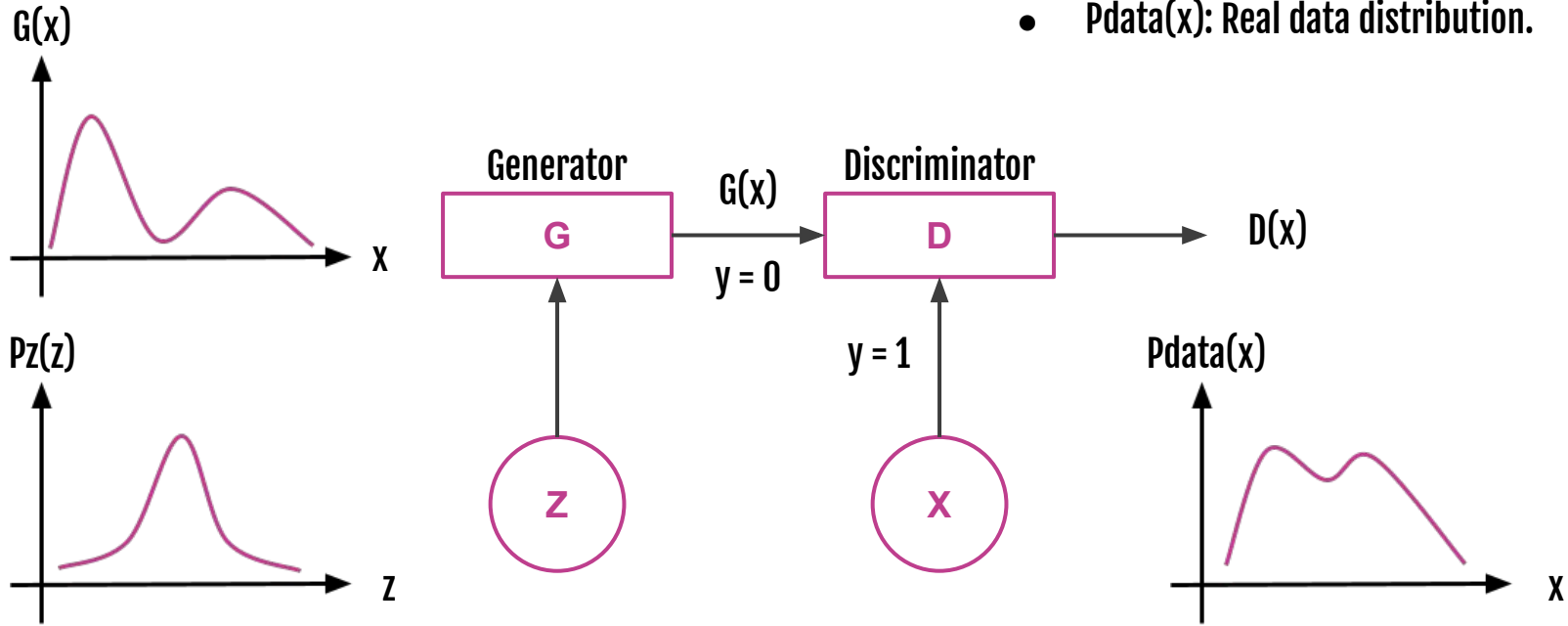
Training Scheme

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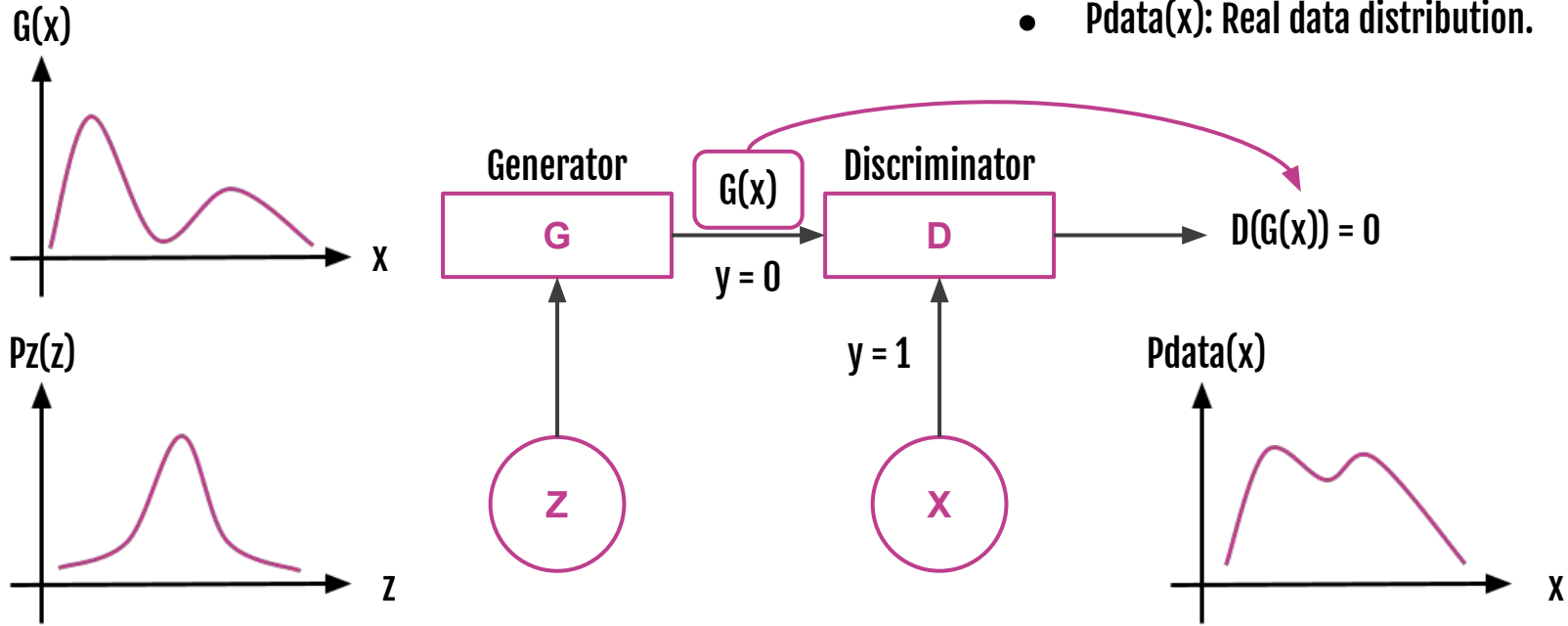
Training Scheme

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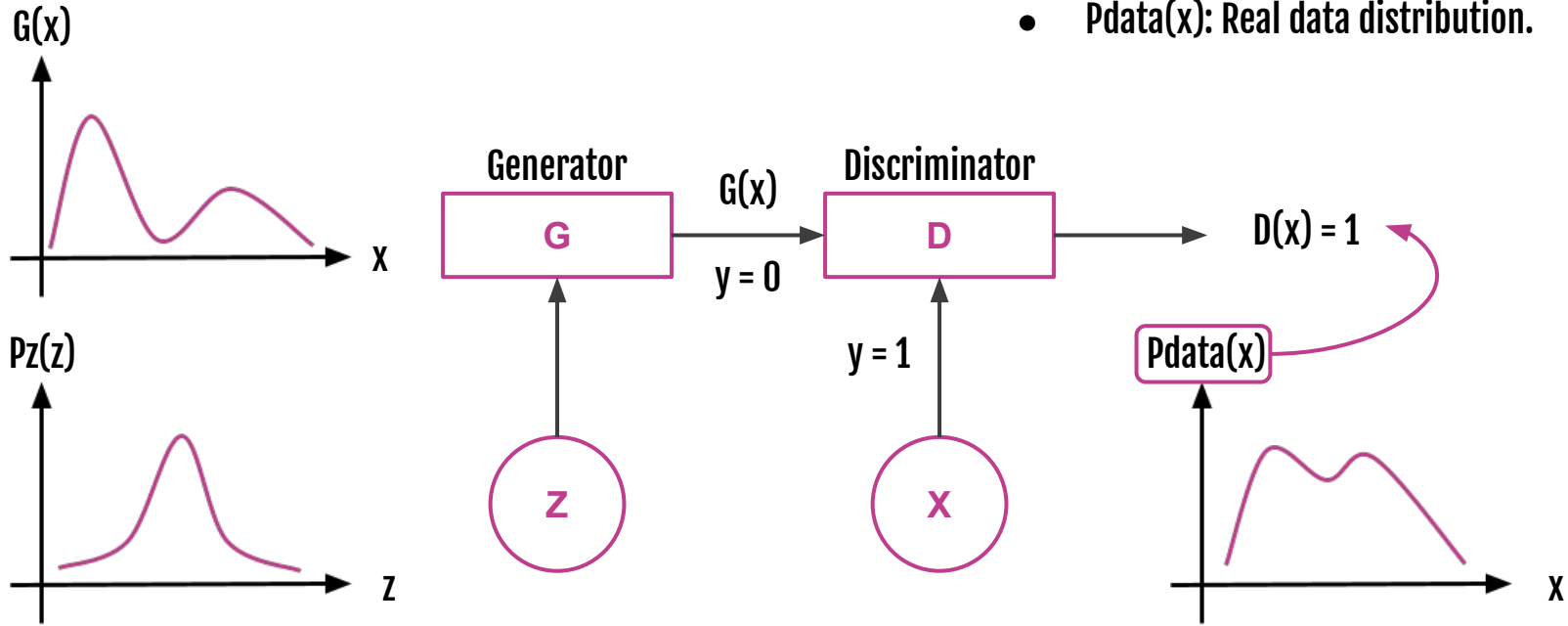
Training Scheme

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Training Scheme

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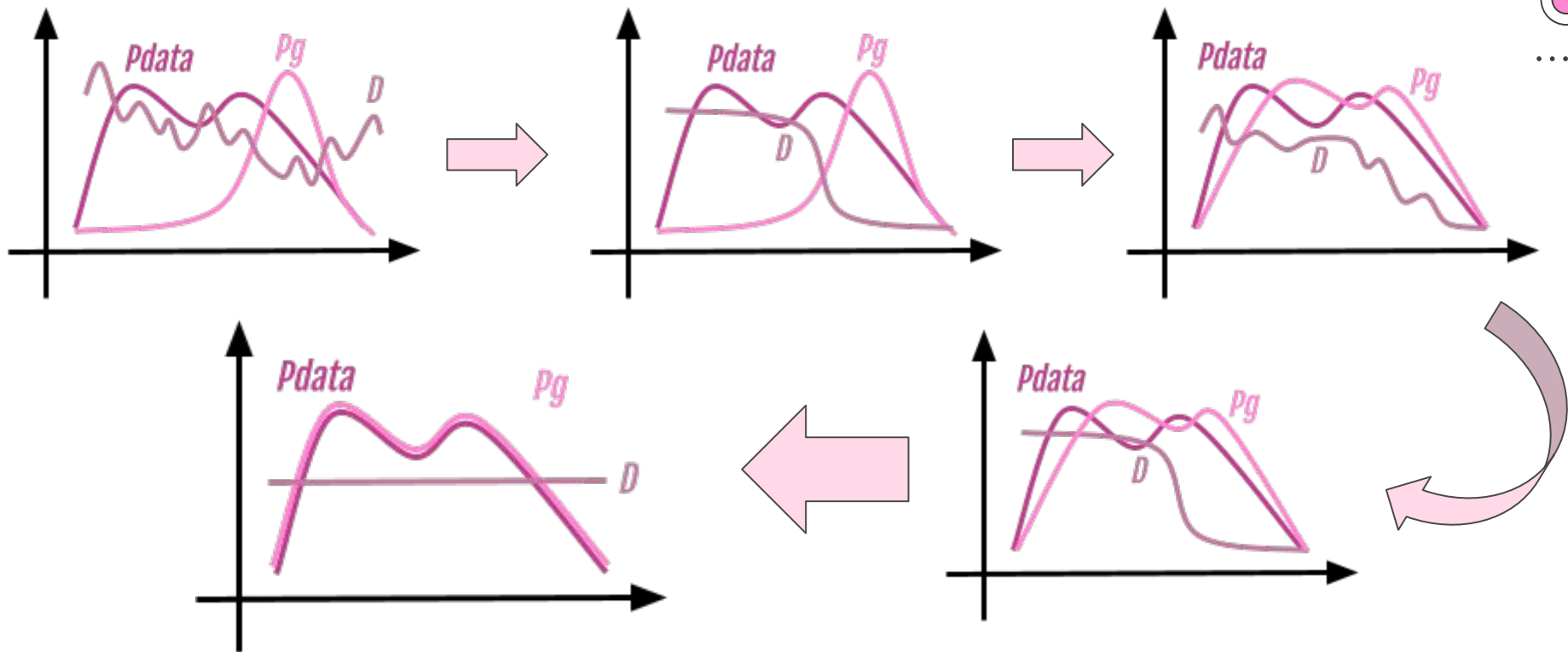


03

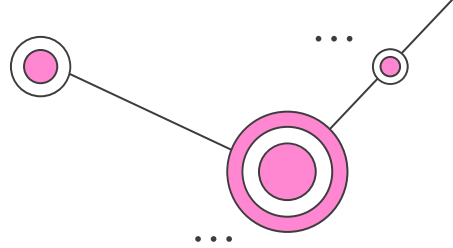
Training Sequence



Training sequence



MinMax Game



Value function

Entropía cruzada = $\sum_i p_i \cdot \log q_i$, Entropía Relativa: $D_{KL}(P||Q) = \sum_i P_i \cdot \ln \frac{P_i}{Q_i}$

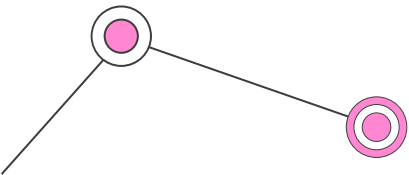
$$\min_G \max_D V(D, G) = \mathbb{E}_{x \sim p_{data}(x)} [\ln(D(x))] + \mathbb{E}_{z \sim p_z(z)} [\ln(1 - D(G(z)))]$$

Generator

Discriminator

$$\max_D V(D, G) = \mathbb{E}_{x \sim p_{data}(x)} [\ln(D(x))] + \mathbb{E}_{z \sim p_z(z)} [\ln(1 - D(G(z)))]$$

$$\min_G V(D, G) = \mathbb{E}_{z \sim p_z(z)} [\ln(1 - D(G(z)))]$$



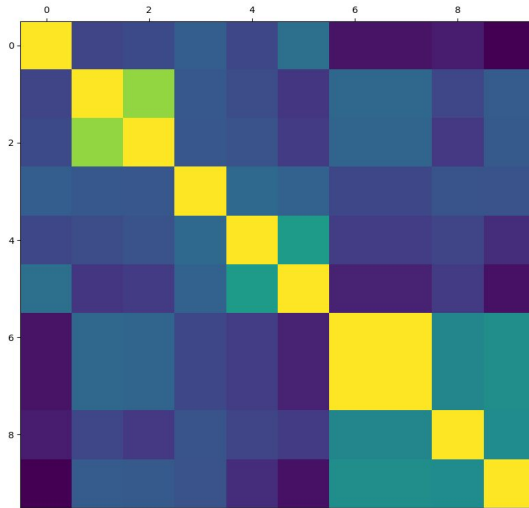
04

Evaluate Synthetic Data

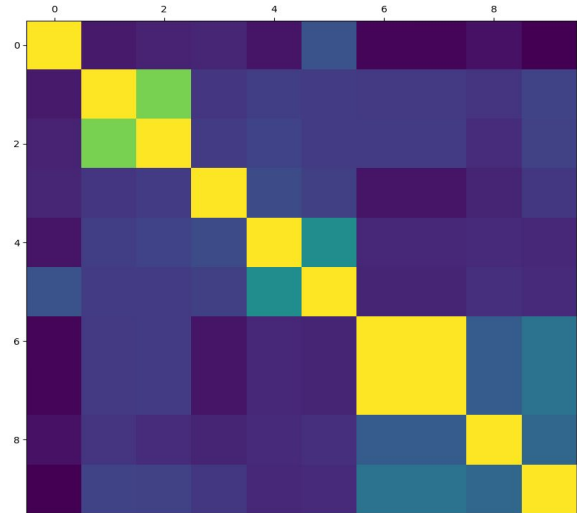
Evaluate Synthetic Data

Correlation Matrix (CM) to show the relations between the variables of the dataset.

Real CM

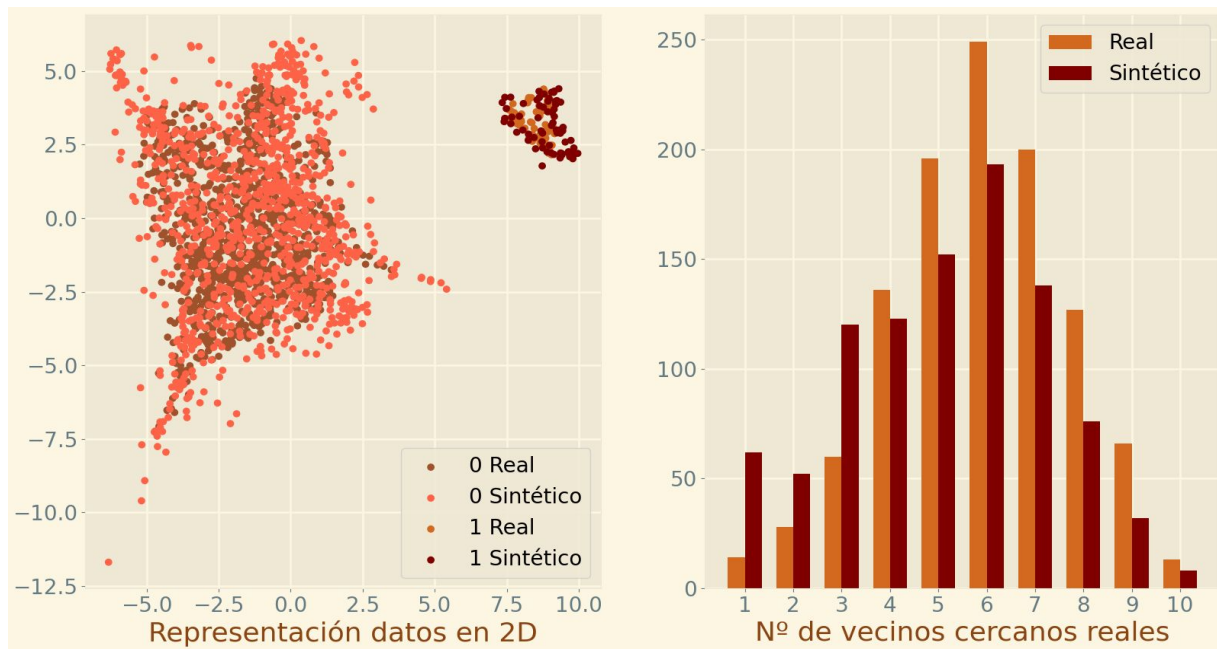


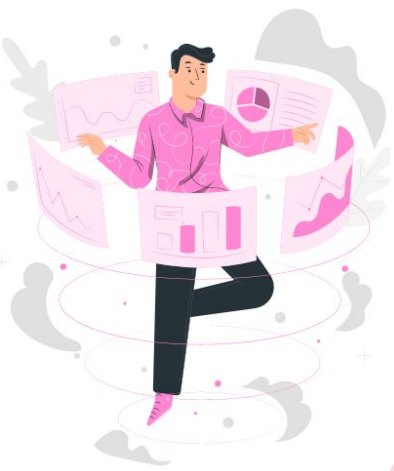
Synthetic CM



Evaluate Synthetic Data

Compress the dataset of high dimension to a 2D representation (UMAP) and show their **10 closest neighbours**.





**NOW,
HANDS ON!**

