

VAEs, GANs and CPPNs: a visual approach to generative models

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Supervisado vs. No Supervisado

Supervisado:

$X - Y$

El objetivo es estimar $y = f(x)$

No supervisado:

$X - X$

El objetivo es aprender la estructura subyacente del conjunto de datos

*Most of human and animal learning is unsupervised learning. If intelligence was a cake, **unsupervised learning would be the cake**, supervised learning would be the icing on the cake, and reinforcement learning would be the cherry on the cake. We know how to make the icing and the cherry, but we don't know how to make the cake.*

We need to solve the unsupervised learning problem before we can even think of getting to true AI.

Yann LeCun

Aprendizaje no supervisado: estímulos que recibimos a lo largo de la vida

Aprendizaje supervisado: educación, lecturas

Aprendizaje por refuerzo: prueba-error, recompensas

Ejemplos de aprendizaje no supervisado

Clustering

Dimensionality Reduction

Principal Component Analysis

Restricted Boltzmann Machines

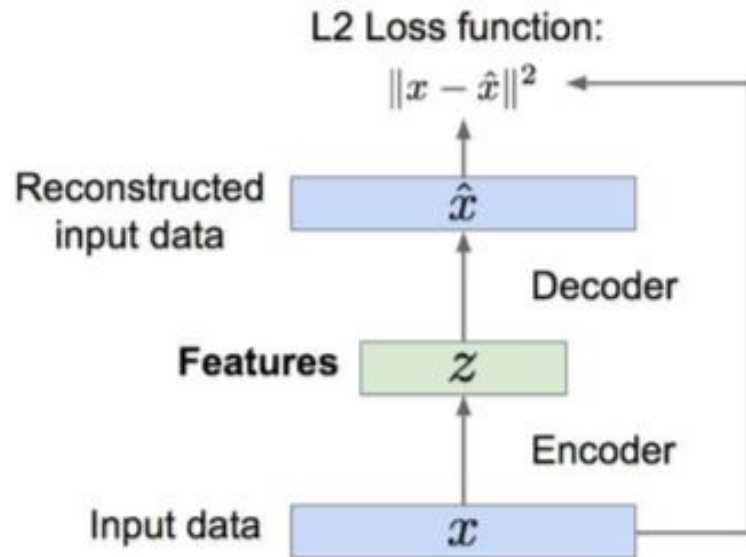
t-SNE (T-distributed Stochastic Neighbor Embedding)

Autoencoders

link: <https://projector.tensorflow.org/>

Autoencoders

El objetivo es aprender los pesos W de forma que podamos reconstruir la entrada original desde un espacio dimensional de menores dimensiones al de la entrada (z), lo cual es una forma de compresión.

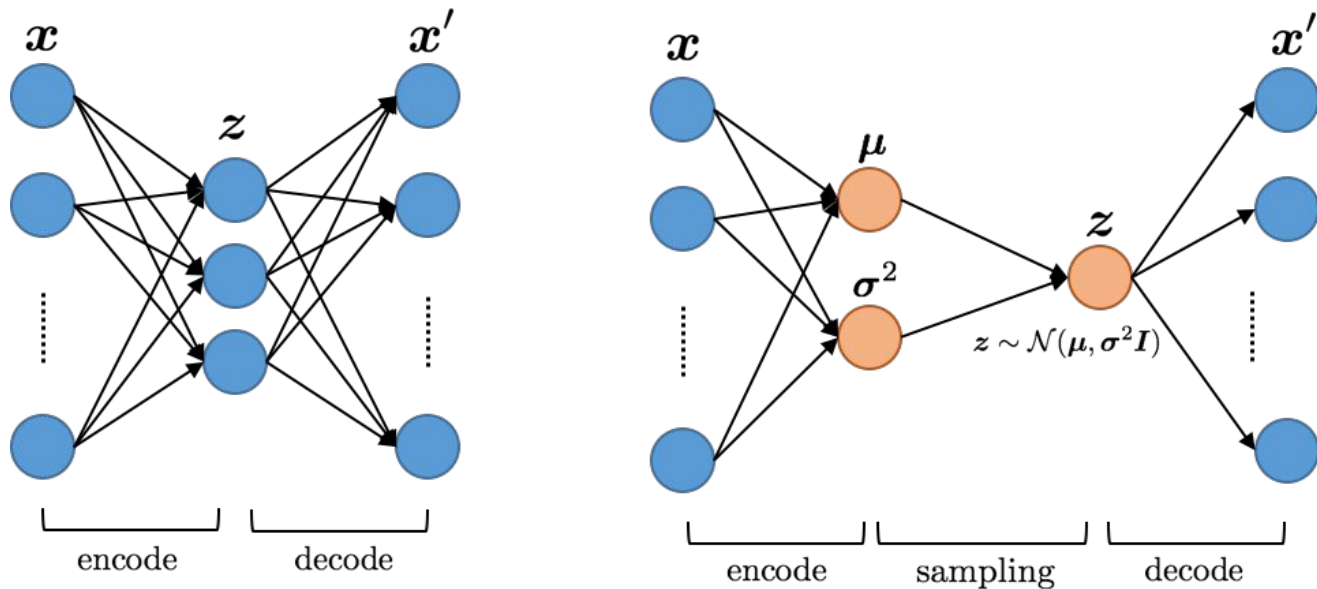


Modelos generativos

Aprender $P_{\text{modelo}}(\mathbf{x})$ similar a $P_{\text{dataset}}(\mathbf{x})$

Una vez aprendida, podemos samplear de esa
distribución

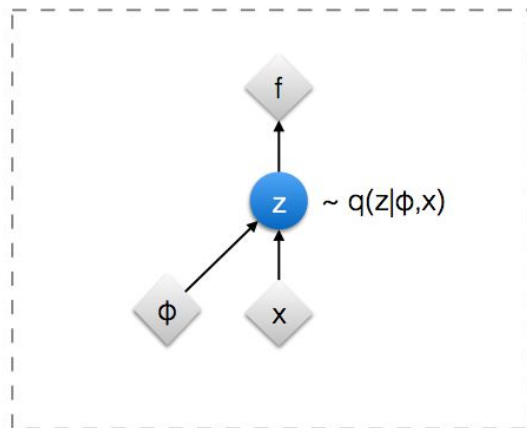
Variational Autoencoder (VAE)



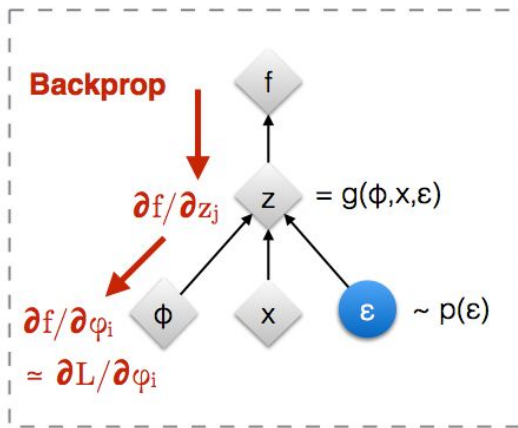
link: <https://transcranial.github.io/keras-js/#/mnist-vae>
<https://github.com/snatch59/keras-autoencoders>

Reparametrization trick

Original form



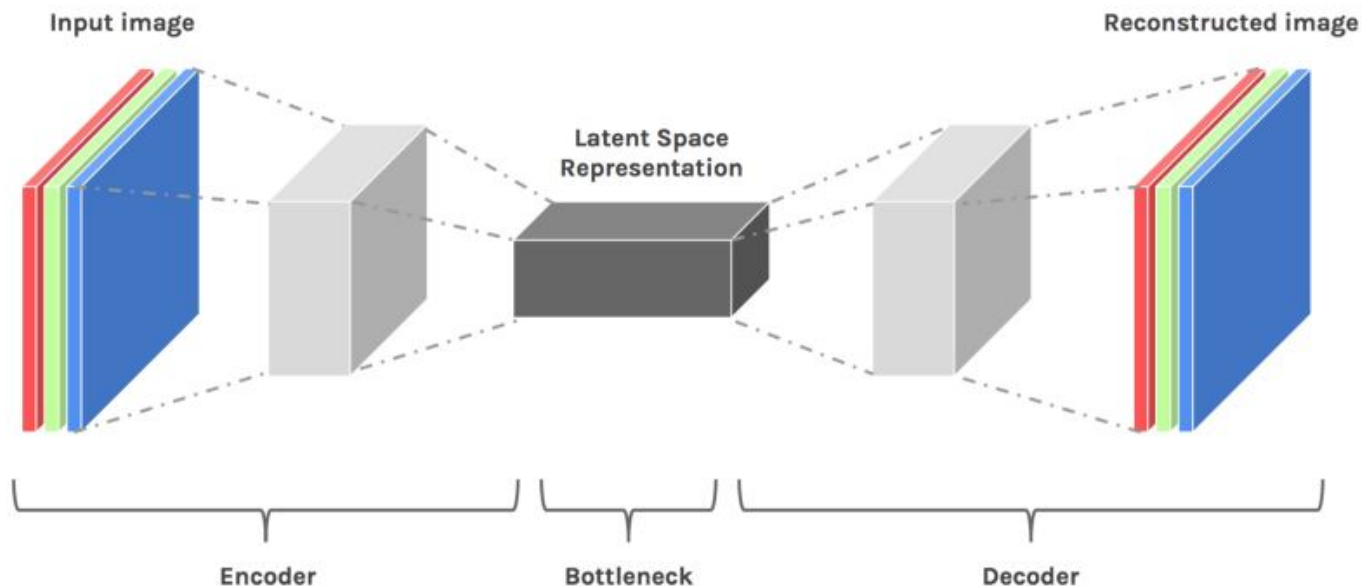
Reparameterised form



◆ : Deterministic node
● : Random node

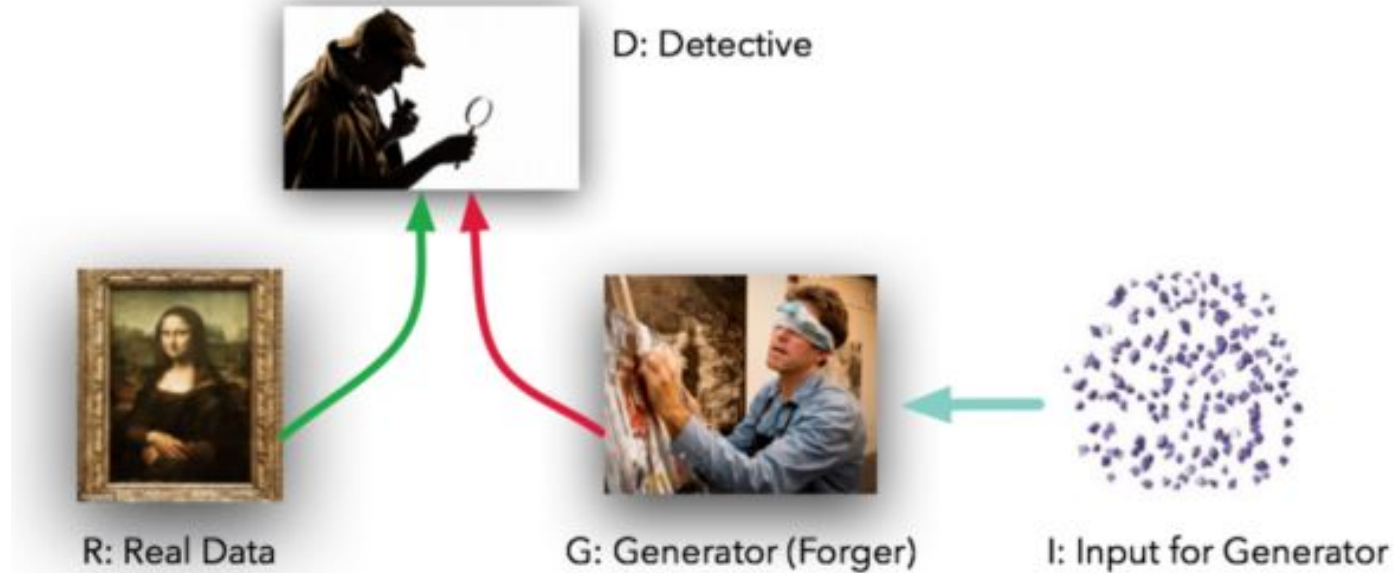
[Kingma, 2013]
[Bengio, 2013]
[Kingma and Welling 2014]
[Rezende et al 2014]

Convolutional Autoencoders

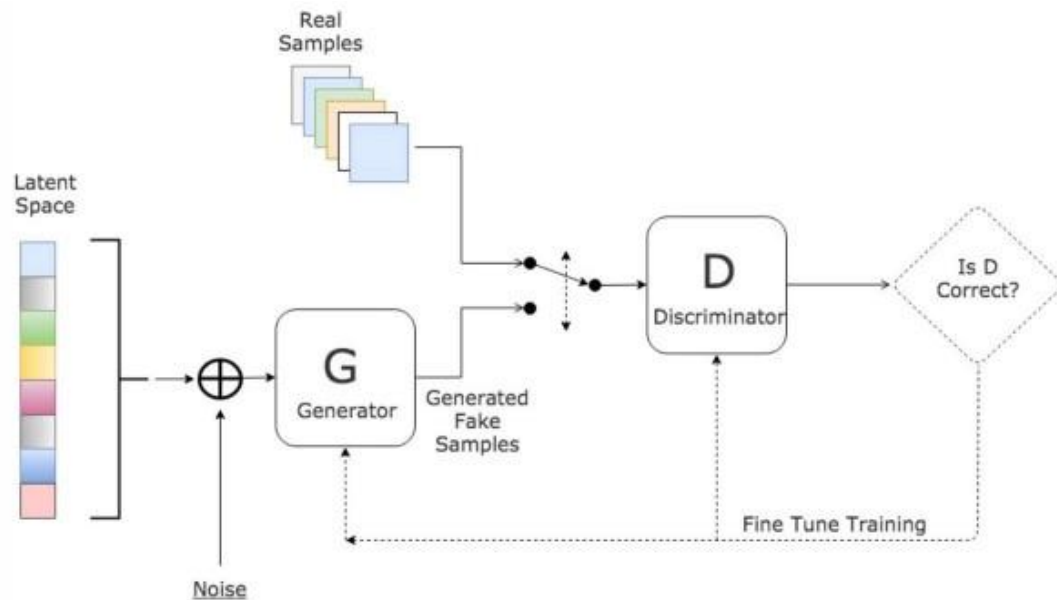


La arquitectura es similar, pero las capas son convolucionales

Generative Adversarial Networks



Generative Adversarial Networks



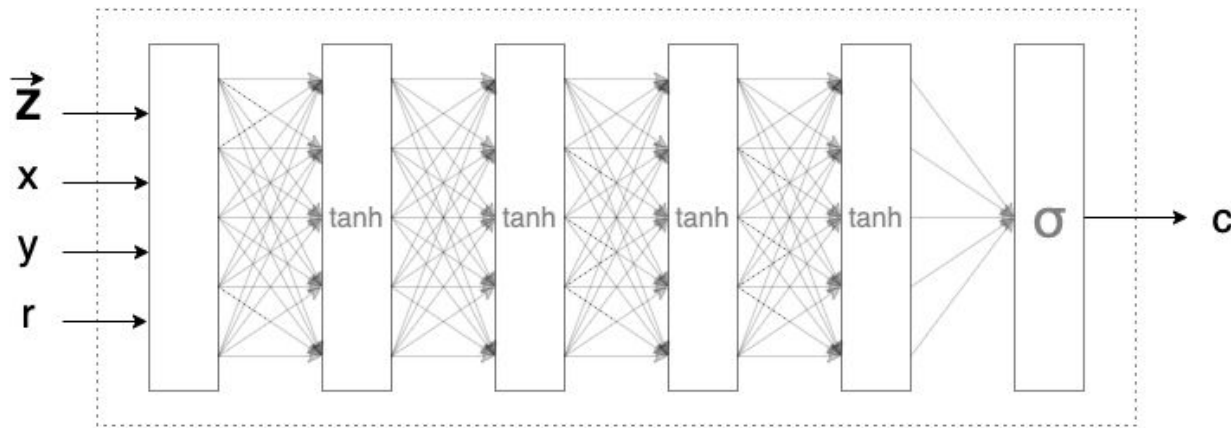
$$\min_{\theta_g} \max_{\theta_d} \left[\mathbb{E}_{x \sim p_{data}} \log D_{\theta_d}(x) + \mathbb{E}_{z \sim p(z)} \log(1 - D_{\theta_d}(G_{\theta_g}(z))) \right]$$

Generative Adversarial Networks

Code review:

<https://github.com/eriklindernoren/Keras-GAN/blob/master/gan/gan.py>

Compositional Pattern-Producing Network



La idea básica detrás de las CPPN es una red neuronal con los pesos no entrenados

<http://blog.otoro.net/2016/03/25/generating-abstract-patterns-with-tensorflow/>

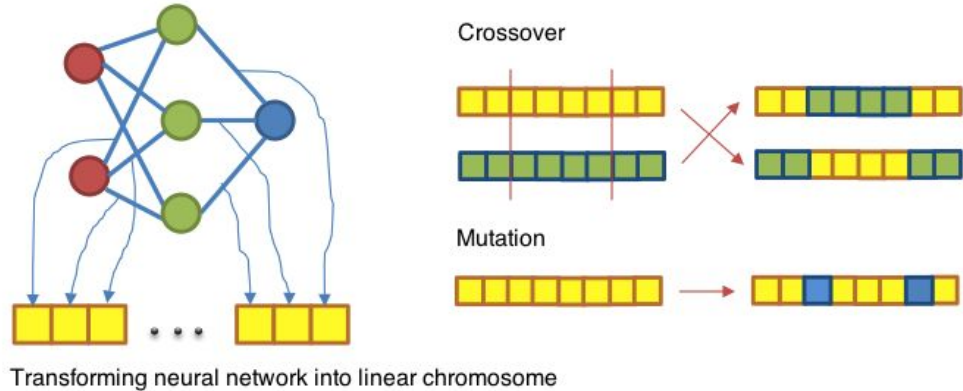
<https://towardsdatascience.com/understanding-compositional-pattern-producing-networks-810f6bef1b88>

Compositional Pattern-Producing Network

Este proceso se puede potenciar mediante la evolución de las arquitecturas (o de los pesos) de las redes neuronales, pero el hecho de no haber una función objetivo hace que este proceso no pueda ser guiado de forma automática.

Genetic Algorithms (Neuroevolution)

Augmenting Topology Neural Networks

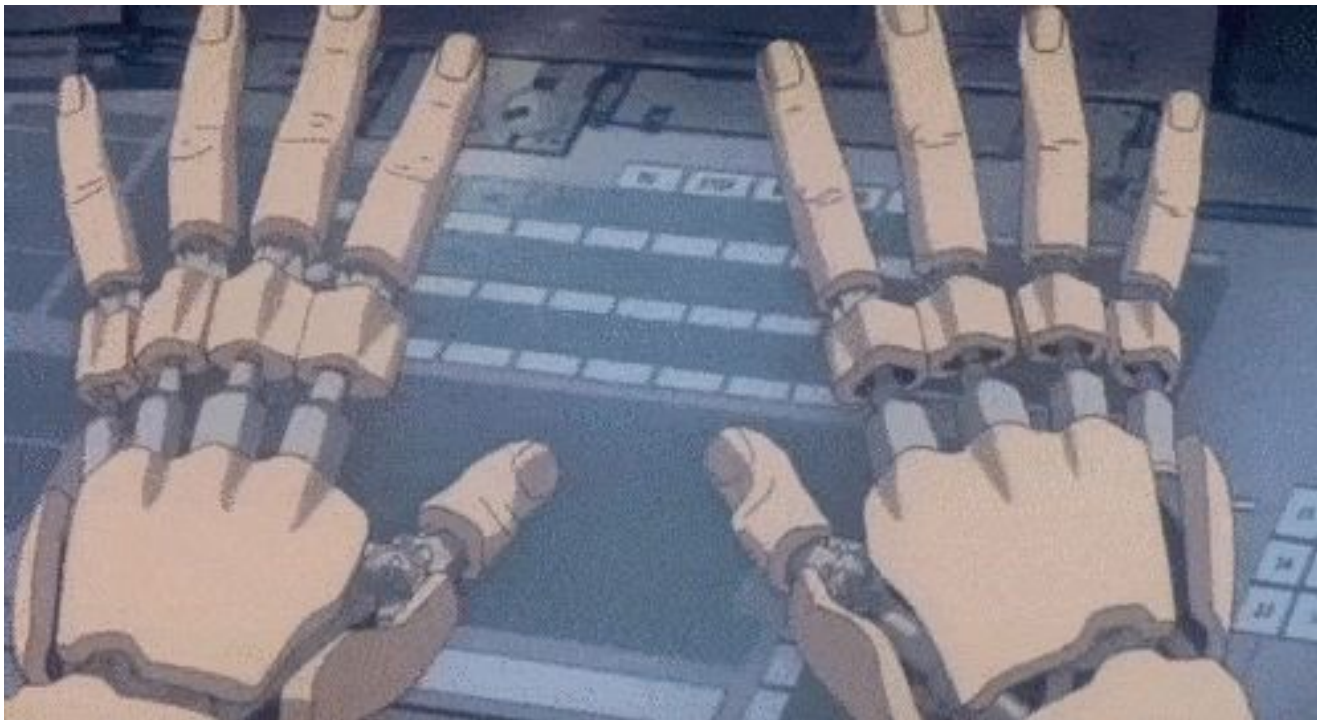


Compositional Pattern-Producing Network

Picbreeder is a collaborative art application based on an idea called evolutionary art, which is a technique that allows pictures to be bred almost like animals. For example, you can evolve a butterfly into a bat by selecting parents that look like bats

link: <http://picbreeder.org/>

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Gracias por la atención