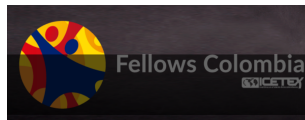


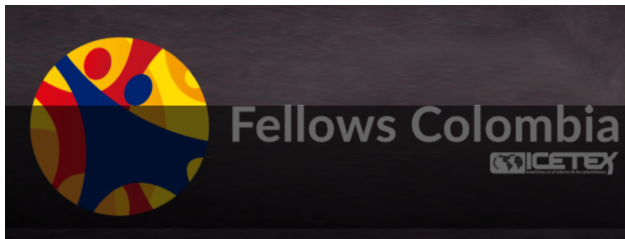
Short Introduction to Variational Autoencoders

Mauricio A. Álvarez

Topics on Deep Probabilistic Models



Acknowledgements



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Autoencoders

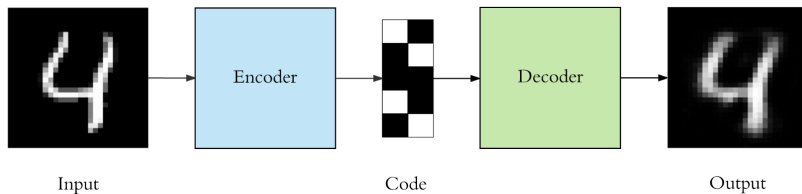
Variational autoencoders

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Autoencoders

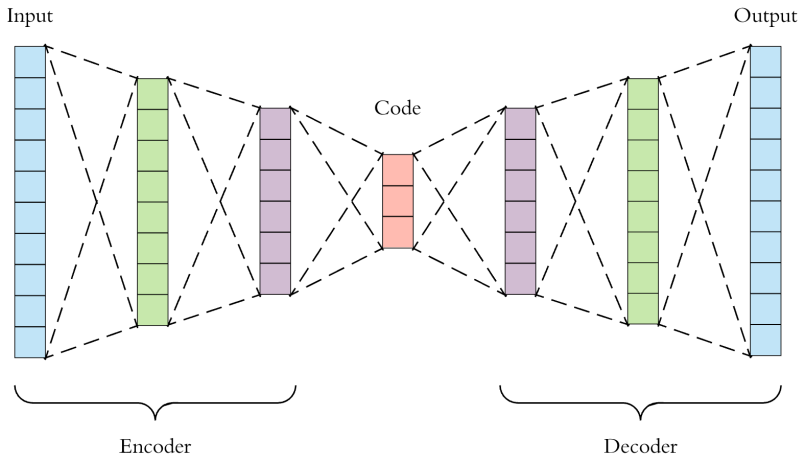
Variational autoencoders

What is an autoencoder?



Credit <https://towardsdatascience.com/applied-deep-learning-part-3-autoencoders-1c083af4d798>

Architecture of an autoencoder

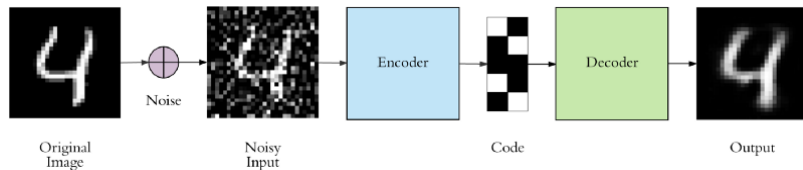


Credit <https://towardsdatascience.com/applied-deep-learning-part-3-autoencoders-1c083af4d798>

How to avoid naive solutions?

- ❑ A naive solution to the above problem would be to learn the identity transformation (copy the input to the output).
- ❑ We can avoid such naive solution using alternatives such as
 - The latent representations should have a smaller dimensionality than the input data.
 - We can learn a mapping from noisy inputs to the original inputs (denoising autoencoders).
 - Sparse autoencoders: we penalise the weights in the neural networks for the encoder and decoder.

Denoising autoencoders



Credit <https://towardsdatascience.com/applied-deep-learning-part-3-autoencoders-1c083af4d798>

Use cases

- ❑ Data denoising.
- ❑ Dimensionality reduction.

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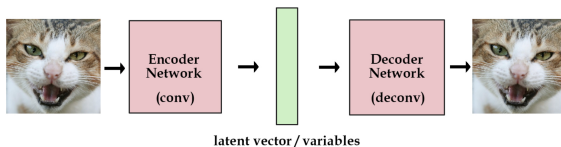
Autoencoders

Variational autoencoders

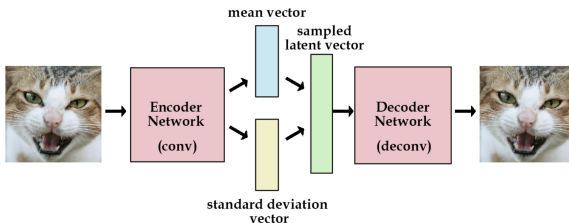
Autoencoders and variational autoencoders (I)

- ❑ In an autoencoder, each input vector is mapped to a latent vector.
- ❑ In a variational autoencoder (VAE), the input data is mapped to a latent probability distribution.
- ❑ We can then use the latent probability distribution to generate “new inputs”.

Autoencoders and variational autoencoders (II)

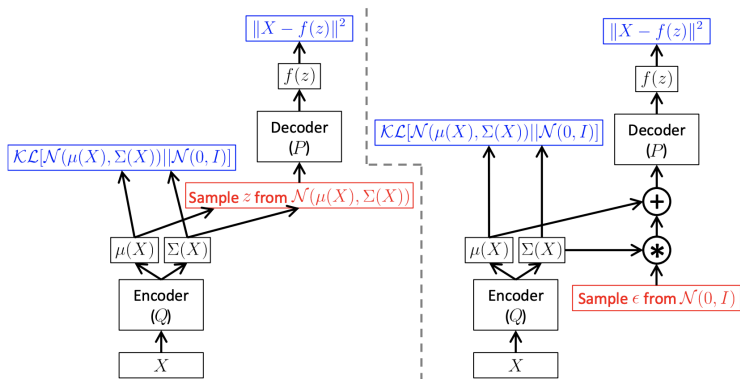


Autoencoder



Variational autoencoder

Variational autoencoder



Example MNIST

