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**COMOD**
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# Relatório de Atividades

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## 1 Introdution

Variational auto-encoder (VAE) model is a stochastic inference and learning algorithm based on variational Bayes (VB) inference proposed by Kingma and Welling (2014). This is a generative technique whose central idea is the development of representations in a low-dimensional latent space that can be mapped back into a realistic-looking image.

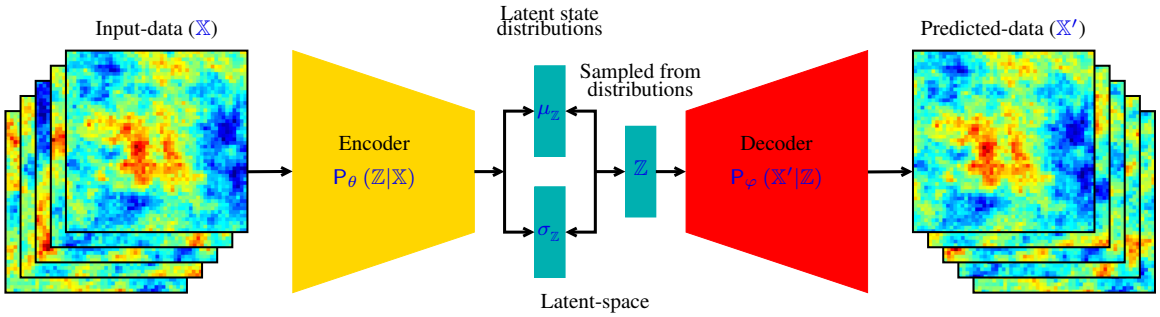
Higgins et al. (2016) introduced the $\beta$-VAE, a modification of the original VAE, that introduces an adjustable hyperparameter $\beta$ to balance latent channel capacity and independence constraints with reconstruction accuracy. They demonstrate that with tuned values of $\beta$ ($\beta > 1$) the $\beta$-VAE outperforms VAE ($\beta = 1$).

## 2 Zhang et al. (2022)

Variational auto-encoder (VAE) model is a generative network based on variational Bayes (VB) inference proposed by Kingma and Welling (2014).

Zhang et al. (2022) proposed a method to reconstruct porous media based on VAE and Fisher information with good quality and efficiency.

Consider the input data $\mathbb{X} = \left\{\boldsymbol{x}^{(i)}\right\}_{i=1}^{\mathsf{N}}$ consisting of $\mathsf{N}$ *i*ndependent and *i*dentically *d*istributed (*i.i.d.*) samples of the continuous (or discrete) variable $\boldsymbol{x}$.




$$\mathbb{Z} = \mu_\mathbb{Z} + \sigma_\mathbb{Z} \cdot \varepsilon, \quad \text{where} \quad \varepsilon \sim \mathbb{N}(0, 1) \tag{1}$$

The Kullback–Leibler divergence (also called relative entropy and I-divergence) is a measure of divergence between two distributions (Kullback and Leibler, 1951; Csiszar, 1975):

$$\mathcal{D}_{\mathsf{KL}}(f_\mathbb{P} || f_\mathbb{Q}) = \tag{2}$$

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