



Laboratório  
Nacional de  
Computação  
Científica

**COMOD**  
Coordenação de Modelagem Computacional

# Relatório de Atividades

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## 1 Introduction

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### 1 INTRODUCTION

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.

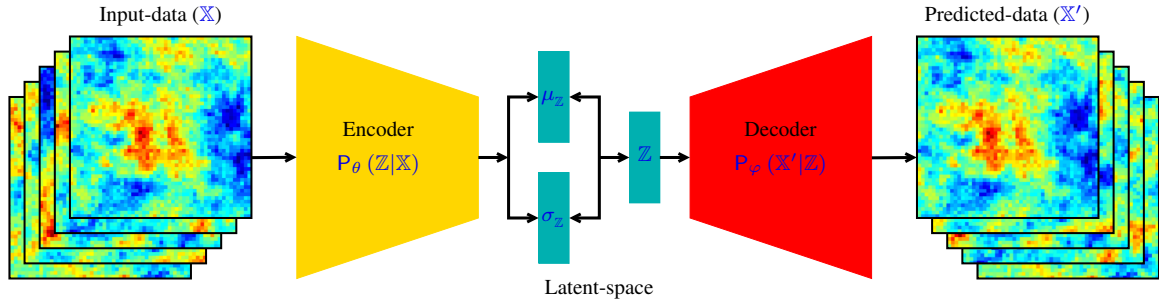
[Higgins et al. \(2016\)](#)

### 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  $\mathbb{X} = \{\mathbf{x}^{(i)}\}_{i=1}^N$  consisting of  $N$  independent and identically distributed (*i.i.d.*) samples of the continuous (or discrete) variable  $\mathbf{x}$ .



$$Z = \mu_Z + \sigma_Z \cdot \varepsilon, \quad \text{where } \varepsilon \sim \mathcal{N}(0, 1) \quad (1)$$

## REFERENCES

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### REFERENCES

- Irina Higgins, Loïc Matthey, Arka Pal, Christopher P. Burgess, Xavier Glorot, Matthew M. Botvinick, Shakir Mohamed, and Alexander Lerchner. beta-vae: Learning basic visual concepts with a constrained variational framework. In *International Conference on Learning Representations*, 2016.
- Diederik P Kingma and Max Welling. Auto-encoding variational bayes. In *International conference on learning representations*, pages 14–27, 2014.
- Diederik P Kingma and Max Welling. Auto-encoding variational bayes, 2022.
- Ting Zhang, Tu Hongyan, Xia Pengfei, and Du Yi. Reconstruction of porous media using an information variational auto-encoder. *Transport in Porous Media*, 143(2):271–295, 2022. doi: [10.1007/s11242-022-01769-5](https://doi.org/10.1007/s11242-022-01769-5). URL <https://doi.org/10.1007/s11242-022-01769-5>.

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variational auto-encoding, [1](#)