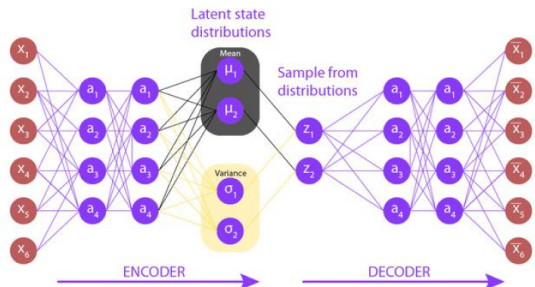


Variational autoencoders for FABRIC PATTERN GENERATION

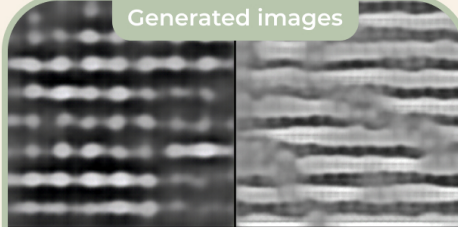
Can we use a variational autoencoder to generate fabric pattern designs similar to Vlisco's?

Variational autoencoders



- Variational autoencoders (VAE) work like a compression system
- They **encode** some input into a **compressed** format (**latent space**)
- Then they **decode** and by that try to retain the original input
- Encoding and decoding are done by **neural networks**
- VAE Uses a **gaussian distribution** as its latent space

Generated images

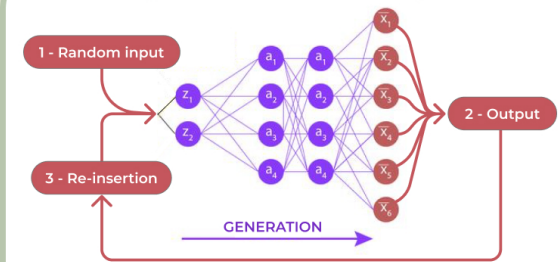


- These are some images generated by a model trained on a dataset consisting of **4000 grey-scale images**
- After training, the decoder was supplied with **random** input data
- Generating an image takes only a **few seconds**



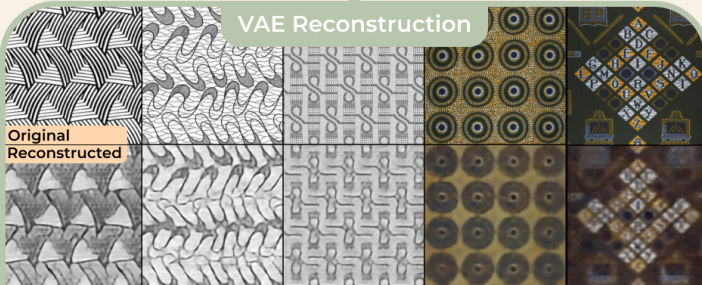
- These are some examples of designs by **Vlisco** (est. 1846)
- Vlisco is a company specialised in fabric pattern designs for **fashion**
- Vlisco's designs currently take a designer about **1 month** to create
- Using AI technology new designs could be artificially **generated**

Repeated re-insertion



- By **re-inserting** a generated image **repeatedly** into the model you get more interesting results
- By repeating this step enough times the image becomes less cloudy
- After each re-insertion the image **changes** slightly
- One can keep repeating this infinitely to create **new images**

VAE Reconstruction

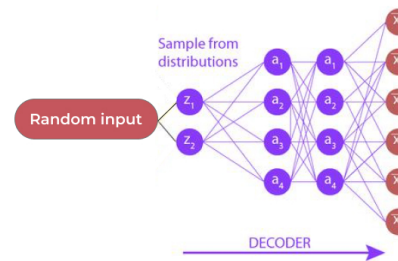


- These are some **test results** where a VAE **reconstructed** some input images
- For these reconstructions a vector quantised VAE was used [1]
- If you look closely you'll see that some **details were lost**
- But you must understand that these images were **compressed** significantly (>500x)

[1] Razavi, A., Oord, A. v. d., & Vinyals, O. (2019). Generating diverse high-fidelity images with vq-vae-2. arXiv:1906.00446.

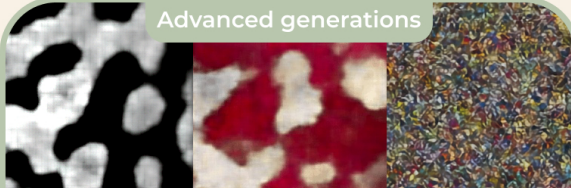


VAE Generation



- To generate data with a VAE we first **train** a VAE
- Then we remove the encoder
- Now we provide the decoder with **random** data
- It will generate new data **similar** to the training data

Advanced generations



- These are some examples of generated images
- The first and second images are the result of re-inserting a generated image back into the model repeatedly
- The rightmost image was generated by **PixelSNAIL** [1][2]

[1] Chen, X., Mishra, N., Rohaninejad, M., & Abbeel, P. (2018). PixelSNAIL: An improved autoregressive generative model.
[2] Razavi, A., Oord, A. v. d., & Vinyals, O. (2019). Generating diverse high-fidelity images with vq-vae-2. arXiv:1906.00446.

- The progress of re-inserting a generated image
- In total the image was re-inserted **200 times**

Re-insertion progression



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