Deep Learning
Assignment 2

Assignment Gdrive Link:

https://drive.google.com/drive/folders/1Ew1Y4Wz3spnlNMfdpWObN8LM_sNgkSNf?usp=sharing

Assignment Description:

Beta Variational Auto-encoders
1. Analyze the VAE code shared to you. Try to vary the parameters and analyse the quality of images and report the same.
2. Try to vary beta value in variational auto-encoder and see how the image changes.

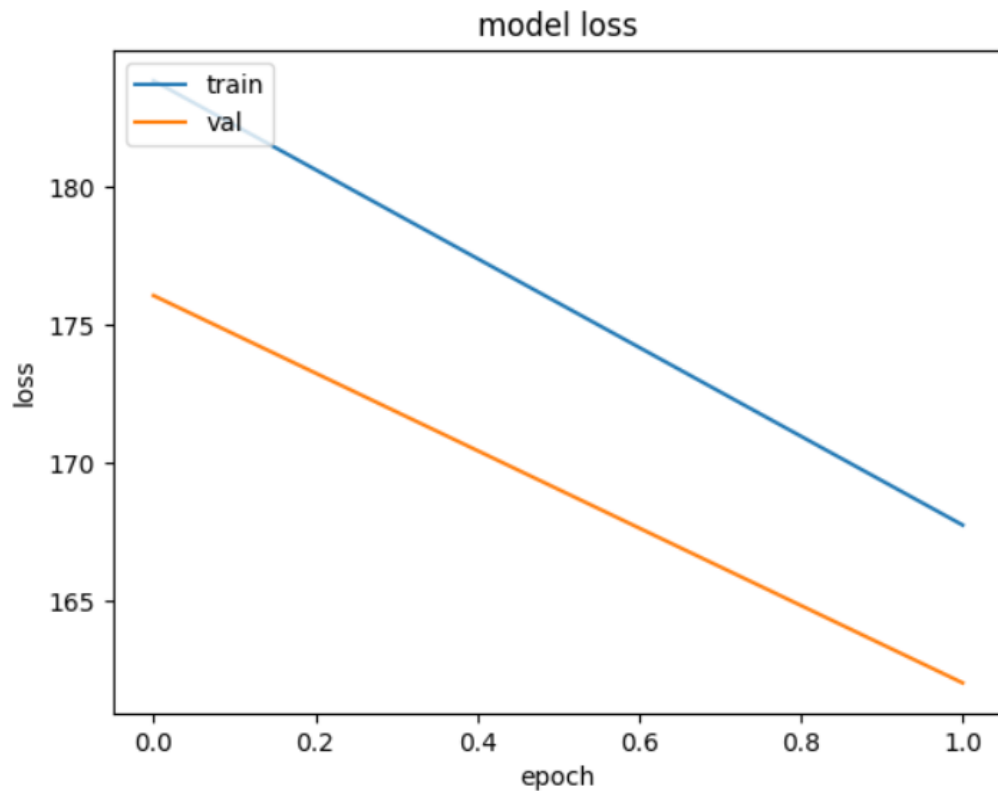## Initial Run:

Latent_dim: 12

Batch size: 64

Encoder Layers: 4 Conv2d + MaxPool2d layer and 3Dense layers (2 among them are mean and log_variance)

Decoder Layers: 3 dense layers, 5 Conv2dTranspose

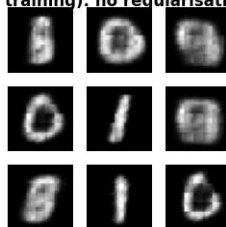Loss function = reconstruction_loss + beta * kl_divergence

Beta = 1

model loss

Reconstructed images (right) from the training-set after 2 epochs: no regularisation in the encoder, decoder, beta=1, latent_dim = 12

Reconstructed images (right) from the validation-set after 2 epochs: no regularisation in the encoder, decoder, beta=1, latent_dim = 12
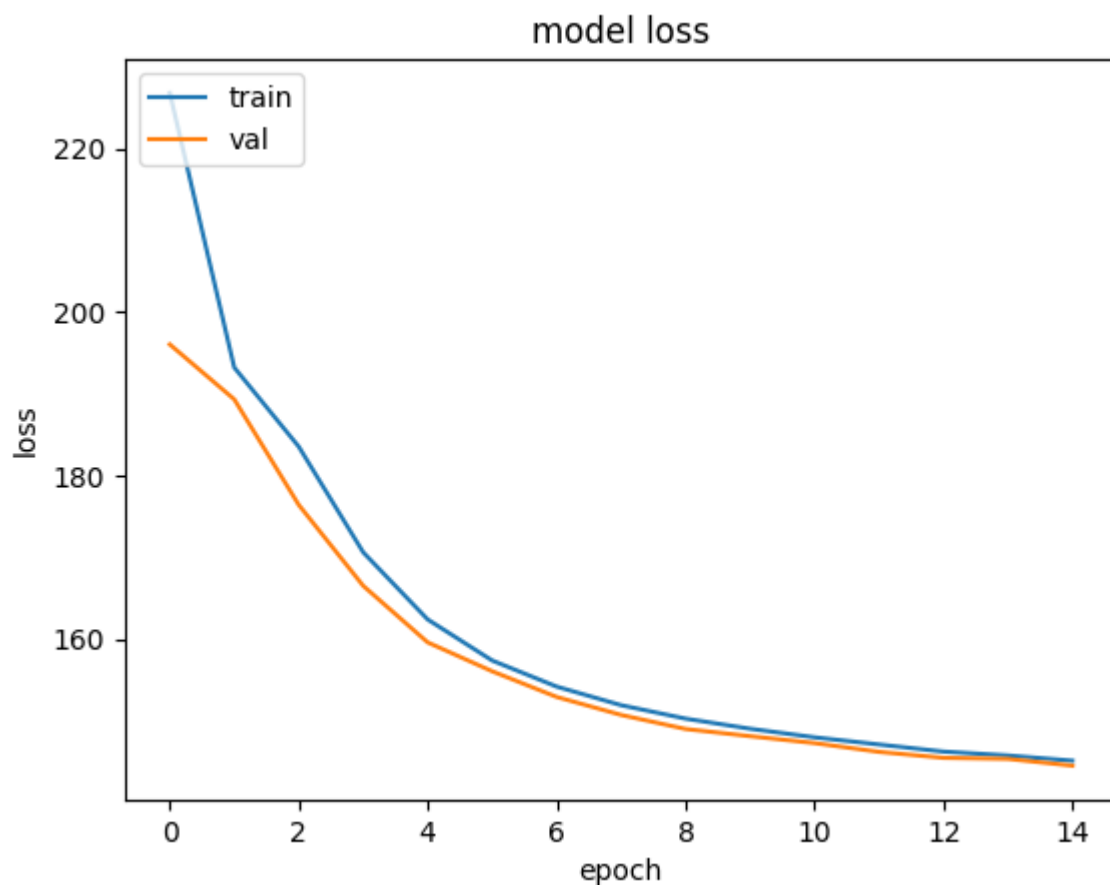

Some randomly generated images (after 2 epochs of training): no regularisation in the encoder, decoder, beta=11, latent_dim = 12

Run 2:

Latent_dim: 24

Epochs: 15

model loss

Reconstructed images (right) from the training-set after 15 epochs: no regularisation in the encoder, decoder, beta=1, latent_dim = 12

Reconstructed images (right) from the validation-set after 15 epochs: no regularisation in the encoder, decoder, beta=1, latent_dim = 12

Some randomly generated images (after 15 epochs of training): no regularisation in the encoder, decoder, beta=1, latent_dim = 12
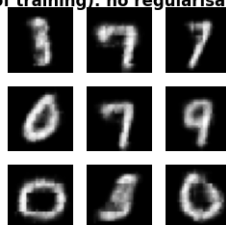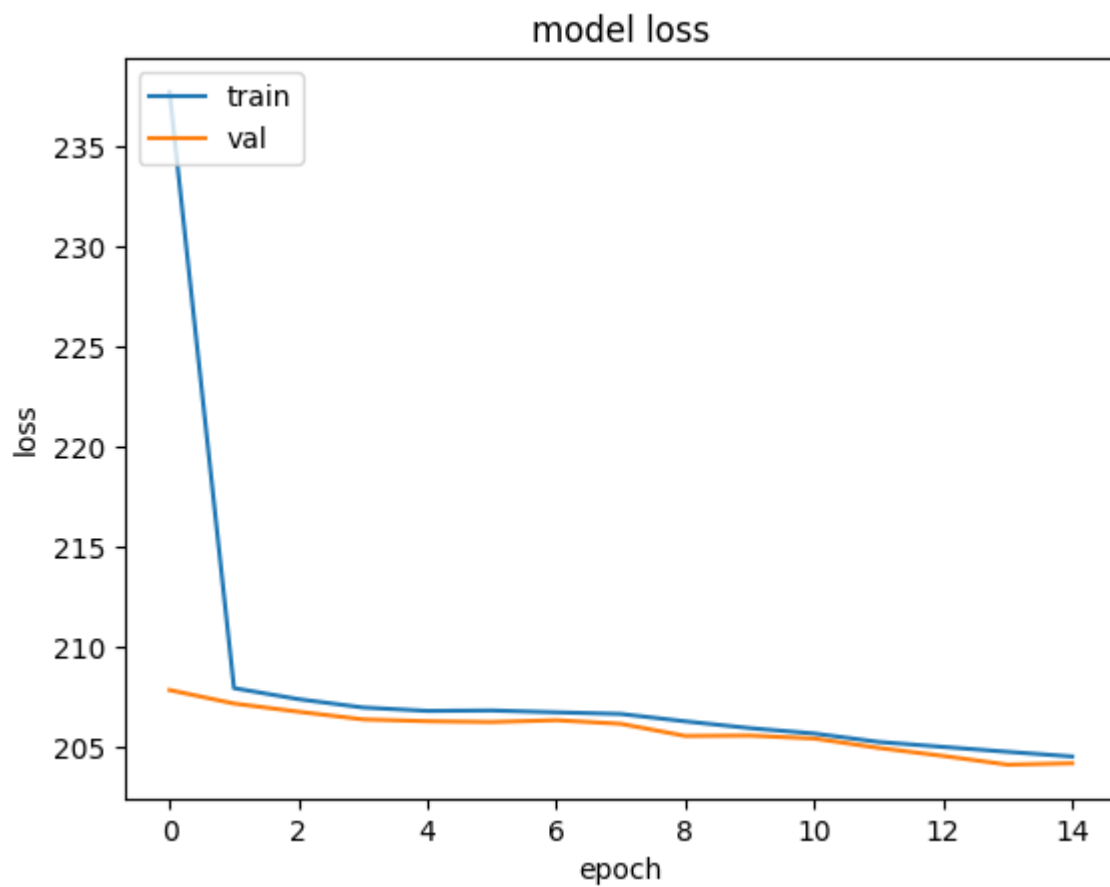

Run 3:

Beta = 18

Conv2d layer: no of filter changed
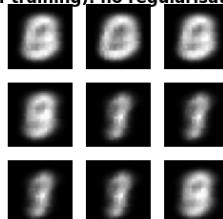
model loss

Reconstructed images (right) from the training-set after 15 epochs: no regularisation in the encoder, decoder, beta=18, latent_dim = 12

Reconstructed images (right) from the validation-set after 15 epochs: no regularisation in the encoder, decoder, beta=18, latent_dim = 12
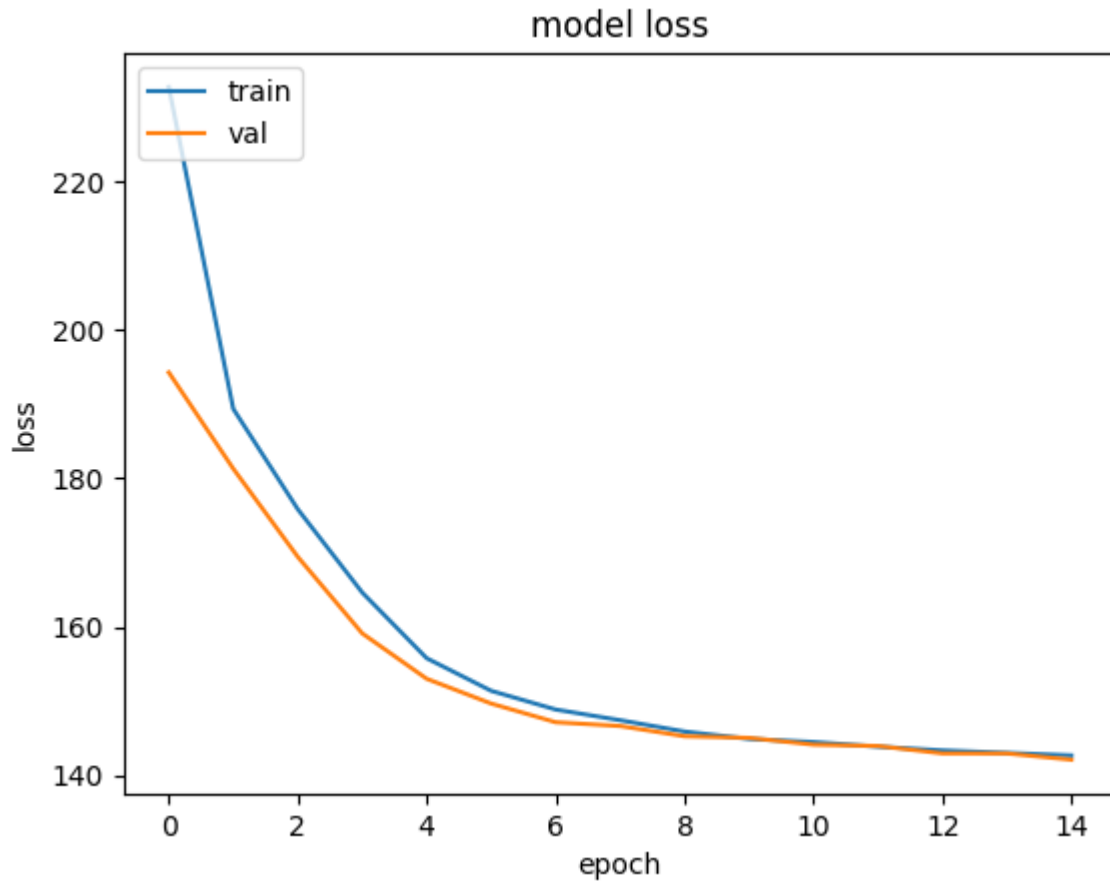

Some randomly generated images (after 15 epochs of training): no regularisation in the encoder, decoder, beta=18, latent_dim = 12

Run 4:

Beta = 0.81

Extra convolution layers added

model loss

Reconstructed images (right) from the training-set after 15 epochs: no regularisation in the encoder, decoder, beta=0.81, latent_dim = 12

Reconstructed images (right) from the validation-set after 15 epochs: no regularisation in the encoder, decoder, beta=0.81, latent_dim = 12

Some randomly generated images (after 15 epochs of training): no regularisation in the encoder, decoder, beta=0.81, latent_dim = 12

References:

- Beta_VAE.ipynb Notebook
  https://wilpbitspilaniacin0.sharepoint.com/:u:/r/sites/DeepLearningS2-
  23_SSZG529Regular/Shared%20Documents/General/Beta_VAE.ipynb?csf=1&web=1
  &e=B7252e
- Assignment Description from Lecture Recording at 1:56
  https://wilpbitspilaniacin0.sharepoint.com/:v:/r/sites/DeepLearningS2-
  23_SSZG529Regular/Shared%20Documents/General/Recordings/Deep%20Learning
  %20(S2-23_SSZG529)(Regular)-20240416_191100-
  Meeting%20Recording.mp4?csf=1&web=1&e=SjTlwq&nav=eyJyZWZlcnJhbEluZm8iOn
  sicmVmZXJyYWxBcHAiOiJTdHJlYW1XZWJBcHAiLCJyZWZlcnJhbFZpZXciOiJTaGFyZURpY
  WxvZy1MaW5rIiwicmVmZXJyYWxBcHBQbGF0Zm9ybSI6IldlYiIsInJlZmVycmFsTW9kZSI6
  InZpZXcifSwicGxheWJhY2tPcHRpb25zIjp7InN0YXJ0VGltZUluU2Vjb25kcyI6Njk5Nn1
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- Keras https://keras.io/api/
- Python Pandas Docs
  https://pandas.pydata.org/docs/reference/index.html#api
- Matplotlib Docs https://matplotlib.org/stable/api/index.html
- Tensorflow Keras Docs
  https://www.tensorflow.org/api_docs/python/tf/keras