



# INITIAL STUDY OF BATIK GENERATION USING VARIATIONAL AUTOENCODER

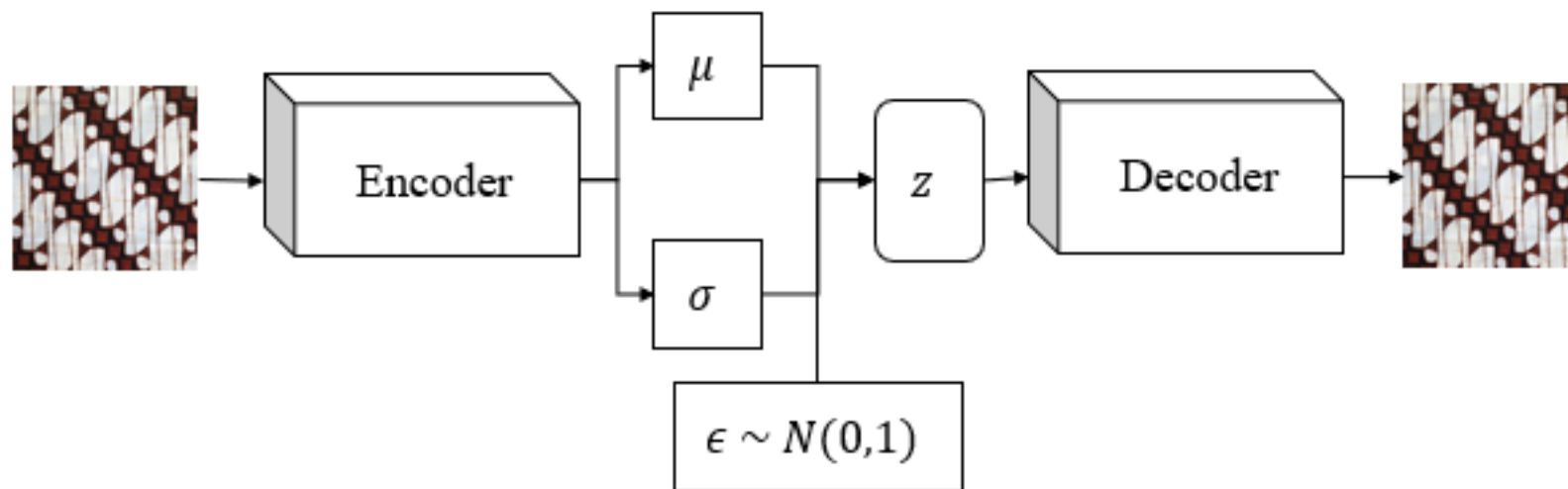
**Aditya Firman Ihsan**

**Telkom University**

# INTRODUCTION

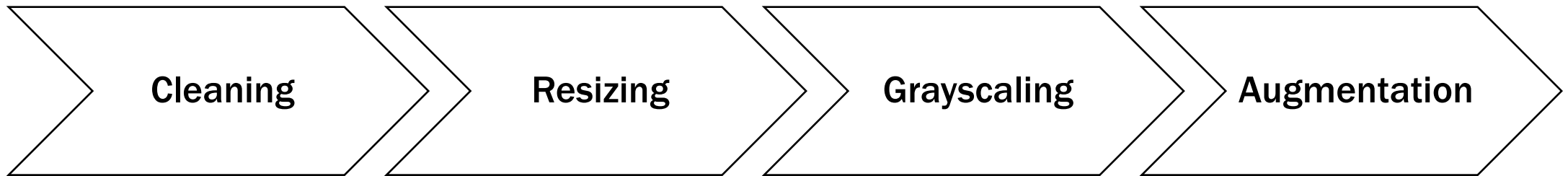
- Deep convolutional neural network become more capable to image generation task.
- One of the generative models, Variational Autoencoder, is quite powerful on generating images.
- Batik, as a cultural art in Indonesia, has potentialities to various forms of computer vision tasks.
- Comprehensive study on VAE implementation to Batik dataset is needed for further development on Batik pattern generation task

# METHODOLOGY



Encoder layers	Kernel	# filters	Stride	Decoder layers
Convolution	3x3	32	2	Transposed Convolution
	3x3	64	2	
	3x3	128	2	

# DATA PREPROCESSING

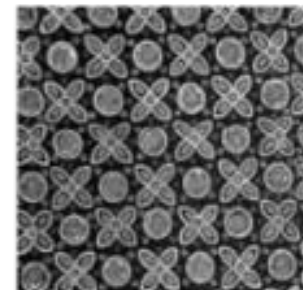
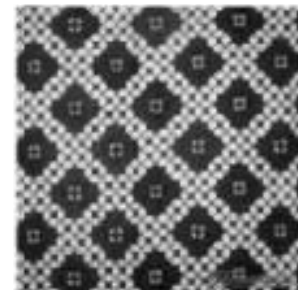
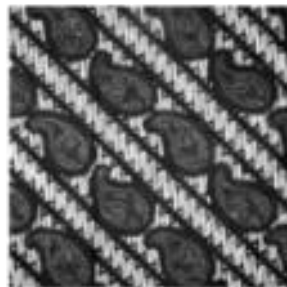
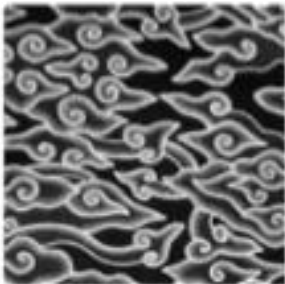
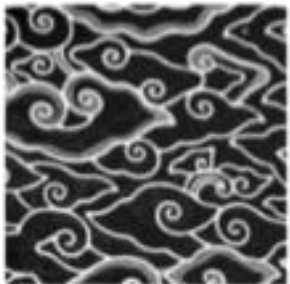
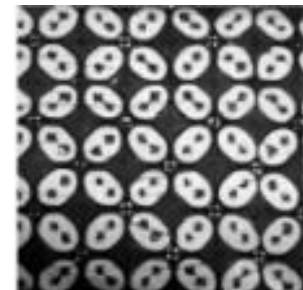
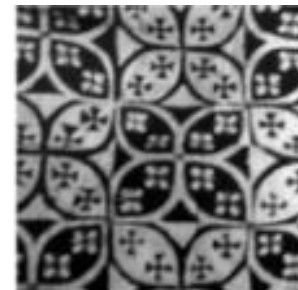
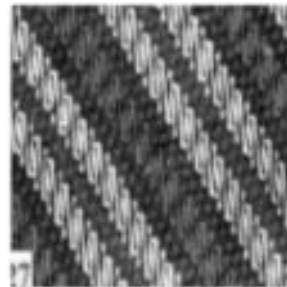
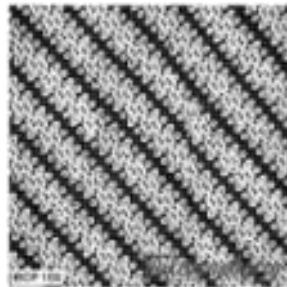
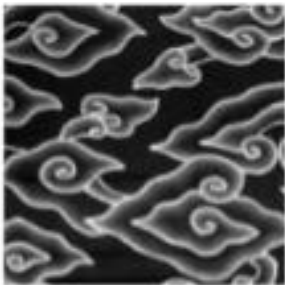


Remove image with mixed pattern, low-resolution, tilted viewpoint, visually-considered outlier

Resize various sized dataset to 200x200 sized image dataset and then turn each one to grayscale image

Augment dataset with random crop and random flip transformation.

# SAMPLE DATASET



Megamendung

Lereng

Kawung

# BASE CASE

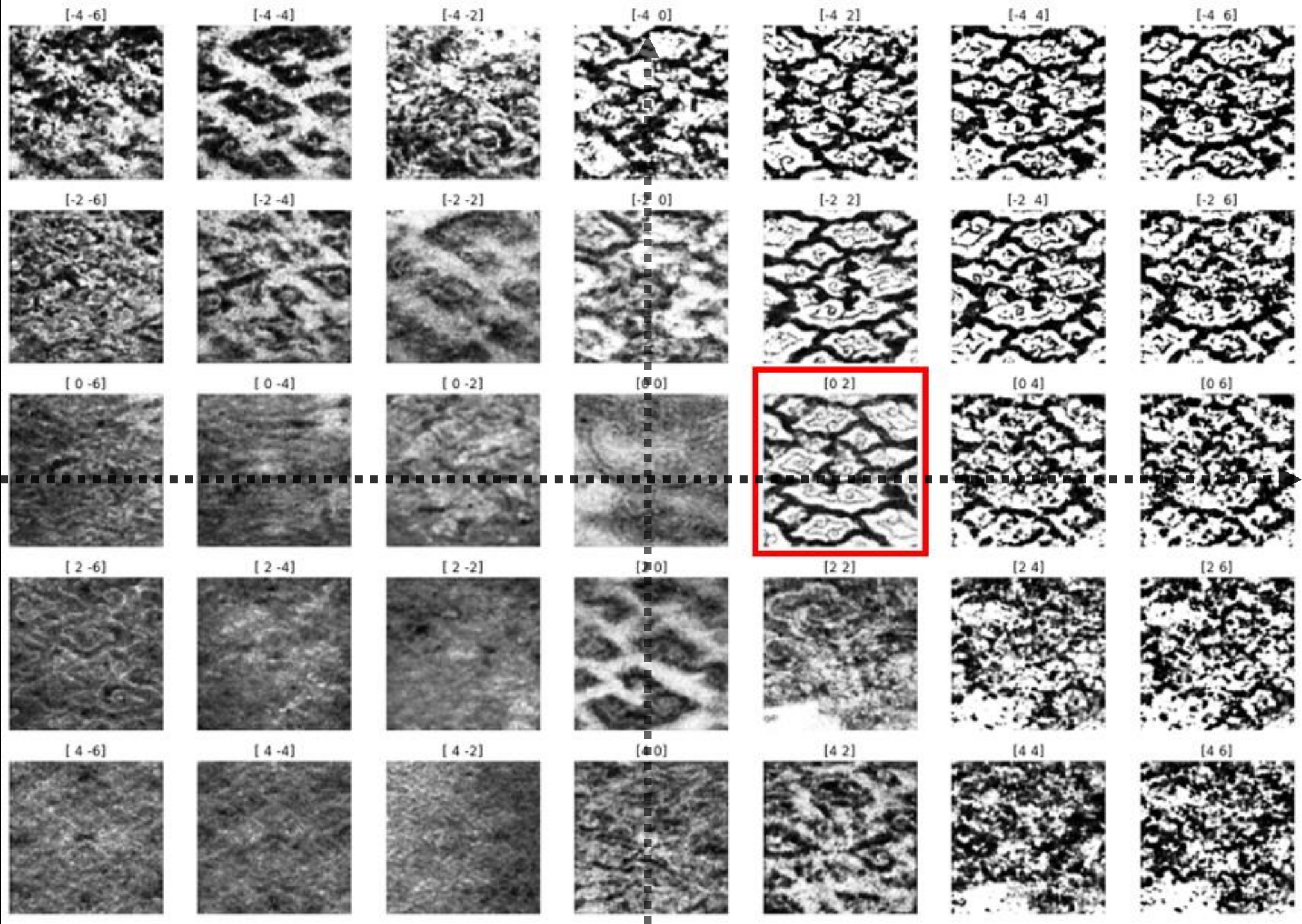
**Latent Space: 2-Dimensional**

**Batch size: 64**

**Loss Function: Binary Crossentropy**

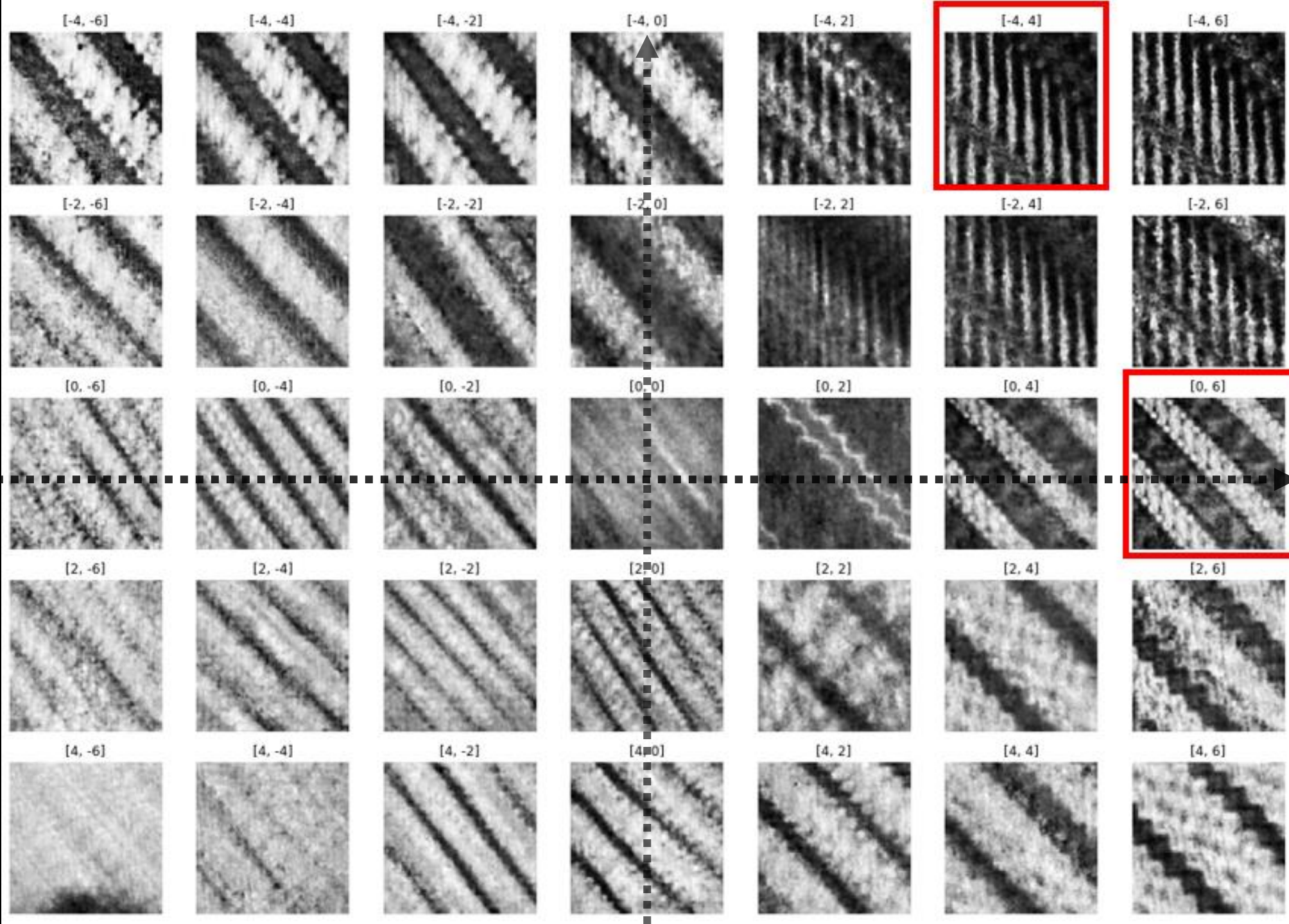


# RESULT - RECONSTRUCTION BATIK MEGAMENDUNG



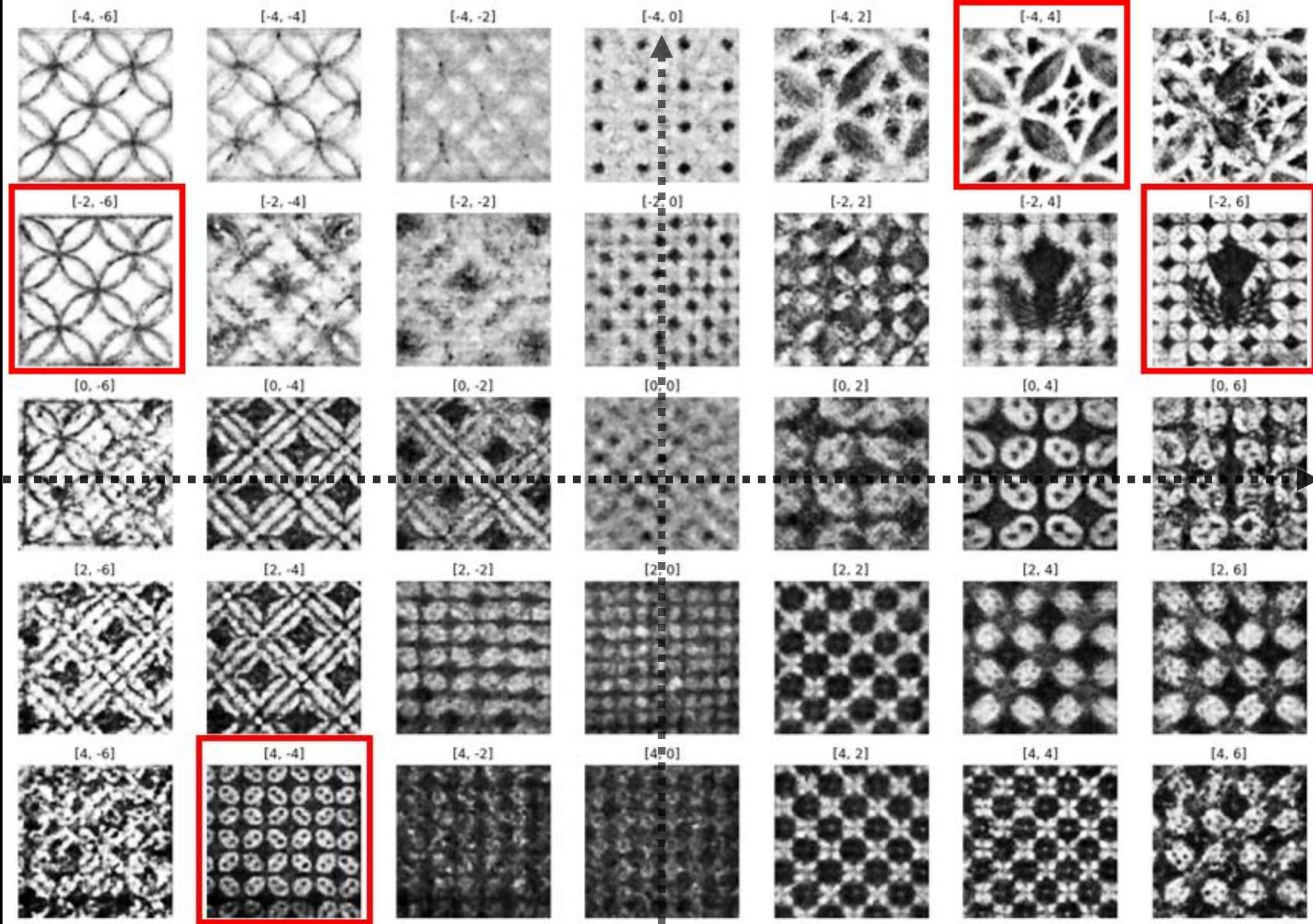


# RESULT - RECONSTRUCTION BATIK LERENG

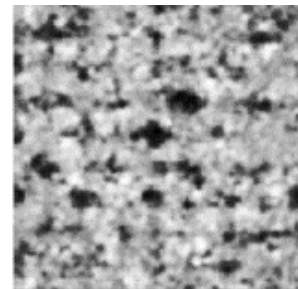
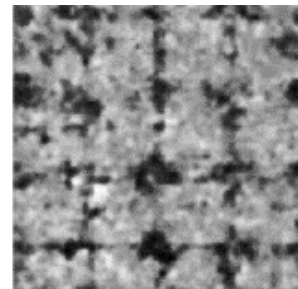
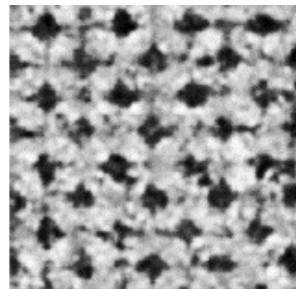
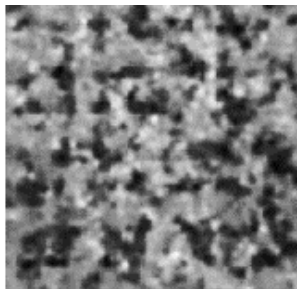




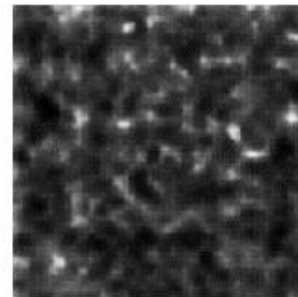
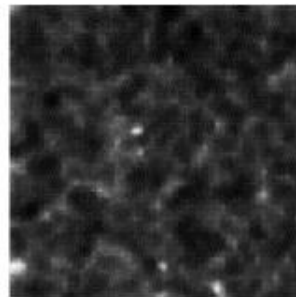
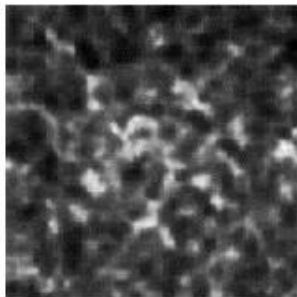
# RESULT - RECONSTRUCTION BATIK KAWUNG



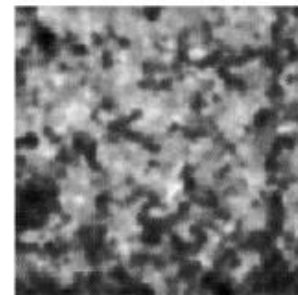
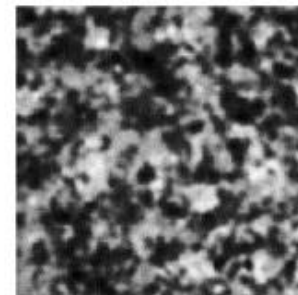
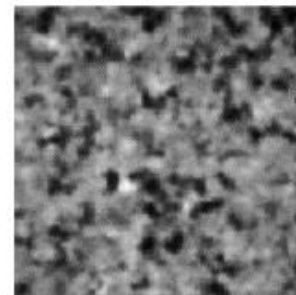
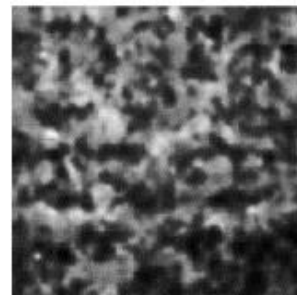
# RESULT: HIGHER DIMENSION OF LATENT SPACE



4-Dimension

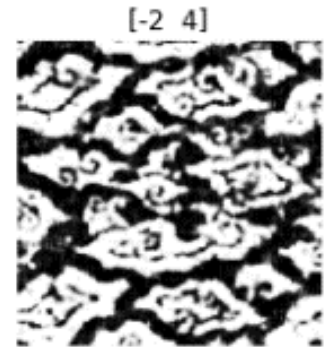
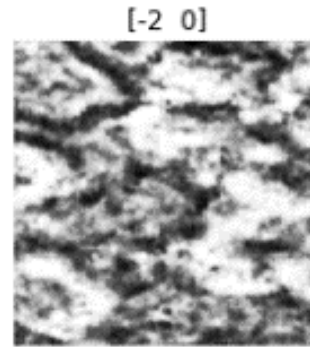
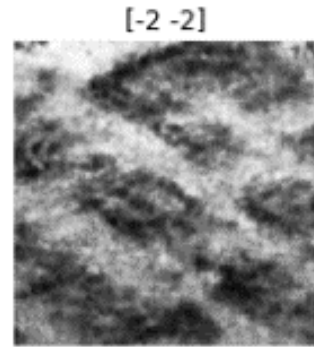


8-Dimension

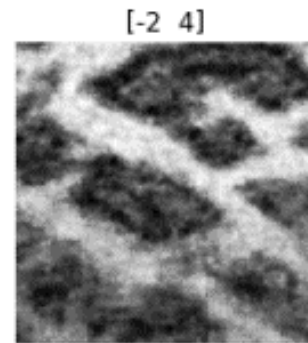
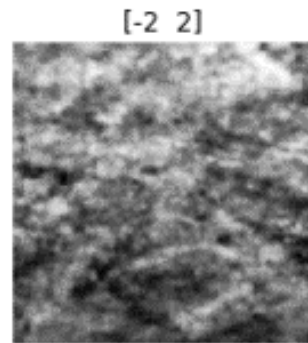
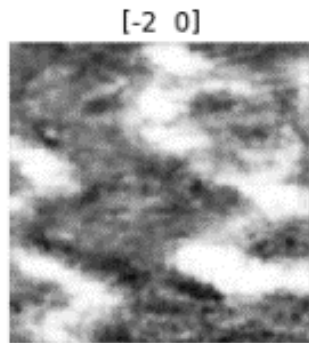
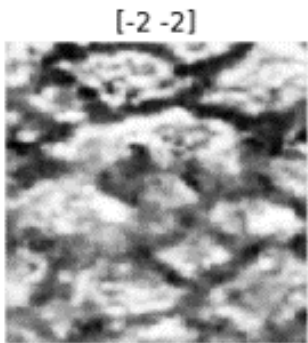


16-Dimension

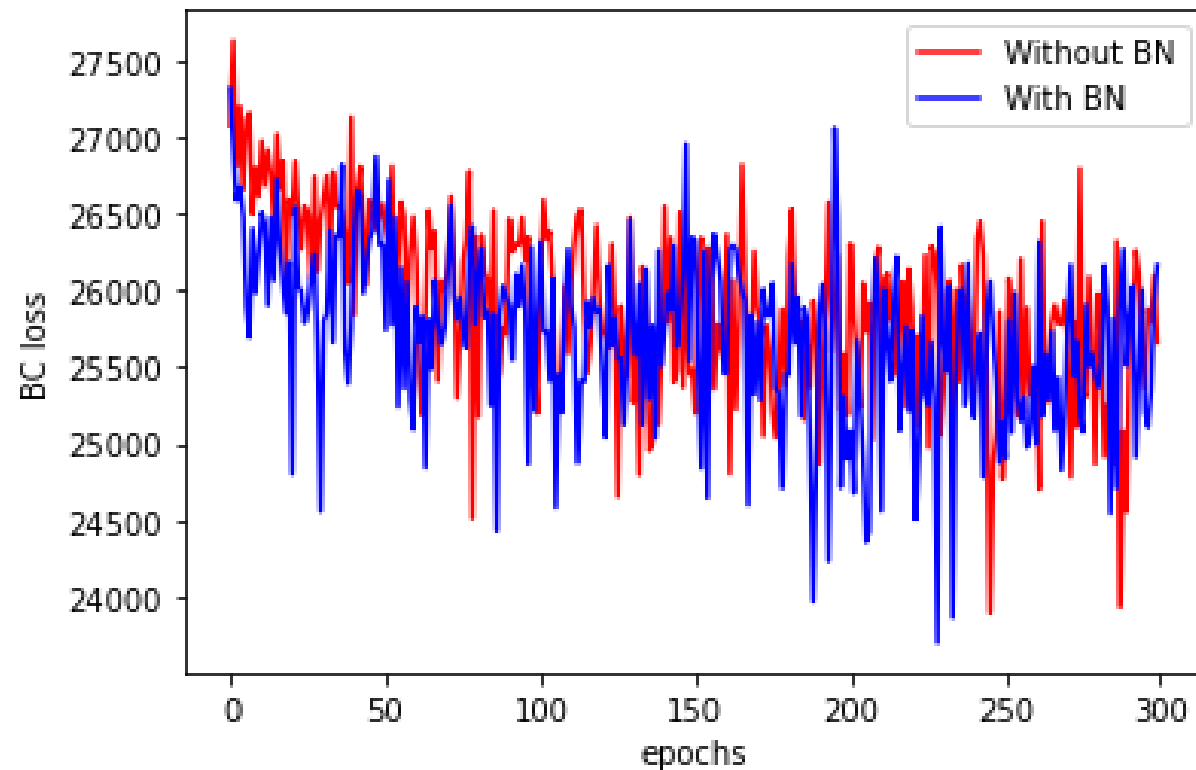
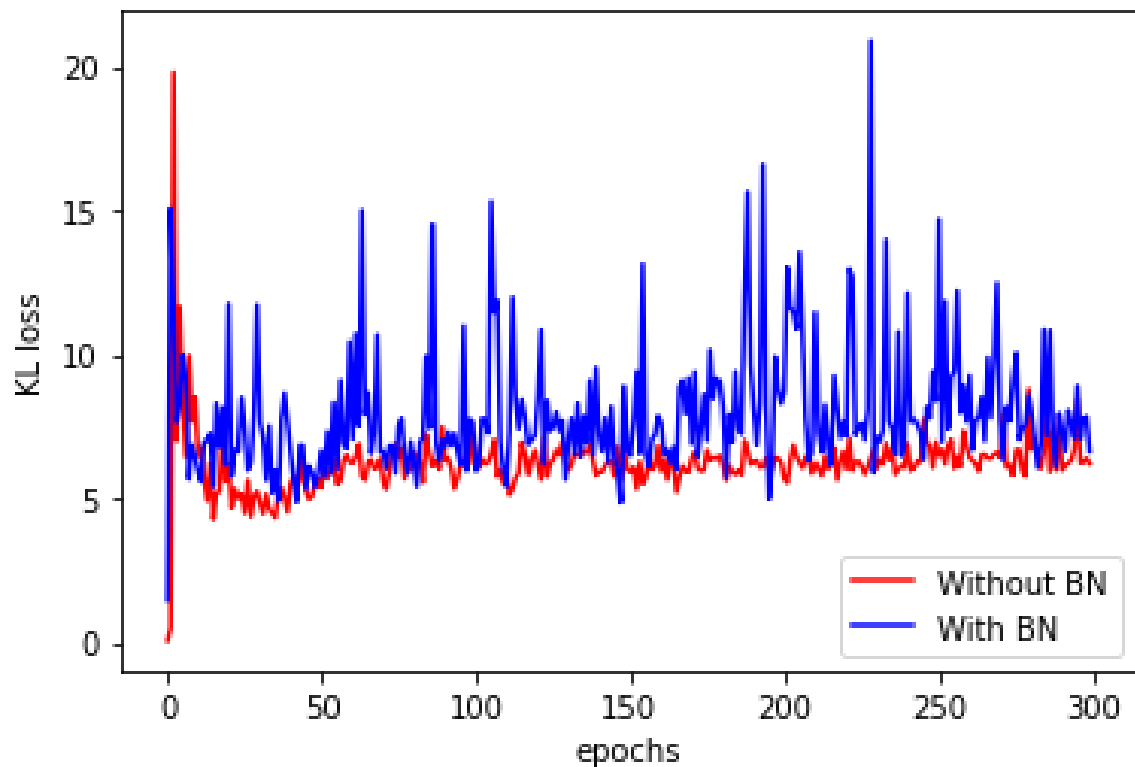
**Without  
Batch-Norm**



# **RESULT: EFFECT OF BATCH NORMALIZATION**



**With  
Batch-Norm**



**RESULT:**  
**EFFECT OF BATCH NORMALIZATION**

# CONCLUSION

- VAE has been implemented to Batik dataset and successfully reconstruct some similar patterns.
- VAE acted as an pattern embedder on latent space, with smooth transition between “classes” of Batik patterns.
- The whole atlas of image embedding is learned without having any specific transformation that can map a single image to a single point in the atlas.
- Higher latent dimension gives more abstract yet unrecognizable reconstruction.
- Reconstruction without batch normalization gives better results.
- For future research, recent development and modification of VAE can be applied. Other Batik type can also be used. Further comparison analysis with GAN is also needed.



**THANK YOU**