TP5

Deep Learning

Autoencoders

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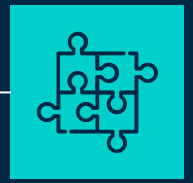
Rossi, Victoria

CONTENIDO



01: Autoencoder

- Implementación de un autoencoder básico
- Denoising Autoencoder

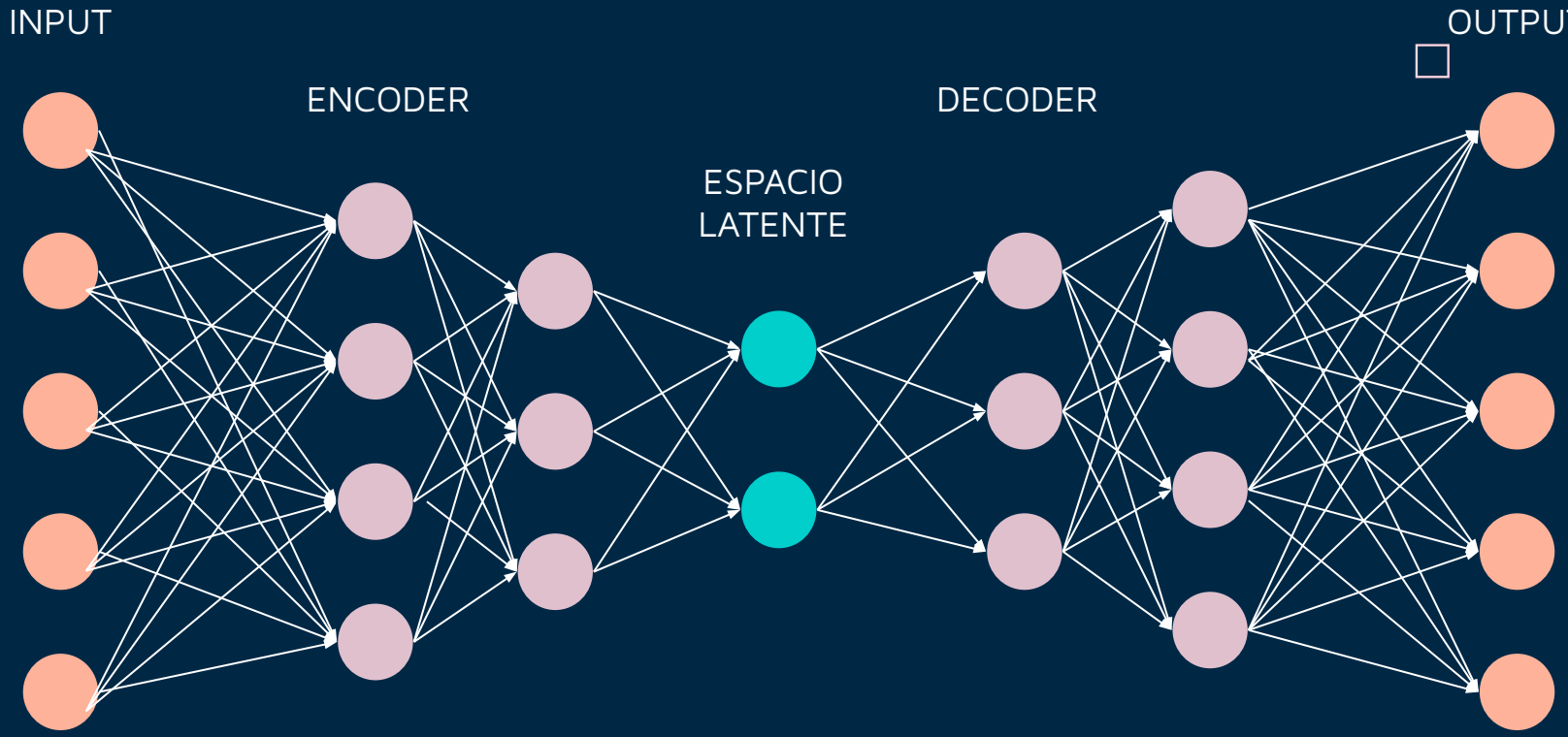
02: Variación del autoencoder

- Conjunto de datos nuevos
- Esquema variacional

EJERCICIO 1

ARQUITECTURA

ARQUITECTURA



TECNICAS DE OPTIMIZACION

OPTIMIZACION

01

MOMENTUM

02

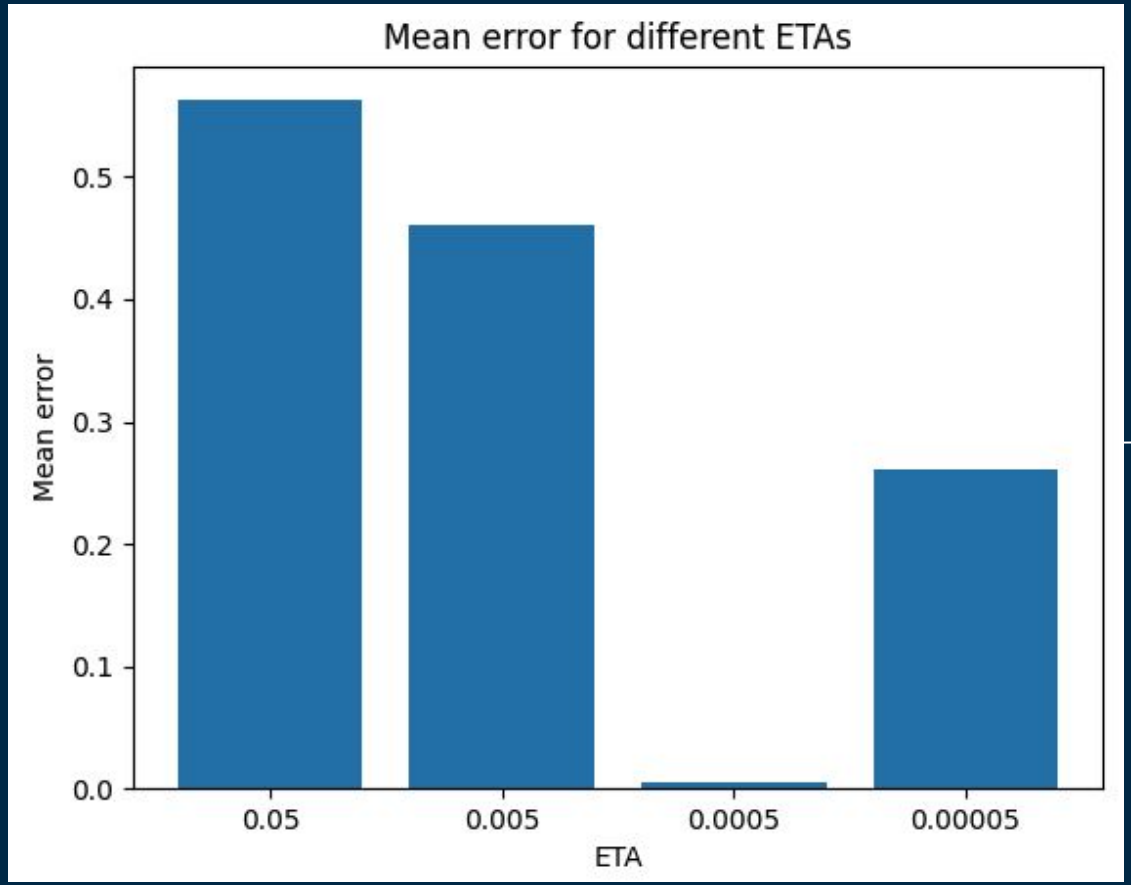
NORMALIZACIÓN DE DATOS

03

INICIALIZACIÓN DE CAPAS

¿Qué parámetros vamos a utilizar?

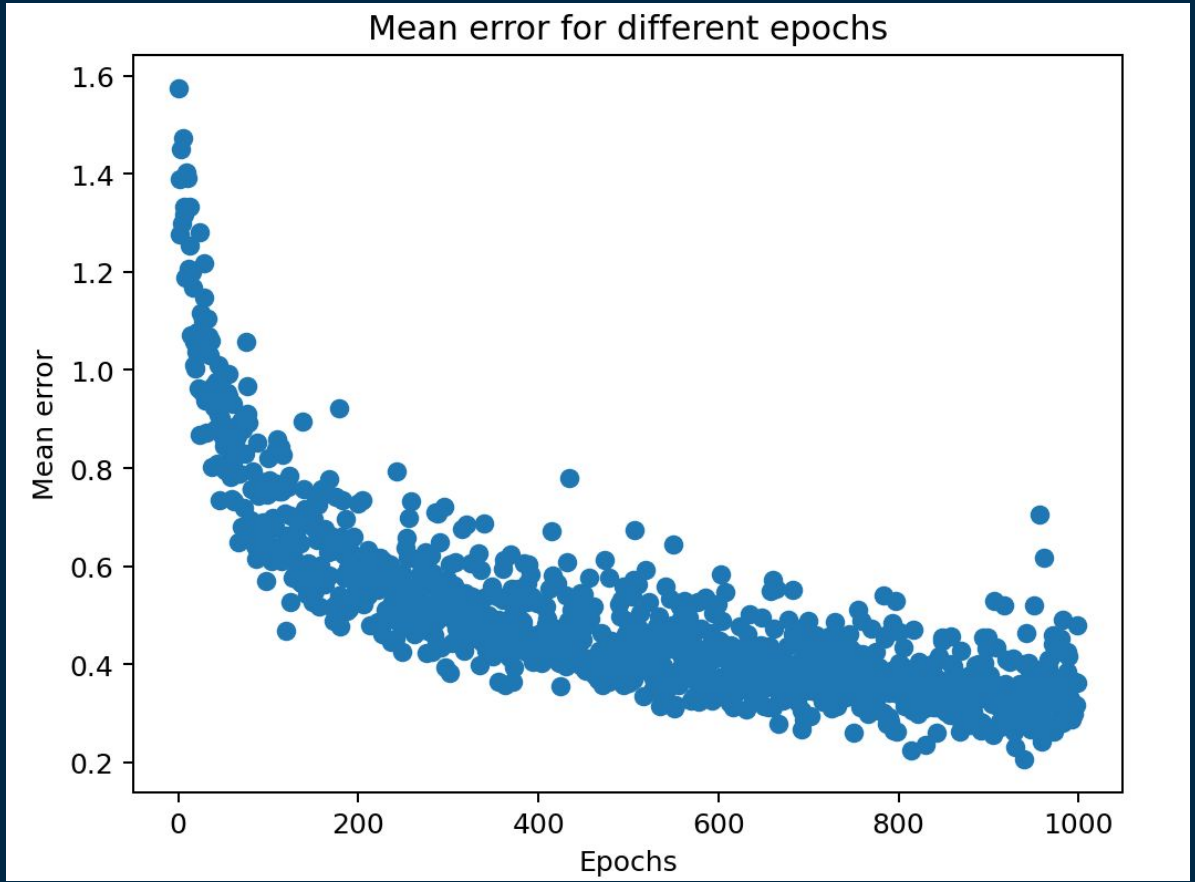
ANÁLISIS ETA con epochs=10000 y arquitectura 35-20-2-20-35



ETA = 0.0005

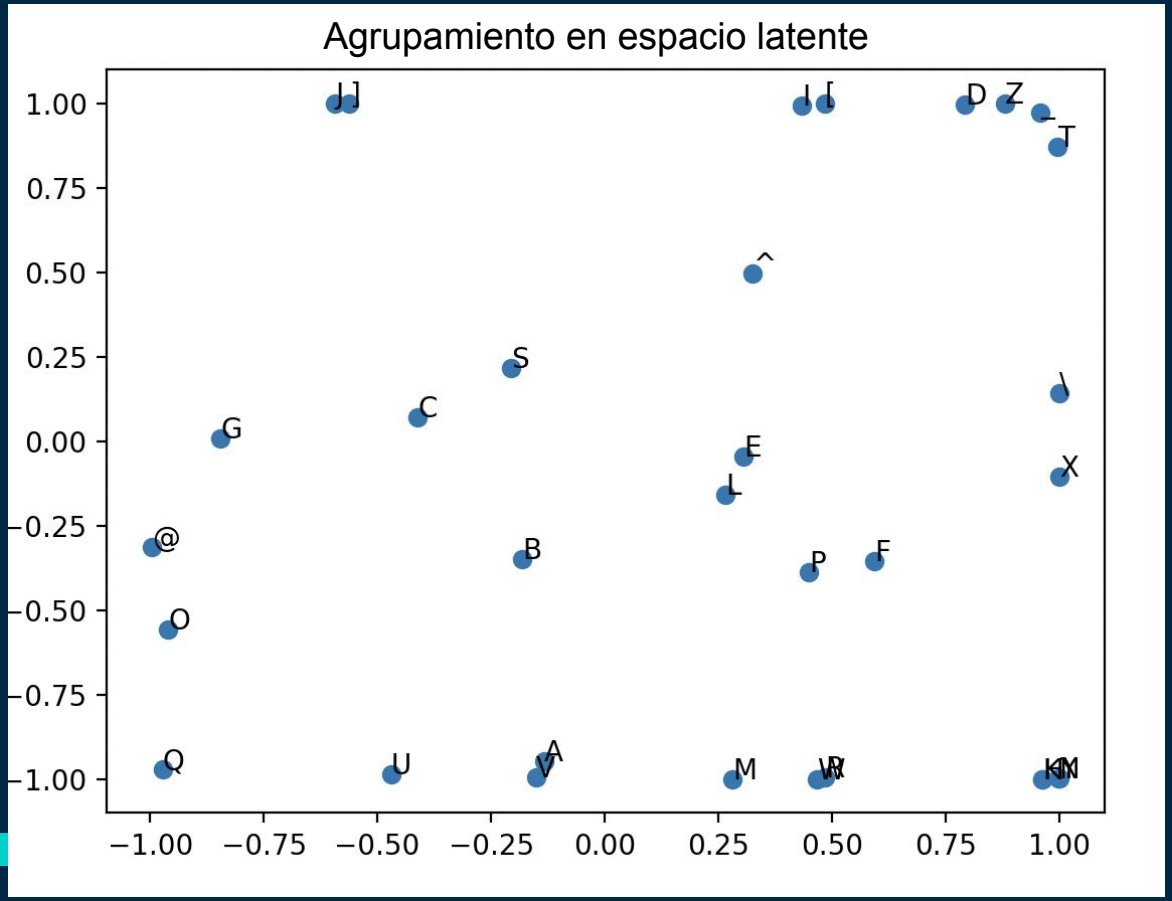
ANÁLISIS POR ÉPOCAS

eta = 0.0005
Momentum = true



¿Cuál es la arquitectura óptima?

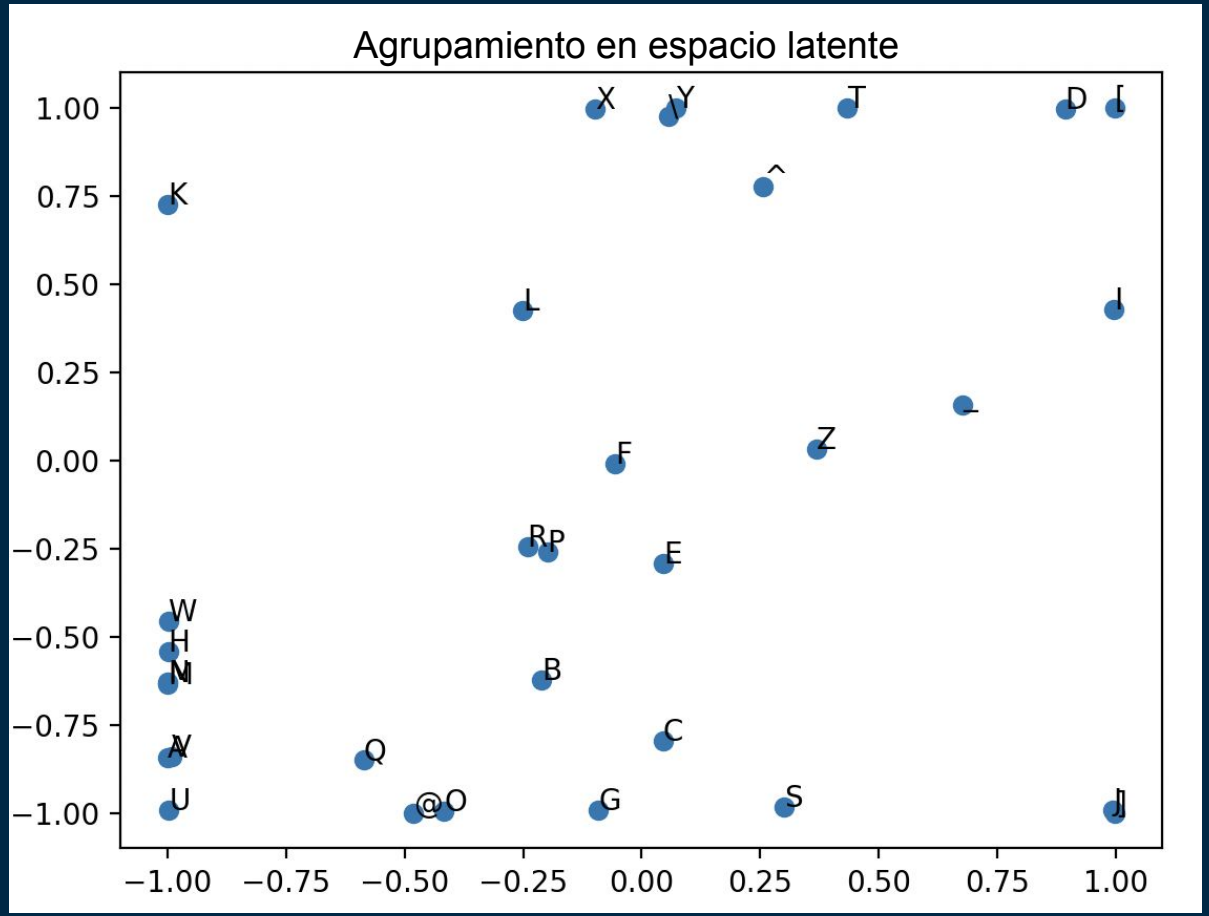
ARQUITECTURA 35-2-35



Eta = 0.0005
Epocas = 1000
Momentum = True

Error medio promedio: 0.526

ARQUITECTURA 35-20-2-20-35

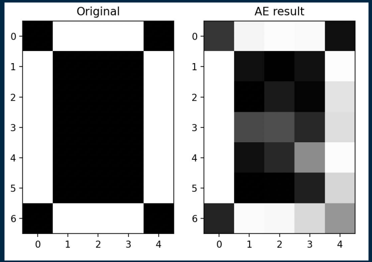


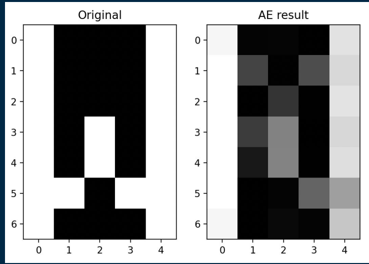
Eta = 0.0005
Epocas = 1000
Momentum = True

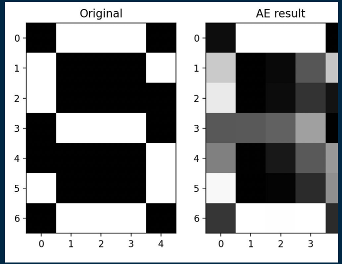
Error medio promedio: 0.383

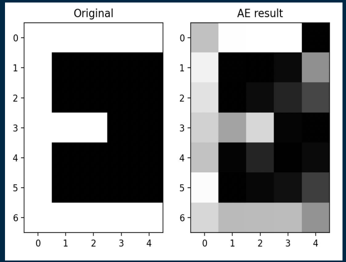
ARQUITECTURA 35-20-2-20-35

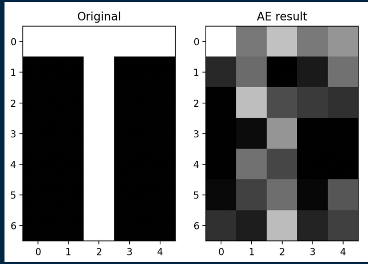
Eta = 0.0005
Epocas = 1000
Momentum = True

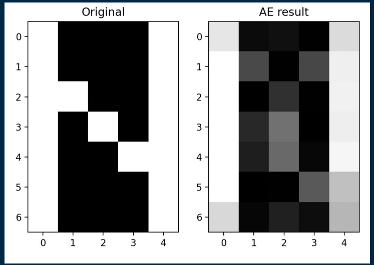


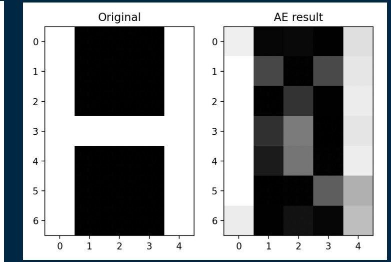


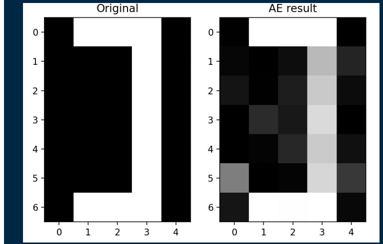


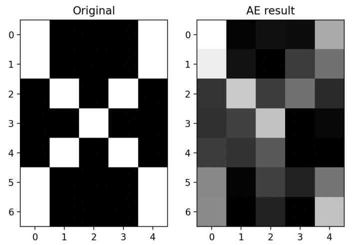


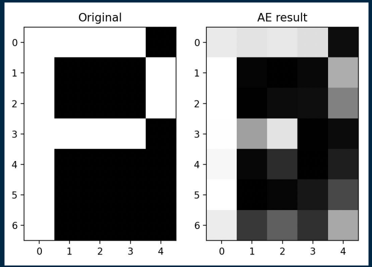


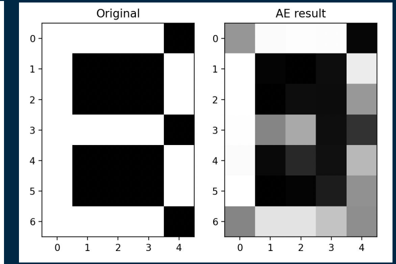


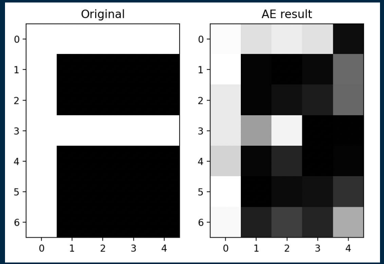


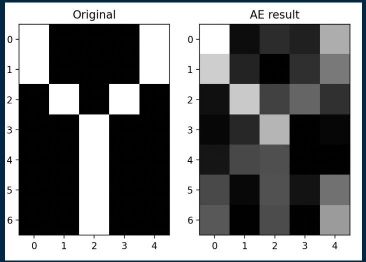




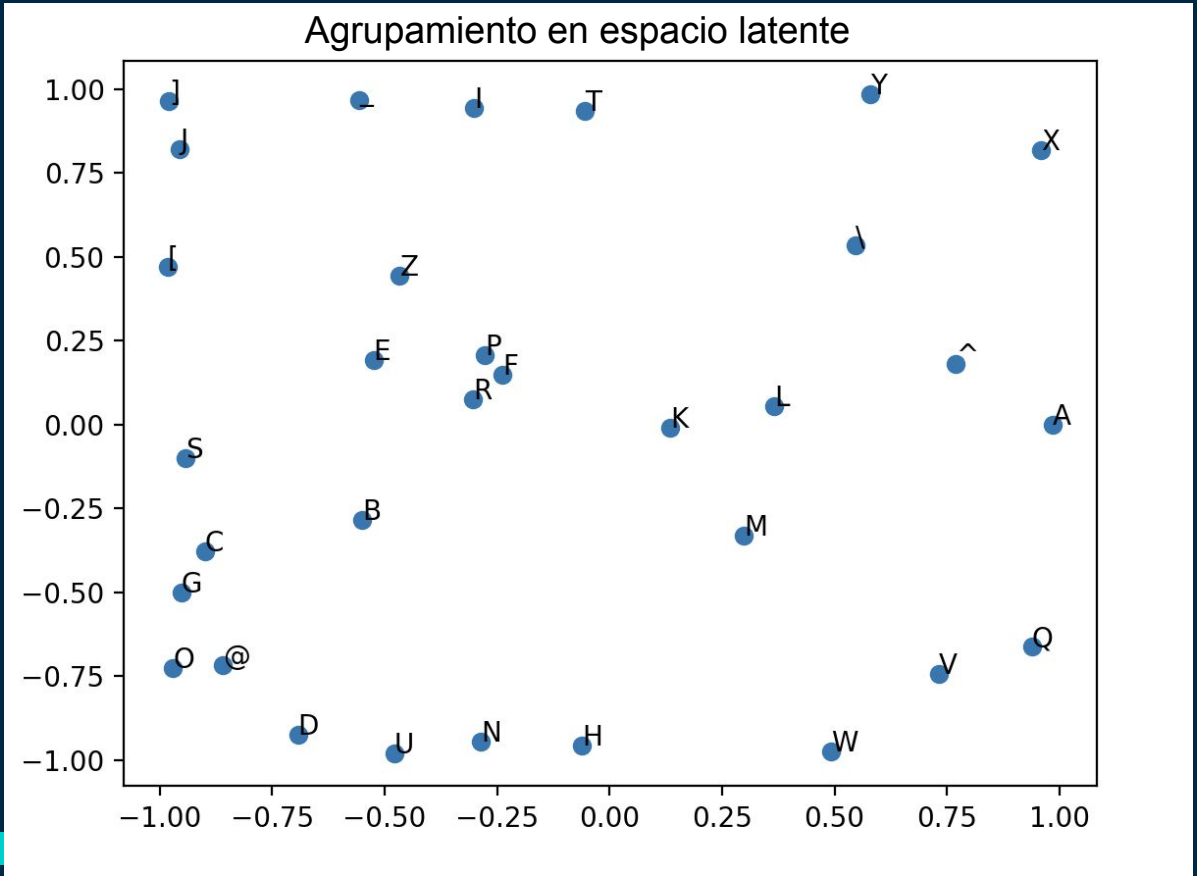








ARQUITECTURA 35-20-10-2-10-20-35

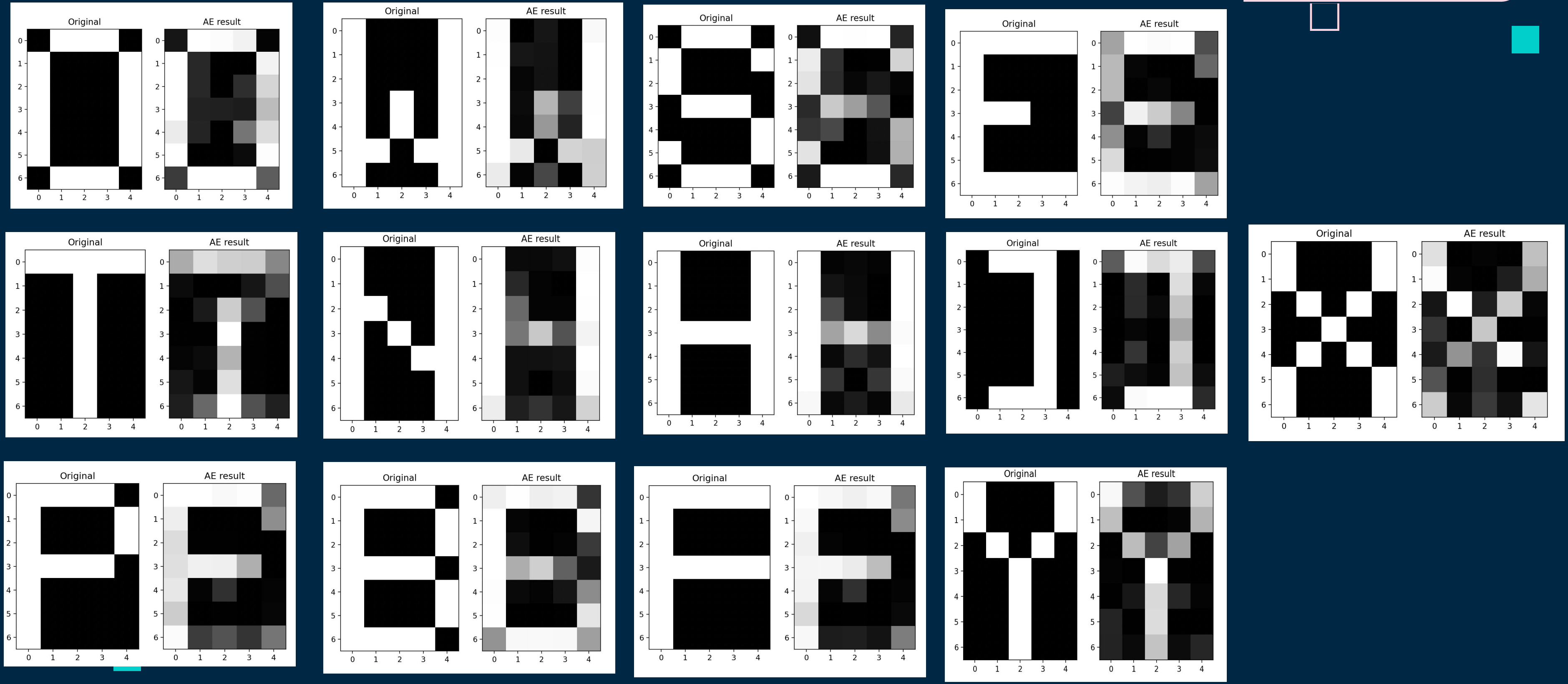


Eta = 0.0005
Epocas = 1000
Momentum = True

Error medio promedio: 0.293

ARQUITECTURA 35-20-10-2-10-20-35

Eta = 0.0005
Epocas = 1000
Momentum = True



OBSERVACION

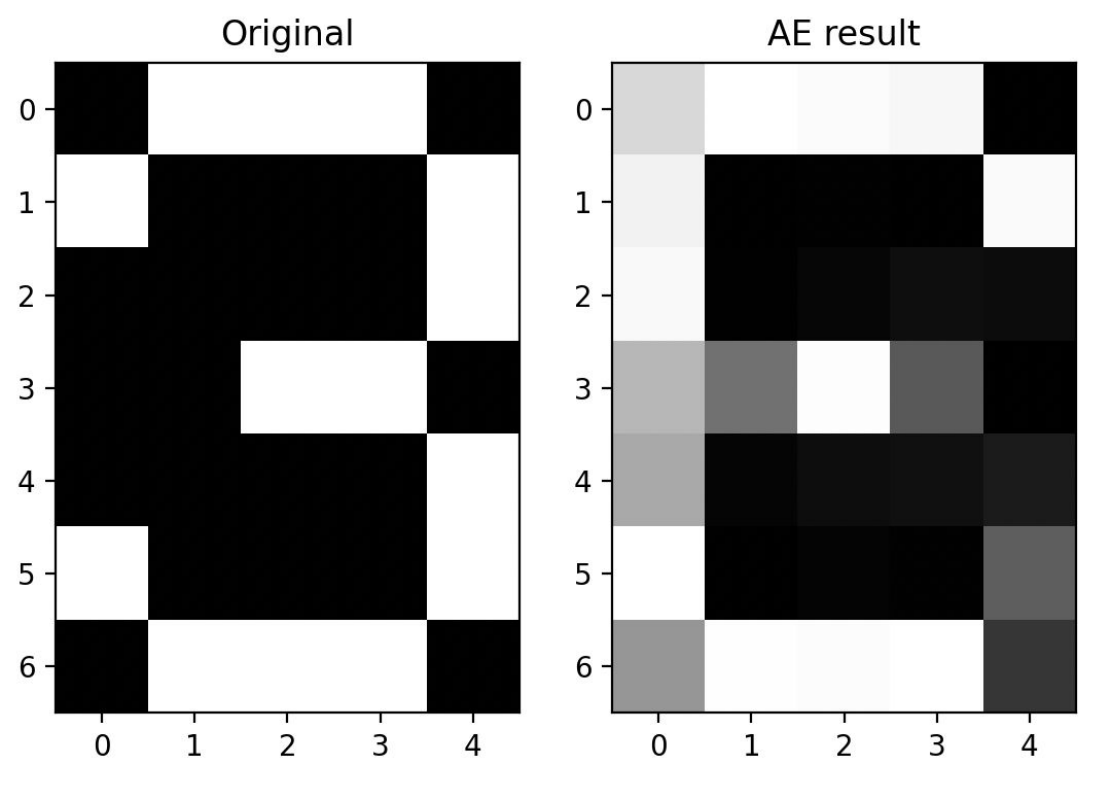
Con menor error de reconstrucción, el espacio latente se vuelve menos representativo, pero las imágenes reconstruidas son más nítidas

Utilizaremos la arquitectura **35-20-10-2-10-20-35** en denoising

GENERATE NEW CHARACTER

ARQUITECTURA 35-20-10-2-10-20-35

Eta = 0.0005
Epocas = 1000
Momentum = True



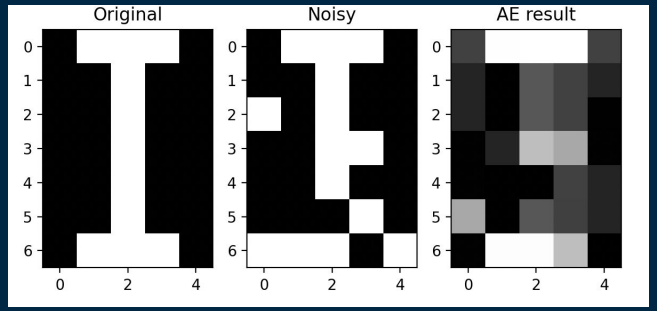
Error medio: 0.66

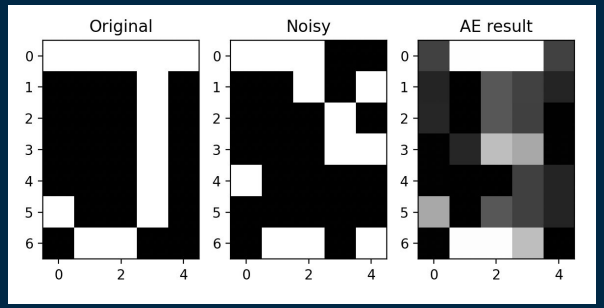
DENOISING AUTOENCODER

ARQUITECTURA 35-20-10-2-10-20-35

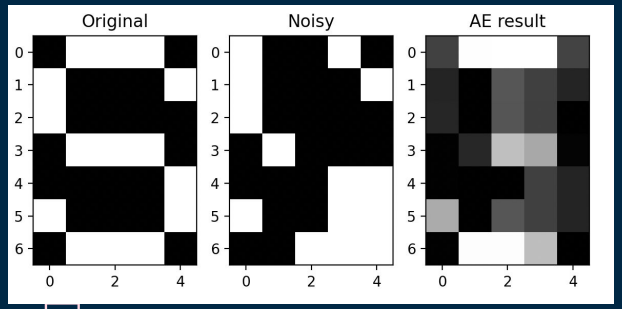
Noise = 0.2

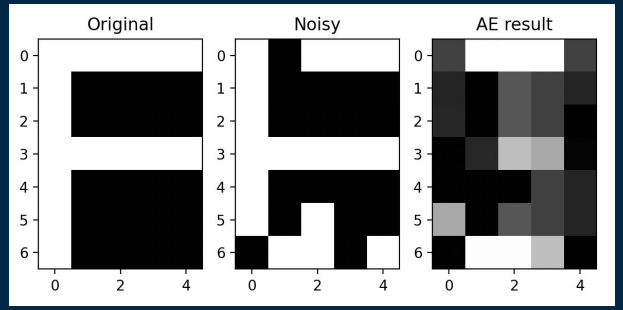
Eta = 0.0005
Epocas = 1000
Momentum = True

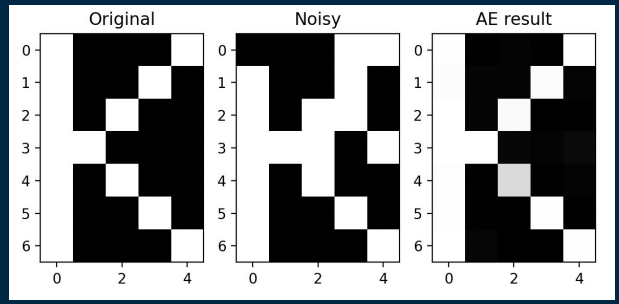




Error medio promedio: 0.573



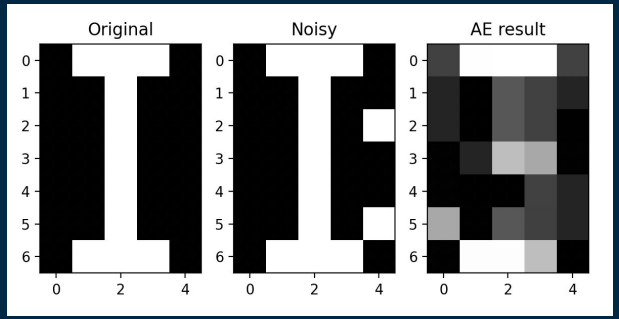


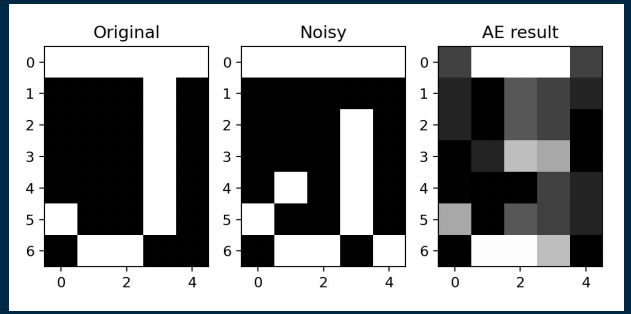


ARQUITECTURA 35-20-10-2-10-20-35

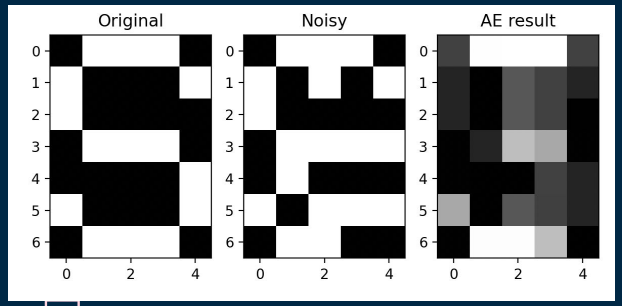
Noise = 0.05

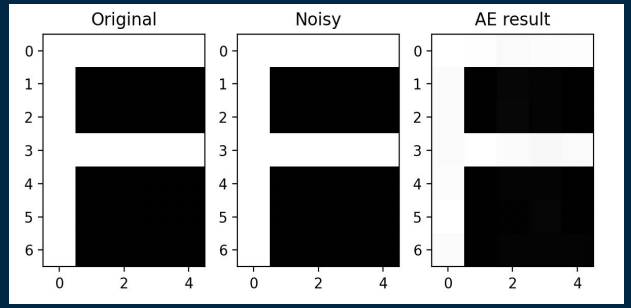
Eta = 0.0005
Epocas = 1000
Momentum = True

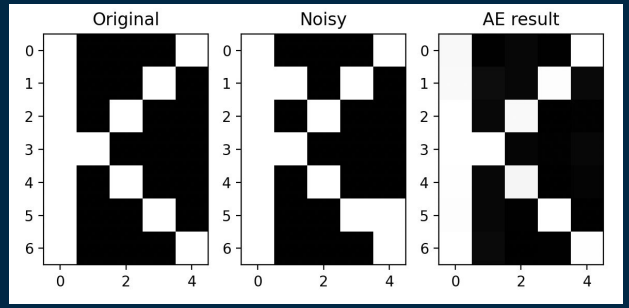




Error medio promedio: 0.33



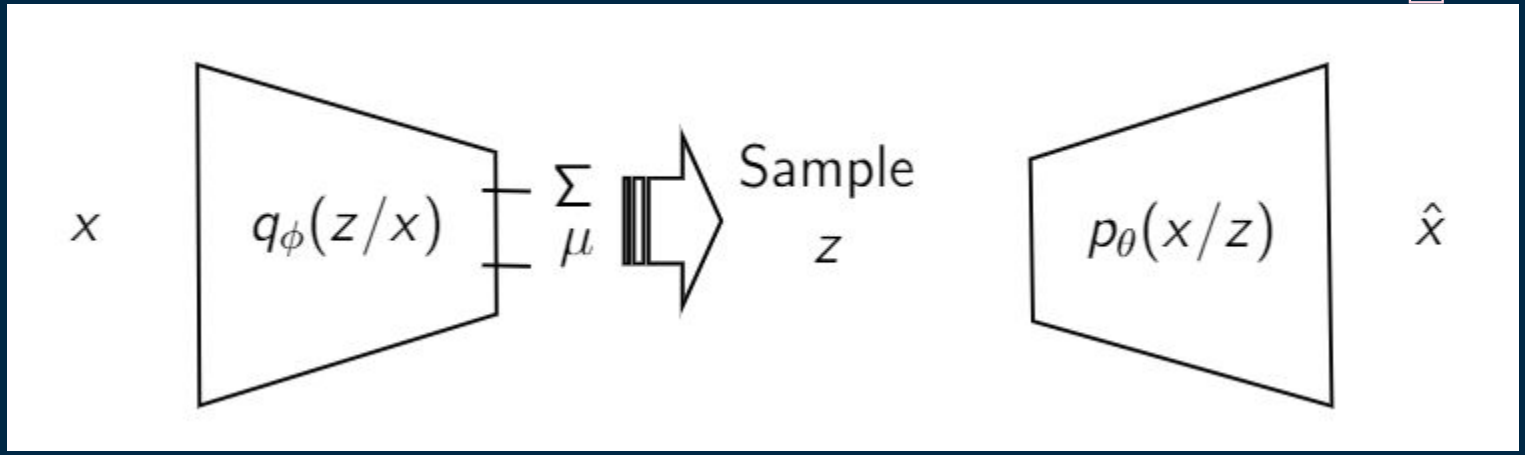




CONCLUSIONES

Ejercicio 2

AUTOENCODER VARIACIONAL



$$-\mathcal{L} = -\underbrace{\mathbb{E}_{q(z)} \log p(x/z)}_{\text{Error de reconstrucción}} + \underbrace{KL(q(z)||p(z))}_{\text{Término regularizador}}$$

$$z = h(x) = \epsilon \odot \Sigma(x) + \mu(x)$$

AUTOENCODER VARIACIONAL

- Busca regularizar el entrenamiento
  - *Continua*
  - *Completa*
- Codifica el input con distribución normal a lo largo del espacio latente
- Problema de varianza *muy chica* y/o distribuciones con medias *lejanas* en espacio latente
  - Regularizar matriz de covarianza y la media de lo retornado por el encoder

PARAMETROS A UTILIZAR

OPTIMIZACION

- ADAM

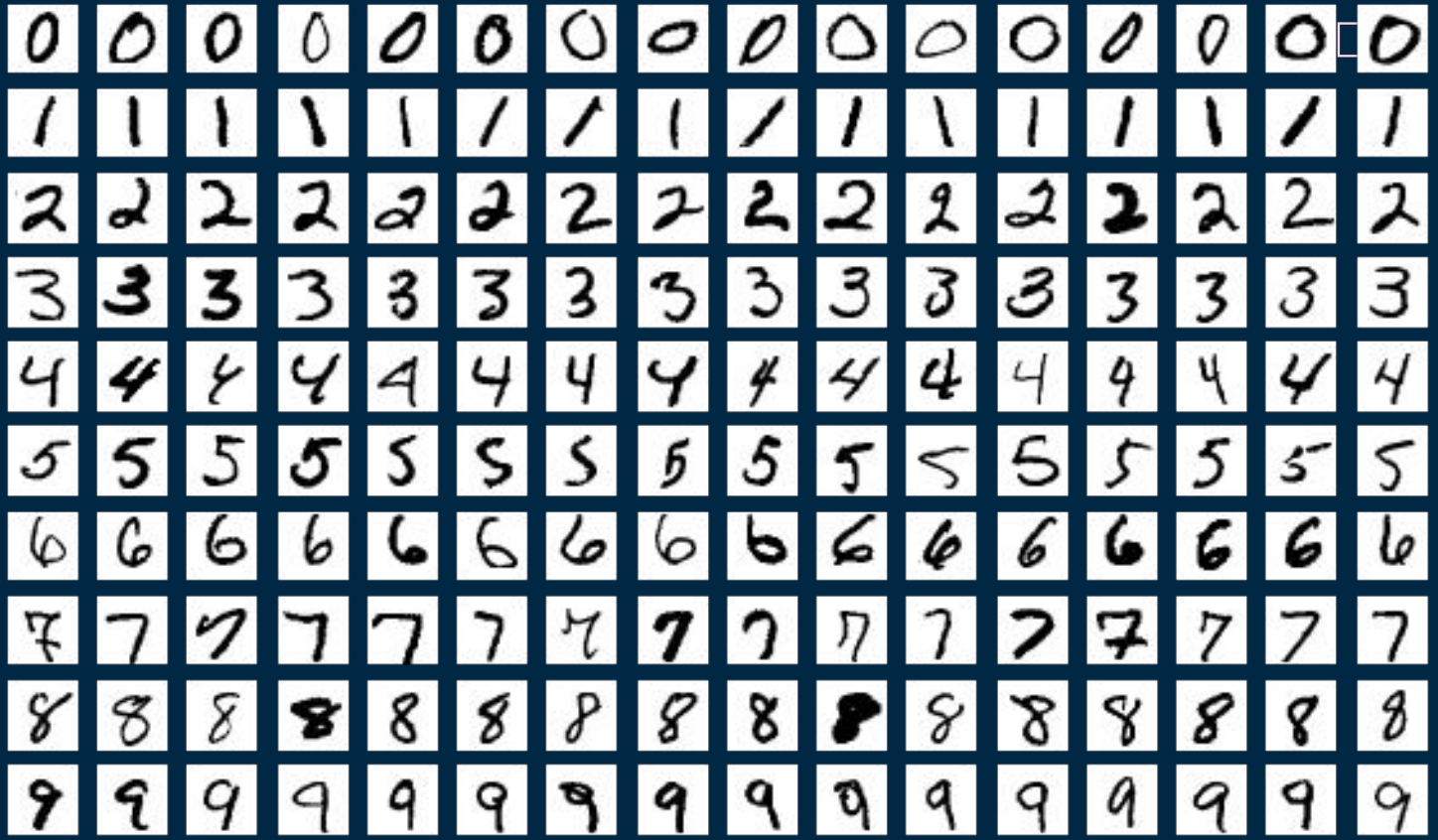
ACTIVACION

- RELU

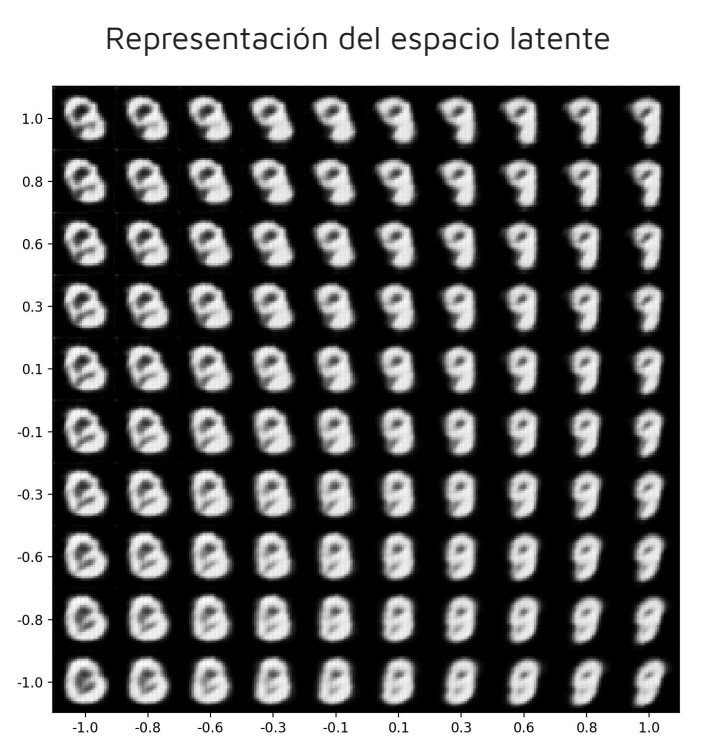
DATASET

- MINST FONT

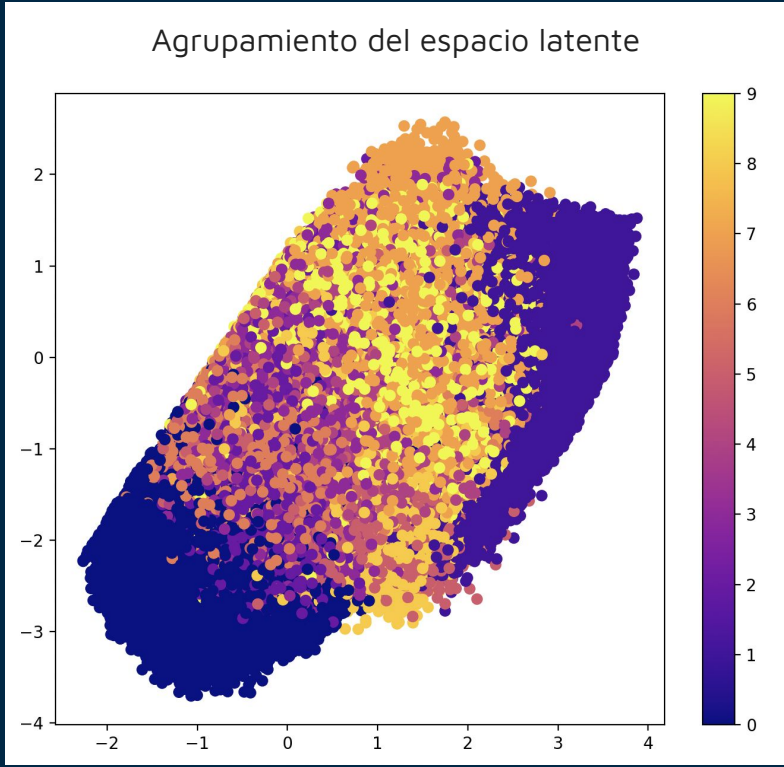
DATASET -> MINST



1 epoca

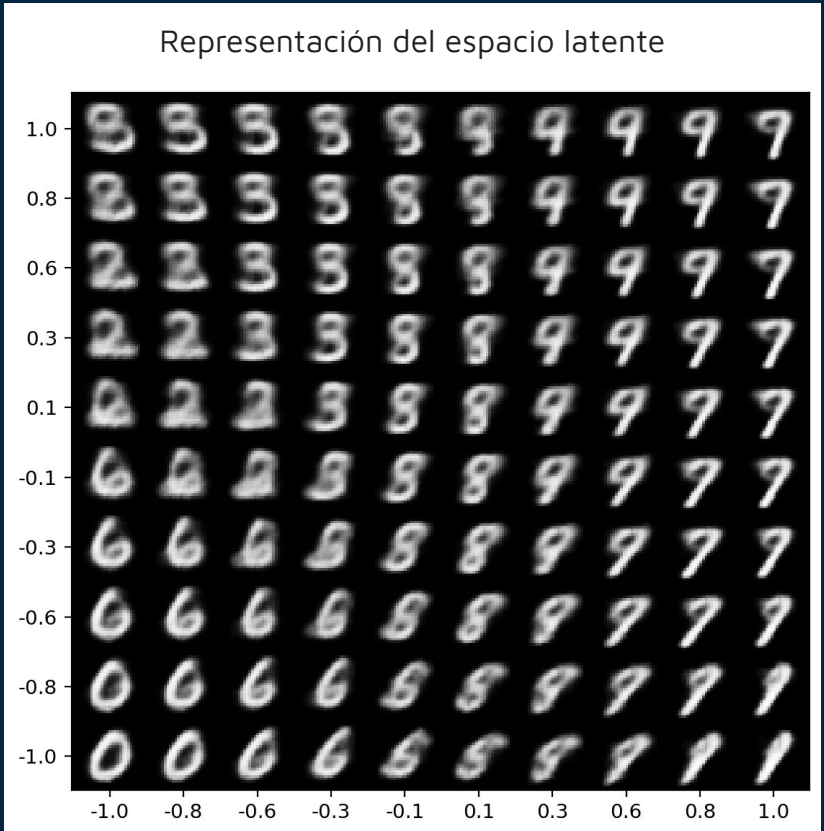


REPRESENTACIÓN EN ESPACIO LATENTE

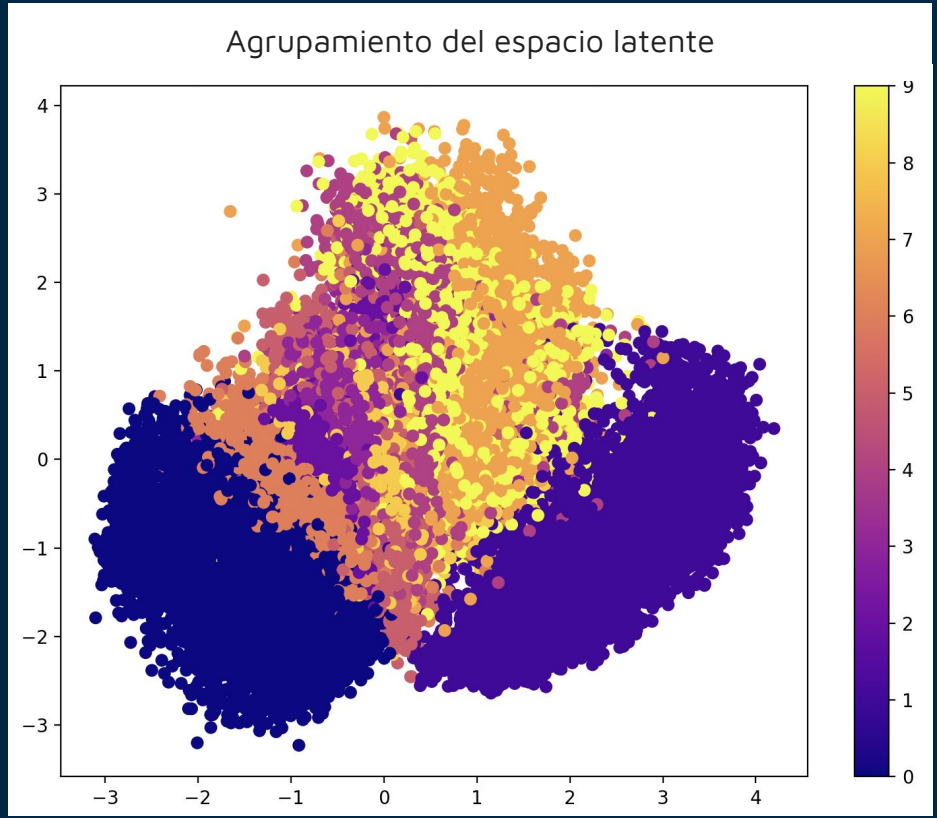


AGRUPAMIENTO EN ESPACIO LATENTE

15 epocas

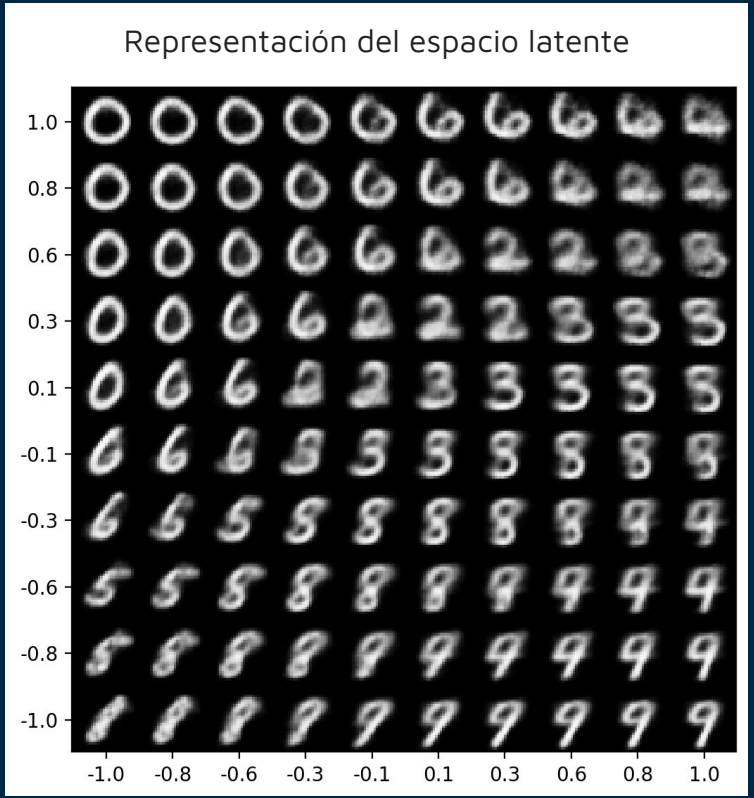


REPRESENTACIÓN EN ESPACIO LATENTE

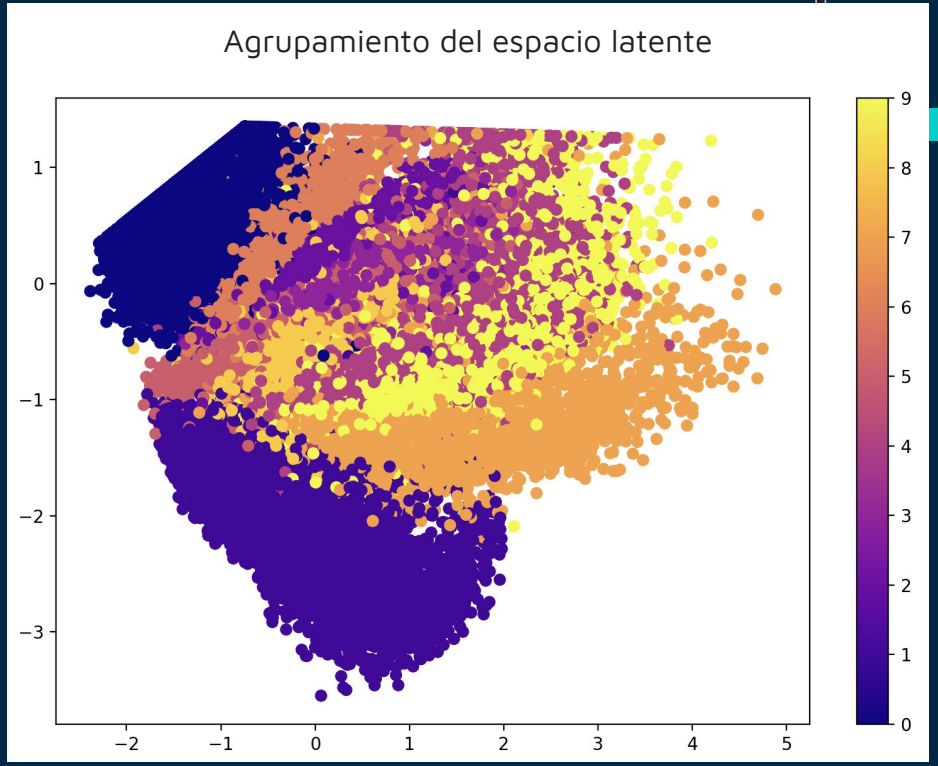


AGRUPAMIENTO EN ESPACIO LATENTE

30 epocas

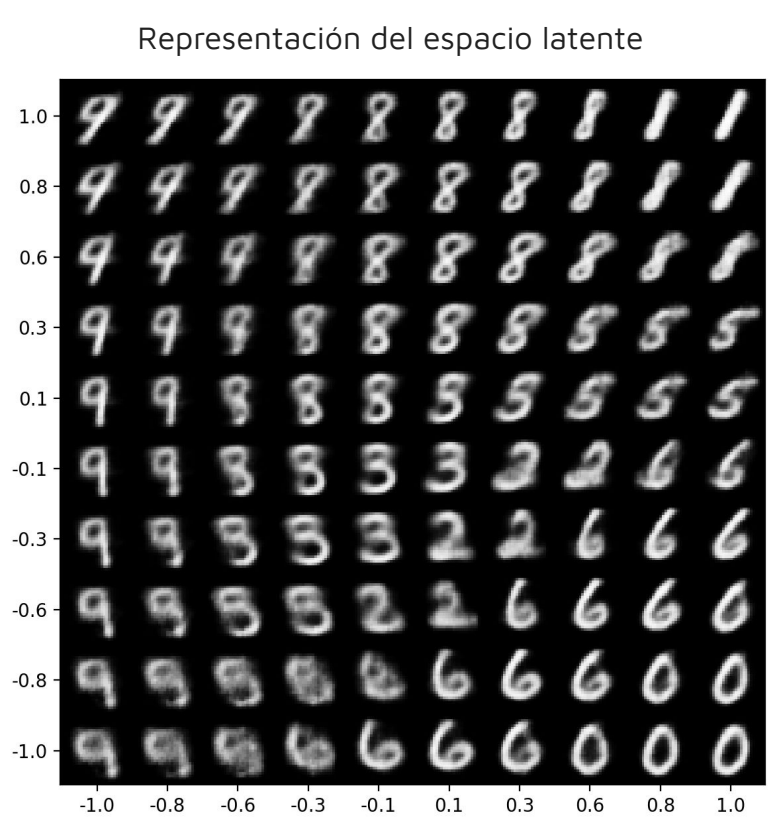


REPRESENTACIÓN EN ESPACIO LATENTE

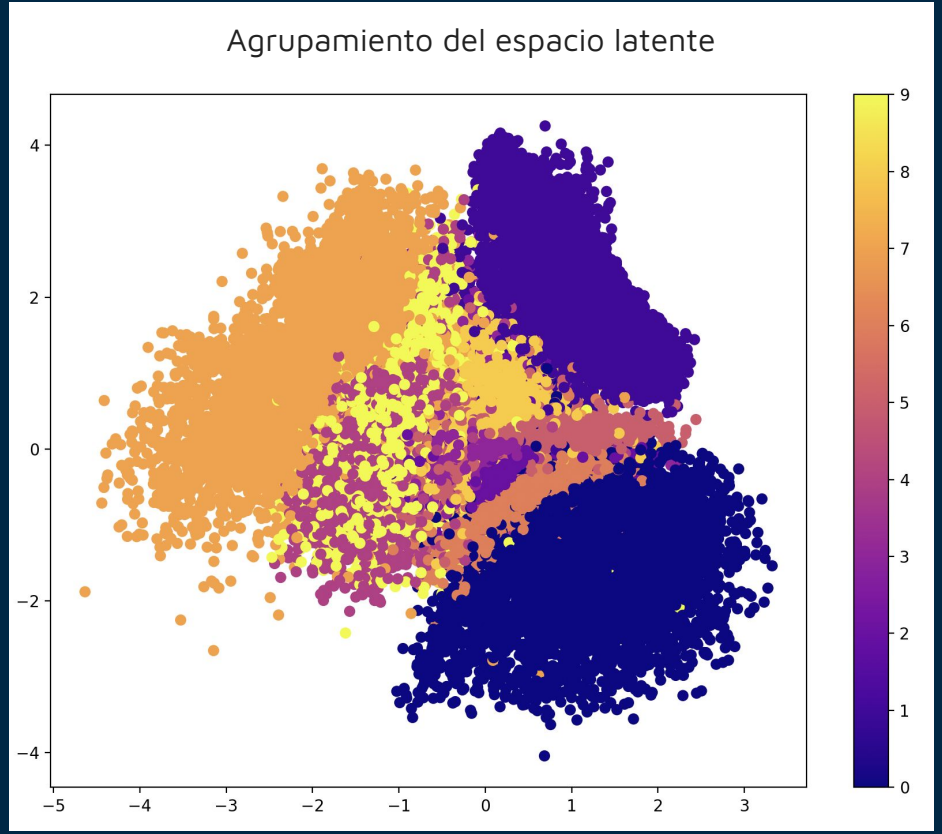


AGRUPAMIENTO EN ESPACIO LATENTE

50 epocas

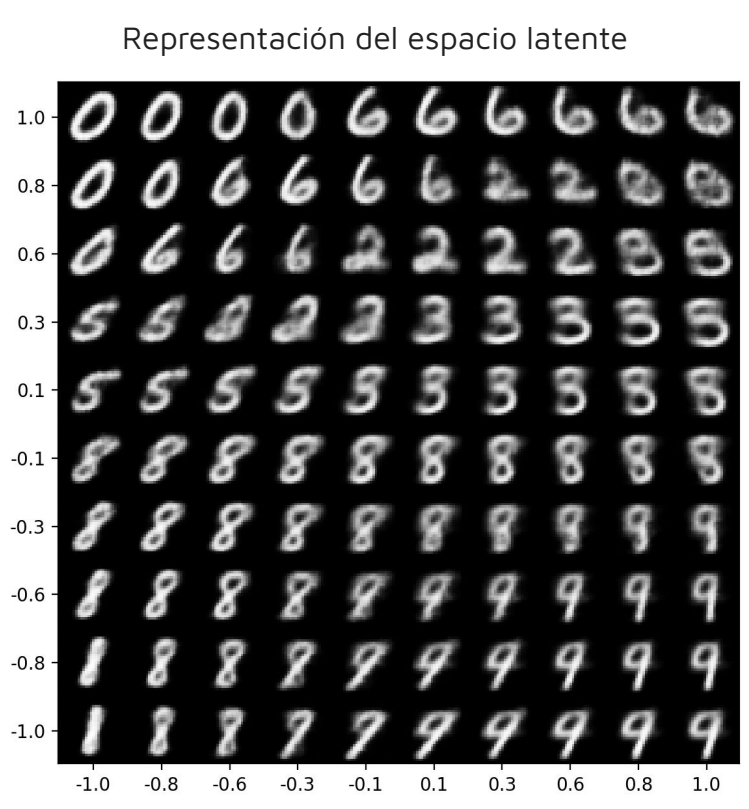


REPRESENTACIÓN EN ESPACIO LATENTE

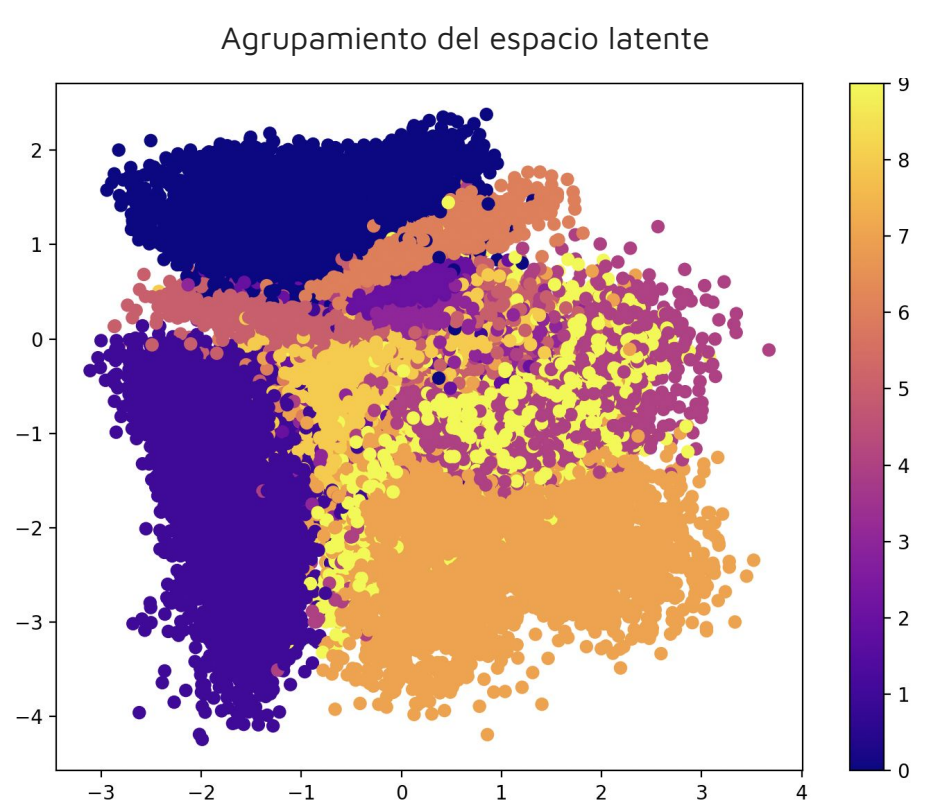


AGRUPAMIENTO EN ESPACIO LATENTE

100 epocas



REPRESENTACIÓN EN ESPACIO LATENTE



AGRUPAMIENTO EN ESPACIO LATENTE

CONCLUSIONES

GRACIAS!