

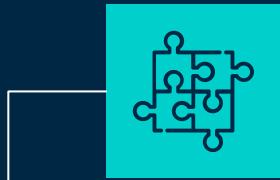
TP5

Deep Learning

Autoencoders

Baron, María Mercedes
Mannelli, Lucciano Elian
Ortu, Agustina Sol
Rossi, Victoria

CONTENIDO



01: Autoencoder

Implementación de un
autoencoder básico

Denoising
Autoencoder

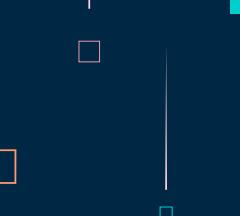


02: Variación del autoencoder

Conjunto de datos
nuevos

Esquema variacional

EJERCICIO 1



ARQUITECTURA



ARQUITECTURA

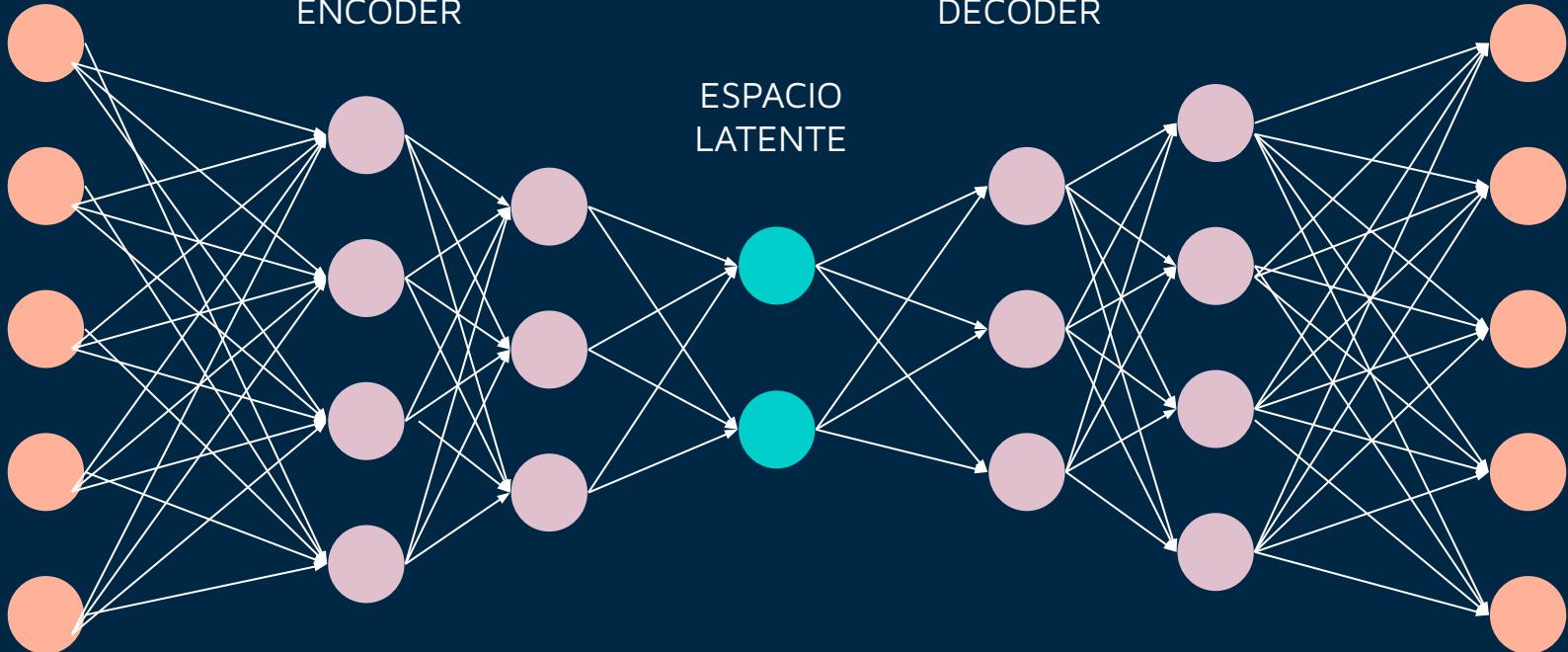
INPUT

ENCODER

DECODER

OUTPUT

ESPACIO
LATENTE



TECNICAS DE OPTIMIZACION



OPTIMIZACION

01

MOMENTUM

02

NORMALIZACIÓN
DE DATOS

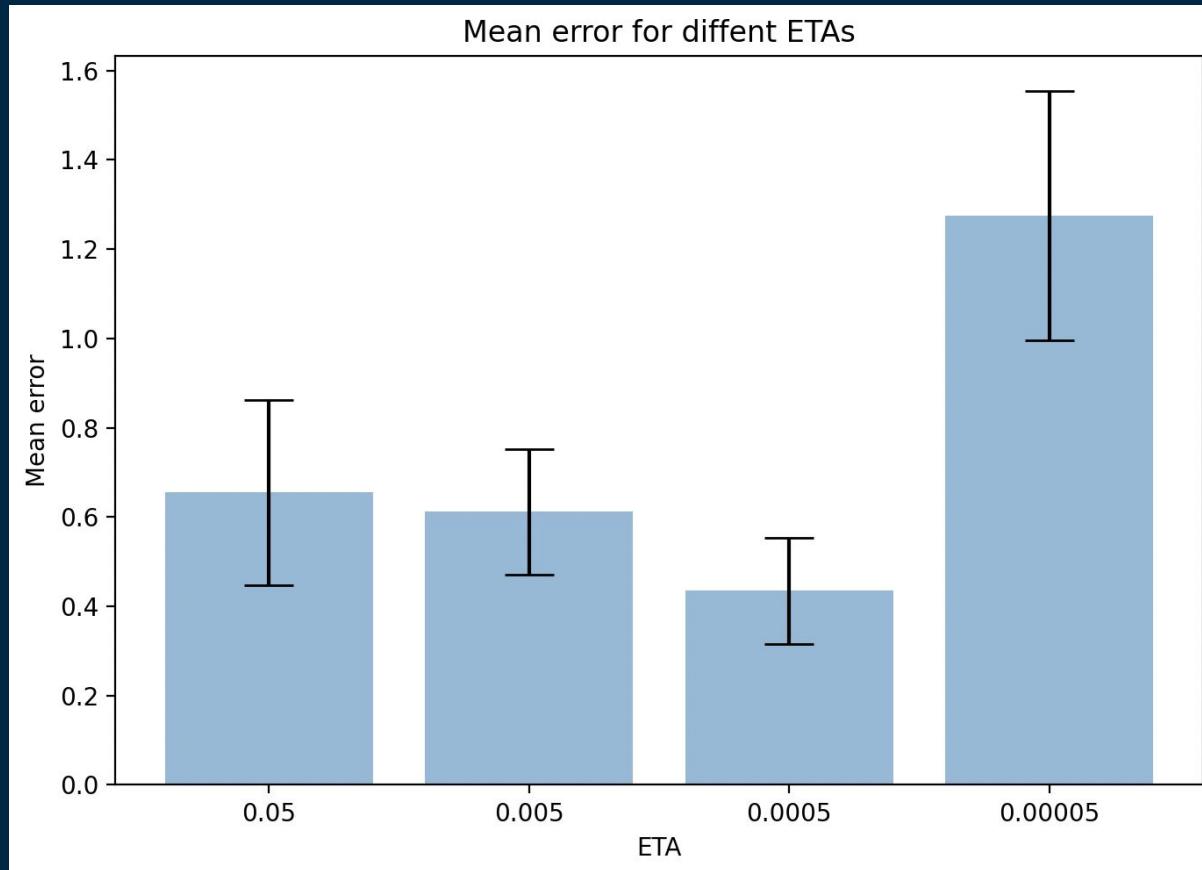
03

INICIALIZACIÓN
DE CAPAS

¿Qué parámetros vamos a utilizar?



ANÁLISIS ETA (corridas: 100 para cada ETA)



Arquitectura
35-20-2-20-35

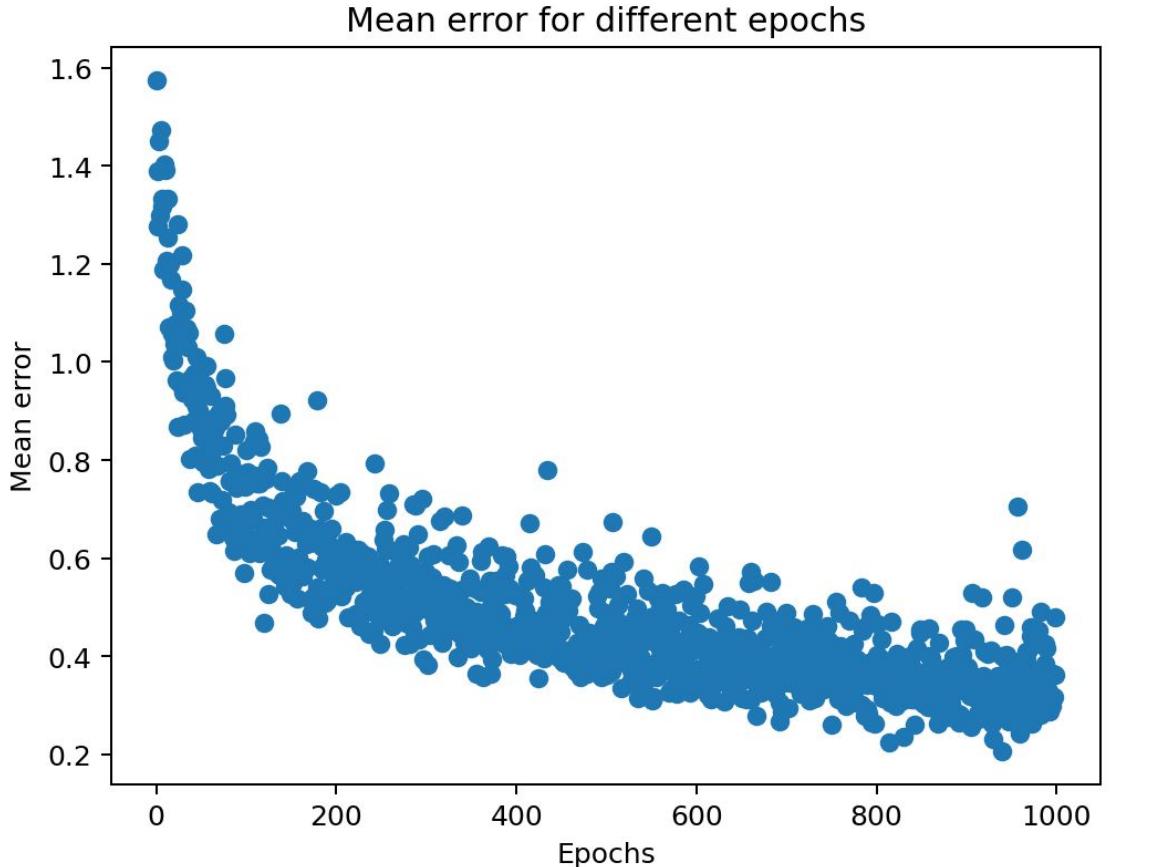
ETA = 0.0005
Epochs = 10000

Desvio estandar
0.05 -> 0.21
0.005 -> 0.14
0.0005 -> 0.12
0.00005 -> 0.28

ANÁLISIS POR ÉPOCAS

eta = 0.0005

Momentum = true

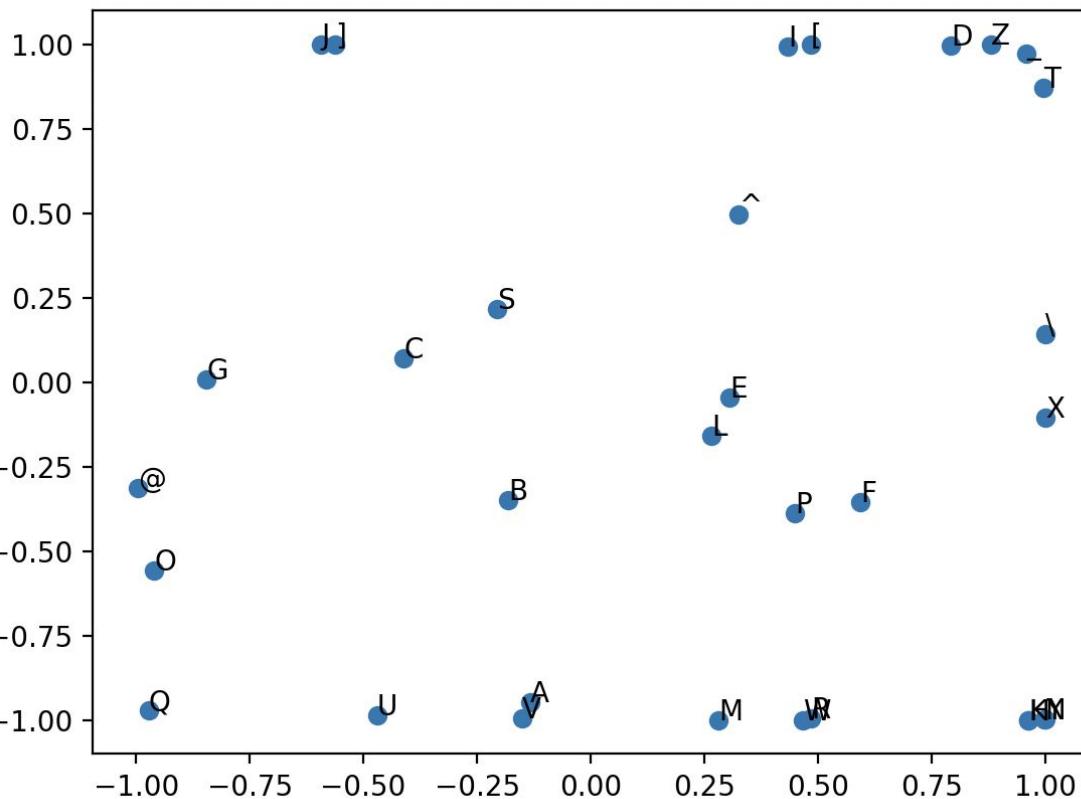


¿Cuál es la arquitectura óptima?



ARQUITECTURA 35-2-35

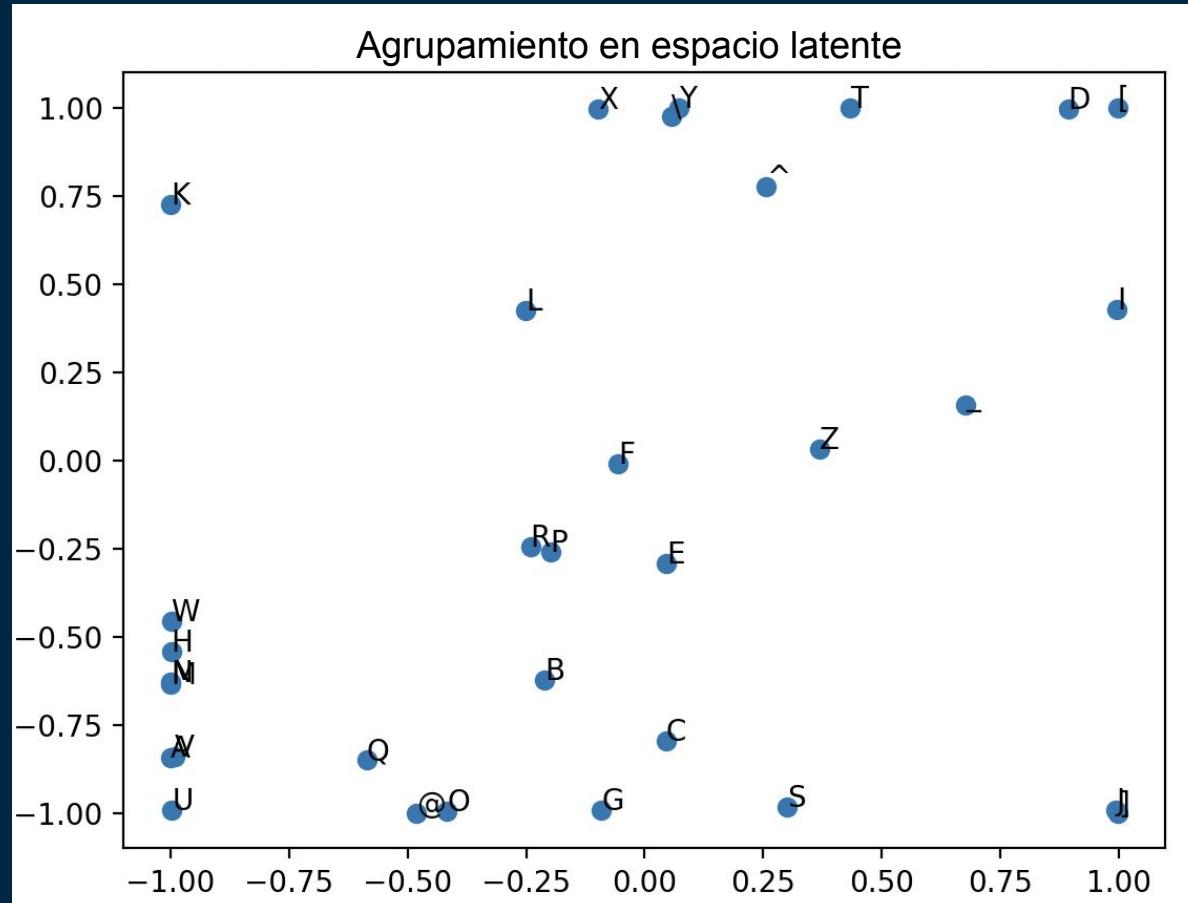
Agrupamiento en espacio latente



Eta = 0.0005
Epocas = 1000
Momentum = True

Error medio promedio:
0.526

ARQUITECTURA 35-20-2-20-35

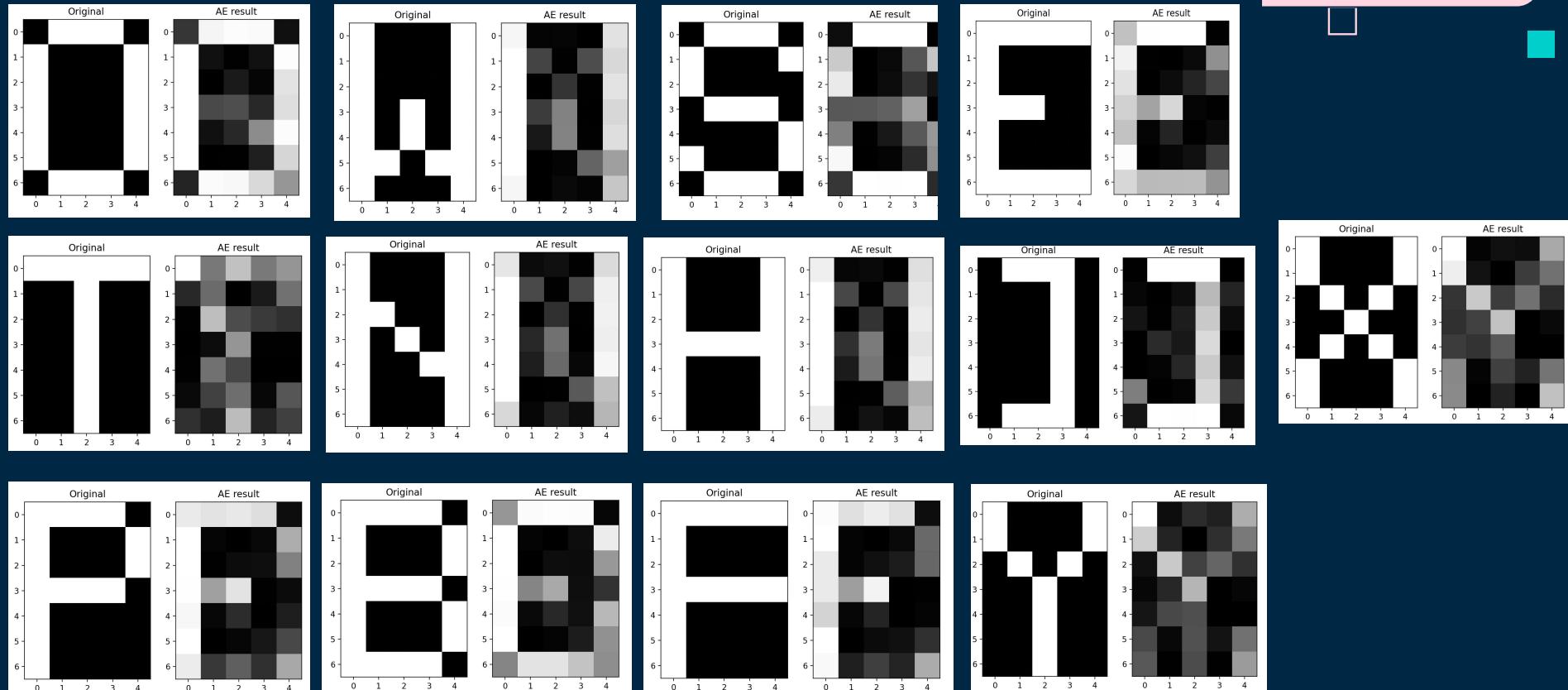


Eta = 0.0005
Epocas = 1000
Momentum = True

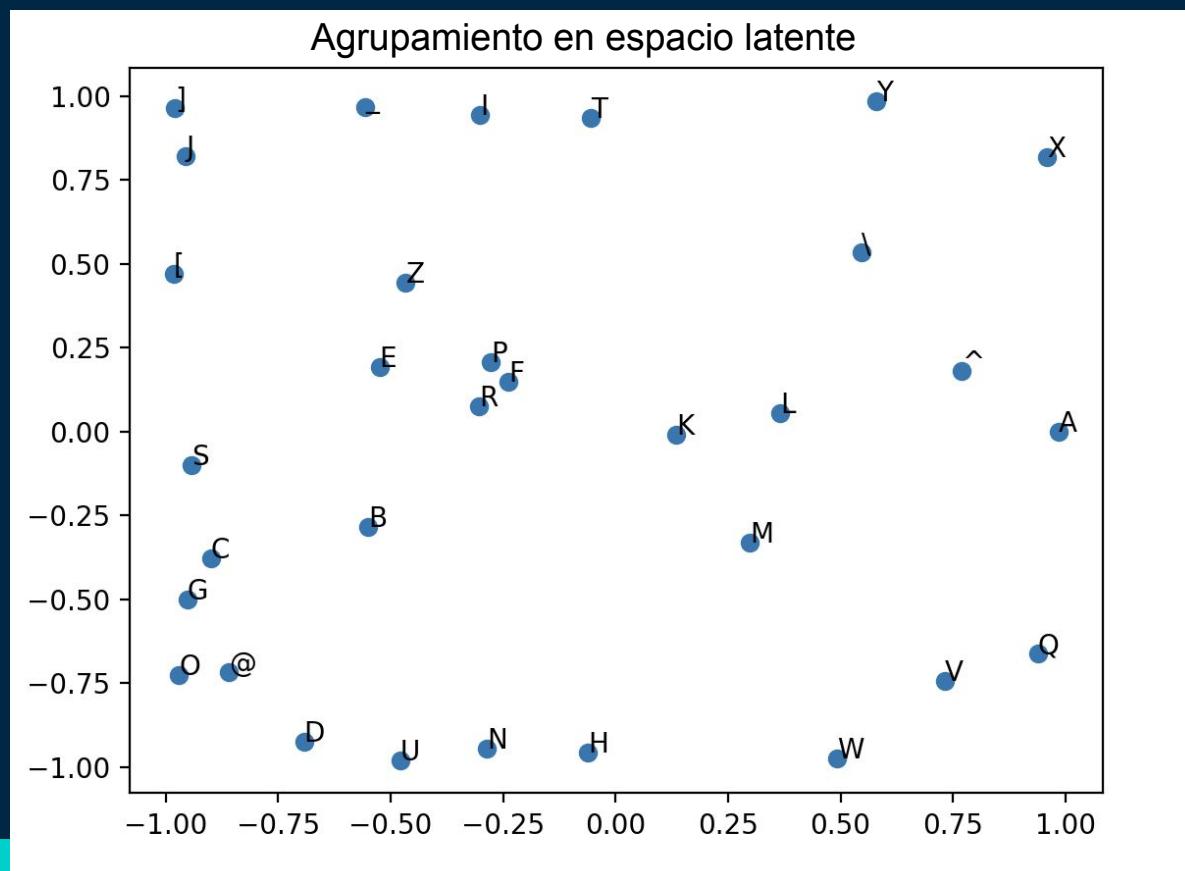
Error medio promedio:
0.383

ARQUITECTURA 35-20-2-20-35

Eta = 0.0005
Epochs = 1000
Momentum = True



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

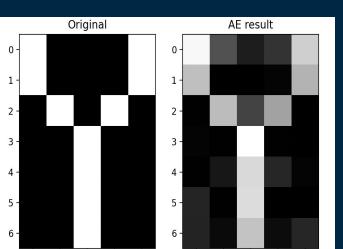
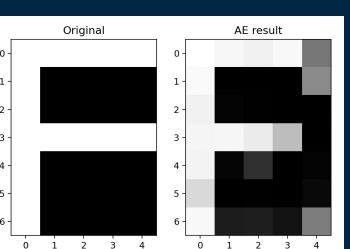
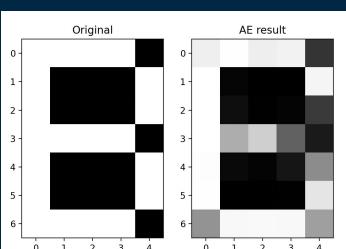
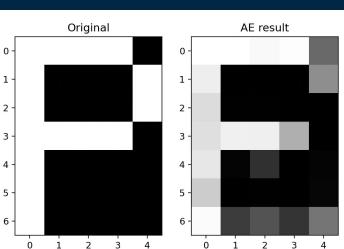
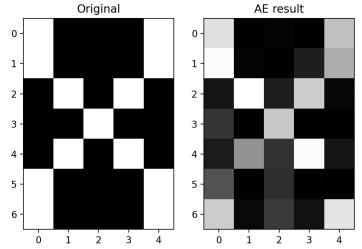
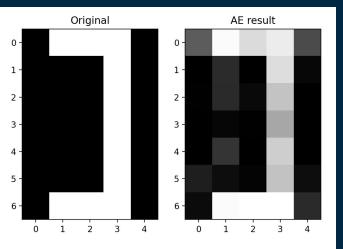
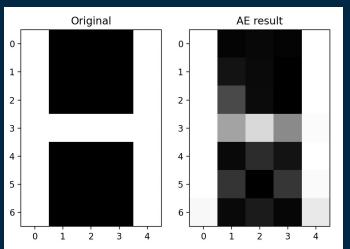
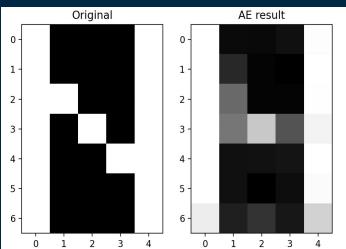
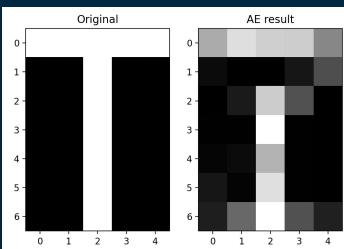
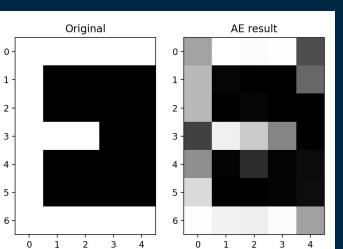
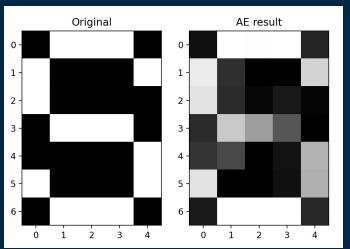
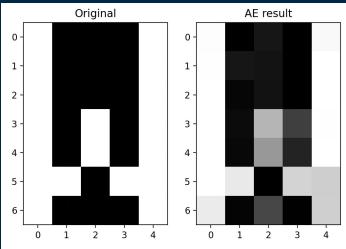
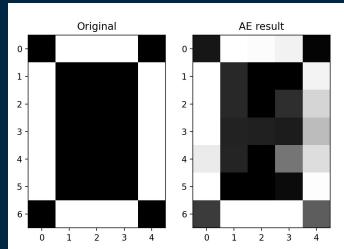


Eta = 0.0005
Epocas = 1000
Momentum = True

Error medio
promedio: 0.293

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

Eta = 0.0005
Epochs = 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

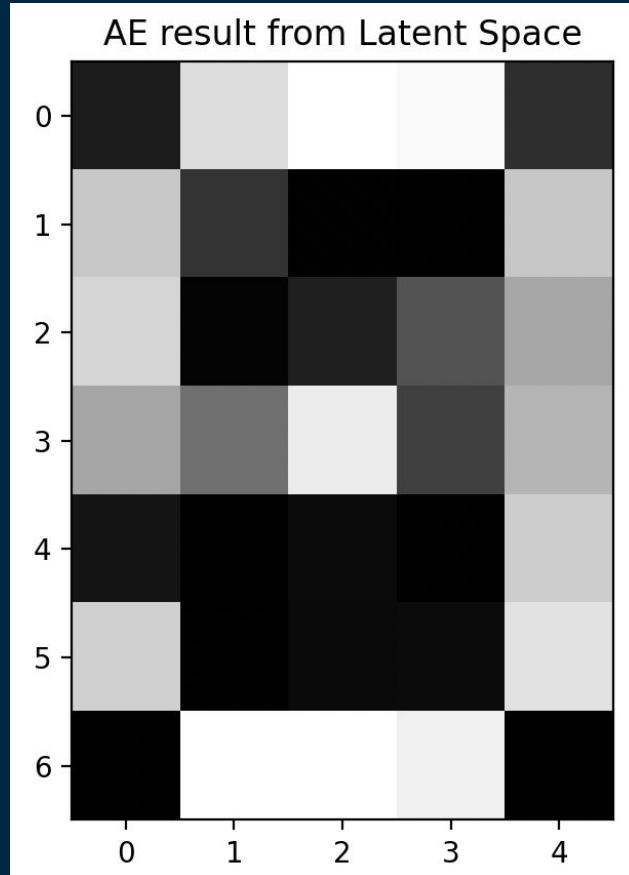


GENERATE NEW CHARACTER



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

Eta = 0.0005
Epocas = 1000
Momentum = True



No es suficiente la información en el espacio latente para generar una muestra nueva.

Podemos ver que está intentando dado que percibimos indicios de S, 0, A, etc

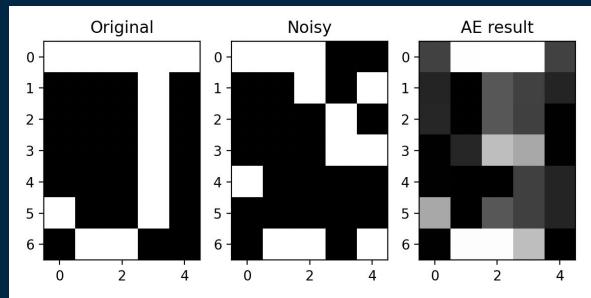
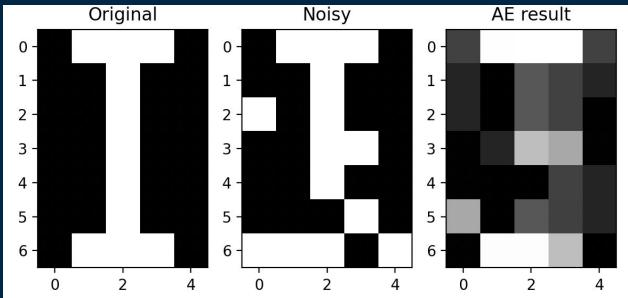
DENOISING AUTOENCODER



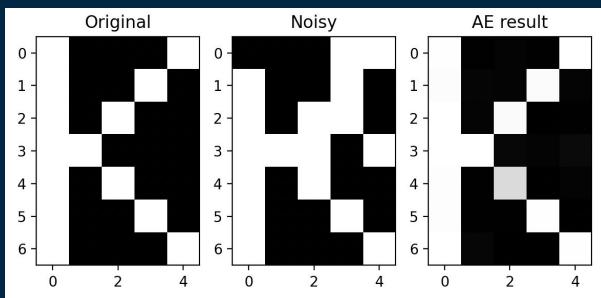
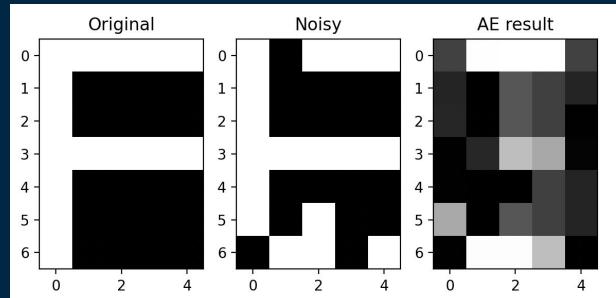
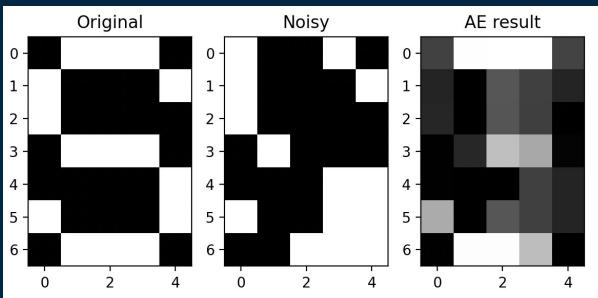
ARQUITECTURA 35-20-10-2-10-20-35

Noise = 0.2

Eta = 0.0005
Epochs = 1000
Momentum = True



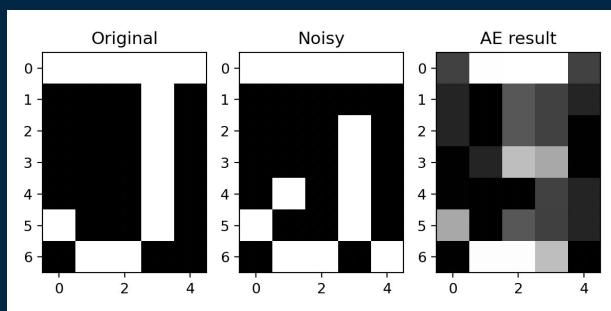
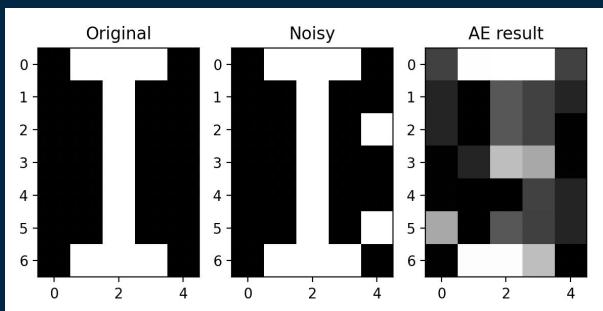
Error medio promedio: 0.573



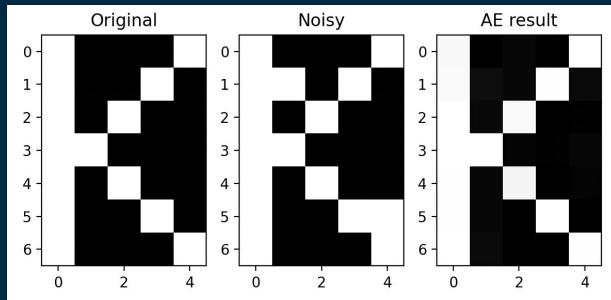
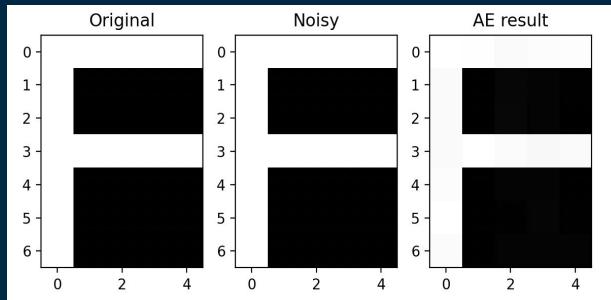
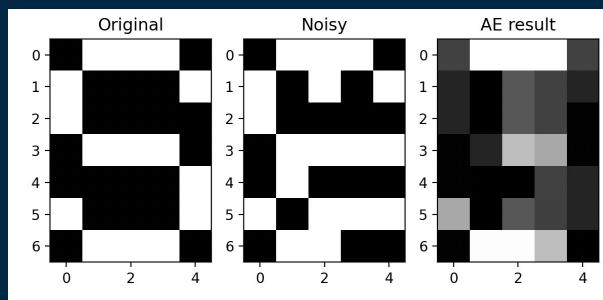
ARQUITECTURA 35-20-10-2-10-20-35

Noise = 0.05

Eta = 0.0005
Epochs = 1000
Momentum = True



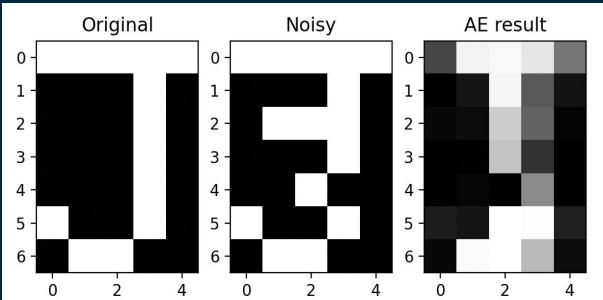
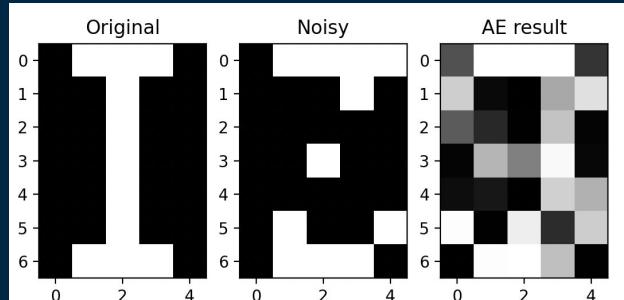
Error medio promedio: 0.33



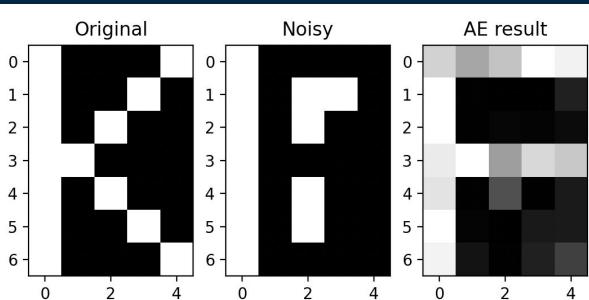
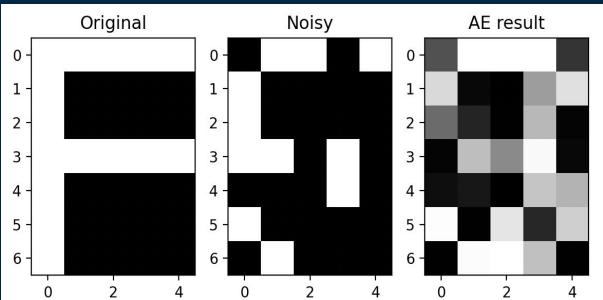
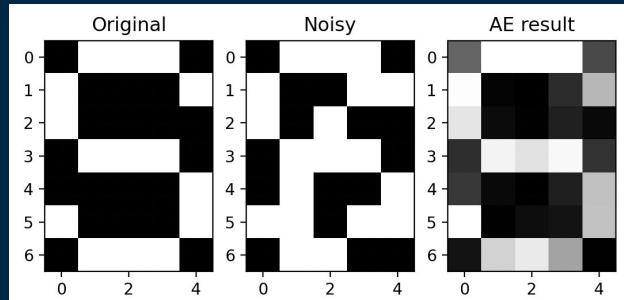
ARQUITECTURA 35-20-2-20-35

Noise = 0.2

Eta = 0.0005
Epocas = 1000
Momentum = True



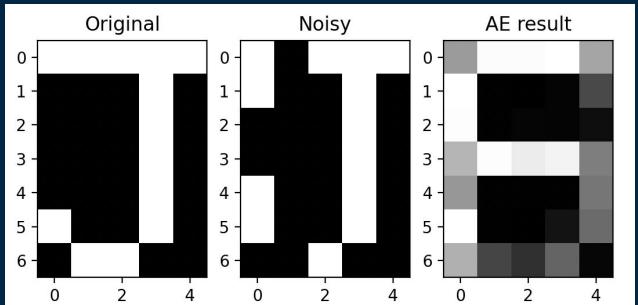
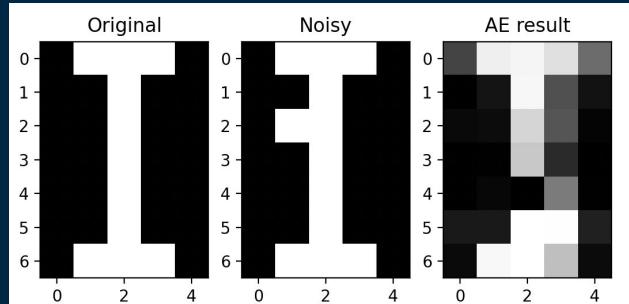
Error medio promedio: 0.87



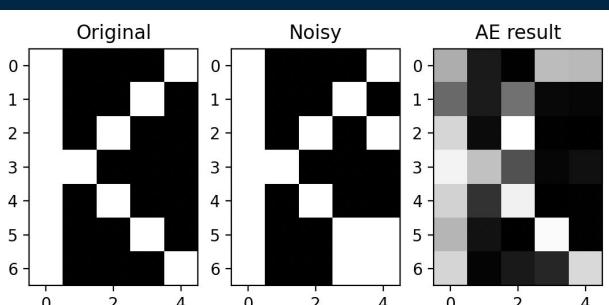
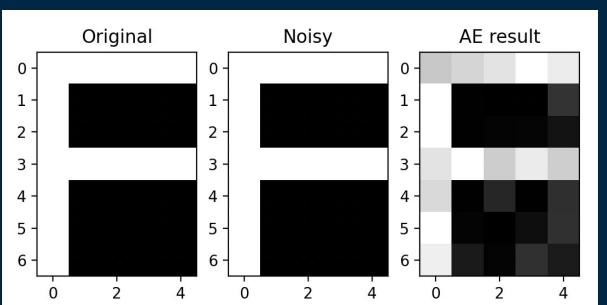
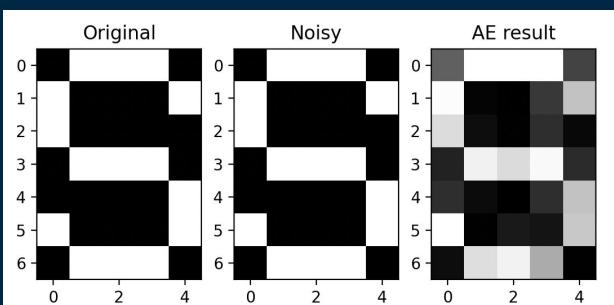
ARQUITECTURA 35-20-2-20-35

Noise = 0.05

Eta = 0.0005
Epochs = 1000
Momentum = True



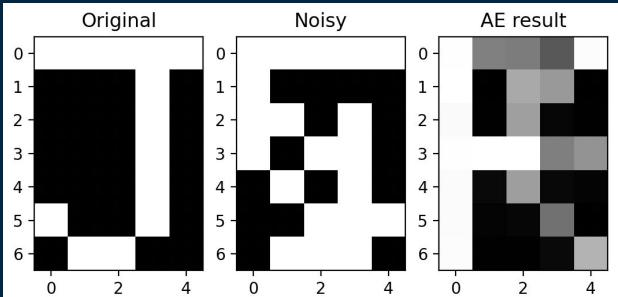
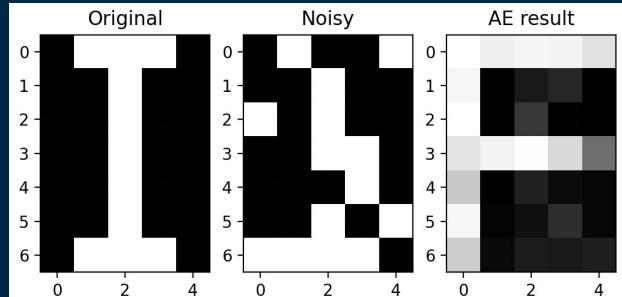
Error medio promedio: 0.41



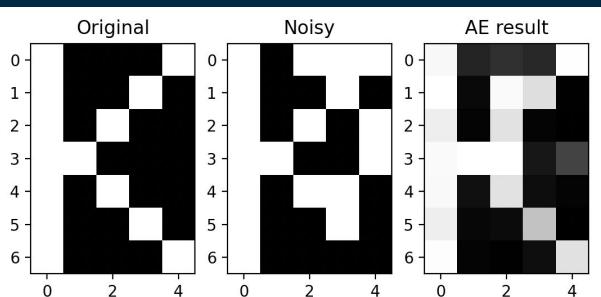
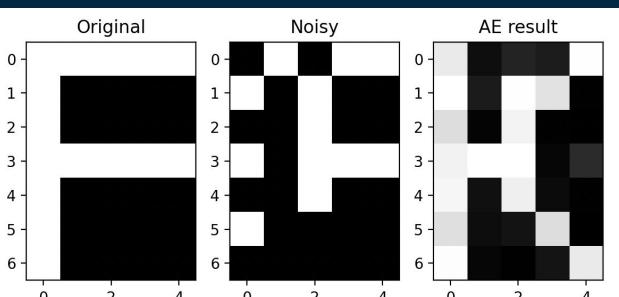
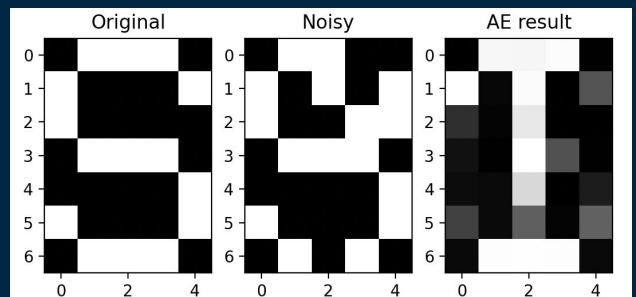
ARQUITECTURA 35-20-10-5-2-5-10-20-35

Noise = 0.2

Eta = 0.0005
Epocas = 1000
Momentum = True



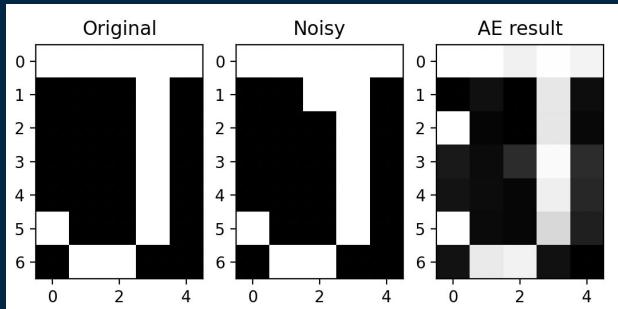
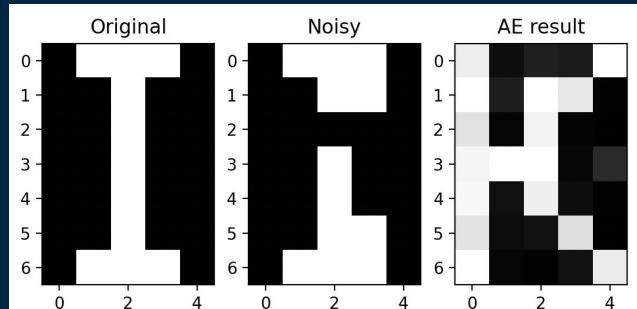
Error medio promedio: 1,07



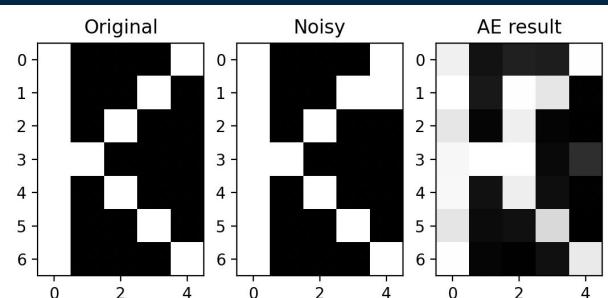
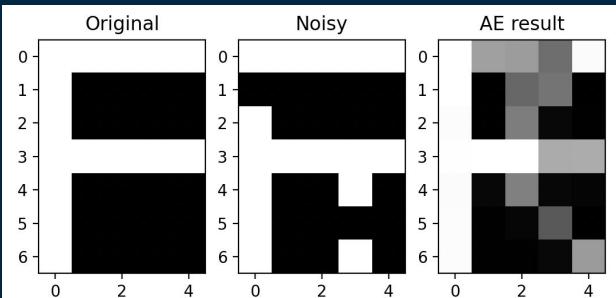
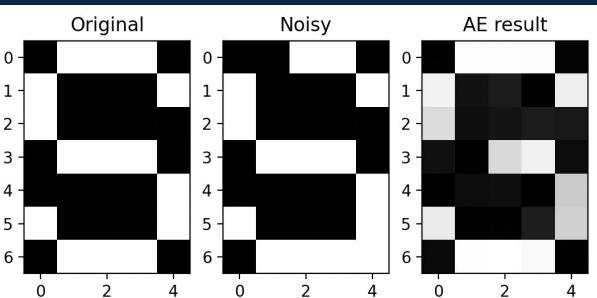
ARQUITECTURA 35-20-10-5-2-5-10-20-35

Noise = 0.05

Eta = 0.0005
Epocas = 1000
Momentum = True



Error medio promedio: 0,54



OPTIMIZACION

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

Error (0,2) = 0,573
Error (0,05) = 0,33

35-20-2-20-35

Error (0,2) = 0,87
Error (0,05) = 0,41

35-20-10-5-2-5-10-20-35

Error (0,2) = 1,07
Error (0,05) = 0,54

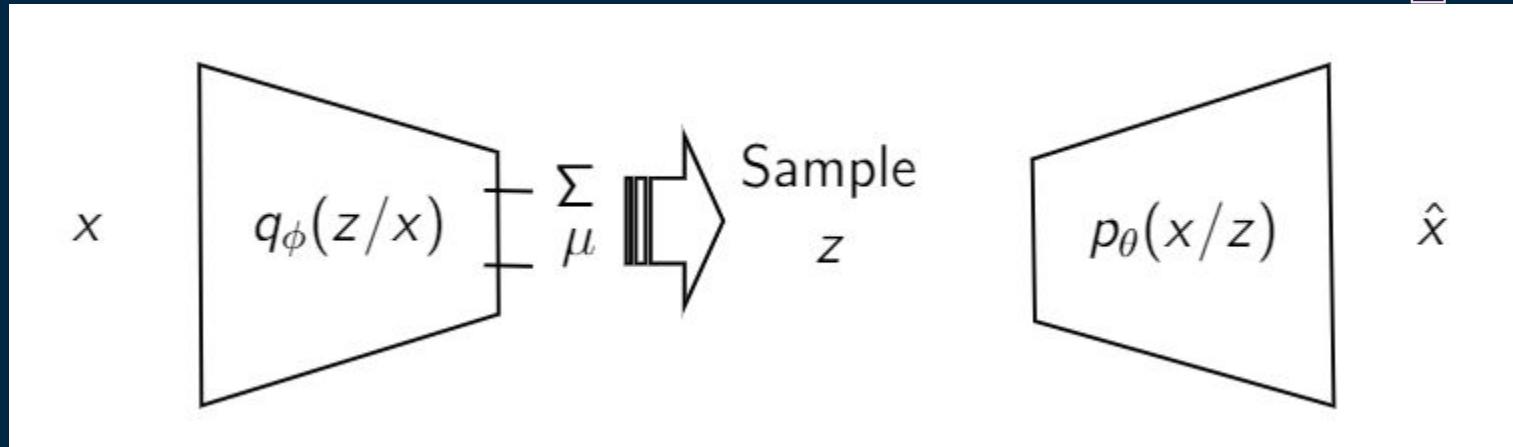
CONCLUSIONES



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

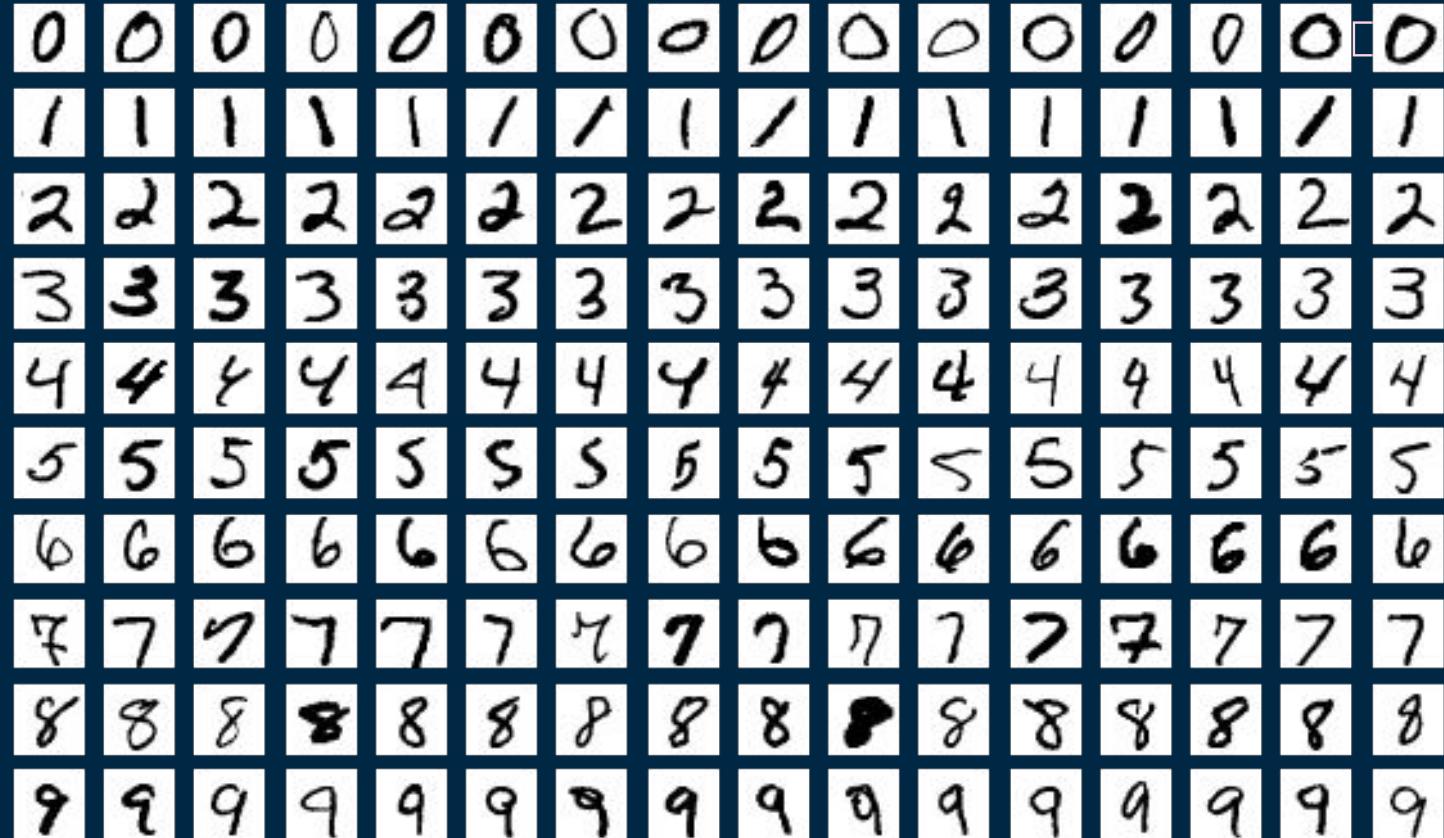
ACTIVACION

RELU

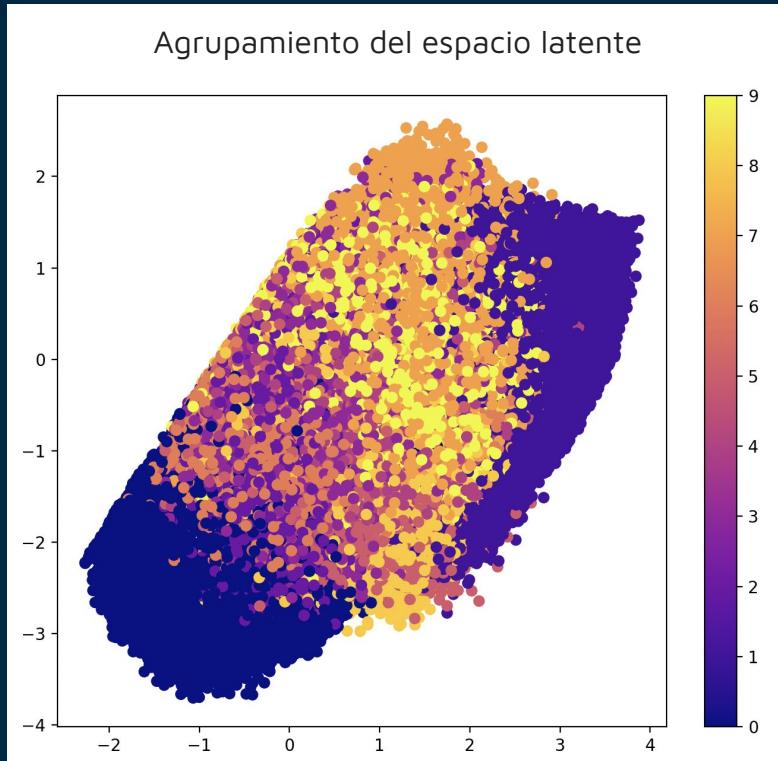
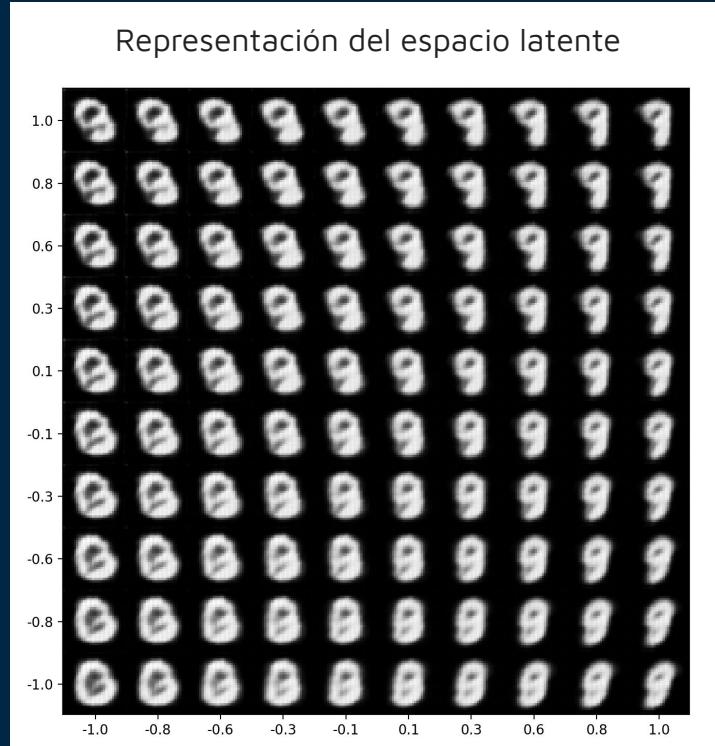
DATASET

MINST FONT

DATASET -> MNIST



1 epoca



REPRESENTACIÓN EN ESPACIO LATENTE



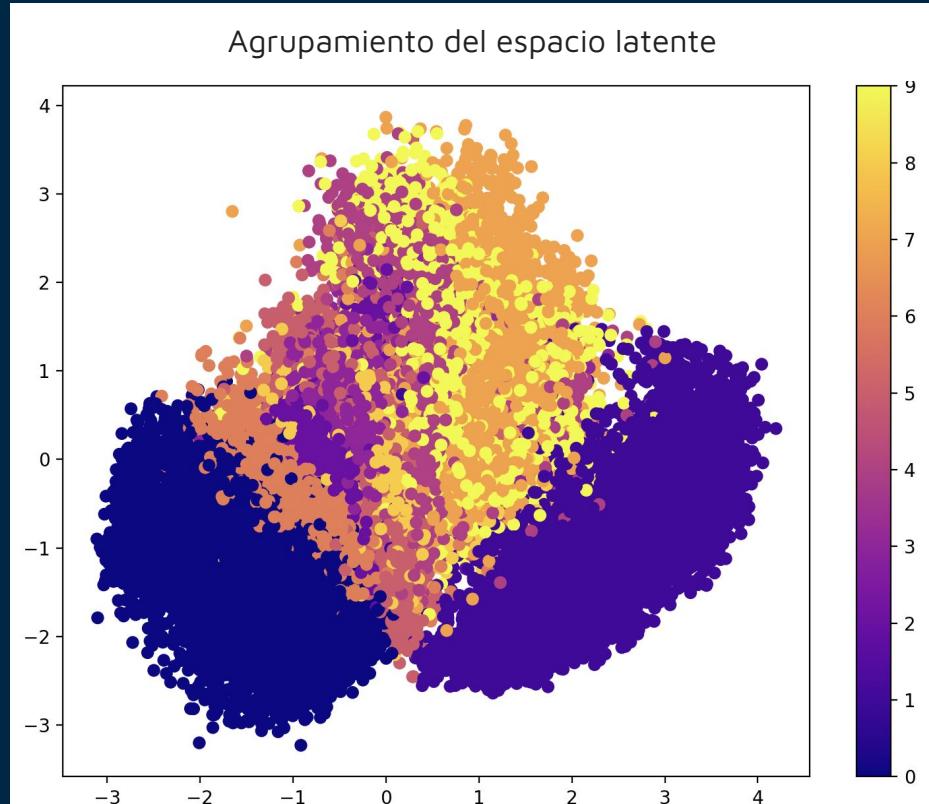
AGRUPAMIENTO EN ESPACIO LATENTE



15 épocas



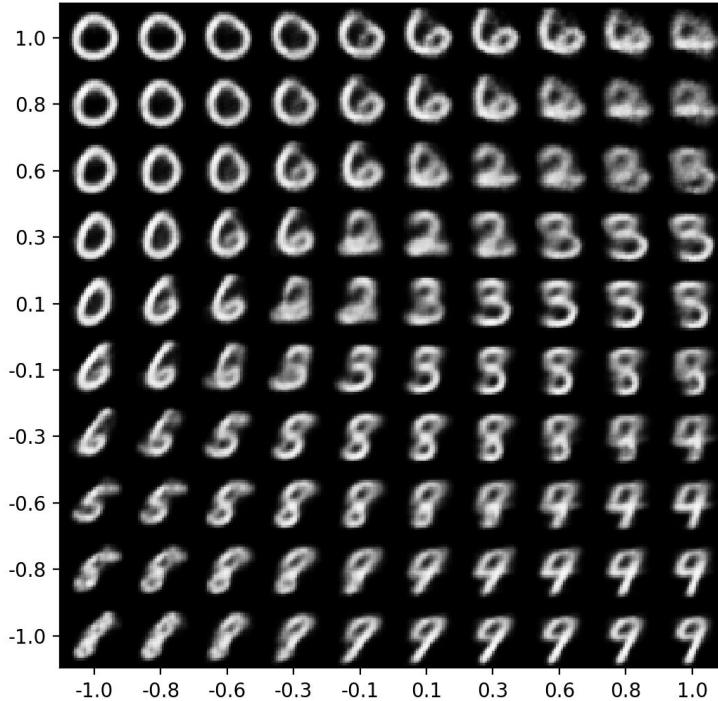
REPRESENTACIÓN EN ESPACIO LATENTE



AGRUPAMIENTO EN ESPACIO LATENTE

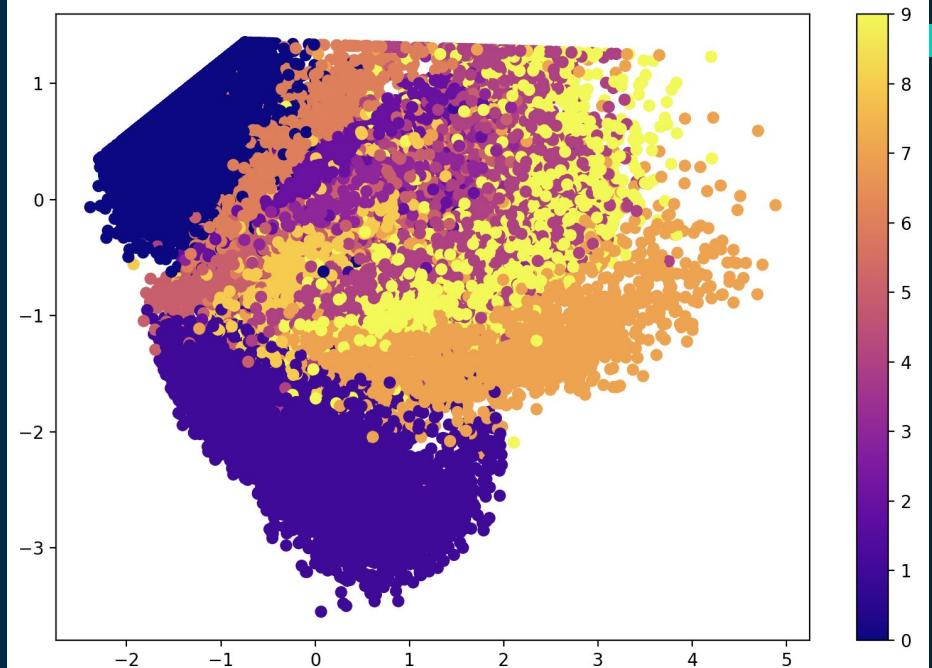
30 épocas

Representación del espacio latente



REPRESENTACIÓN EN ESPACIO LATENTE

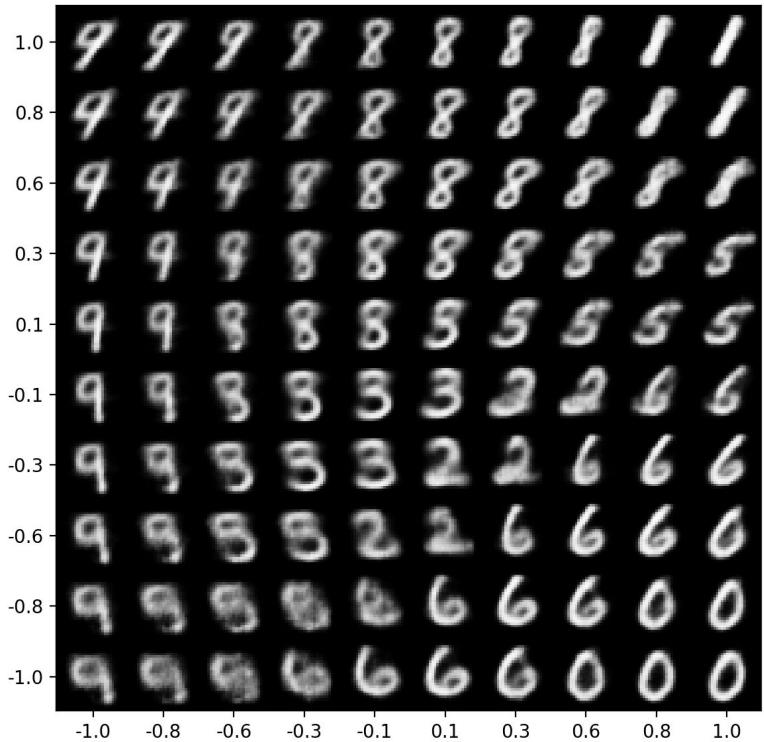
Agrupamiento del espacio latente



AGRUPAMIENTO EN ESPACIO LATENTE

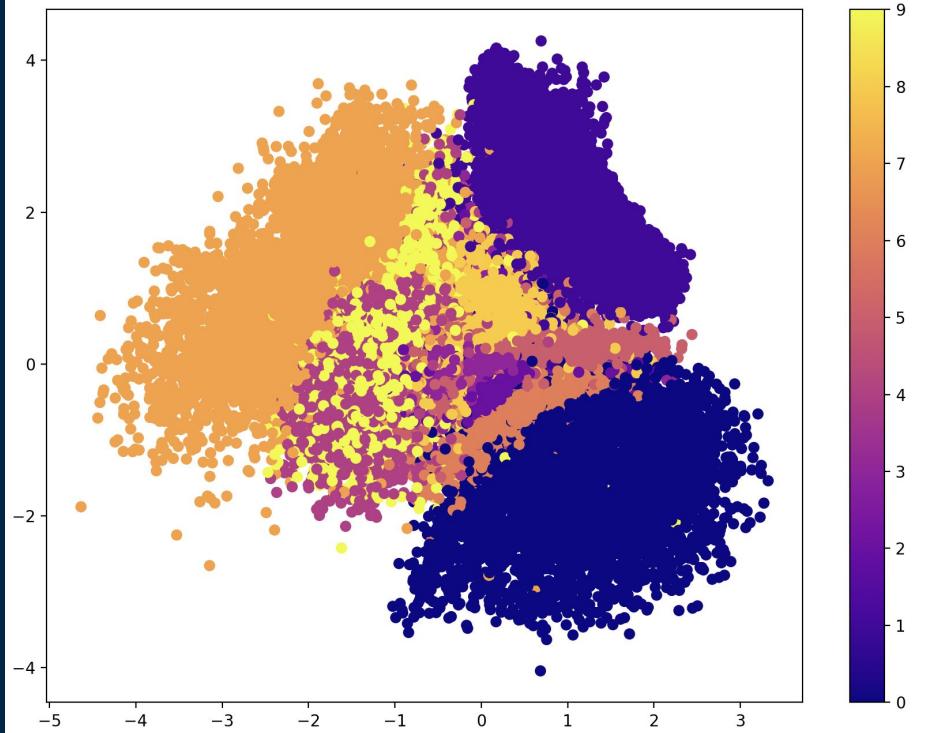
50 épocas

Representación del espacio latente



REPRESENTACIÓN EN ESPACIO LATENTE

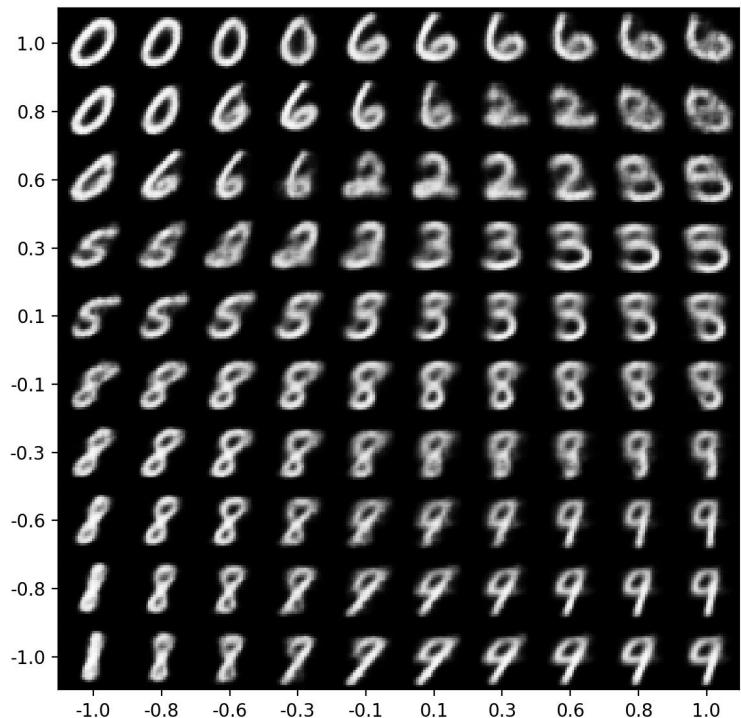
Agrupamiento del espacio latente



AGRUPAMIENTO EN ESPACIO LATENTE

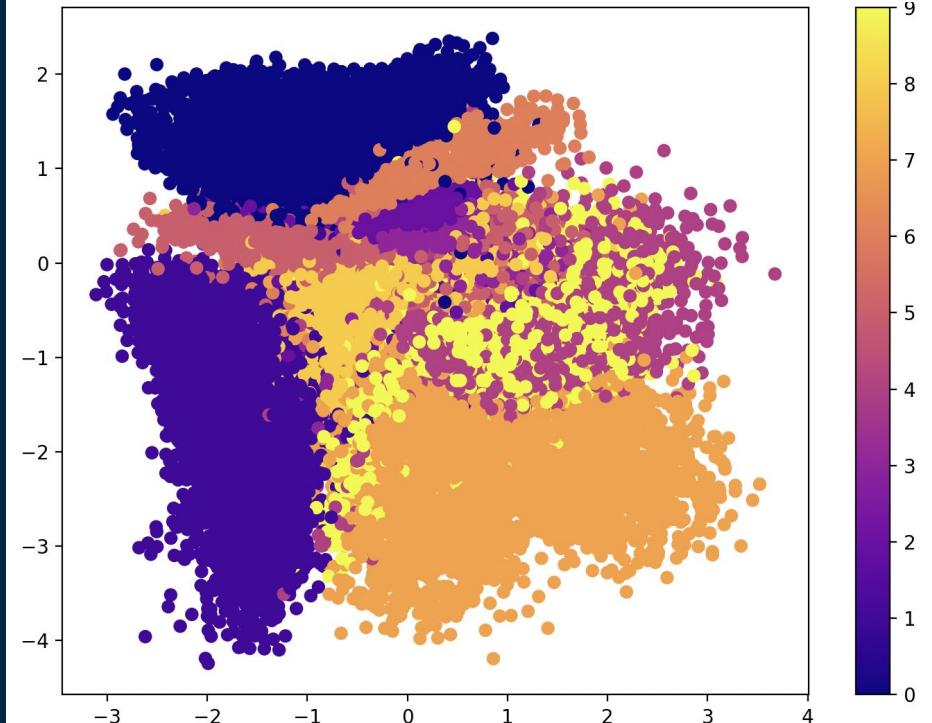
100 épocas

Representación del espacio latente



■ REPRESENTACIÓN EN ESPACIO LATENTE

Agrupamiento del espacio latente



AGRUPAMIENTO EN ESPACIO LATENTE

CONCLUSIONES



GRACIAS!

