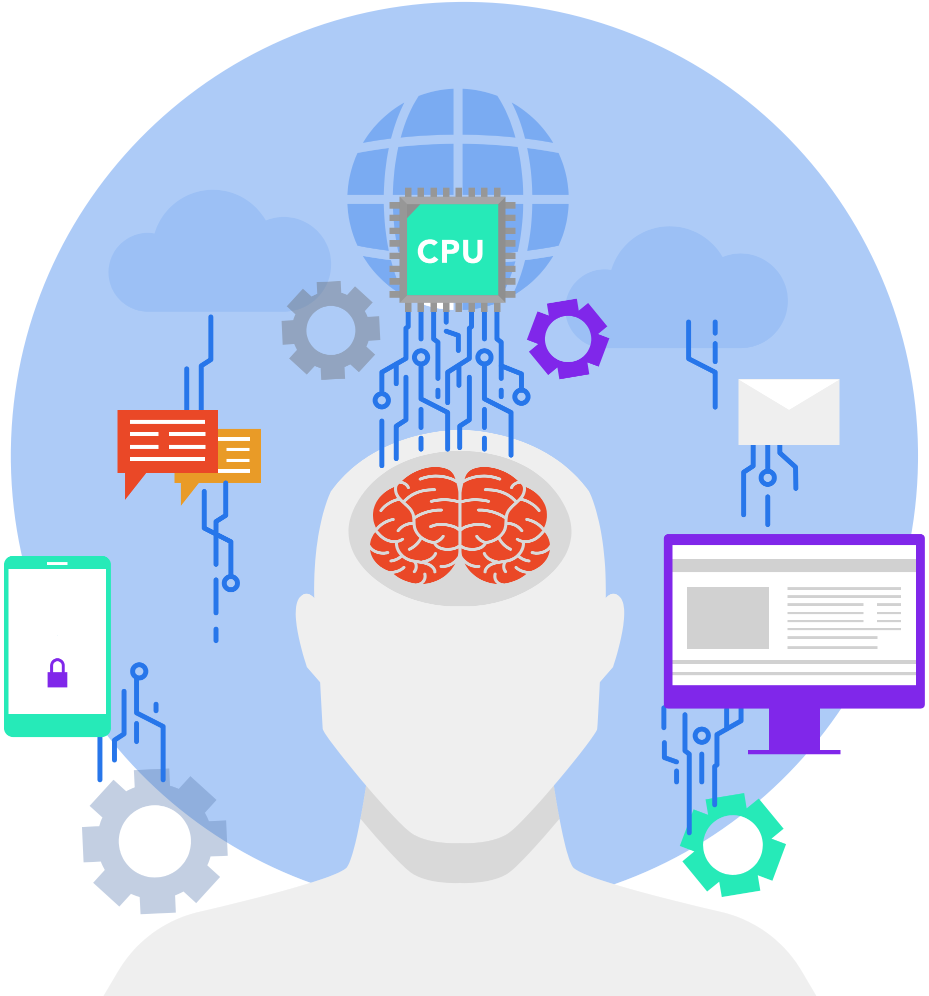
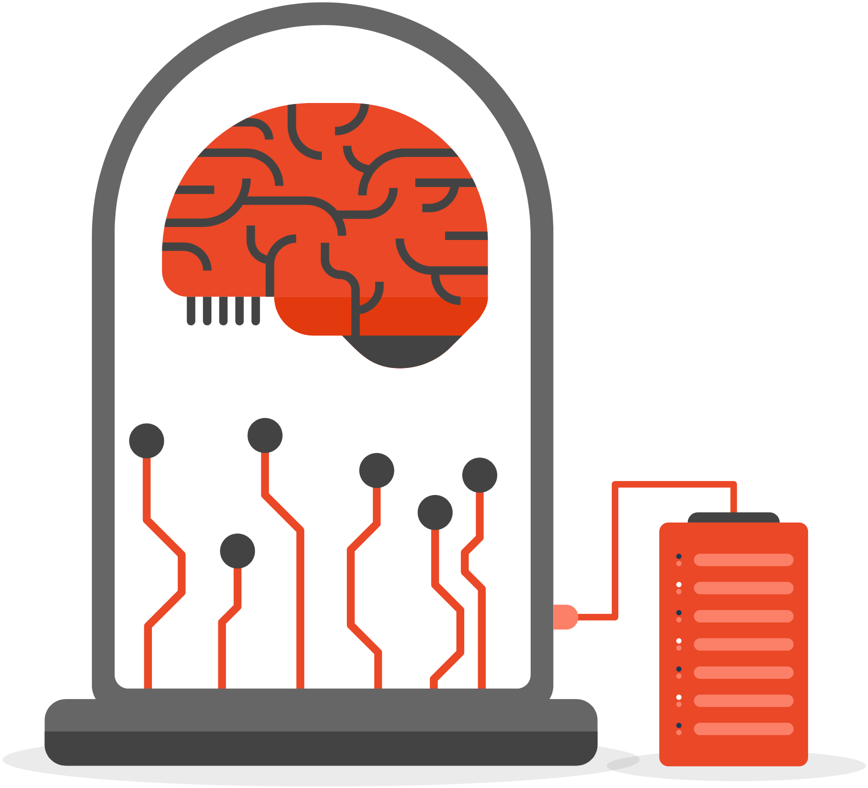


TP3
Autoencoders

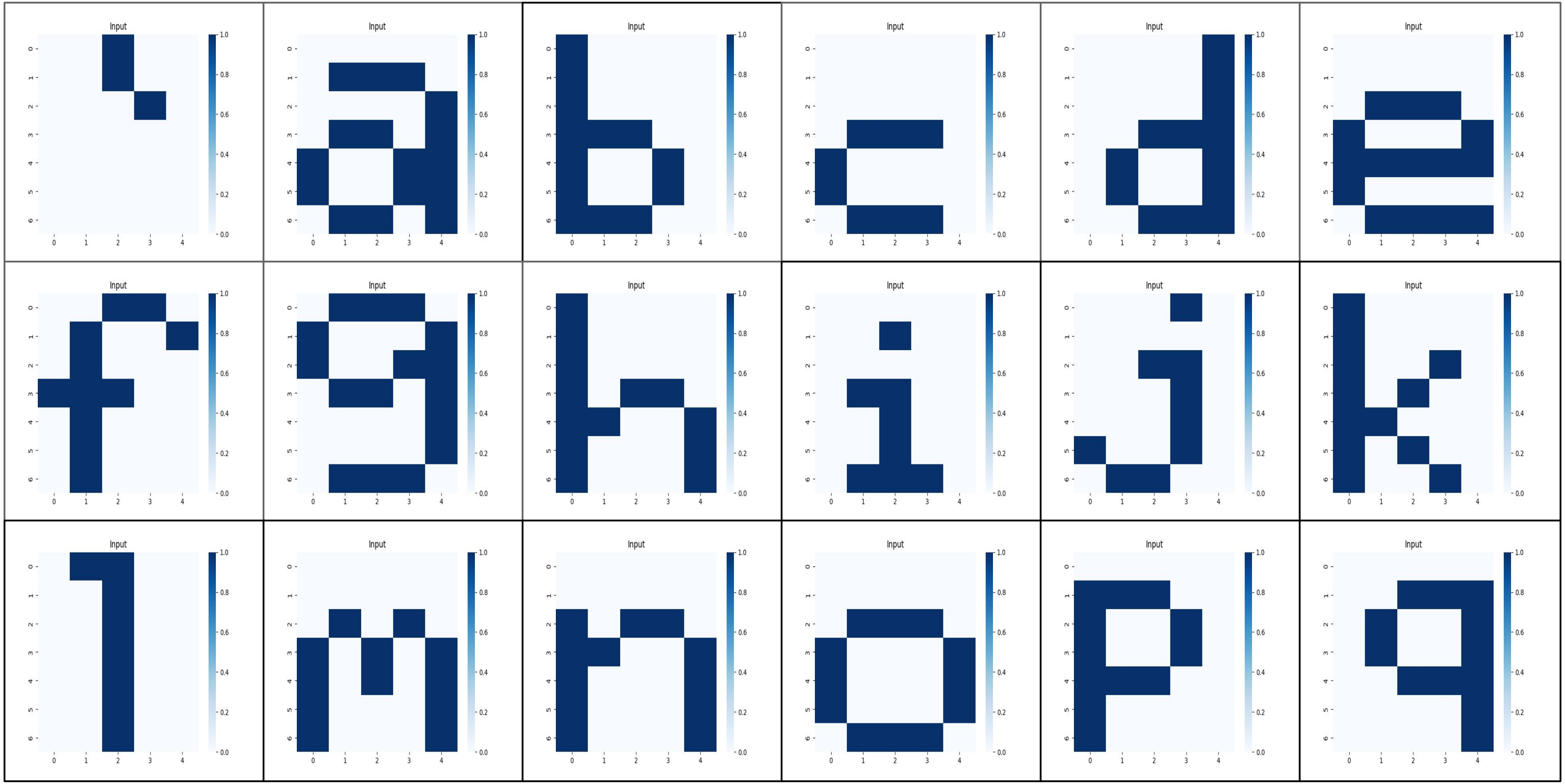
Alejandro Rolandelli
Benjamin Delasoie
Facundo Zimbimbakis
Malena Vasquez Currie
Santiago Larroude Alvarez

EJ1a.
Autoencoder Básico

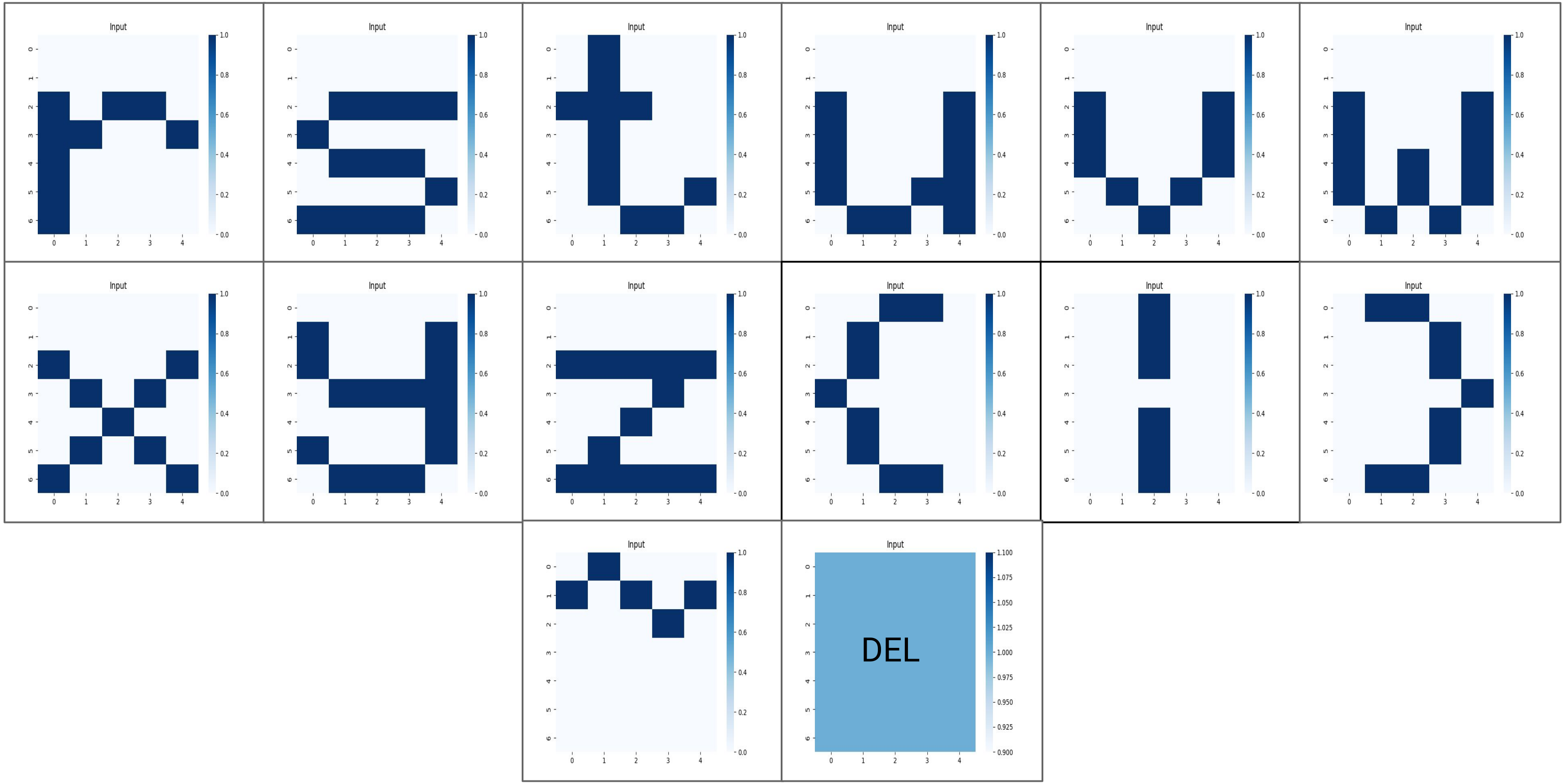


Representación de las fuentes

Conjunto Original (1/2)



Conjunto Original (2/2)

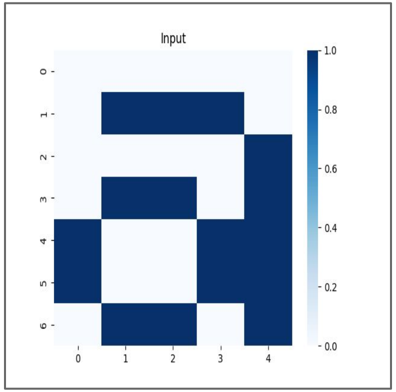


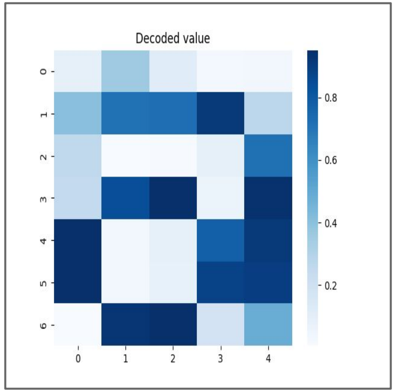
Subconjunto {a, b, e, n}

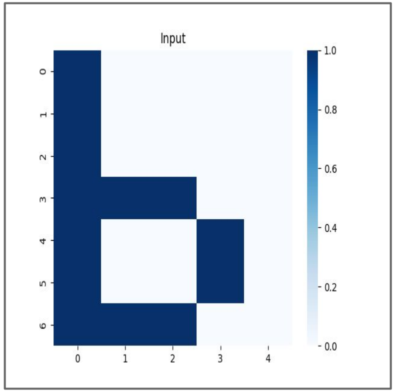
Comparación Original vs Generado

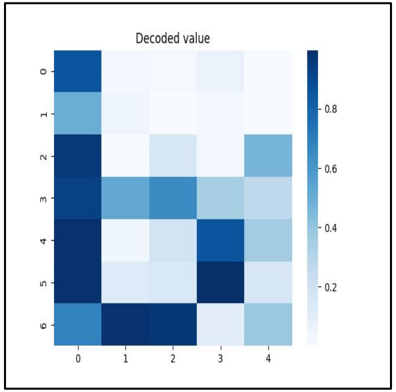
[35,25,16,12,16,25,35]

Dimensión Capa Latente - 12

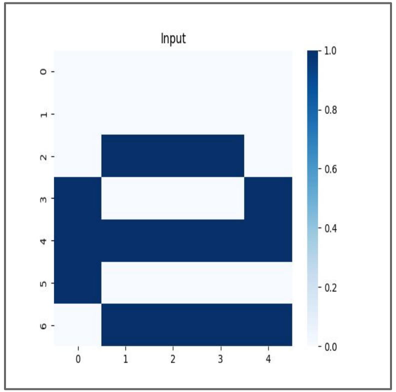


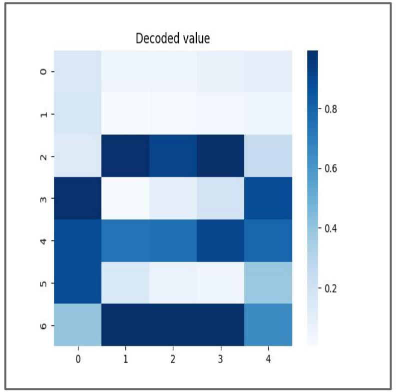


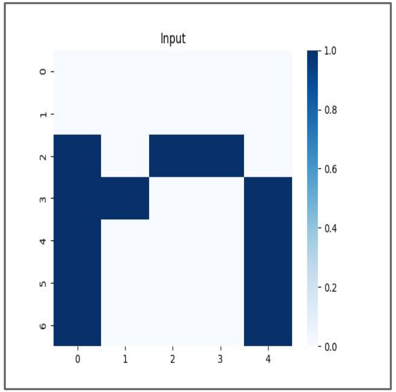


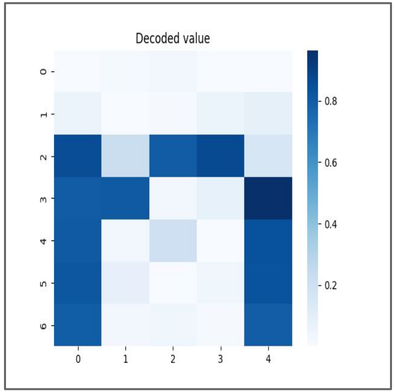


Error: 11.03



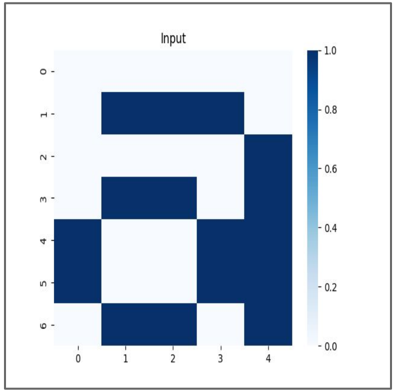


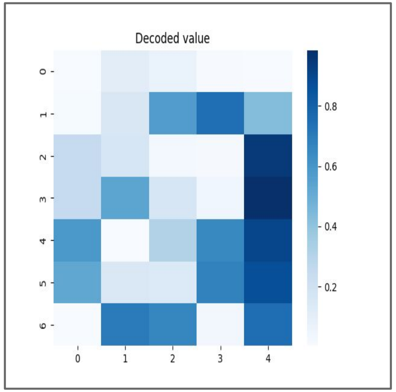


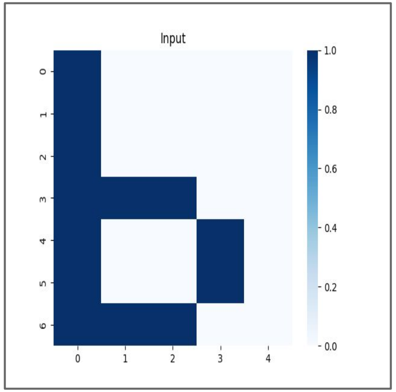


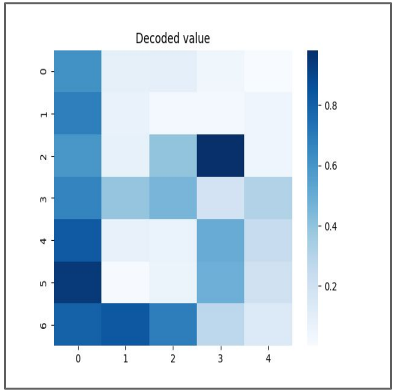
[35,25,16,6,16,25,35]

Dimensión Capa Latente - 6

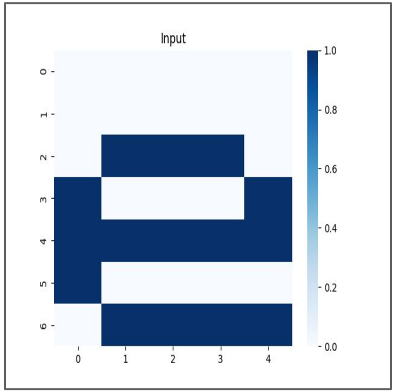


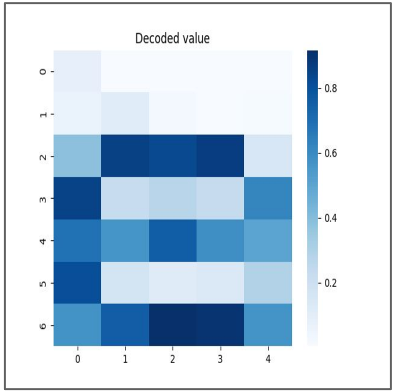


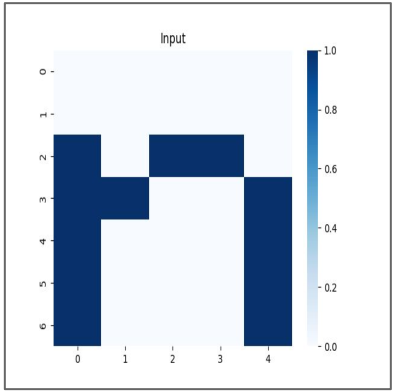


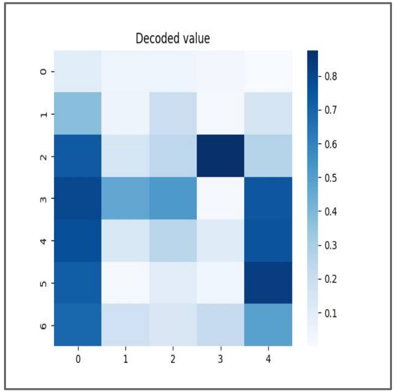


Error: 25.02



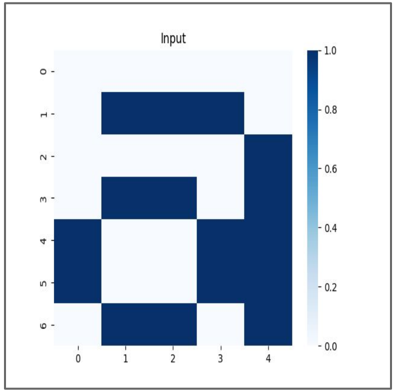


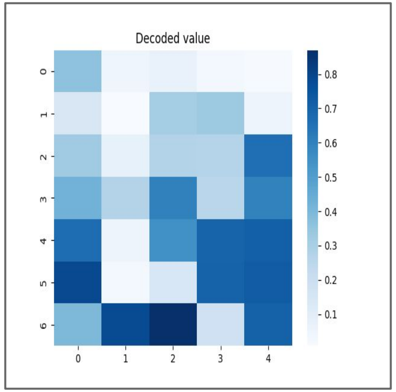


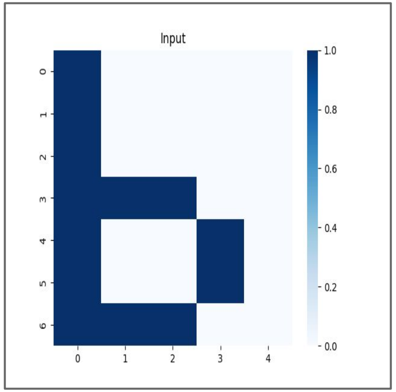


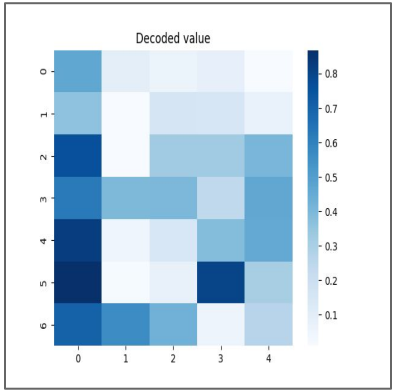
[35,25,16,2,16,25,35]

Dimensión Capa Latente - 2

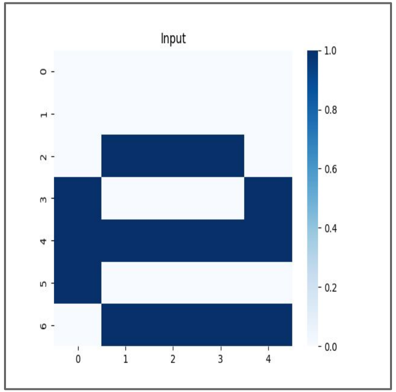


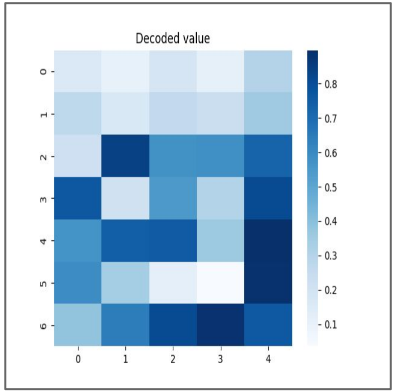


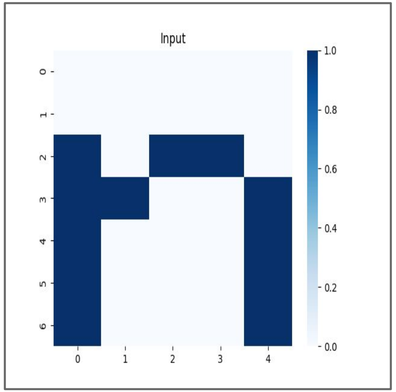


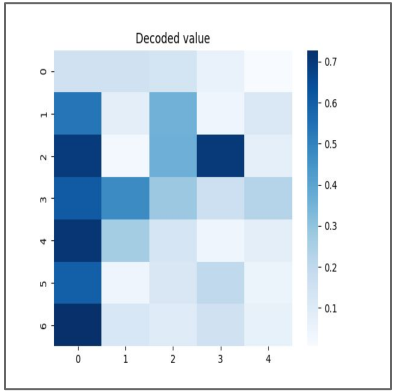


Error: 72.38



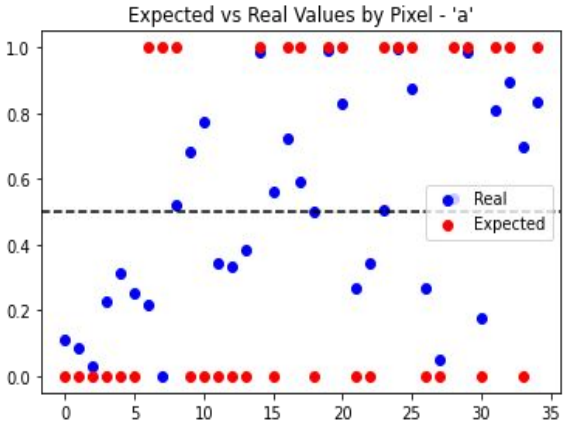


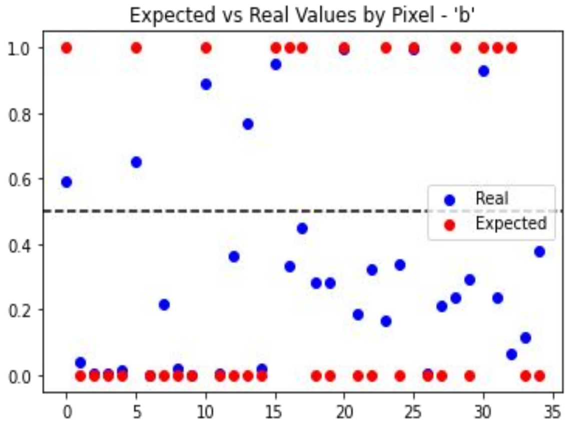




Promedio

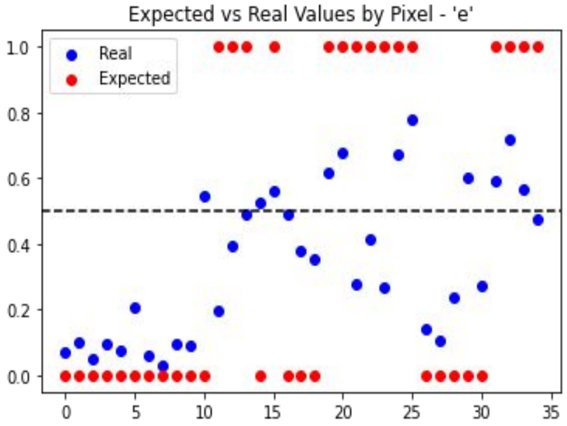
Aciertos: 29/35

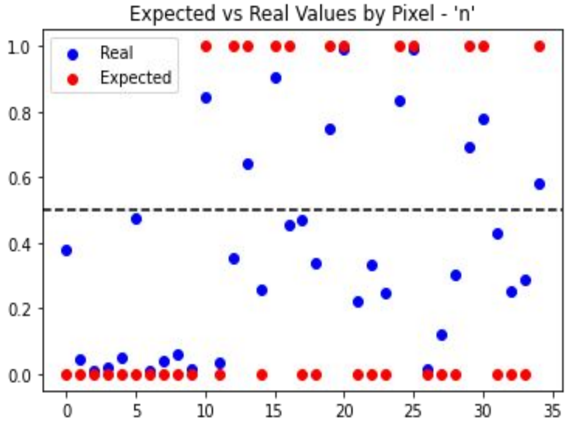




Aciertos: 29/35

Aciertos: 27/35



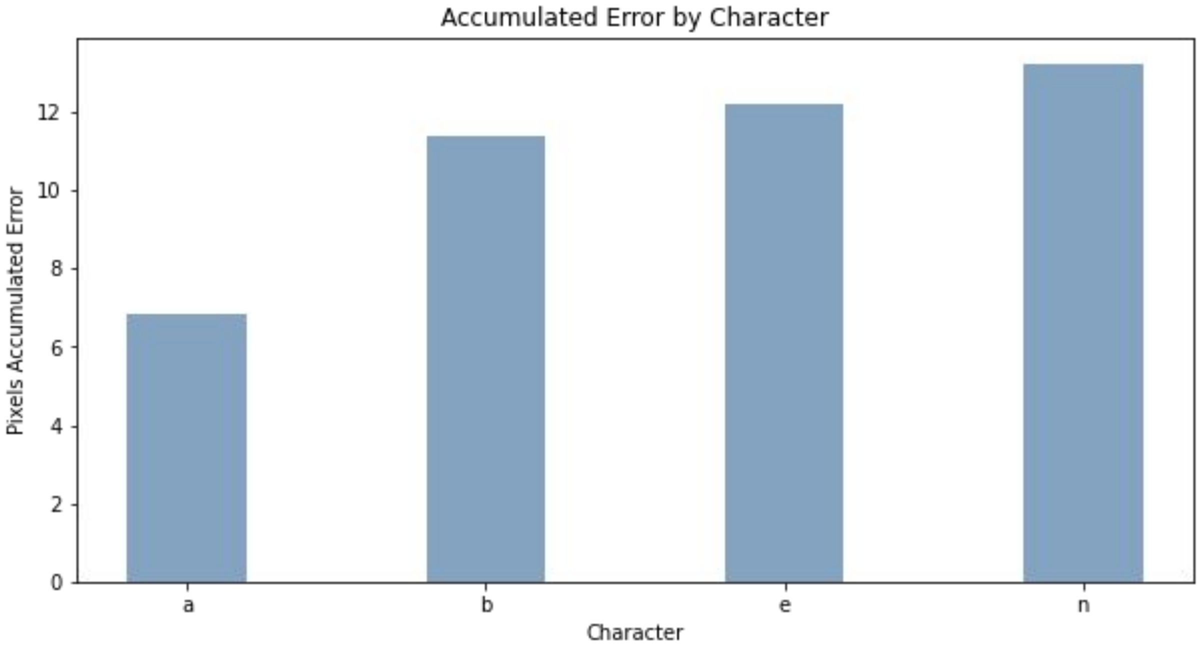


Aciertos: 32/35

Se considera acierto a todo pixel para el cual la diferencia entre su valor real y esperado es <= 0.5

Promedio

Evolución de los Errores



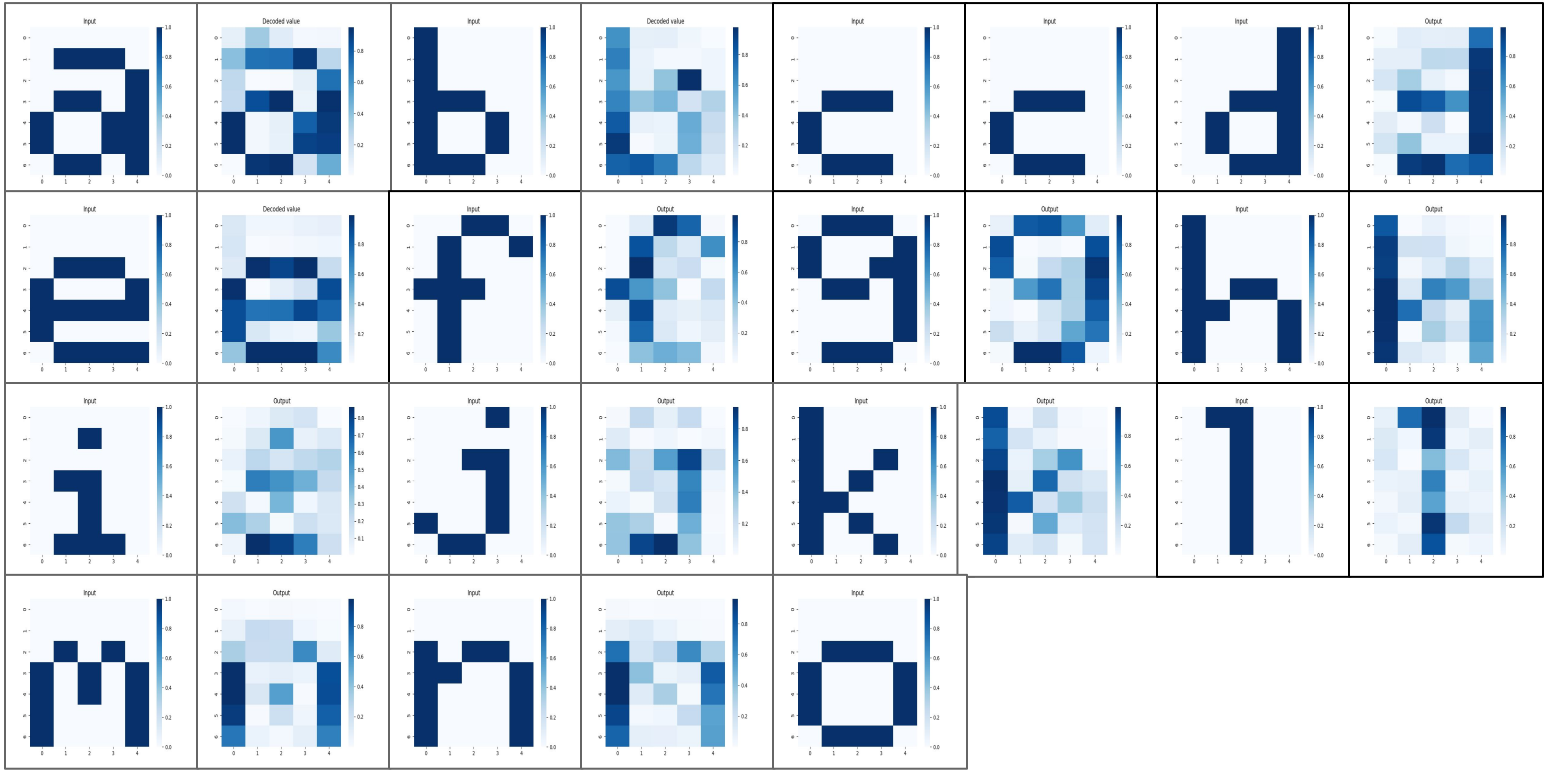
Puede aprender todo? Afecta la calidad del aprendizaje?

Conjunto Completo

Comparación Original vs Generado

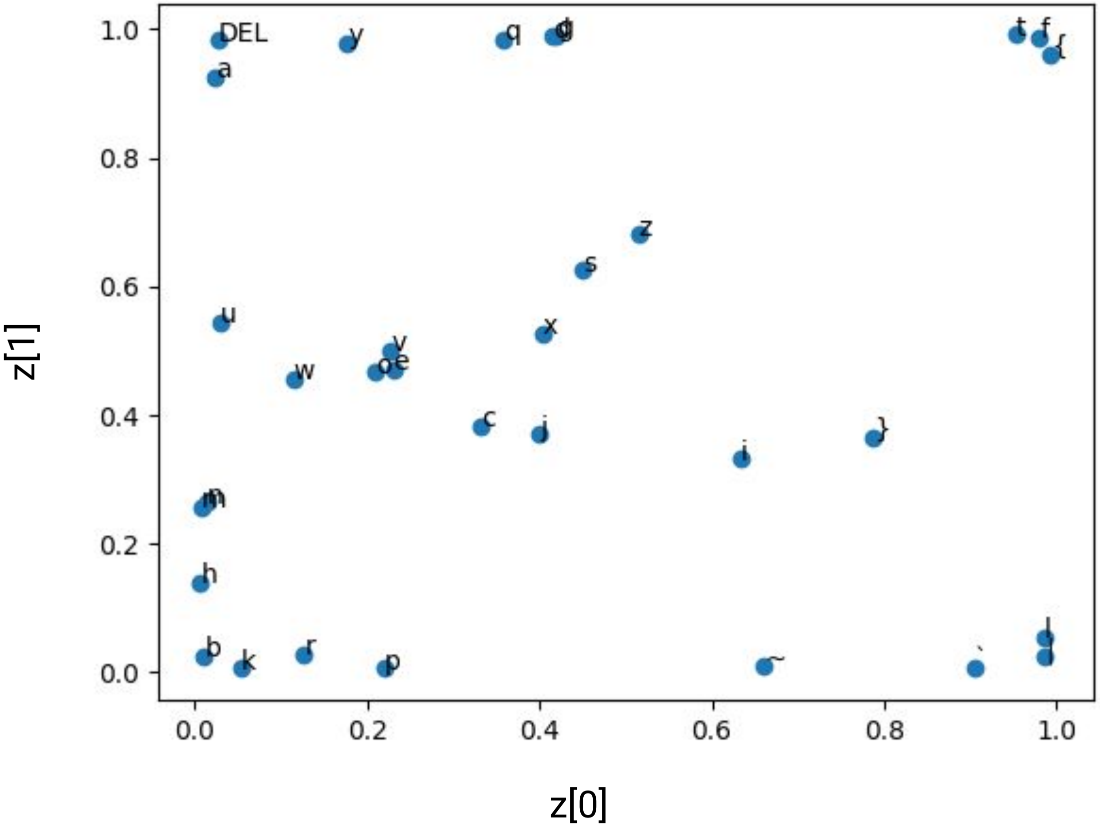
[35,25,12,16,12,16,12,25,35]

Dimensión Capa Latente - 12



Dimensión Capa Latente - 2

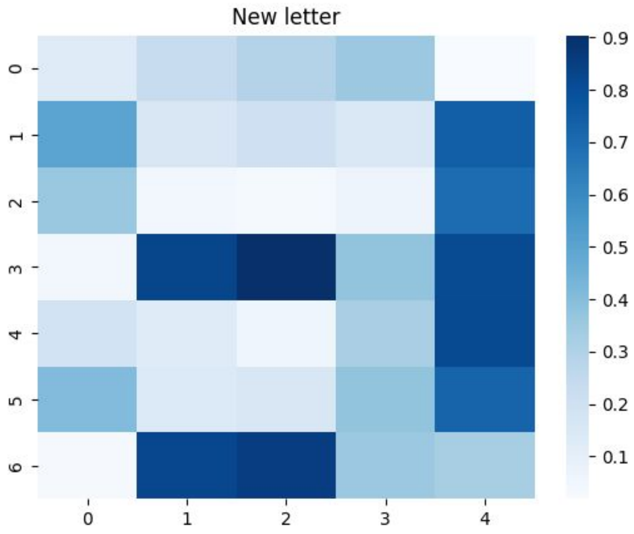
Character classes in the latent space

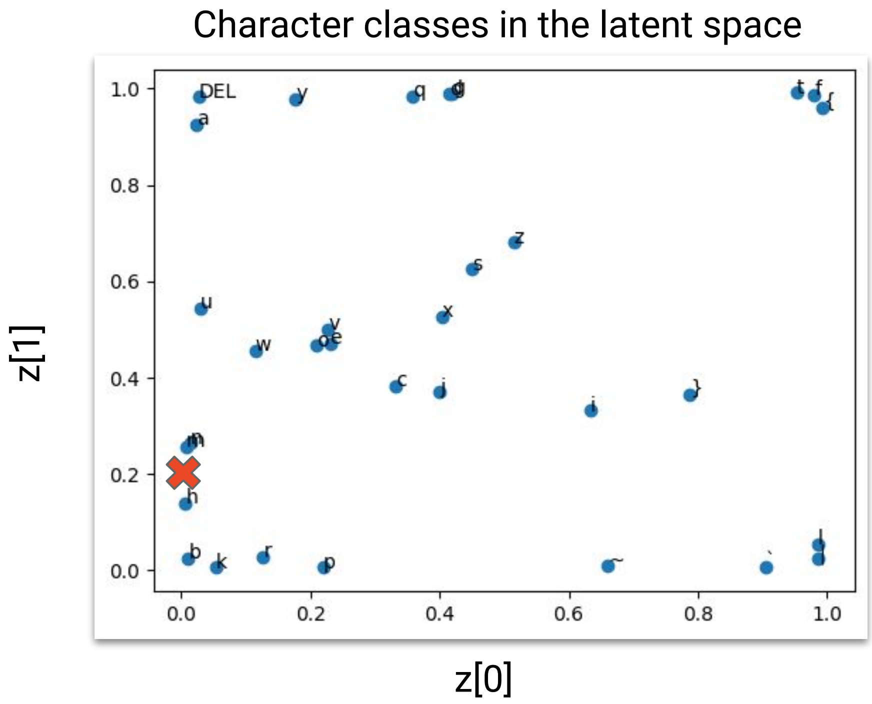


Creación de nuevas letras

[35,20,2,20,35]

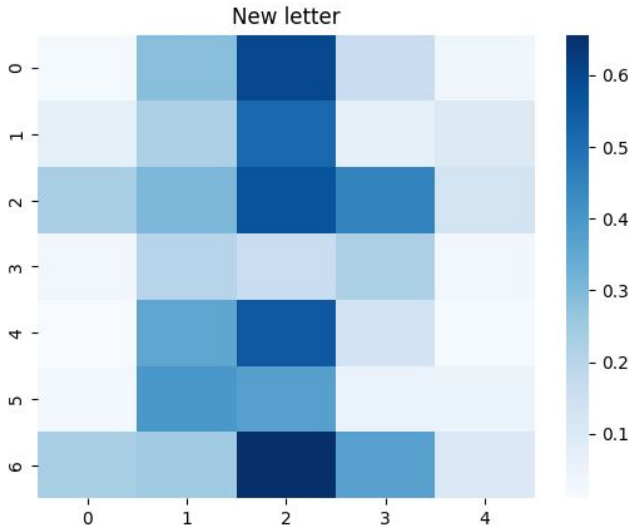
Usando el conjunto completo (0, 0.2)

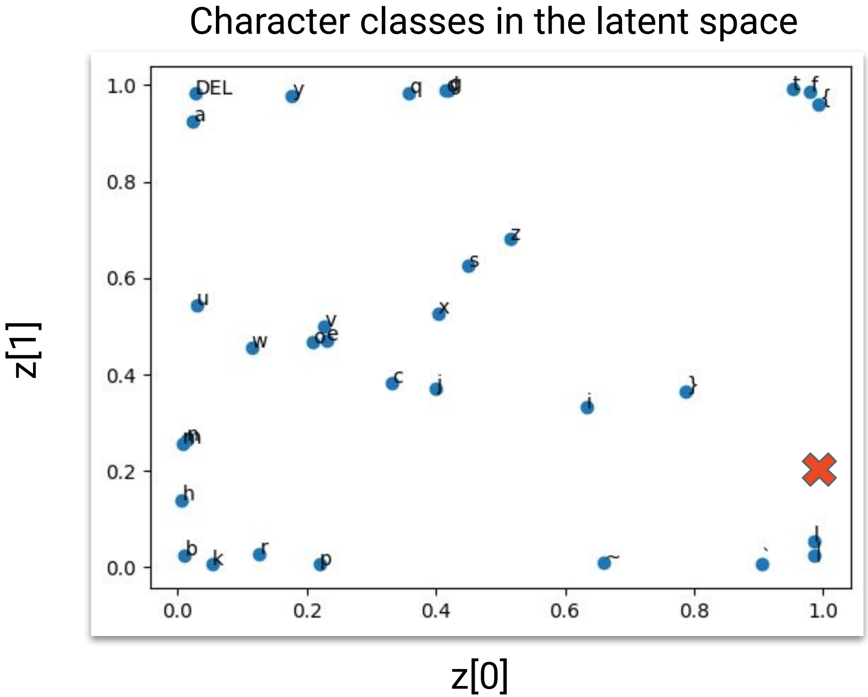




[35,20,2,20,35]

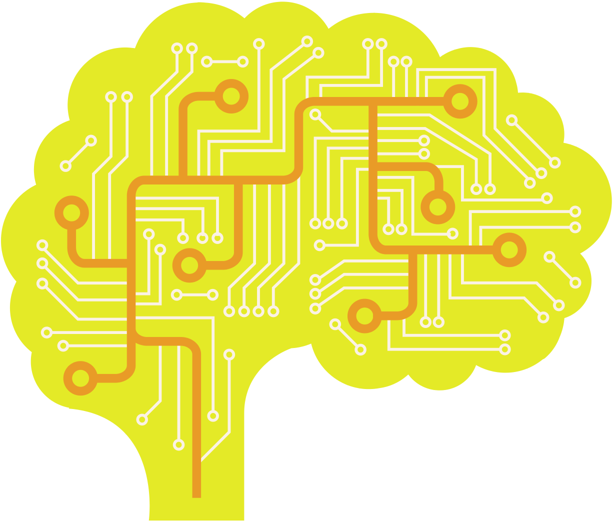
Usando el conjunto completo (1, 0.2)





Conclusiones

Aprendizaje diferente
El AE aprende algunos caracteres mejor que otros

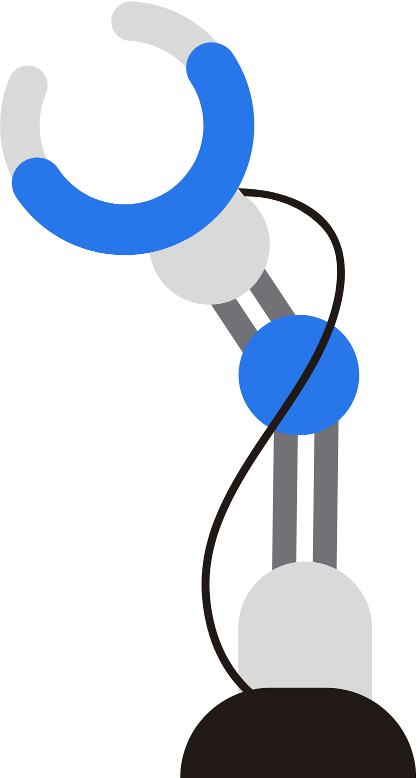


01 La capa latente tiene un rol importante. Mientras mayor su dimensión, menor el error

02 El autoencoder no solo tiene la habilidad de aprender el conjunto completo sino también crear nuevos elementos a partir de lo aprendido.

EJ1b.
Denoising Autoencoder

[35, 25, 9, 12, 4, 12, 9, 25, 35]

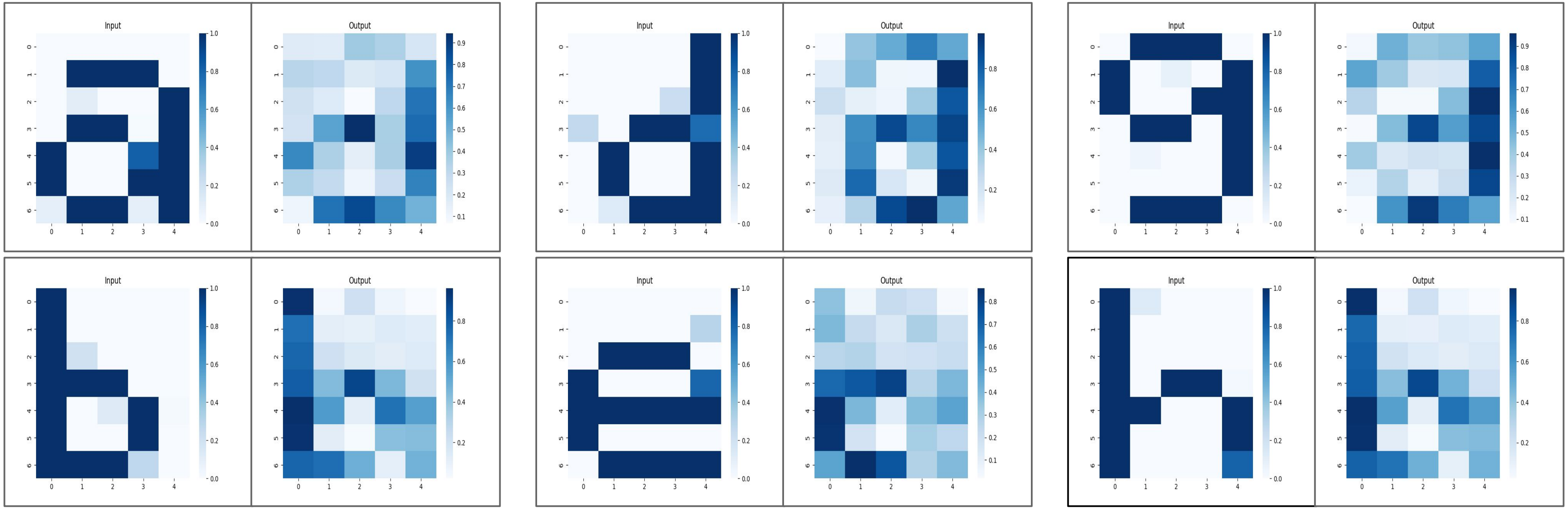


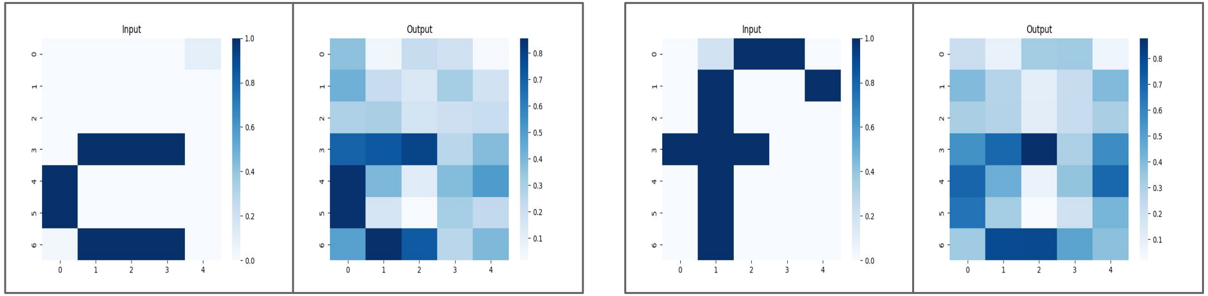
Capacidad de eliminación del ruido

Variación de la probabilidad de mutación y el ruido máximo

[35, 25, 9, 12, 4, 12, 9, 25, 35]

Mutation Prob: 0.1 Max Noise: 0.3

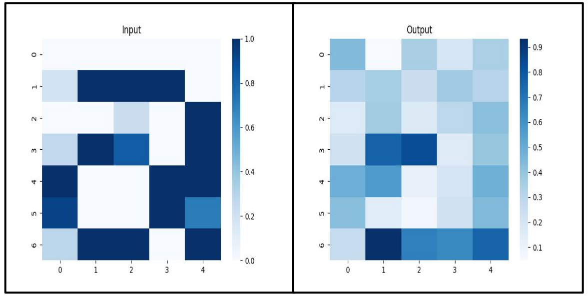


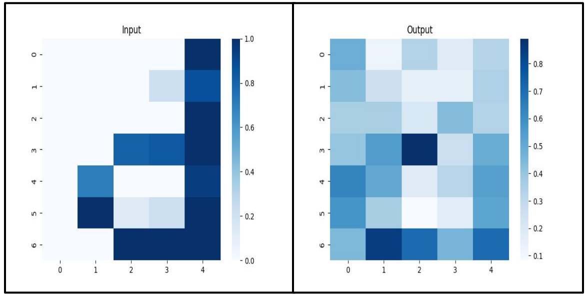


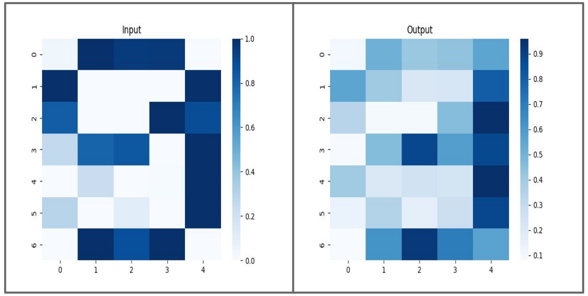
Error 18.11

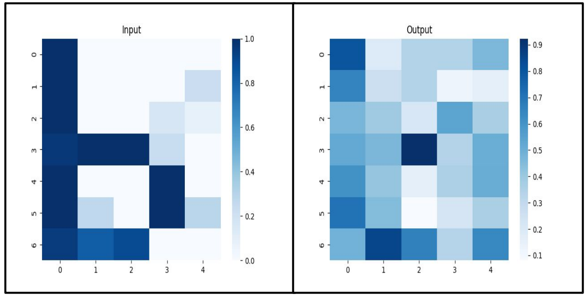
[35, 25, 9, 12, 4, 12, 9, 25, 35]

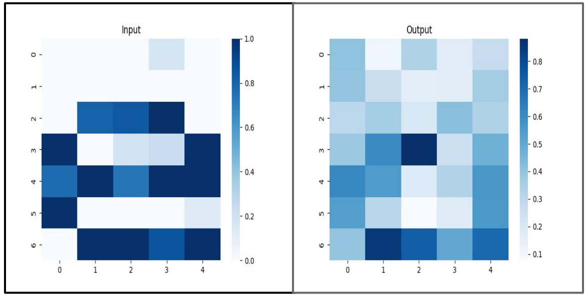
Mutation Prob: 0.3 Max Noise: 0.3

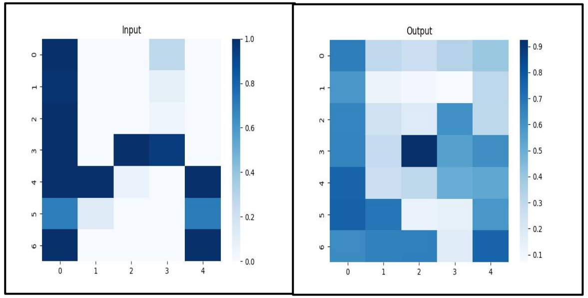


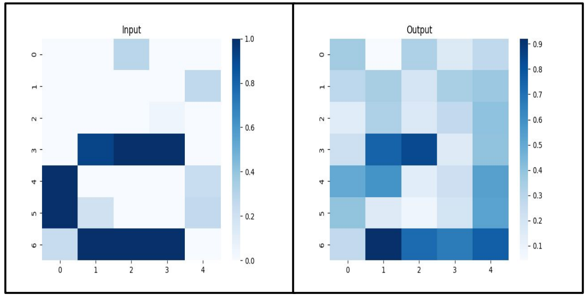


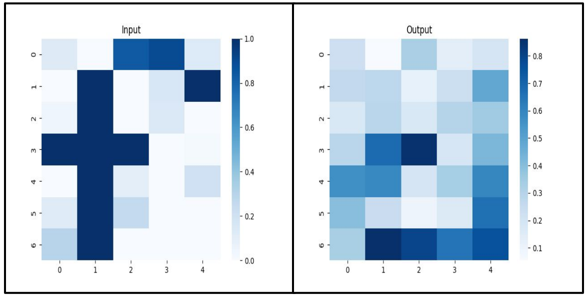








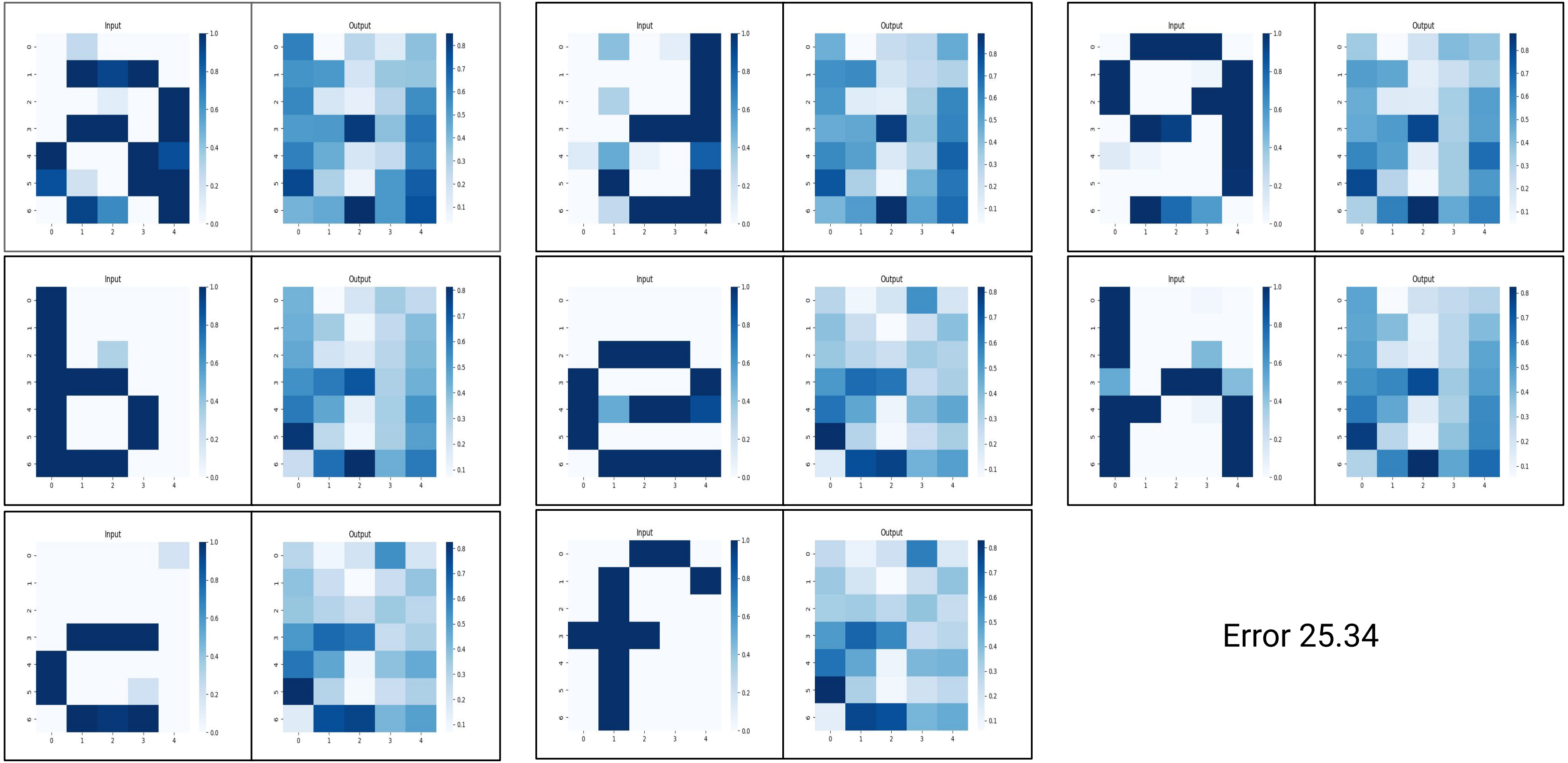




Error 25.56

[35, 25, 9, 12, 4, 12, 9, 25, 35]

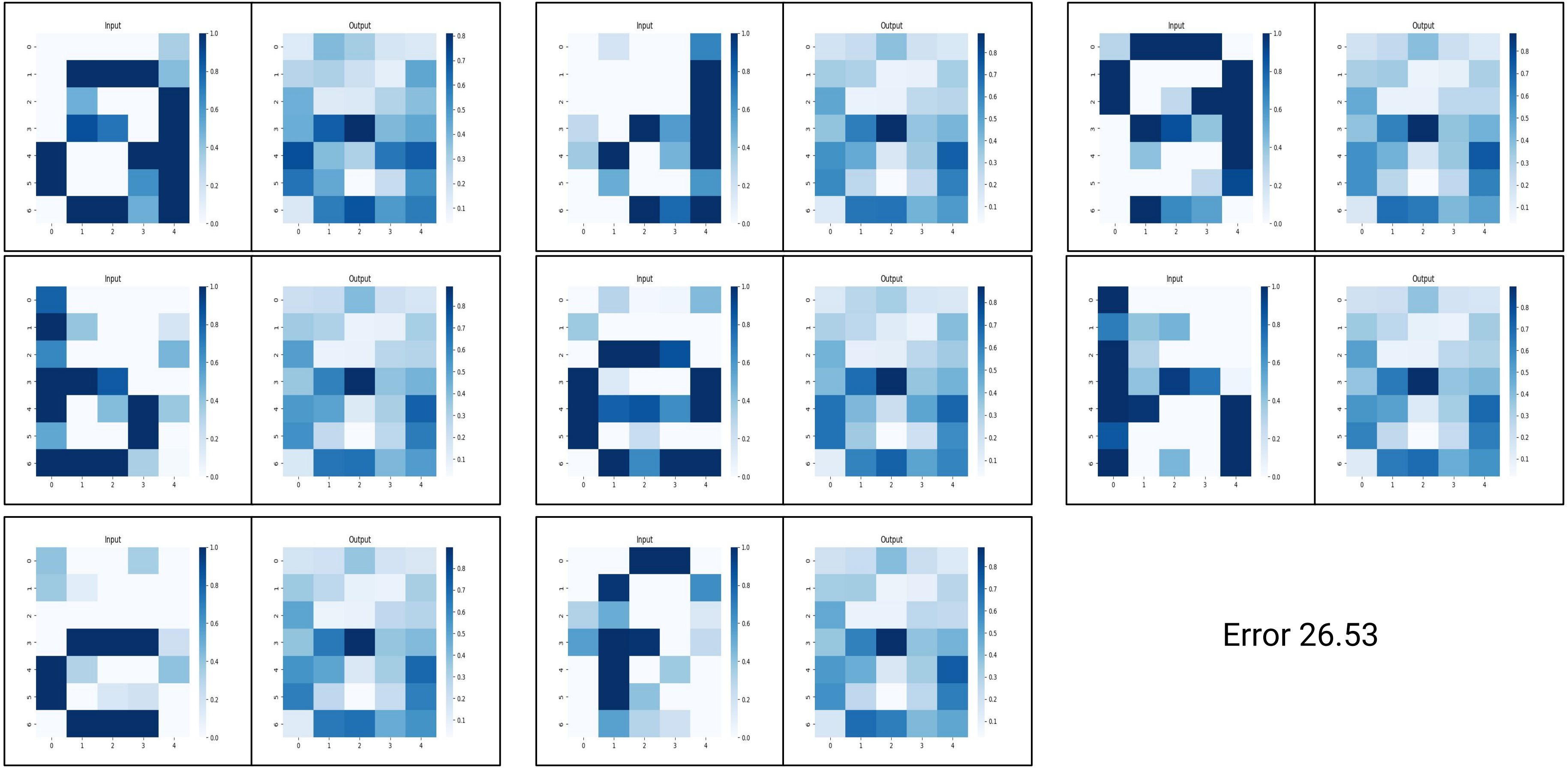
Mutation Prob: 0.1 Max Noise: 0.5



Error 25.34

[35, 25, 9, 12, 4, 12, 9, 25, 35]

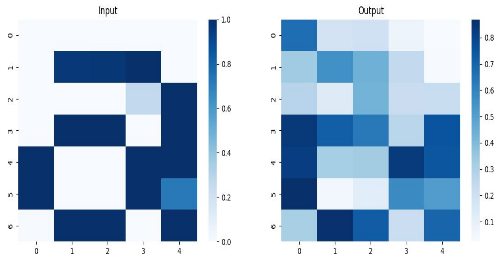
Mutation Prob: 0.3 Max Noise: 0.5



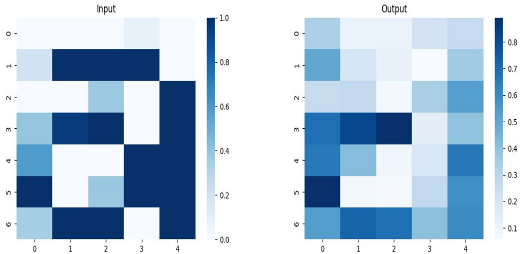
Error 26.53

[35, 25, 12, 12, 12, 25, 35]

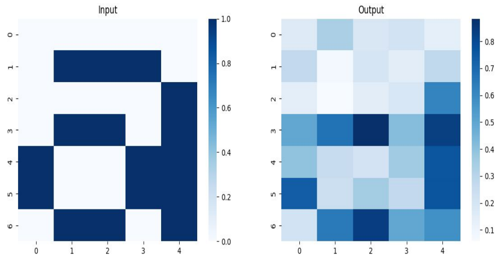
Otra arquitectura?



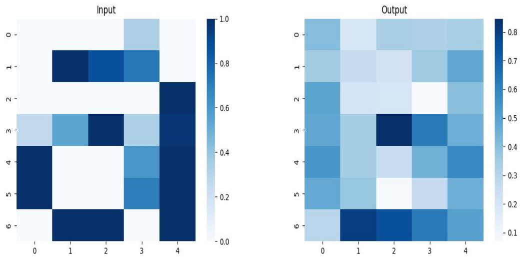
Mut Prob: 0.1
Max Noise: 0.3



Mut Prob: 0.3
Max Noise: 0.3

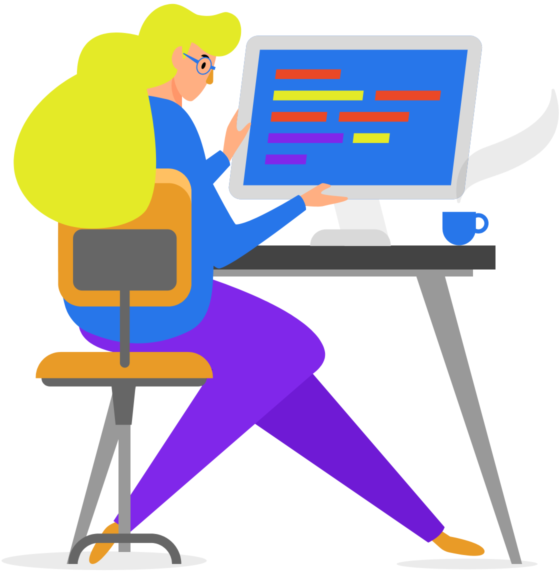


Mut Prob: 0.1
Max Noise: 0.5



Mut Prob: 0.3
Max Noise: 0.5

Resumen y Conclusiones



[35, 25, 9, 12, 4, 12, 9, 25, 35]			[35, 25, 12, 12, 12, 25, 35]		
Mut. Prob	**Max Noise**	**Error**	**Mut. Prob**	**Max Noise**	**Error**
0.1	0.3	18.11	0.1	0.3	22.31
0.1	0.5	25.34	0.1	0.5	24.31
0.3	0.3	25.26	0.3	0.3	23.85
0.3	0.5	26.53	0.3	0.5	27.03

01

Muchos factores

El error puede variar en base a una combinación de factores

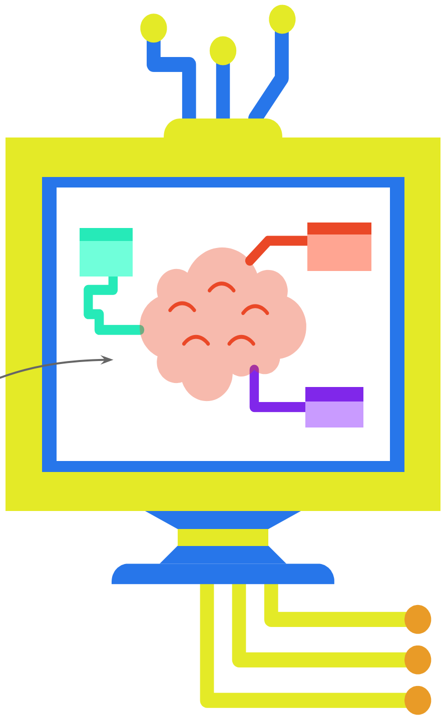
02

+ Ruido, + Error

Parece que existe una correlación directa entre ruido y error.

EJ.2 Autoencoder Variacional Simple

- Tensorflow

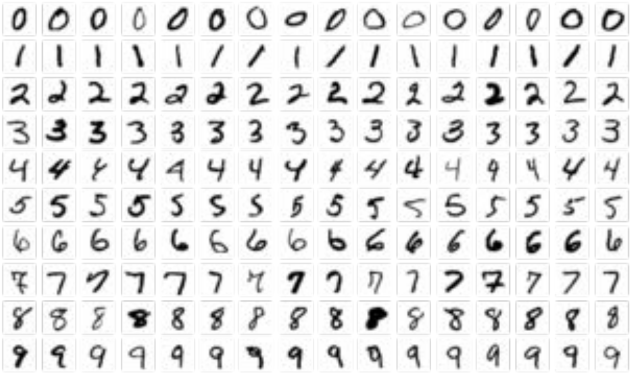


- Keras

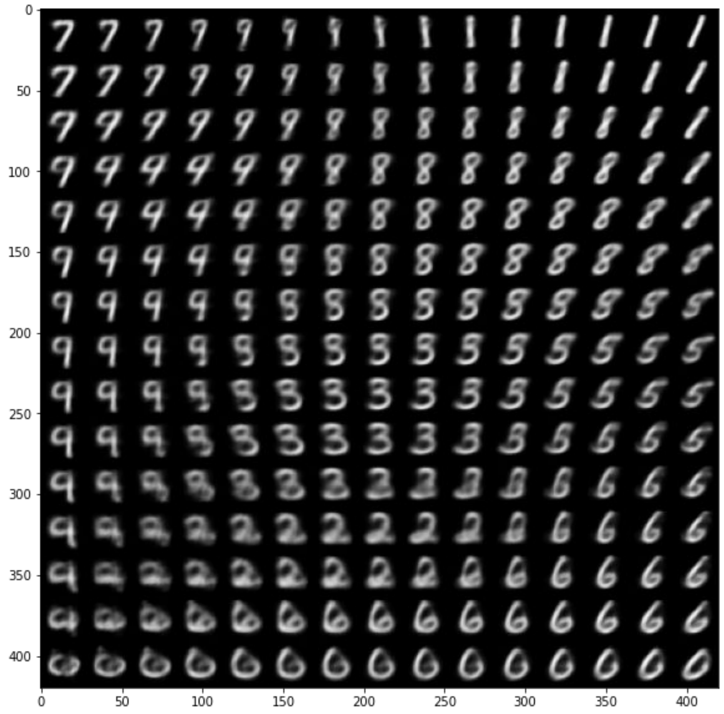
MNIST Digit Dataset

Métodos de Optimización: Adam, RMS Prop

RMS Prop (1/2)

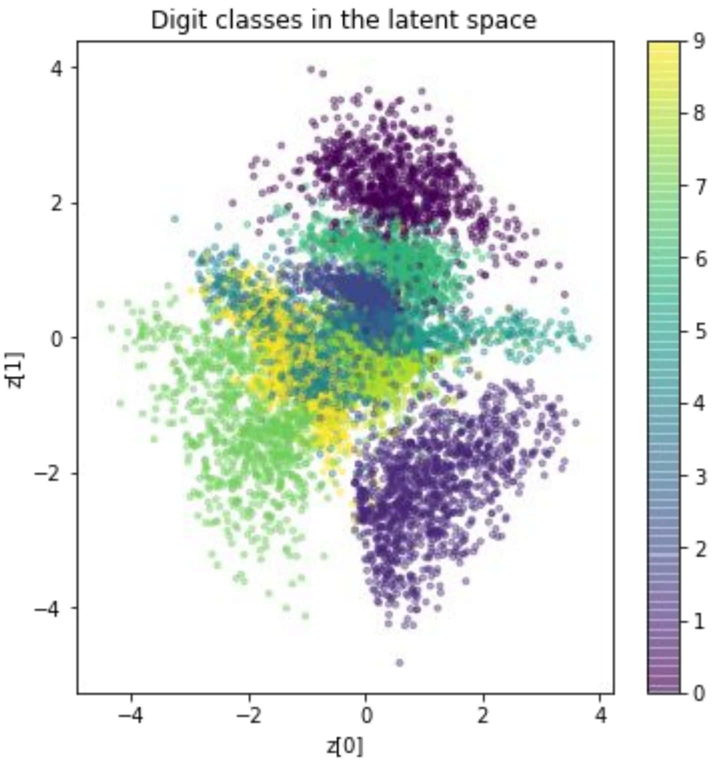


Original

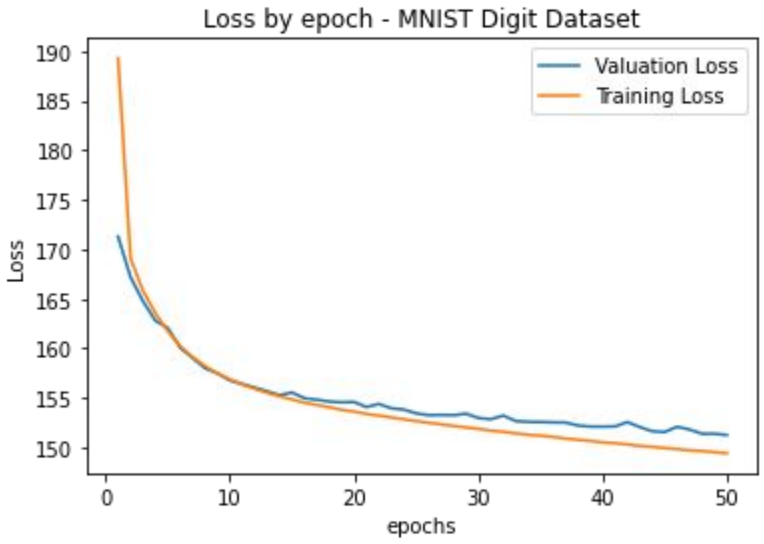


Generado

RMS Prop (2/2)

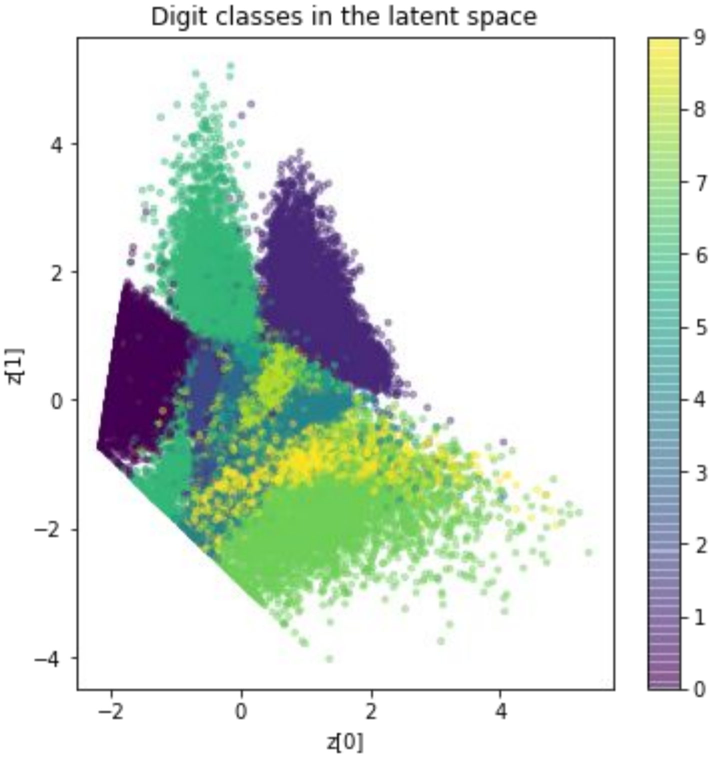


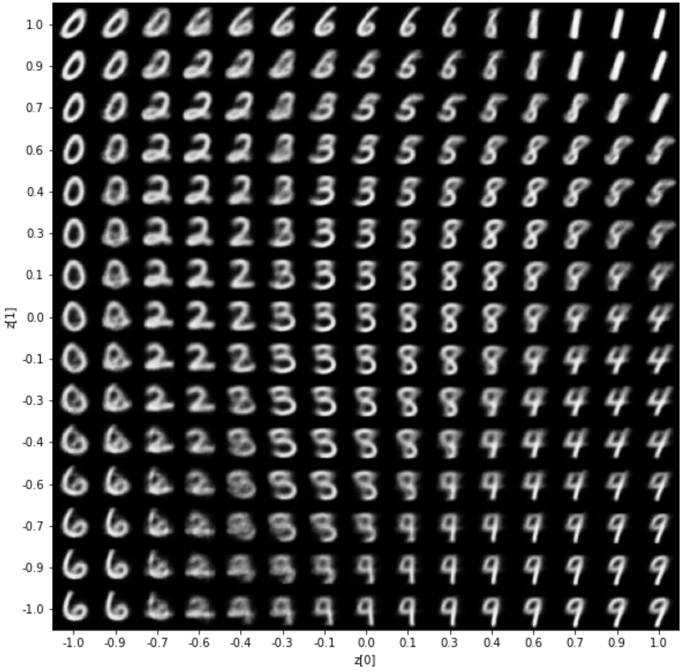
Digit classes in the latent space
z[1]
z[0]
4
2
0
−2
−4
−4
−2
0
2
4
9
8
7
6
5
4
3
2
1
0



Loss by epoch - MNIST Digit Dataset
Valuation Loss
Training Loss
Loss
epochs
190
185
180
175
170
165
160
155
150
0
10
20
30
40
50

Adam


Digit classes in the latent space
z[0]
z[1]
−2
0
2
4
−4
0
1
2
3
4
5
6
7
8
9

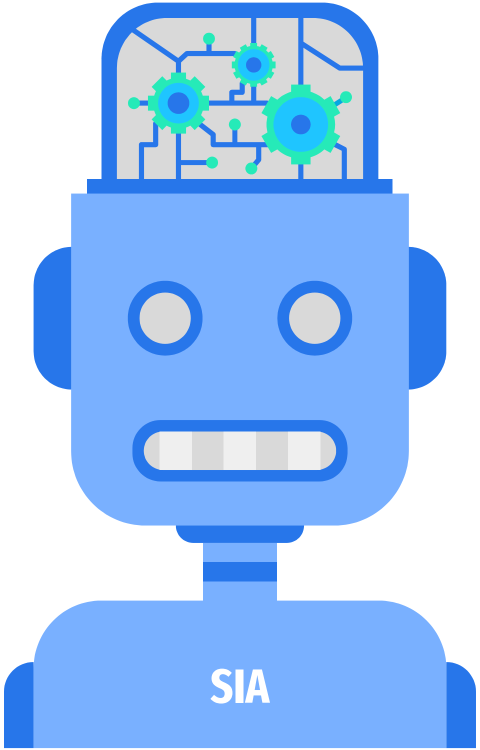

z[0]
z[1]
-1.0
-0.9
-0.7
-0.6
-0.4
-0.3
-0.1
0.0
0.1
0.3
0.4
0.6
0.7
0.9
1.0

Análisis y Conclusiones

RMS

01

Se forman agrupaciones separadas de dígitos. La separación entre ellas indica que el autoencoder puede distinguirlos correctamente.



Errores

02

La valuation loss y la training loss tienen un camino parecido. Indica que el modelo es bueno, ya que no hay demasiado overfitting o underfitting.

Adam

03

Mayor agrupamiento entre clases. Indica que el autoencoder no los puede reconocer bien. Se podría aumentar la cantidad de capas ocultas.

Gracias!
Preguntas?