Sistemas de Inteligencia Artificial
TPE 2: Redes Neuronales

Grupo 1
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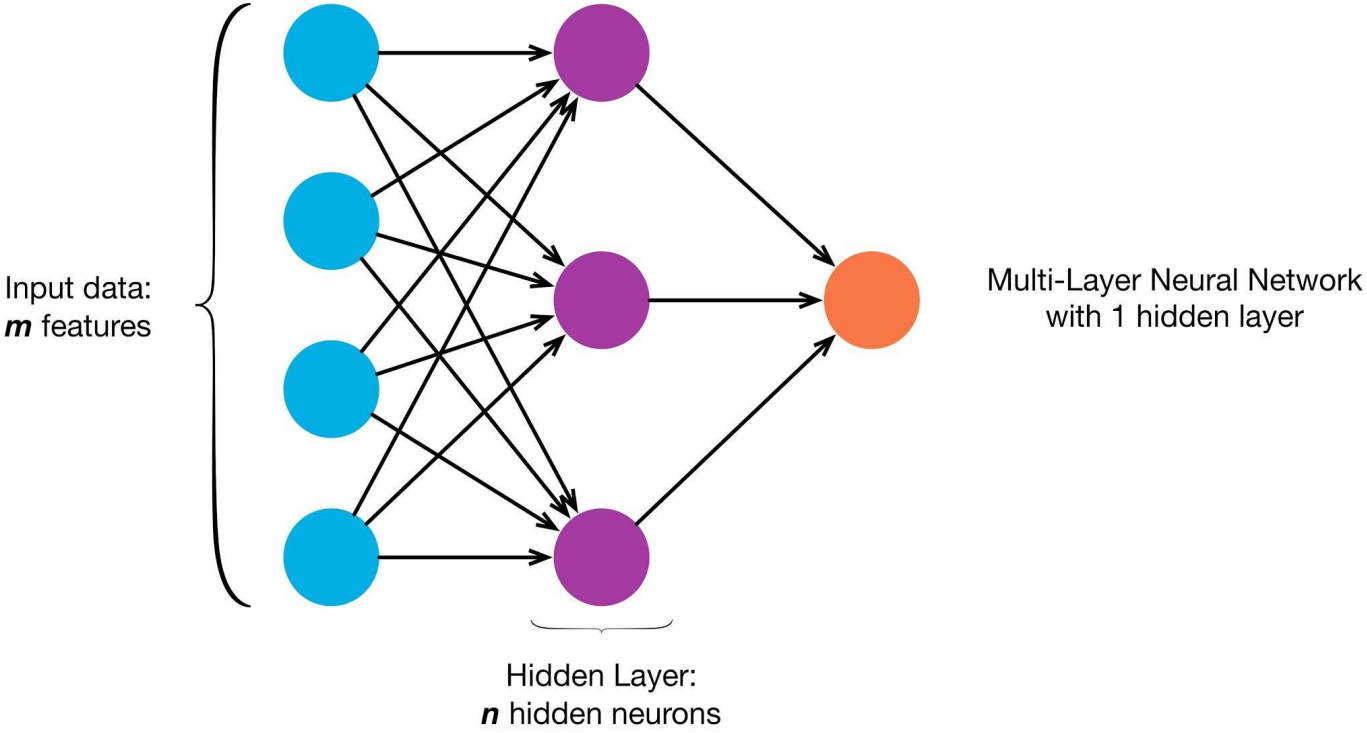
Objetivos

- Desarrollar una red neuronal que pueda simular terrenos a partir de mediciones de terrenos reales
- Analizar y comparar distintas configuraciones de red
- Analizar variantes del algoritmo backpropagation
- Comparar performance de la red utilizando las distintas variantes

Red neuronal multicapa



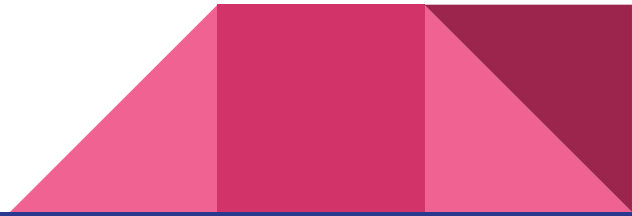
Métricas

Las métricas utilizadas para el análisis de resultados fueron:

- Error de entrenamiento
- Error de testing
- Épocas

Variables de la arquitectura

- Cantidad de capas
  - Utilizamos 3 arquitecturas distintas una con 1 capa oculta, las otras con 2 capas ocultas
- Cantidad de neuronas por capa
- Épocas
- Eta
- Alpha momentum
- a, b para eta adaptativo
- Steps para eta adaptativo
- Iteraciones batch
- Umbral de error
- Prevención de saturación



Optimizaciones consideradas

- Eta adaptativo
- Batch
- Prevención de saturación
- Momentum

$$\alpha(t+1) = \begin{cases} \alpha(t)+a & \text{if } \Delta E < 0 \text{ for last few epochs} \\ (1-b).\alpha(t) & \text{if } \Delta E > 0 \\ \alpha(t) & \text{otherwise} \end{cases}$$

$$\Delta w_{ij} = (\eta * \frac{\partial E}{\partial w_{ij}}) + (\gamma * \Delta w_{ij}^{t-1})$$

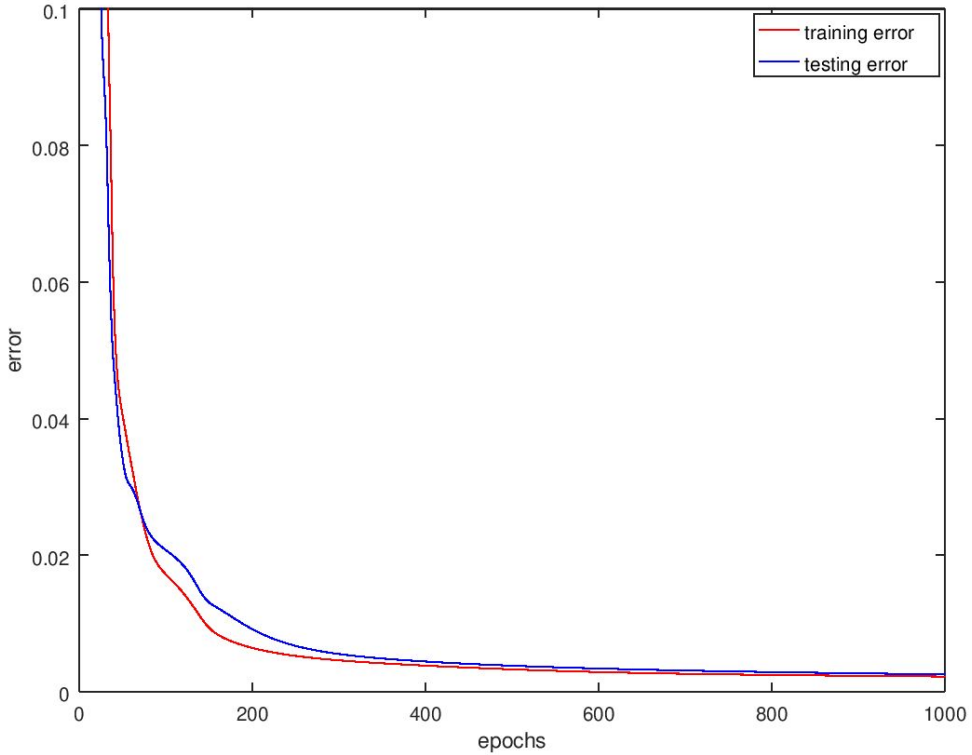
momentum factor

weight increment, previous iteration

Caso Base

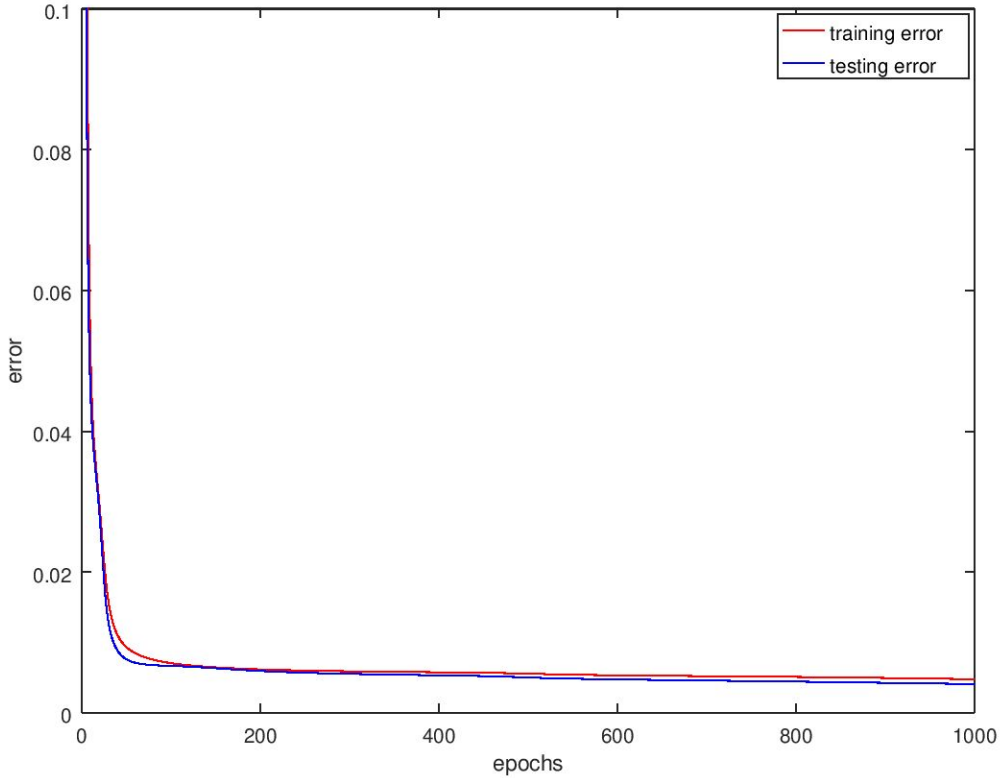
Arqui.	*Training size*	*Aprendizaje*	*Eta*	*Eta Adapt*	*Momentum*	*Funcion*	*Prev. de Saturación*
2,15,10,1	300	Incremental	0.01	No	No	tanh	No

Distintas Arquitecturas



Arquitectura:
2,15,10,1

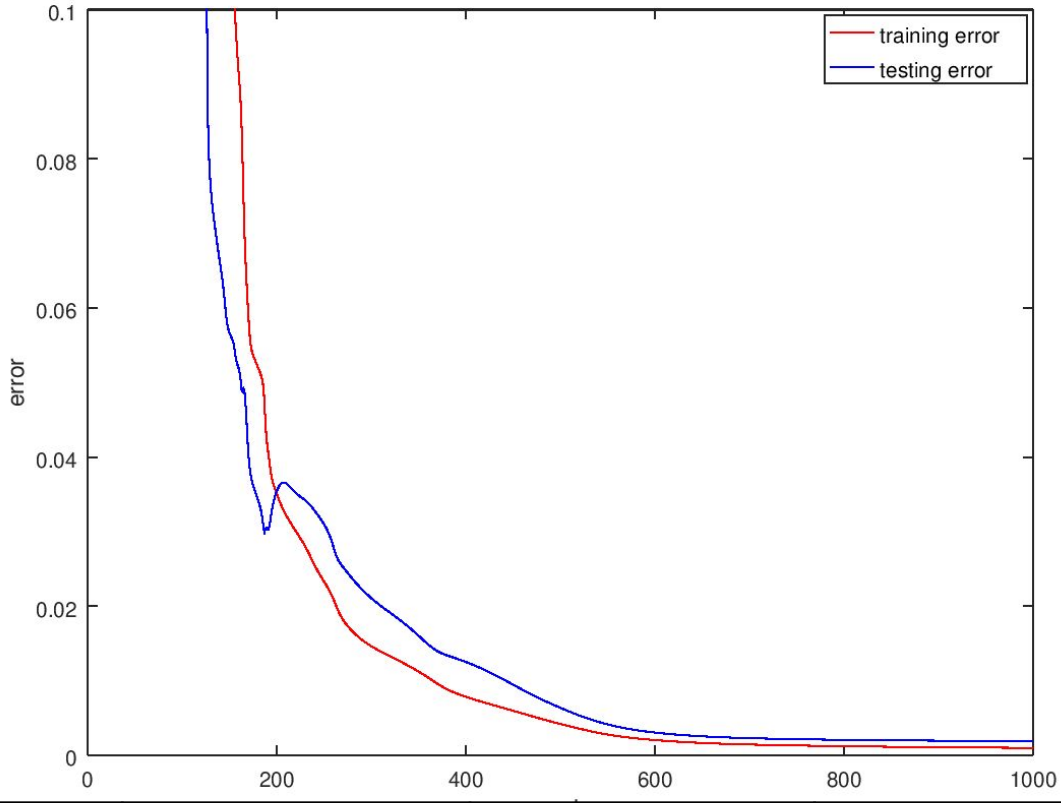
Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.0022366	0.0025531	87.3333%	82.2695%



Arquitectura:

2,10,1

Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.0047929	0.0041049	74.3333%	81.5603%

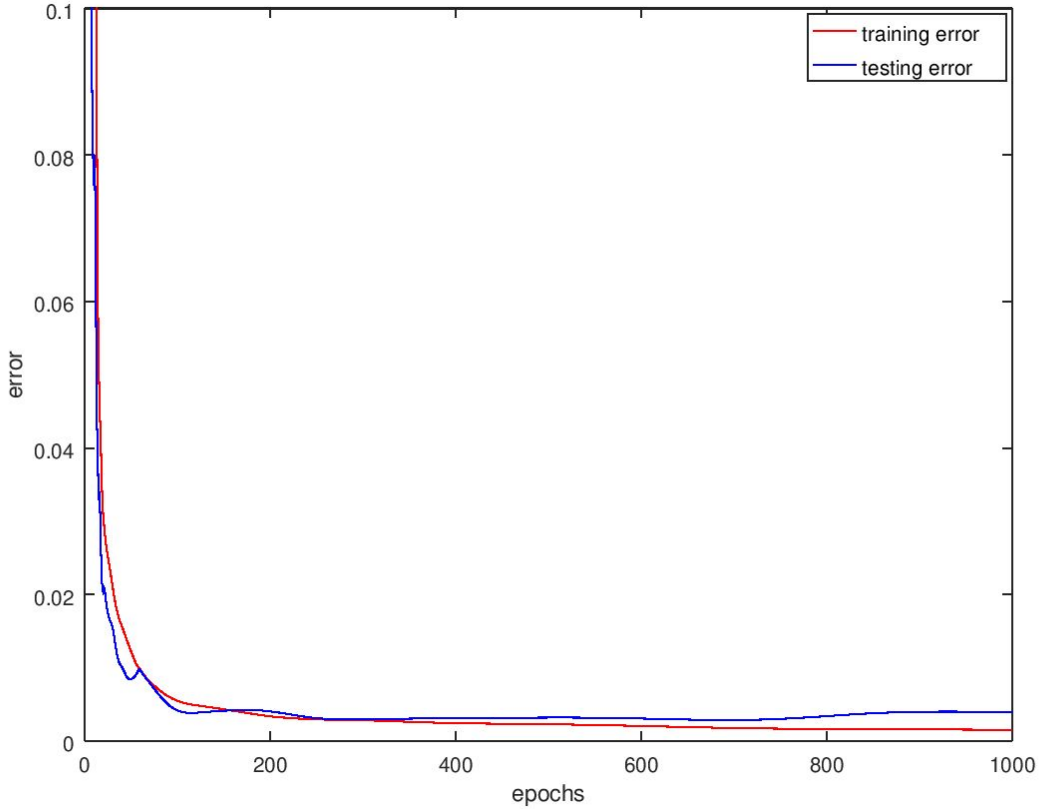


Arquitectura:

2,30,20,1

Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.0010003	0.0019097	95%	92.9078%

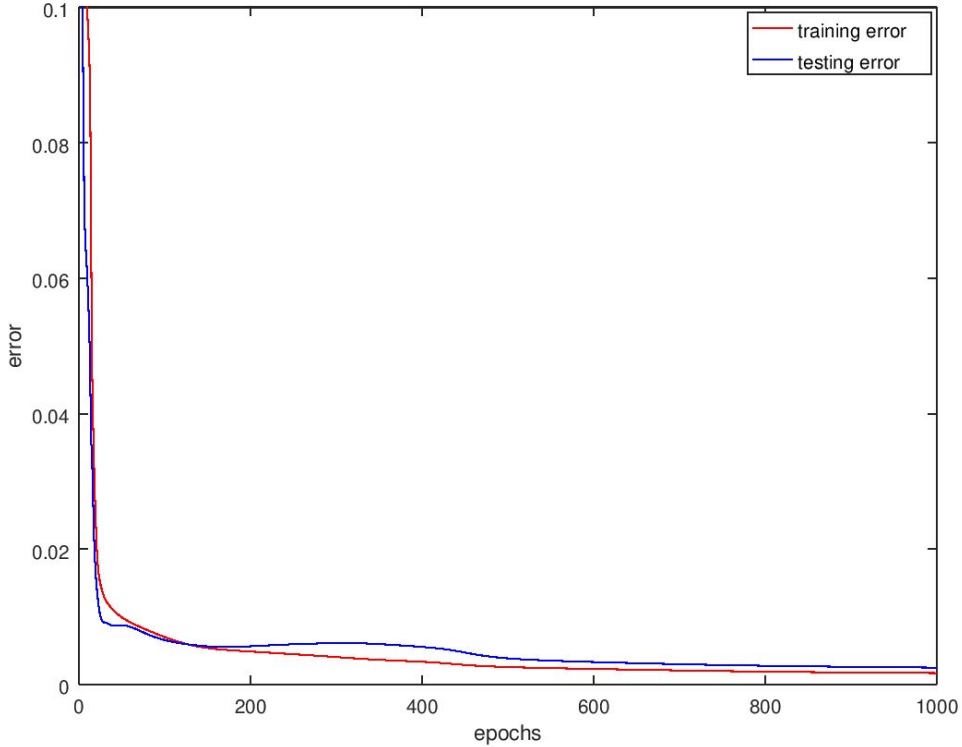
Cambios en el Eta



Eta:

0.1

Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.0015415	0.0039599	93.6667%	78.0142%

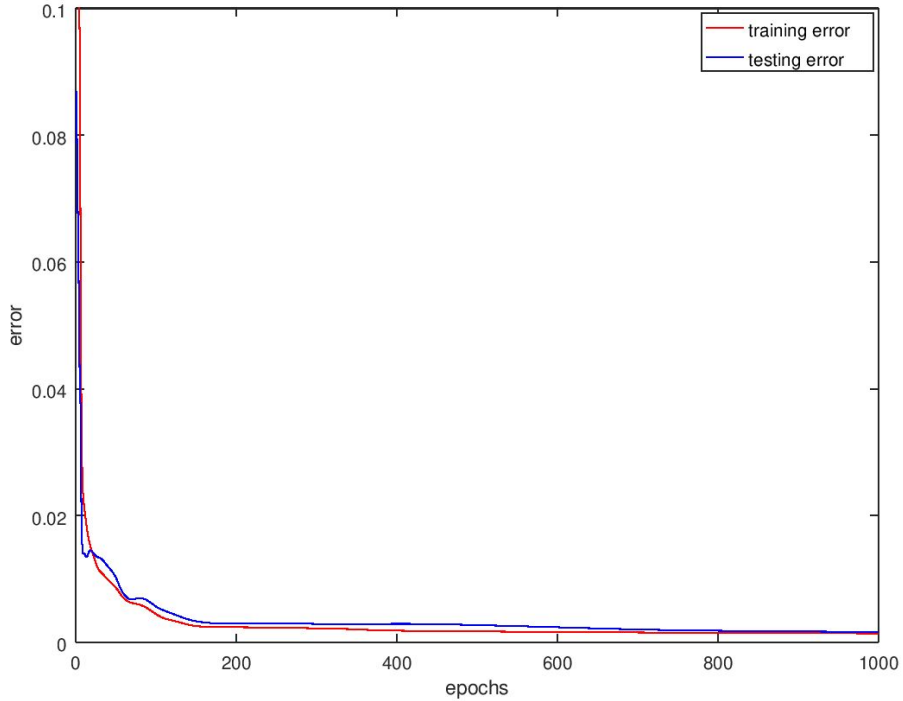


Eta:

0.05

Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.0016994	0.0025072	91%	83.6879%

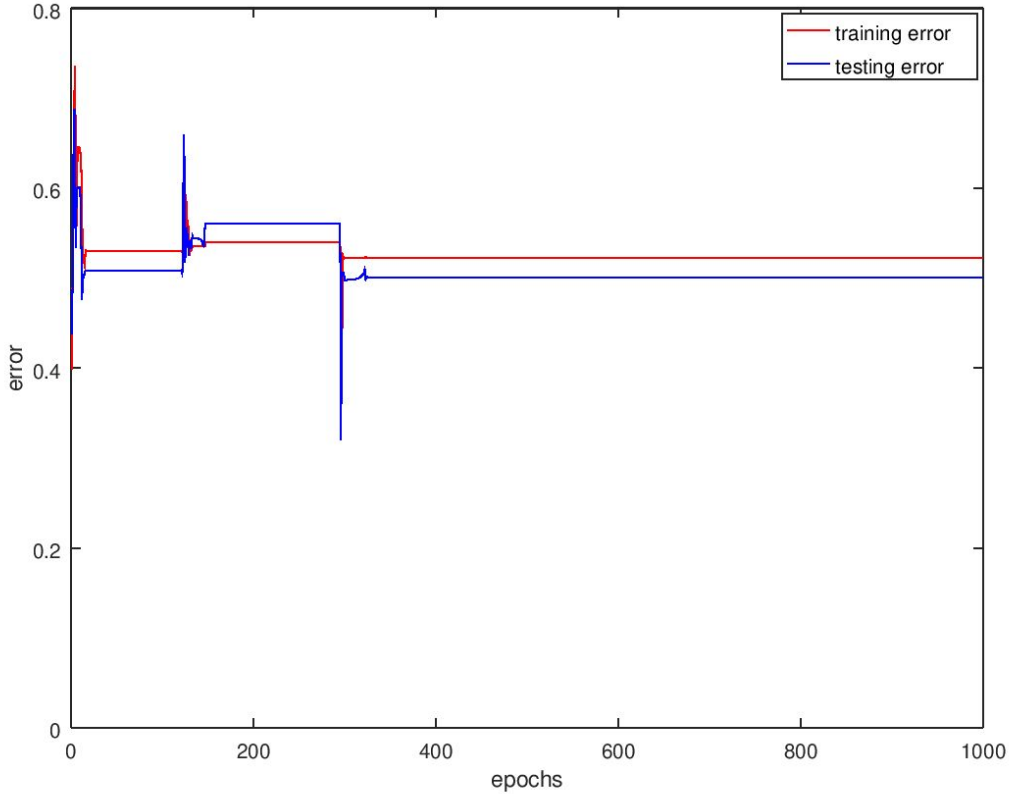
Momentum



alfa:

0.9

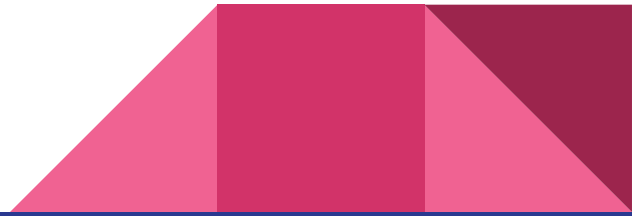
Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.0014231	0.0016422	93.6667%	92.1986%

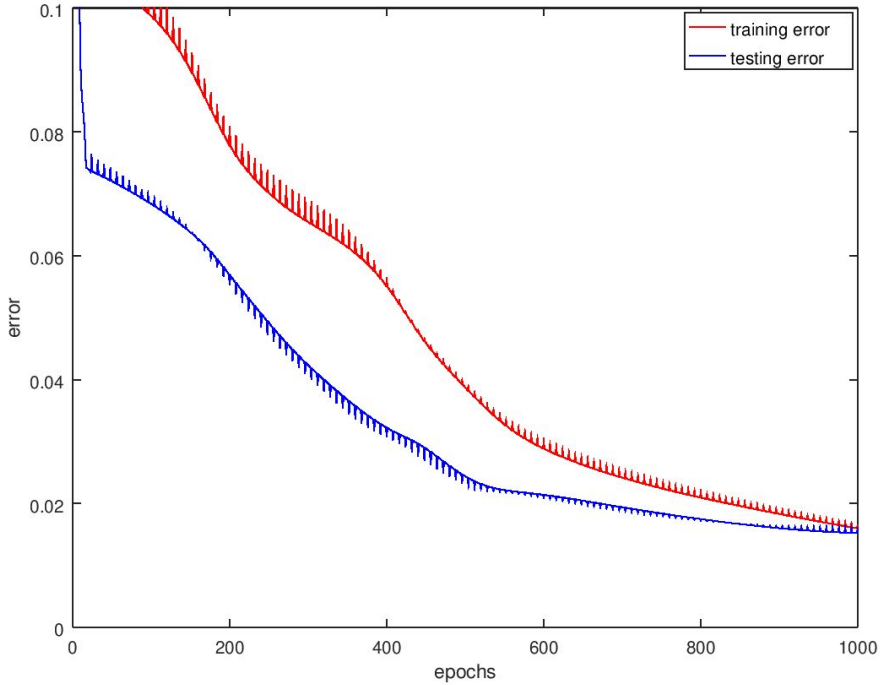


Alfa:
0.99

Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.52244	0.50111	5%	4.25532%

Eta Adaptativo

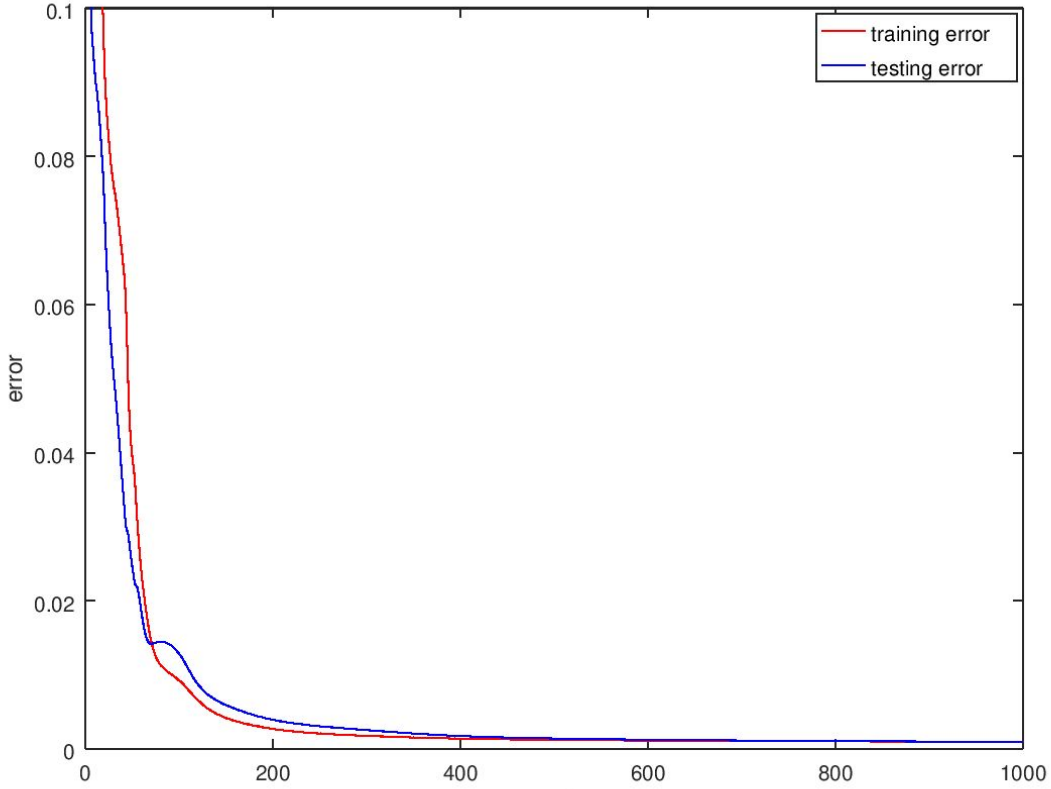




Eta:

inicial: 0.01
a: 0.01
b: 0.95
pasos: 7

Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.016618	0.016136	47.6667%	43.9716%

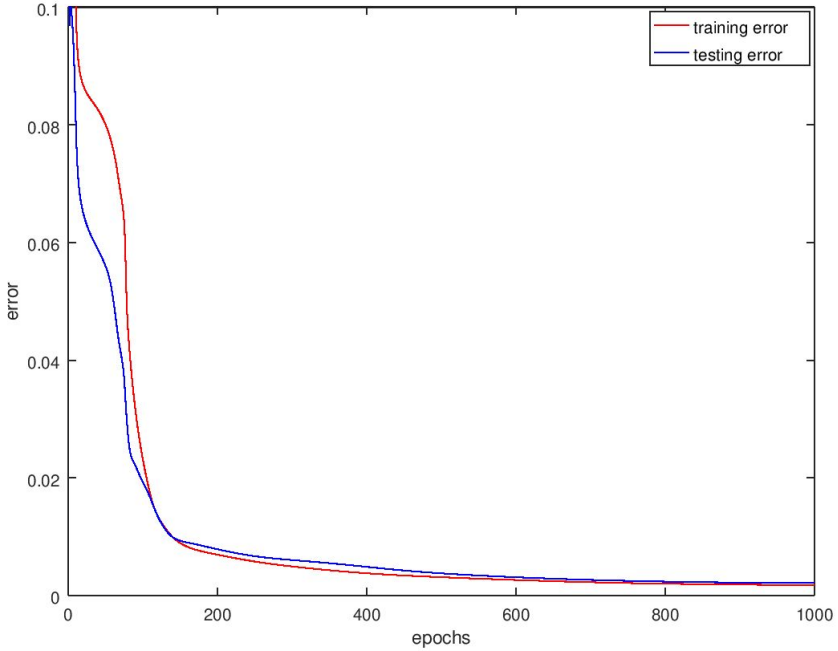


Eta:

inicial: 0.01
a: 0.001
b: 0.05
pasos: 10

Training error	*Testing error*	*Training success rate*	*Testing success rate*
9.7906e-04	9.6789e-04	95.6667%	95.7447%

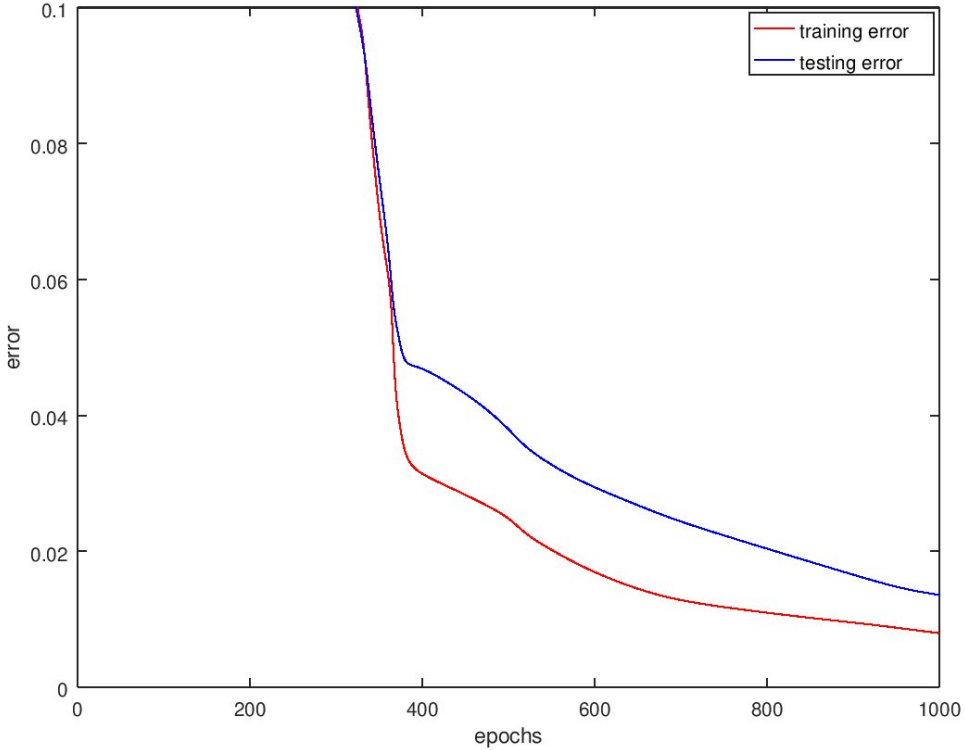
Prevención de Saturación



Prevención:
0.1

Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.0017686	0.0021263	91%	87.9433%

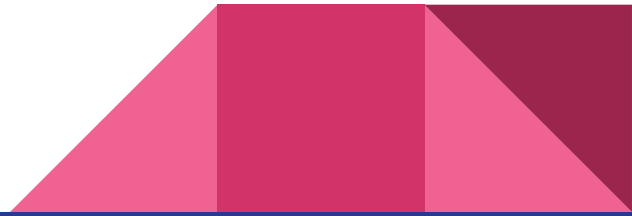
Muestras de Aprendizaje

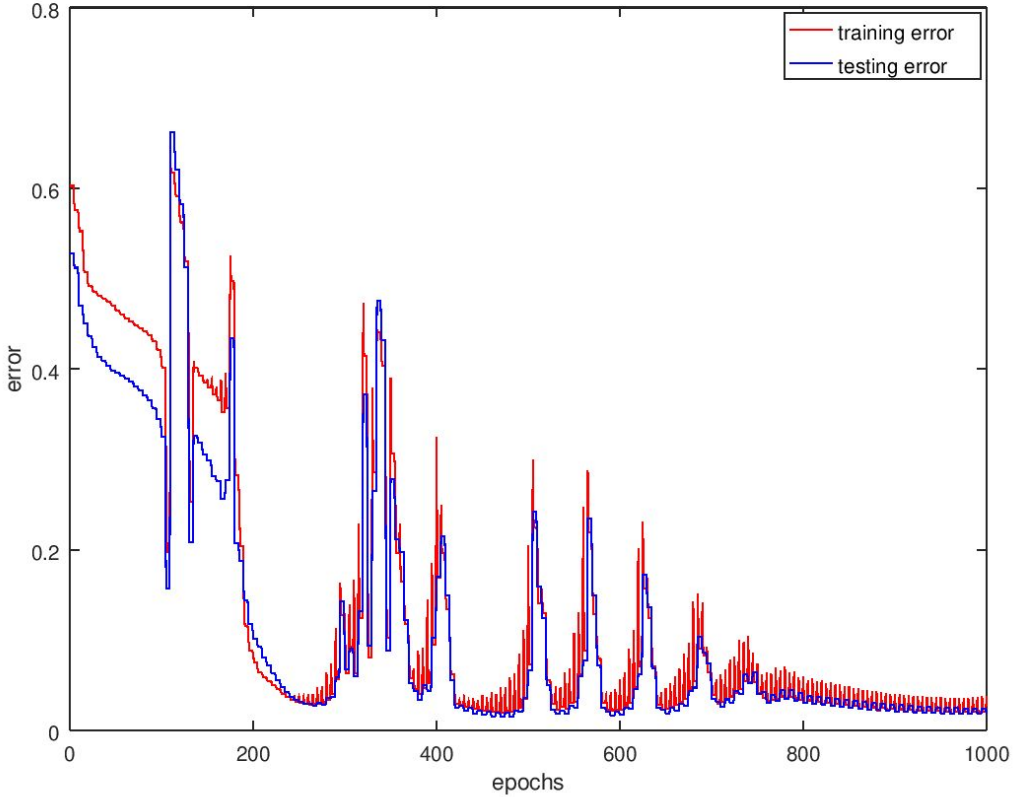


Cantidad:
100

Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.0079526	0.013595	76%	45.7478%

Batch





Batch:
5

Training error	*Testing error*	*Training success rate*	*Testing success rate*
0.037926	0.018614	22.6667%	39.0071%