

Redes Neuronales

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Variables del diseño

- Arquitectura
 - Capas
 - Neuronas
- Batch vs Incremental
- Factor de aprendizaje
- Épocas
- Modificaciones a backpropagation
 - η adaptativo
 - Momentum

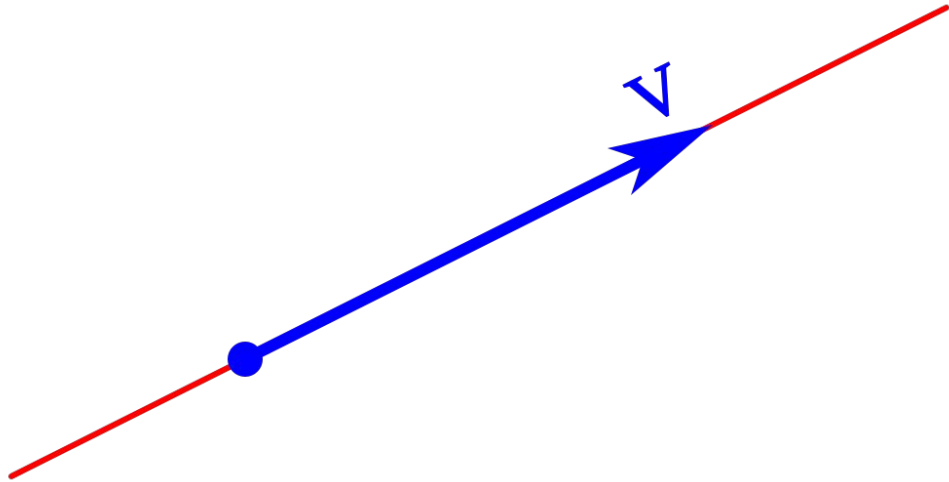
Inicialización de los pesos

- Constante
- Constante que depende de las entradas
- Al azar dependiendo de las entradas
 - Media (μ) = 0
 - Desviación estándar (σ) = $1 / \text{sqrt}(\# \text{Entradas})$



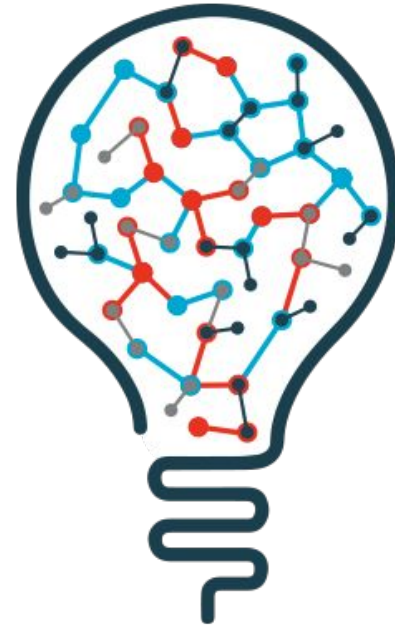
Normalización de la entrada

- $f(x) = a + (x - A) * (b - a) / (B - A)$
- Dividir por la norma



Métricas

- Error cuadrático medio
 - De aprendizaje
 - De prueba
- Evolución del factor de aprendizaje



Mejoras utilizadas

- η adaptativo

$$\Delta\eta = \begin{cases} +a & \text{si } \Delta E < 0 \\ -b\eta & \text{si } \Delta E > 0 \\ 0 & \text{en otro caso} \end{cases}$$

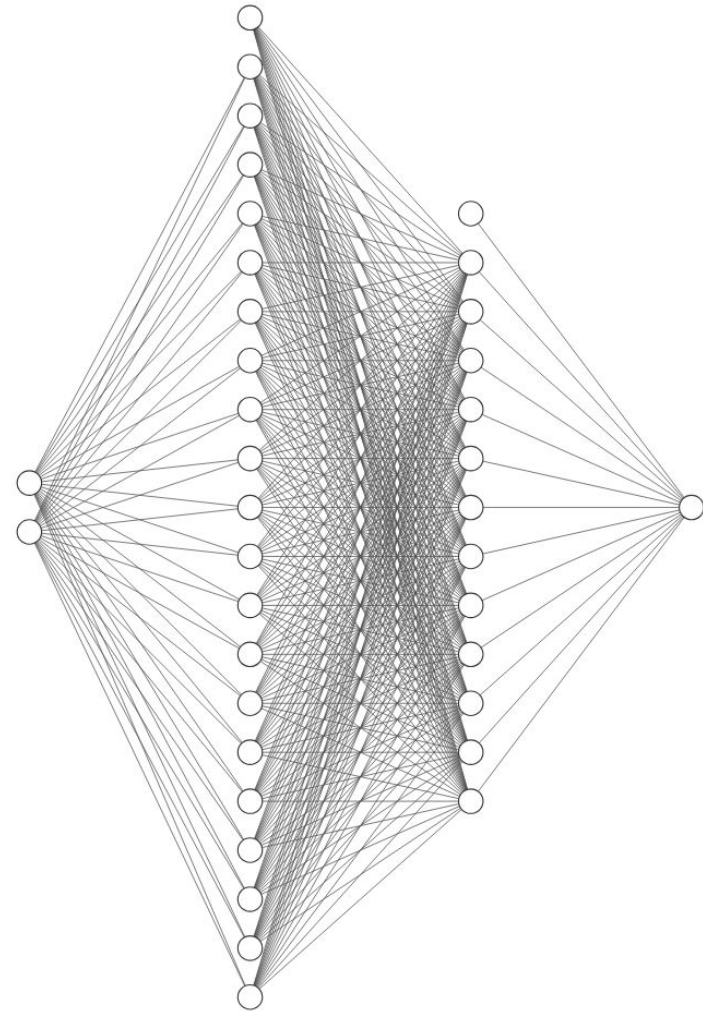
- Momentum

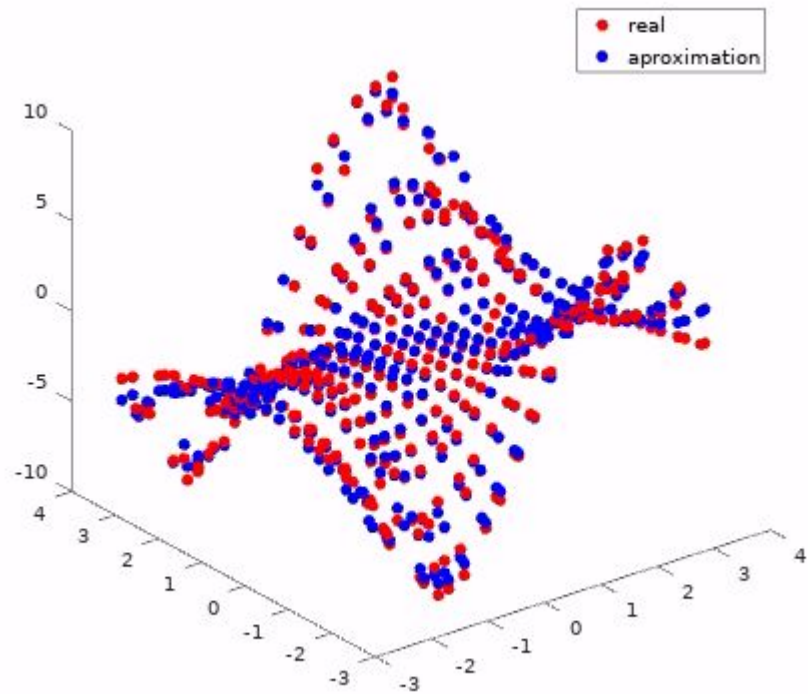
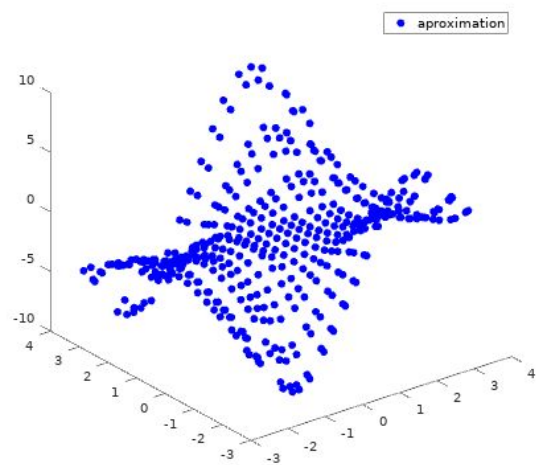
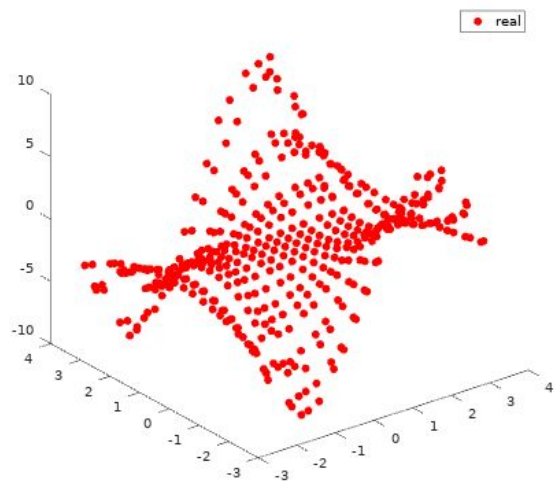
$$\Delta w_{pq}(t+1) = -\eta \frac{\partial E}{\partial w_{pq}} + \alpha \Delta w_{pq}(t)$$

Resultados

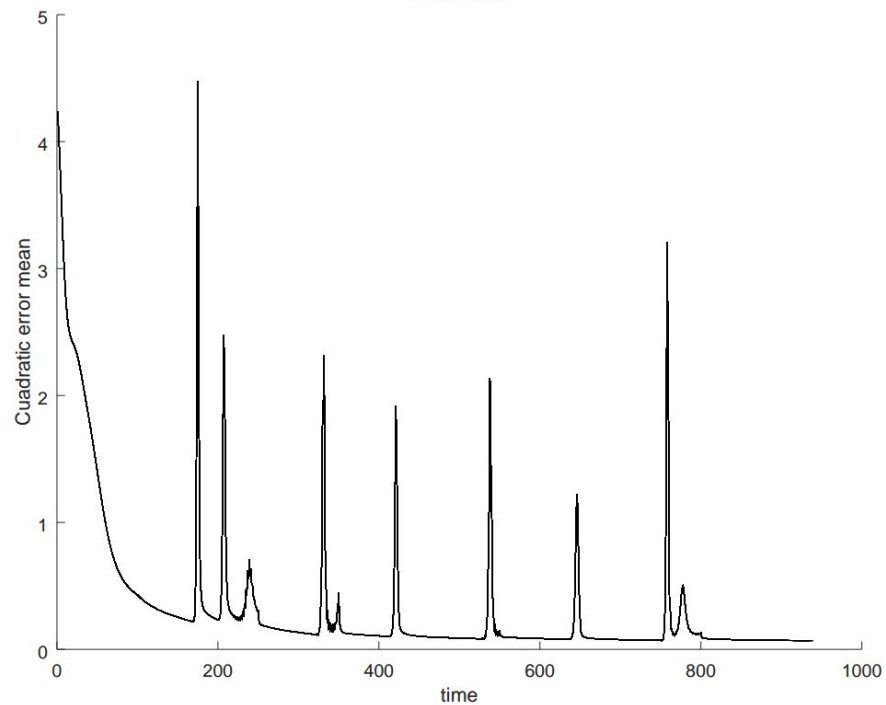
CONFIGURACIÓN

learningRate	0.0001
adaptiveLearningRate	1
timesLR	50
incLR	0.00005
decLR	0.25
momentum	0
momentumRate	0.9
maxError	0.05
epoch	1000
debugTimes	Inf
deltawCalculation	batch
beta	1
gamma	0
function	tanh
betaLast	1
gammaLast	0
functionLast	linear
learningSamplePercentage	0.7
testingSample	terrain02.data
qtyNeuronsInLayer1	2
qtyNeuronsInLayer2	20
qtyNeuronsInLayer3	10
qtyNeuronsInLayer4	1

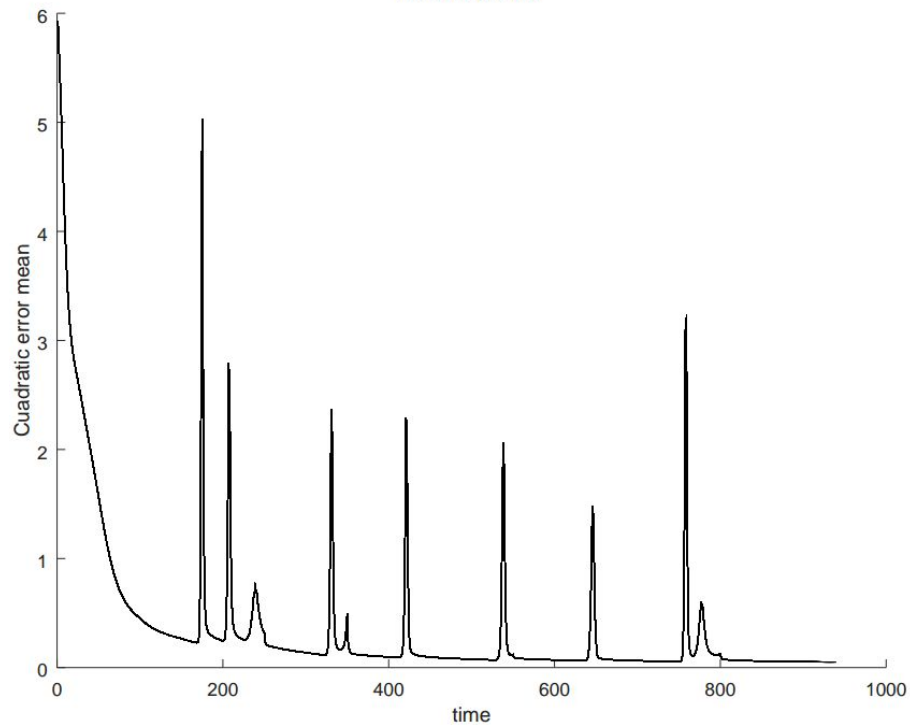




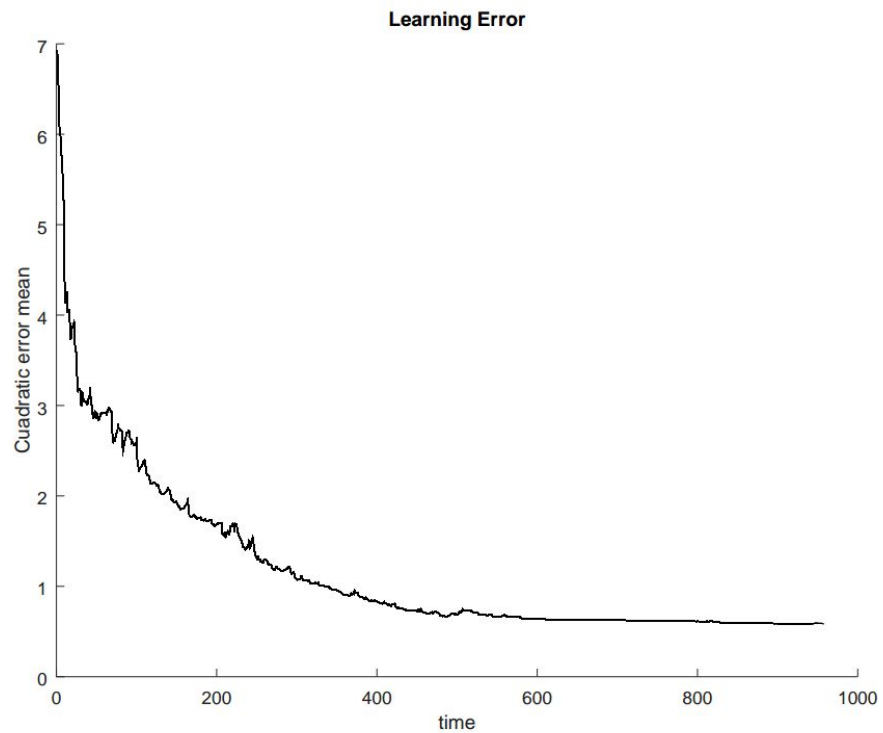
Test Error



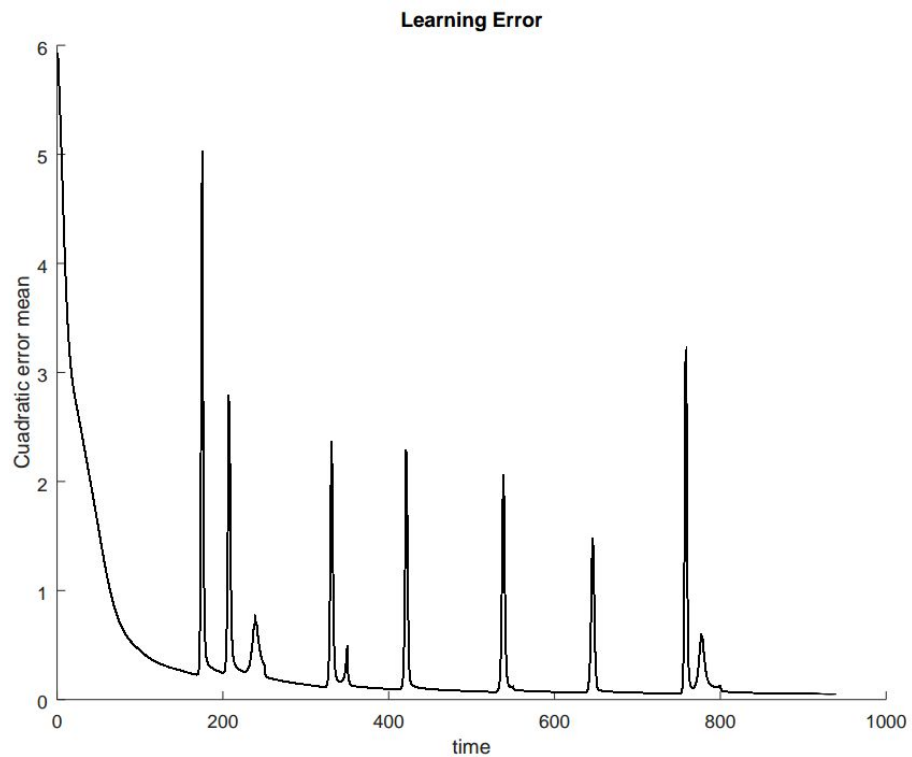
Learning Error



Test Error = 0.067393

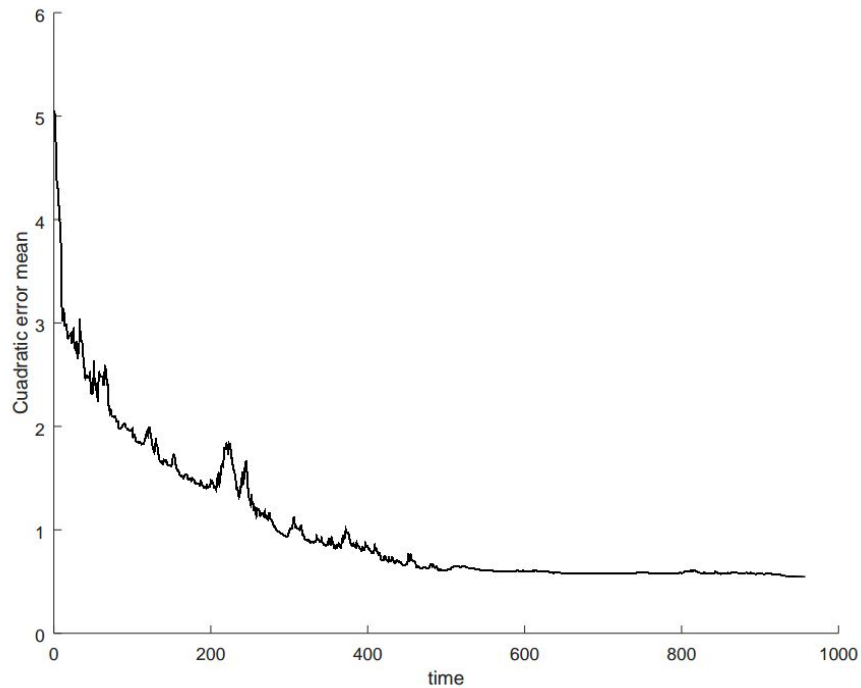


Incremental



Batch

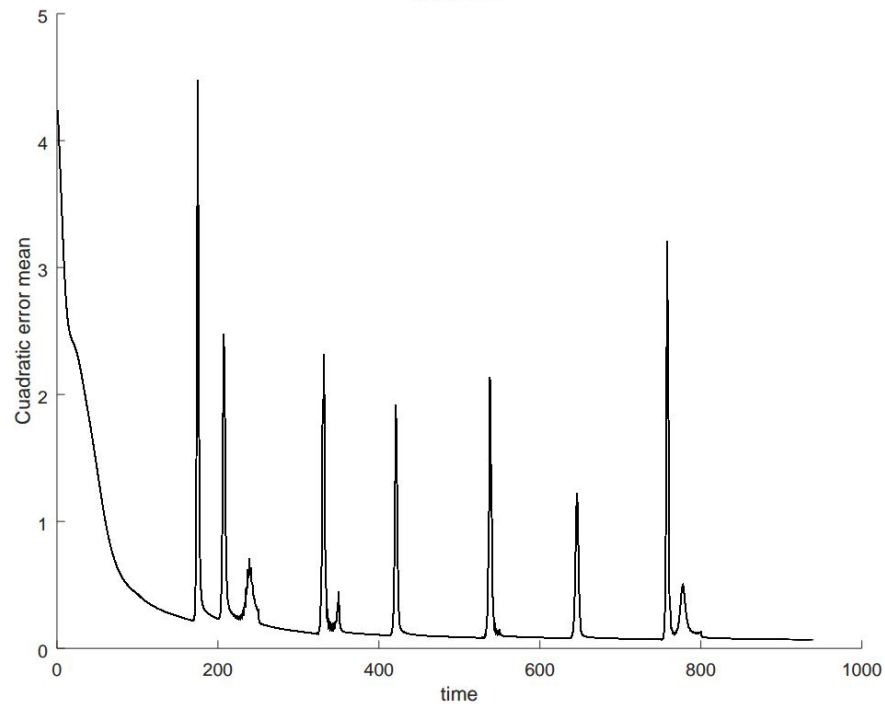
Test Error



Incremental

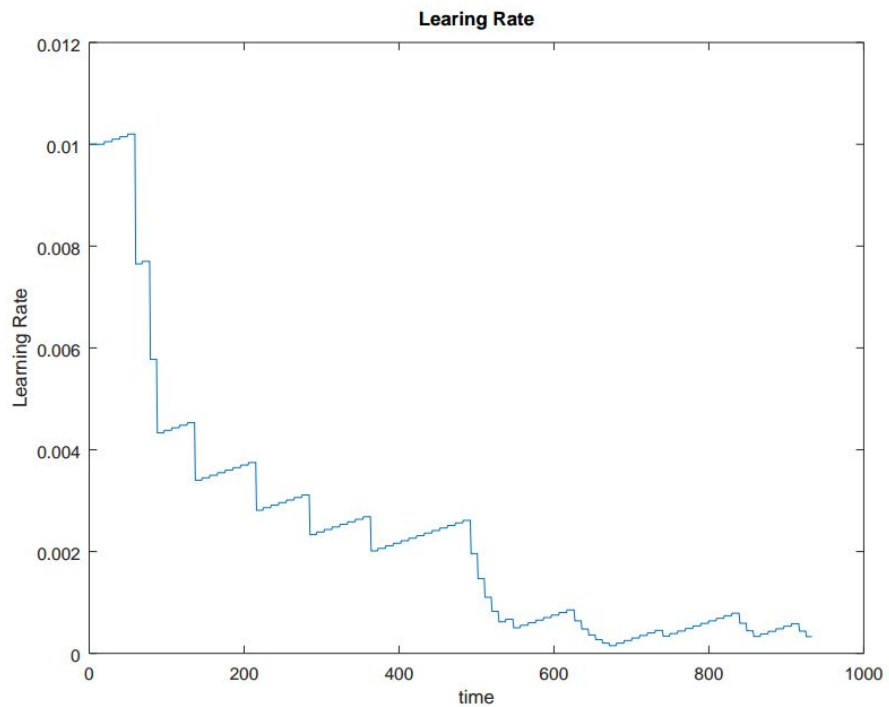
Test Error = 0.54764

Test Error

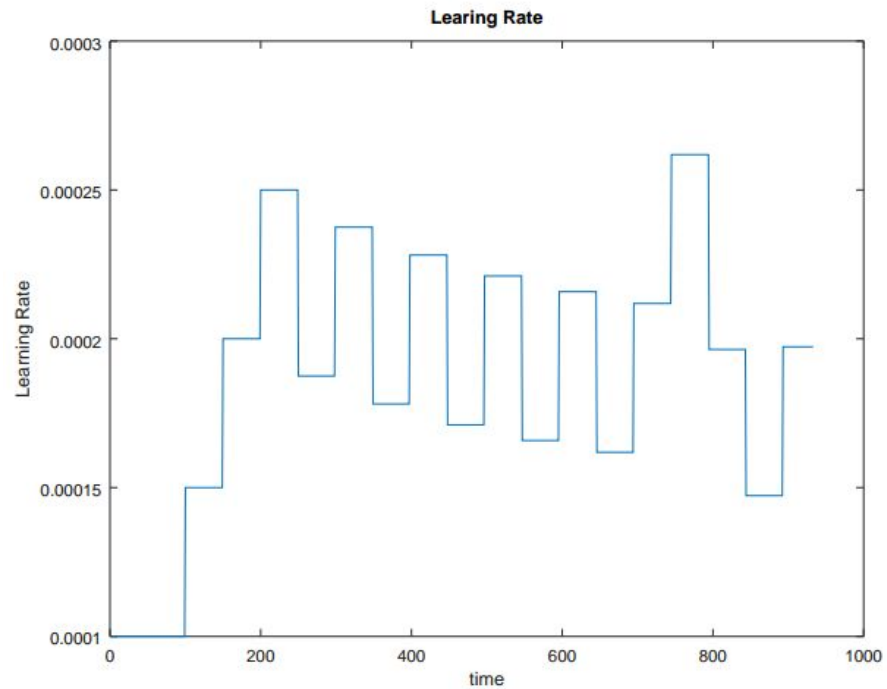


Batch

Test Error = 0.067393

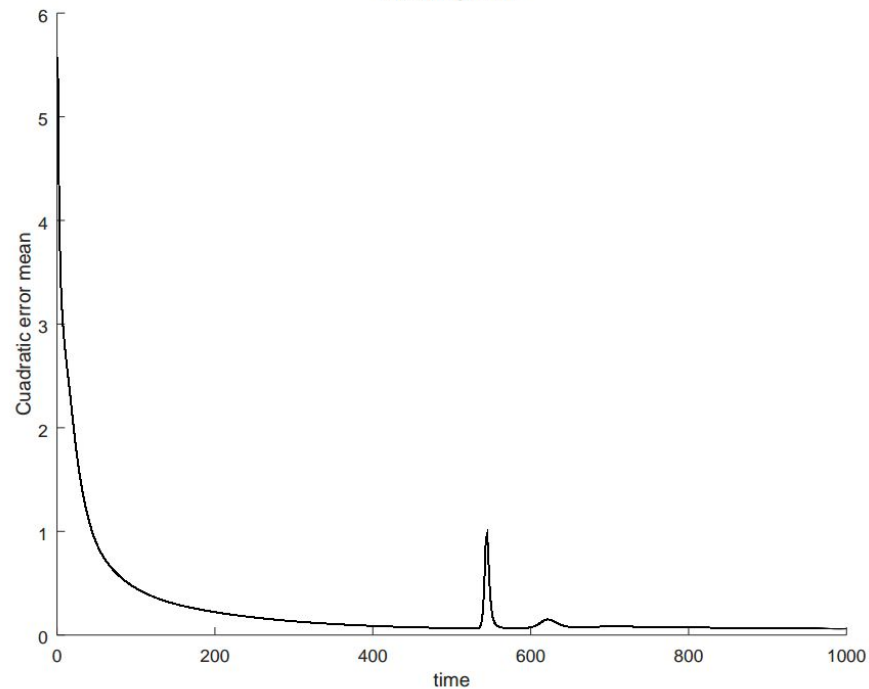


Incremental



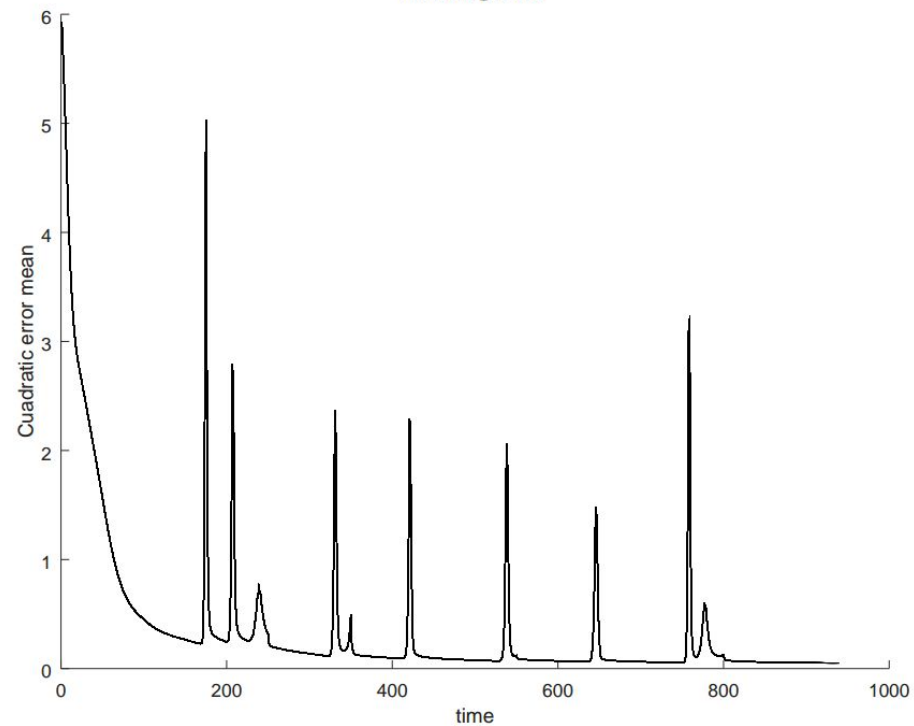
Batch

Learning Error

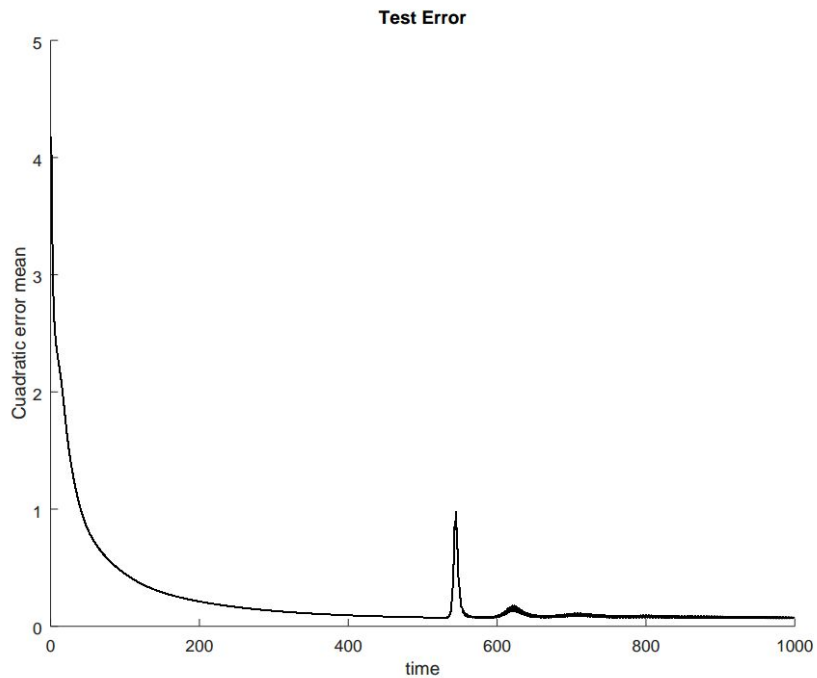


Constant learning rate & without Momentum

Learning Error

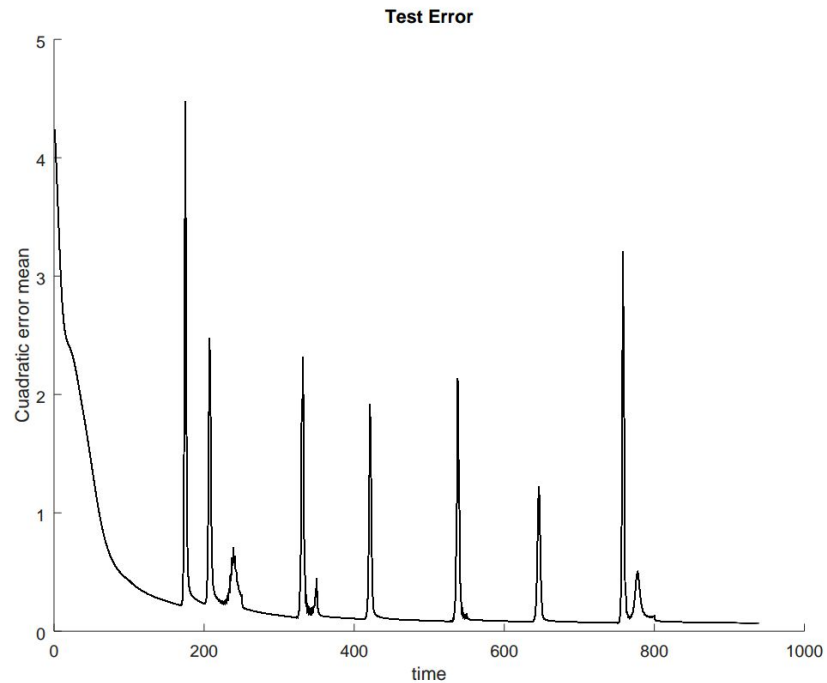


Adaptive learning rate & without Momentum



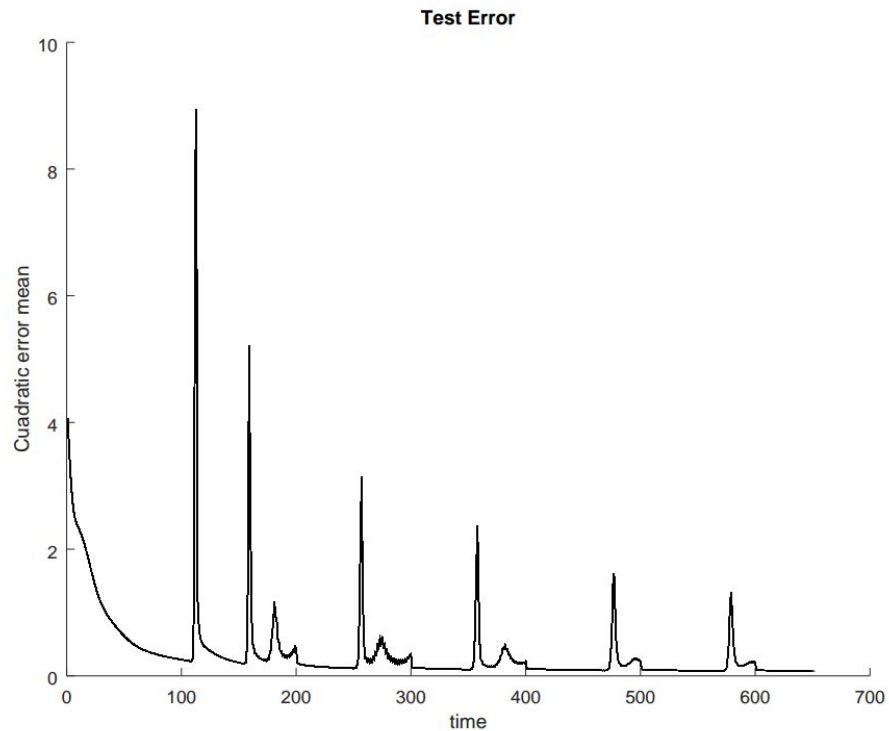
Constant learning rate & without Momentum

Test Error = 0.068420

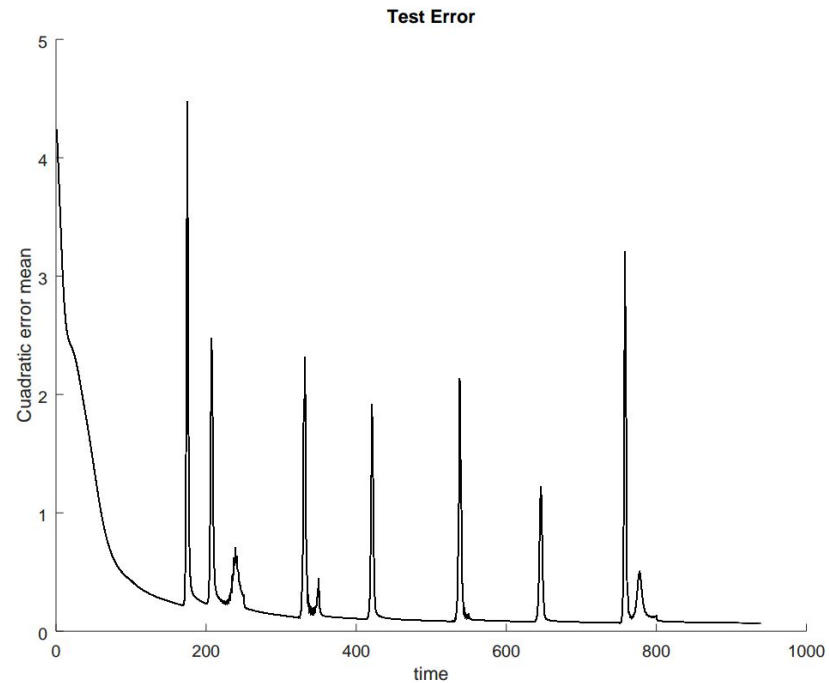


Adaptive learning rate & without momentum

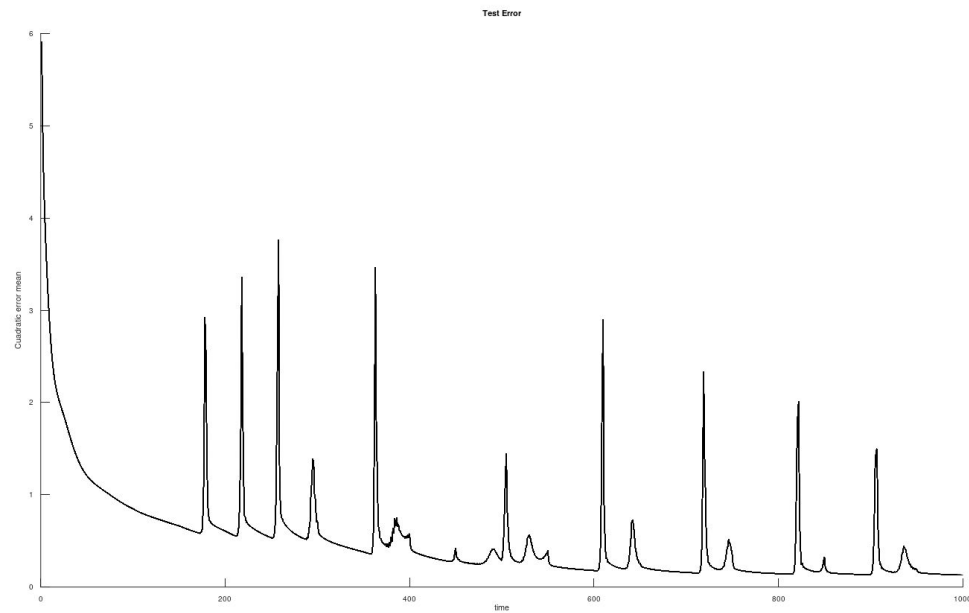
Test Error = 0.067393



With momentum

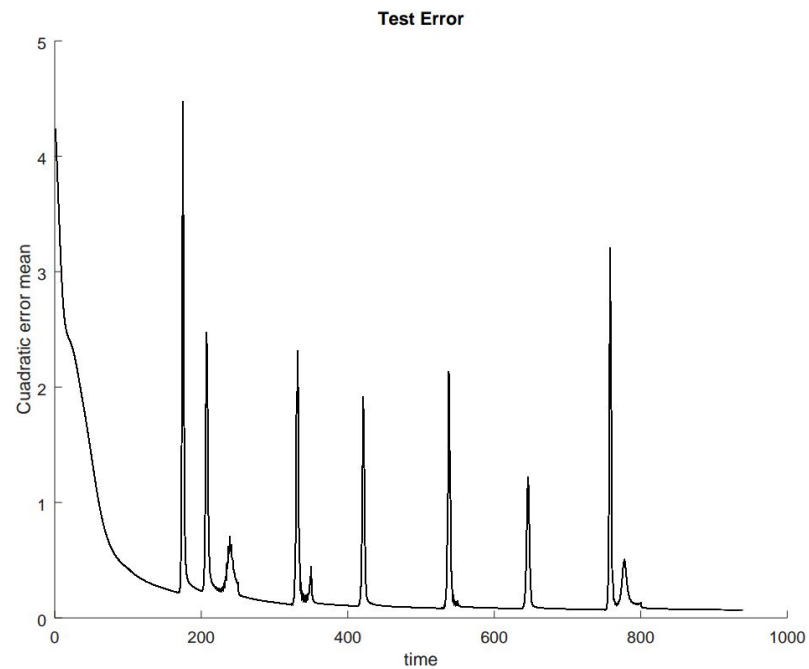


Without momentum



50%

Test Error = 0.13105



70%

Test Error = 0.067393

¿Preguntas?