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4. Artificial Neural Network
5. Feedback

1. Dried Zone
2. Drying Zone
3. Undried Zone

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(RBF)

(MLP)

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RBF

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MLP

MLP

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(MLP)

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- 4. Soft Computing
 - 5. Learning
 - 6. Neuron
 - 7. Training
 - 8. Noise

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- 1. Levenberg-Marquardt
 - 2. Radial Basis Function
 - 3. Multi Layer Perceptron

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(BP)

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(RMSE)

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1. Back Propagation
 2. Root Mean Square Error

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LoutronA-M-4202

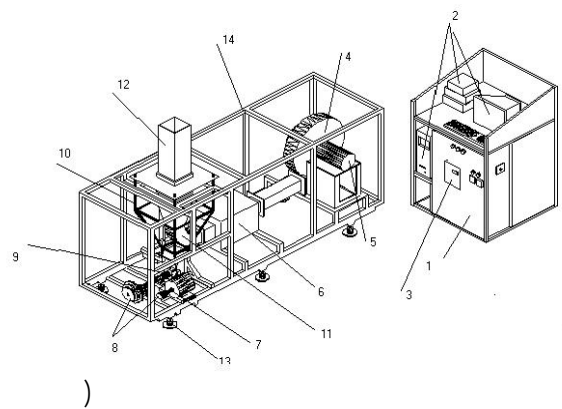
± / m/s

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$$M_2 = 1 - \frac{W_1(1 - M_1)}{W_2}$$

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M_1
 M_2 (%w.b.)
 W_1 (%w.b.)
 W_2 (g)
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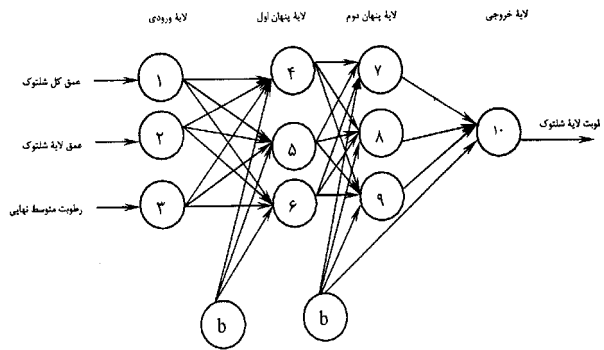
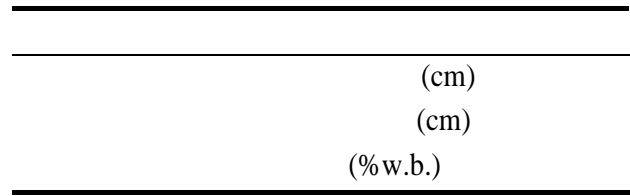
Neural Works Professional 11/PLUS (Ver. 5.23)

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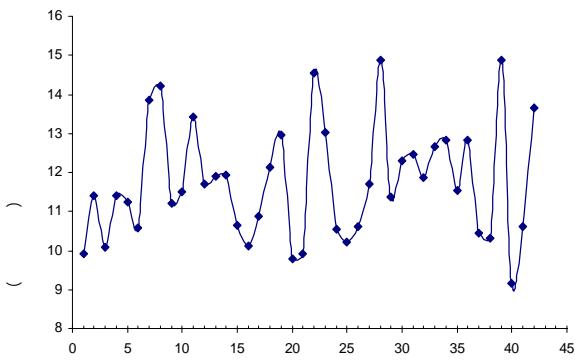
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m RBF

$$Y_i = \sum_{j=1}^m W_{ij} \exp\left(-\sum_{i=1}^n \frac{\|x_i - c_i\|^2}{2\sigma_{ij}^2}\right) + b_j \quad (1)$$



Ext DBD



MLP :
RBF

$$E_{RMS} = \sum_{p=1}^M \sum_{i=1}^N (S_{ip} - T_{ip})^2 \quad (2)$$

1. Delta Rule
2. Norm-Cum-Delta Rule
3. Extended Delta-Bar-Delta Rule
4. Quick Propagation Rule
5. Max Propagation Rule
6. Delta-Bar-Delta Rule

$$Y_j = \sin(X_j) \quad (3)$$

$$Y_j = \frac{1}{1 + \exp(-X_j)} \quad (4)$$

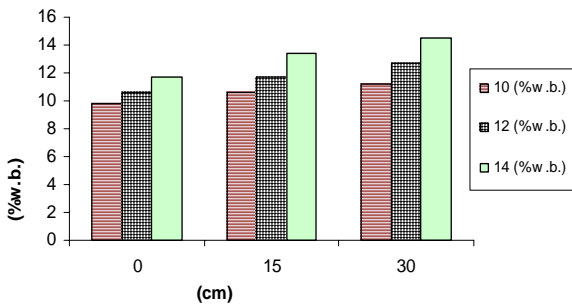
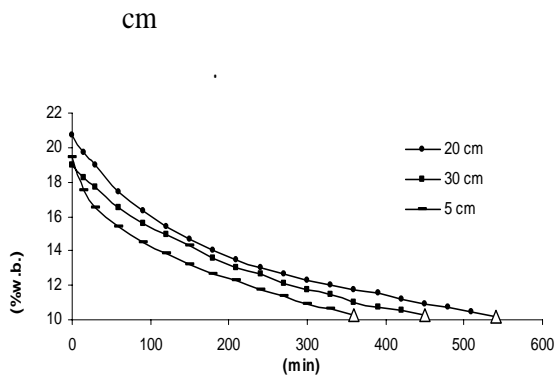
$$Y_j = X_j \quad (5)$$

$$Y_j = \tanh(X_j) \quad (6)$$

$$X_j = \sum_{i=1}^m W_{ij} \times Y_i + b_j \quad (7)$$

m MLP

$$b_j \quad i \quad Y_i \quad j \quad i \quad W_{ij}$$



cm

RBF R^2 RMSE
MLP

$$T_{ip} = \frac{E_{RMS}}{N} \quad p = \frac{i}{M} \quad S_{ip}$$

$$E_{MA} = \frac{1}{T} \sum_{k=1}^T |S_k - T_k| \quad (1)$$

$$SD_{E_{MA}} = \sqrt{\frac{\sum_{k=1}^T |S_k - T_k| - |S_k - T_k|}{T-1}} \quad (2)$$

$$SD_{E_{MA}} \quad E_{MA}$$

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$$X_n = \frac{X_i - X_{\min}}{X_{\max} - X_{\min}} \quad (3)$$

$$X_{\min} \quad X_i \quad X_{\max} \quad X_n$$

(MLP)

cm

SD_{EMA}	E_{MA}	R^2	RMSE			
/	/	/	/	Delta Rule		
/	/	/	/	Ext DBD		
/	/	/	/	Ext DBD		
/	/	/	/	Ext DBD		
/	/	/	/	Ext DBD		
/	/	/	/	Norm-Cum-Delta		
/	/	/	/	Norm-Cum-Delta	Sin	RBF
/	/	/	/	Norm-Cum-Delta	Sin	
/	/	/	/	Ext DBD	Sin	
/	/	/	/	Ext DBD	Sin	
/	/	/	/	Delta Rule	TanH	
/	/	/	/	Delta Rule	Sigmoid	
/	/	/	/	Ext DBD	Sigmoid	
/	/	/	/	Delta Rule	Sin	
/	/	/	/	Norm-Cum-Delta	TanH	
/	/	/	/	Norm-Cum-Delta	TanH	
/	/	/	/	Norm-Cum-Delta	TanH	
/	/	/	/	Delta Rule	TanH	
/	/	/	/	Delta Rule	TanH	
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/	/	/	/	Ext DBD	TanH	MLP
/	/	/	/	Ext DBD	TanH	
/	/	/	/	Delta Rule	Sigmoid	
/	/	/	/	Ext DBD	Sigmoid	
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/	/	/	/	Delta Rule	Sin	
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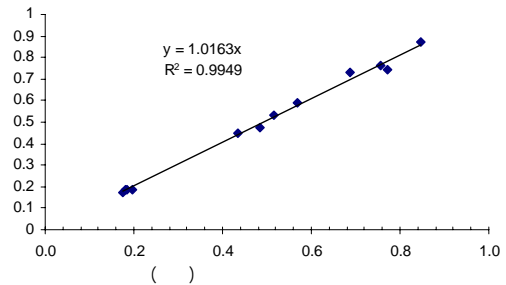
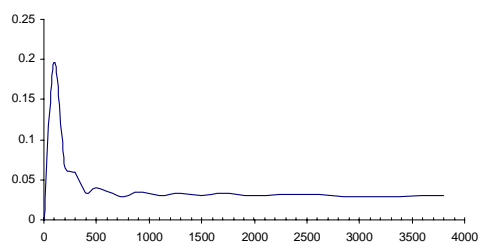
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R² RMSE

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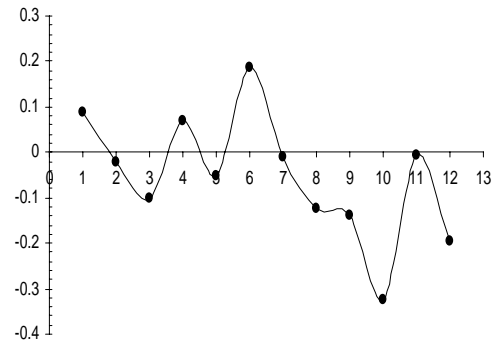
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1. Over Training

MLP



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