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() Eil Smith () Lettenmiare Hamlet

.(Hsu et. al, 1993)

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(Coulibaly et. al, 1999)

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$$a^0 = P$$

$$a^{l+1} = f^{l+1}(w^{l+1}a^l + b^{l+1}) \quad l = 0, 1, 2, \dots, l-1 \quad ()$$

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- ¹ Multilayer Perceptron
 - ² Backpropagation
 - ³ Feedforward
 - ⁴ Stopped training



BP

(TDL)

TDL

$N-1$

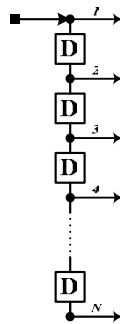
N

TDL

¹ Epoch

² Cross Validation

³ Tapped Delay Line



(TDL) :

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TDL

.(Widrow & Stern, 1985)

¹ Adaptive ADALINE
² Noise Cancellation
³ LMS



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$$R_t = f(R_{t-1}, P_{t-1}, T_{t-1}, S_t)$$

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t	$= R_t$
$t-1$	$= P_{t-1}$
$t-1$	$= T_{t-1}$
t	$= S_t$



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$$R_t = f(R_{t-1}, P_t, T_t, S_t)$$

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$$t = R_t$$

$$t = P_t$$

$$t = T_t$$

$$t = S_t$$

ARIMA ARMA

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$$Z_t = \alpha \cos(2\pi ft) + \beta \sin(2\pi ft) + e_t \quad (1)$$

$$\beta \quad \alpha \quad f \quad e_t$$

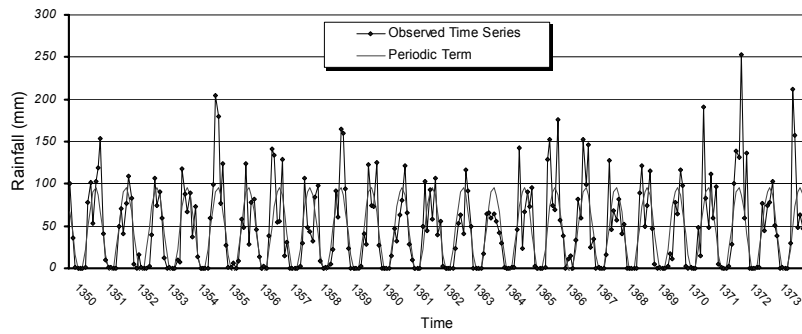
$$: \quad (2)$$

$$P_t = f(P_{t-1}, P_{t-2}, \dots, P_{t-N}) \quad (3)$$

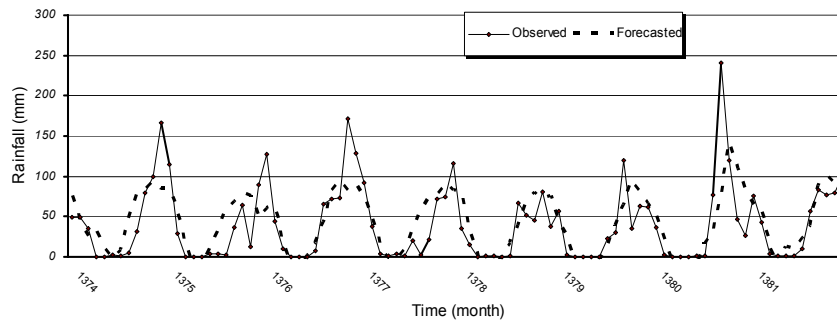
$$T_t = f(T_{t-1}, T_{t-2}, \dots, T_{t-N}) \quad (4)$$

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$$\begin{aligned} & t & = P_t \\ & t-N & = P_{t-N} \\ & t & = T_t \\ & t-N & = T_{t-N} \end{aligned}$$



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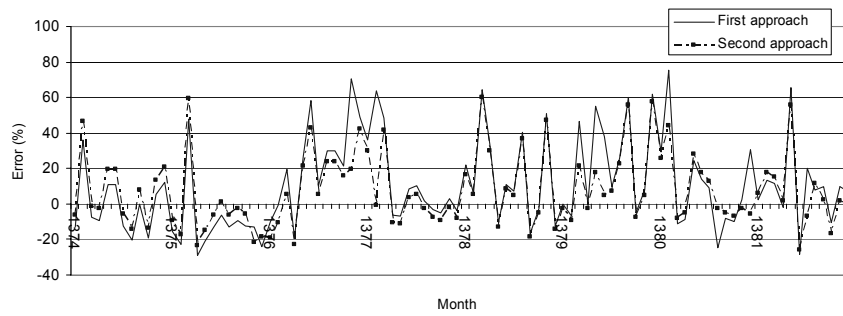
$$RMSE = \frac{\sqrt{\sum_i^n (obs_i - for_i)^2}}{n} \quad ()$$

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$$\%VE = \frac{\sum_{i=1}^n \frac{|obs_i - for_i|}{obs_i}}{n} \quad ()$$

$\frac{\sum_{i=1}^n |obs_i - for_i|}{\sum_{i=1}^n obs_i}$ (first approach) $\frac{\sum_{i=1}^n |obs_i - for_i|}{\sum_{i=1}^n for_i}$ (second approach)



BP



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