The Recursive Future Equation And The Recursive Past Equation Based On The Ananda-Damayanthi Normalized Similarity Measure

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Technical Note

Abstract

In this research Technical Note the author have presented a Recursive Future Equation and Recursive Past Equation to find one Step Future Element or a one Step Past Element of a given Time Series data Set.

Theory

Note that from [1], the Recursive Future Average Of A Time Series Data Based on Cosine Similarity can be given by the following methods:

Method 1:

$$y_{n+1} = \frac{\sum_{i=1}^{n} (y_i)\{CS(y_i, y_{n+1})\}}{\left\{\sum_{i=1}^{n} \left(\{CS(y_i, y_{n+1})\}^2\right)\right\}^{1/2}}$$

where $CS(y_i, y_{n+1}) = \left\{\dfrac{Smaller\ \ of\ \ (y_i, y_{n+1})}{Larger\ \ of\ \ (y_i, y_{n+1})}\right\}$

when the Time Series Data is of the kind

$$S = \{y_1, y_2, y_3, \ldots\ldots, y_{n-1}, y_n\}$$

Method 2:

$$y_{n+1} = \frac{\sum_{i=1}^{n} (y_i)\{CS(y_i, y_{n+1})\}\{CS(y_i, y_{n+1})\}}{\sum_{i=1}^{n} \{CS(y_i, y_{n+1})\}}$$

where $CS(y_i, y_{n+1}) = \left\{ \frac{Smaller\ \ of\ \ (y_i, y_{n+1})}{Larger\ \ of\ \ (y_i, y_{n+1})} \right\}$

when the Time Series Data is of the kind

$$S = \{y_1, y_2, y_3, \ldots\ldots, y_{n-1}, y_n\}$$

Deriving motivation from this concept we extend this concept thusly as follows:

Method 1:

$$y_{n+1} = \frac{\sum_{j=1}^{\infty} \sum_{i=1}^{n} (y_{i\,j}) \{CS(y_{i\,j}, y_{n+1})\}}{\left\{ \sum_{j=1}^{\infty} \sum_{i=1}^{n} \left(\{CS(y_{i\,j}, y_{n+1})\}^2 \right) \right\}^{1/2}}$$

$$y_{i\ j} = Larger\ of\ \ (y_{n+1}, y_{i(j-1)}) - Smaller\ of\ (y_{n+1}, y_{i(j-1)})$$

where especially, $y_{i\ (j=1)} = Larger\ of\ \ (y_{n+1}, y_i\ ) - Smaller\ of\ (y_{n+1}, y_i\ )$ and

similarly, $CS(y_{i\,j}, y_{n+1}) = \left(\frac{Smaller\ of\ (y_{n+1}, y_{i\ j})}{Larger\ of\ (y_{n+1}, y_{i\ j})} \right)$

where especially, $CS(y_{i(j=1)}, y_{n+1}) = \left(\frac{Smaller\ of\ (y_{n+1}, y_i\ )}{Larger\ of\ (y_{n+1}, y_i\ )} \right)$

And, ∞ for each y_i term is defined such that, it is the positive integral number at which the ratio

$CS(y_{i\,j}, y_{n+1}) = \left(\frac{Smaller\ of\ (y_{n+1}, y_{i\ j})}{Larger\ of\ (y_{n+1}, y_{i\ j})} \right)$ tends to zero.

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