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The Recursive Future Equation Based On The Ananda-Damayanthi Normalized Similarity Measure. {File Closing Version 2}.

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Technical Note

Abstract

In this research Technical Note the author have presented a Recursive Future Average Of A Time Series Data Based on Cosine Similarity.

Theory

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

when the Time Series Data is of the kind

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

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 further extend this formula using [1] as

$$y_{n+1} = \frac{\left\{ \begin{array}{l} \sum_{i=1}^{n} (y_i)\{CS(y_i, y_{n+1})\} + \sum_{i=1}^{n} ({}^1y_i)\{CS({}^1y_i, y_{n+1})\} + \sum_{i=1}^{n} ({}^2y_i)\{CS({}^2y_i, y_{n+1})\} + \ldots\ldots\ldots + \\ \sum_{i=1}^{n} ({}^ry_i)\{CS({}^ry_i, y_{n+1})\} \end{array} \right\}}{\left\{ \begin{array}{l} \sum_{i=1}^{n} \left(\{CS(y_i, y_{n+1})\}^2\right) + \sum_{i=1}^{n} \left(\{CS({}^1y_i, y_{n+1})\}^2\right) + \sum_{i=1}^{n} \left(\{CS({}^2y_i, y_{n+1})\}^2\right) + \ldots\ldots\ldots\ldots + \\ \sum_{i=1}^{n} \left(\{CS({}^ry_i, y_{n+1})\}^2\right) \end{array} \right\}^{1/2}}$$

where ${}^1y_i = \dfrac{\left\{ y_i y_{n+1} - \dfrac{(Smaller\ of\ (y_i, y_{n+1}))^2}{y_i y_{n+1}} \right\}}{y_{n+1}}$ and

${}^2y_i = \dfrac{\left\{ {}^1y_i y_{n+1} - \dfrac{(Smaller\ of\ ({}^1y_i, y_{n+1}))^2}{{}^1y_i y_{n+1}} \right\}}{y_{n+1}}$, ……, i.e., and so on, so forth

$${}^ky_i = \frac{\left\{ {}^{k-1}y_i y_{n+1} - \dfrac{(Smaller\ of\ ({}^{k-1}y_i, y_{n+1}))^2}{{}^{k-1}y_i y_{n+1}} \right\}}{y_{n+1}}$$

upto

${}^ry_i = \dfrac{\left\{ {}^{r-1}y_i y_{n+1} - \dfrac{(Smaller\ of\ ({}^{r-1}y_i, y_{n+1}))^2}{{}^{r-1}y_i y_{n+1}} \right\}}{y_{n+1}}$ such that we can write

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

where r is a number such that ${}^ry_i \to 0$.

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