Abstract

In this research investigation, the author has detailed a novel scheme of finding the next term of any given time series type sequence.

Theory

Given any Sequence of the Time Series kind, 
\[ S = \{y_1, y_2, y_3, \ldots, y_{n-1}, y_n\} \]
which represent some Time Series data of concern, we write a Truth Statement Equation as follows:

\[
y_{n+1} = \left( \sum_{i=1}^{n} \text{Smaller}(y_i, y_{n+1}) \right) + \sum_{i=1}^{n} \left( \text{Larger}(y_i, y_{n+1}) - \text{Smaller}(y_i, y_{n+1}) \right)\]

Equation 1

The above Equation cannot be solved for \( y_{n+1} \) but can be used to find \( y_{n+1} \) by guessing its value. For the correct guess, i.e., the true value of \( y_{n+1} \), i.e., the next Term of the Sequence, the above Equation is satisfied, i.e., \( \text{LHS}=\text{RHS} \).

One can note that this Grand Equation can be used to find the Next Prime as well, given a sequence of Primes from the beginning, while considering 1 as Prime as well, i.e., the beginning or first Prime. One can note the concepts of Similarity & Dissimilarity from author’s [1]. The author calls \( \sum_{i=1}^{n} \text{Smaller}(y_i, y_{n+1}) \) as Direct Dissimilarity and \( \sum_{i=1}^{n} \left( \text{Larger}(y_i, y_{n+1}) - \text{Smaller}(y_i, y_{n+1}) \right) \) as Direct Dissimilarity.
For Guessing, we can usually start with a Guess value much smaller than the smallest data value of the data set and keep increasing its value by very small increments till the value of the $\delta_j$ tends to zero within the limits of our computational ability to guess. The $\delta_j$ is given by

$$\delta_j = y_{n+1} \text{Guess}_j - \frac{\sum_{i=1}^n \{ \text{Smaller}(y_i, y_{n+1} \text{Guess}_j) \} \cdot x_j}{n}$$

where $y_{n+1}$ is the $j^{th}$ Guess for $y_{n+1}$.

**Example**

For the data given below

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual GNP deflator, U.S., 1889 to 1970</th>
<th>Year</th>
<th>Annual GNP deflator, U.S., 1889 to 1970</th>
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</table>

The above stated authors algorithm predicted the 83rd data element (corresponding to the year 1970) correctly as 135.3 when the first 82 data elements (corresponding to the years 1889-1917) were used to predict the 83rd data element.

Furthermore, when the author used the first 74 data elements (corresponding to the years 1889-1961) to predict the 75th data element, the Prediction Error was zero. Similarly, this Accumulated Progressive Error of Prediction (for the next 10 steps) was Zero for the next 10 steps, i.e., until we predicted the last 83rd data element. By Accumulated Progressive Error (for One Step), we mean the Prediction Error obtained using the last Predicted data element to Predict the next data element. If we get a non-Zero Prediction Error in the beginning, the Accumulated Progressive Error of Prediction keeps increasing.
References

Bagadi, R. (2017). Total Intra Similarity And Dissimilarity Measure For The Values Taken By A Parameter Of Concern. {Version 2}. ISSN 1751-3030. PHILICA.COM Article number 1153.
http://www.philica.com/display_article.php?article_id=1153

http://vixra.org/author/ramesh_chandra_bagadi