Exploring Complexity with a Function for R: Comin.

Cristian Villate\textsuperscript{1}, Carlos Gershenson\textsuperscript{2} & Nelson Fernández\textsuperscript{1}

\textsuperscript{1}Laboratorio de Hidroinformática, Facultad de Ciencias Básicas, Universidad de Pamplona, Colombia.
\textsuperscript{2}Instituto en Matemáticas Aplicadas y en Sistemas; Centro de Ciencias de la Complejidad. Universidad Nacional Autónoma de México-UNAM.

ABSTRACT
In order to facilitate and promote the measurement of complexity for the understanding of a broad range of phenomena, a function for R was developed. The computational aspects of Comin (Complexity and Information Tool) are based on recent work (Gershenson and Fernández, 2012; Fernández et al., 2014).

With Comin function, the formal calculation of information theoretical measures of complexity, emergence, self-organization, homeostasis and autopoiesis is possible.

Comin function is a useful, easy and intuitive tool for studying and evaluating general data and time series, illustrating the dynamical properties related to order, change, self-regulation, and autonomy in complex systems. We describe and demonstrate the main properties of Comin tool, to promote its use among the scientific community.

MEASURES

\[ Information = - \sum_{i} P_i \times \log P_i \]
\[ Emergence = Information \]
\[ Self. organization = 1 - Emergence \]
\[ Complexity = 4 \times Emergence \times Self. organization \]

Arguments of the Comin Function

- \textbf{it}: Input type: 1 < R Vectors; 2 < Matrix from other software; 3 < Matrix from R; 4 < Vectors extracted
- \textbf{b}: Desired base (Scale): e.g. 2, 10, ..., 2^n
- \textbf{ld}: Local data used when data are produced in R
- \textbf{ext}: Extension file: 1 < .csv; 2 < .txt; 3 < .spss.
- \textbf{r}: Route location of data: r < "C:\Users\Cristian\Downloads"
- \textbf{f}: File Name: f < "ArticoFQ_Normal.csv"

Comin URL: https://github.com/dlizcano/Comin

COMIN SCREENSHOT AND GRAPHICS

Fig. 1 Comin Screenshot

Fig. 2 SECHA Properties for Physicochemical Variables of an Arctic Lake

Fig. 3 SECHA Annual Temporal Variation of Physicochemical Variables of an Arctic Lake

REFERENCES
