Discovering hidden experimental effects through the detection of recurring hierarchical structured real-scale time patterns: T-pattern detection and analysis with the special purpose THEME software.

The workshop presents T-Pattern Analysis (TPA) with THEMETM including some illustrative published applications. The concept of T-pattern is defined and the principal detection algorithm is described as well as the statistical and external validation of findings. T-patterns are recurrent structured hierarchical multivariate patterns in sets of (occurrence) point series on a single dimension, characterized by statistically significant translation symmetry over the occurrences of a T-pattern, structured, here, thus refers to the significant invariance across occurrences of the same pattern in the distances between consecutive parts (i.e., translation symmetry), which also defines each pattern as being the same pattern repeating rather than different ones.

The single dimension is usually time, but when applied to molecular pattern detection it is replaced with positions along molecules (until present DNA or proteins). A T-Pattern may be seen as a repeated natural (i.e., pseudo and statistical) fractal object. T-Patterns are usually invisible to the naked eye and are understandably missed by standard multivariate statistical methods as these were not designed for this task, which for behavioral scientists may, however, seem obviously needed.

The use of the THEMETM software for TPA is here demonstrated using a) real human and animal behavior data with complex hidden T-patterns and b) neuronal network interaction data from rats’ olfactory bulb showing abundant and highly significant inter-neuronal T-patterns of firing of a number individual neurons (patterns missed by earlier methods and tools). Further concepts defined around the T-pattern are T-Markers, T-Associates, T-Packets, T-Prediction and T-Retrodiction, together called the T-System which continues to be developed primarily for the detection, analysis and description of recurrent patterns in behavior.

When T-Patterns are detected in different conditions and subjects a number of T-pattern parameters, among other their frequency, complexity and content allow discovery of effects of independent variables easily missed by methods other than TPA. Tables of T-pattern parameters can be exported for further statistical analysis in search for experimental or treatment effects.


Biography

Magnus S Magnusson is a Research Professor, and did his PhD in 1983 from University of Copenhagen. He is the creator of the T-system model and algorithms implemented in Theme. Focus on real-time organization of behaviour, co-directed a two-year DNA analysis project, and published numerous papers. He was invited for talks at numerous conferences (including AIMS, IFNA, Neurontalk, Proteomics) and universities in Europe, USA and Japan. He was the Deputy Director in 1983-1988, at the Anthropology Laboratory, Museum of Natural History, Paris. He was repeatedly the invited Professor at Universities of Paris (V, VIII, XIII). Since 1991, he was the Founder and Director of the Human Behaviour Laboratory, University of Iceland. Since 1995, he was in collaboration between 24 universities based on “Magnusson’s analytical model” initiated at the Sorbonne, Paris.