Bayesian Updating Based on Hausdorff Outer Measures and the Role of Emotions During the Therapeutic Phase of Alliance

Serena Doria
Department of Engineering and Geology,
University G.d'Annunzio, Chieti, Italy
s.doria@dst.unich.it

Iolanda Angelucci
Psychotherapist and teacher
CTA Trainer at SSPIG-IRPIR
iolanda381@virgilio.it

Formulating diagnosis is a complex process, related to the clinician's ability to represent the patient's discomfort, to use error due to the incompleteness of the information available, to make predictions about well-being. We interpret the therapist-patient system as a complex system, whose evolution, representing the phase of alliance, is described by a finite family of contractions that, starting from certain initial conditions, evolve the system into the attractor; this set, characterized by its own complexity, measured in terms of the Hausdorff dimension, represents the state in which the therapist and patient find themselves after the phase of alliance.

Updating the Level of Knowledge and Making a Successful Diagnosis   A probabilistic approach of the diagnostic process is proposed in which the subject's degree of knowledge is represented with coherent upper conditional probabilities defined by Hausdorff outer measures [1]. Using this model, the diagnosis is assumed to be positive when it produces a change, that is when the subject's level of knowledge is defined by an a posteriori Hausdorff outer measure different from the initial Hausdorff outer measure. We believe that one of the roles of the therapist in the phase of the alliance (i.e. interactive and collaborative relationship between patient and therapist, common to different psychotherapies, where both have an active role in achieving therapeutic goals) is to shorten the distance between him and the patient so that he can update the level of cognitive and emotional understanding of the problem the patient asks for his help for. The first step that the therapist must take is to realize that he is a complex system and small perturbations to the initial state, i.e. the encounter with the patient, can bring to totally unpredictable states, from which he has to assess the probability of success of the diagnosis. The phase of the therapist-patient alliance can be interpreted as the phase in which the complexity is likely to increase. In the mathematical model, the role of the therapist is represented by choosing a particular system of contractions, the similarities, that keep unchanged some geometric properties. These invariance of geometric properties aims to describe the fact that some features of the therapist are repeated at different scales, influencing the diagnostic attitude. By iterating these contractions, the patient-therapist system reaches a state represented by a self-similar set, called the attractor of the system; if the attractor has zero probability with respect to the Hausdorff measure that defines the initial level of knowledge of the patient then another measure needs to be used to represent the subject's level of knowledge conditioned to the attractor. The goal of the phase of the alliance is therefore to have the patient to confront with an unpredictable state, represented by a set having initial probability of zero value.

Conclusions   According to the mathematical representation of the diagnostic process highlighted in this work, we find similarities with the idea of Matte Blanco [2] that emotion can undergo endless measurements. The attractor of the system represents the unconscious of the system therapist-patient and according to the theory developed in [2] it is characterized by symmetry and self-similarity.

Keywords.   Iterated functions system, Hausdorff outer measure, coherent upper conditional probabilities, symmetry, self-similarity.

References

[1] S. Doria, Characterization of a coherent upper conditional prevision as the Choquet integral with respect to its associated Hausdorff outer measure, Annals of Operations Research, 33-48, 2012

[2] Matte Blanco, I. The Unconscious as Infinite Sets. An Essay in BiLogic. Duckworth, London 1975.