

**THE USE OF PROBABILITIES IN ORDER TO
REPRESENT, STORE, EXPLOIT, THE INFORMATION
GIVEN BY PHYSICAL MEASUREMENTS.**

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Any physical experience provides only a small number of results, whereas a large number of parameters may vary. What is the value of the information obtained this way, if, for instance, we have 300 measures, where the whole experiment may involve 50 parameters, thus leading to 10^{50} possible states, if each parameter can take 10 values? Can we, from this very limited amount of information, predict the result of a new experience ?

We introduce a new concept, called "Experimental Probabilistic Hypersurface" (in short EPH). It allows us to represent the information obtained from any number of measures, in a physical experiment or in a computational code. This information is stored as a density of probability, above each point in the configuration space. If the experiment depends upon k parameters (x_1, \cdot, x_k) , the EPH consists in the collection of the density functions $f(t; x_1, \cdot, x_k)$.

These densities are built from the existing information (the measures that have already been made). The existing information "propagate" all over the space, with the following rule: the entropy should always be maximal. The principle of maximal entropy thus governs the whole construction, which allows us a construction with no artificial rules or probability laws. If you are close to a place where the experiment has been performed, the density will be more concentrated; if you are far away, the density will be less concentrated, because you know less.

The applications are multiple. The EPH is a "storage" of information, which grows and becomes more precise when more and more experiments are performed. It allows you to get immediately "local" results: which regions or points are dangerous, which are safe, and so on. The EPH is intended to replace both the deterministic methods (for instance interpolation between existing values), which are artificial, and the statistical methods, which are only global. The EPH gives local results, but still keeps the global characteristics.

We are interested in developing joint research programs, from this concept, including applications to various fields (risk analysis, epidemiology, chemistry, and so on, just to mention a few).

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