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ANALYZING THE MEANING OF FUZZINESS IN RANDOM EXPERIMENTS

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In this paper a discussion on the interpretation and management of fuzziness as a kind of randomness is developed in a statistical framework.

1. INTRODUCTION

Statistics is concerned with the making of decisions or inferences about a population, on the basis of the information supplied by the performance of some random experiment associated with that population. Statistics is closely related to uncertainty, since one cannot usually guarantee that the making of decisions or inferences is developed under absolutely certain conditions and leads to absolutely certain conclusions.

Types and sources of uncertainty cannot be described in a unique way. Thus, some common types of uncertainty are randomness and fuzziness, and some common sources of uncertainty are experimental errors, lack of information, imprecise data reports, uncertain meaning, and others.

Among the approaches to model uncertainty, Probability Theory and Fuzzy Set Theory have become the most used ones, and since fuzzy sets were introduced by Zadeh several authors have studied different connections between both theories.

Maybe, the most controversial connection is that stating that membership functions characterizing fuzzy sets can be regarded as an "imitation" of probability distributions. In that way, Lindley (1982, 1987) claimed that "... only probability is a sensible description of uncertainty ...". Criticisms about Lindley's claim have been presented based on different arguments, from Generalized Information Theory to Statistics (see Goodman & Nguyen, 1985, Zadeh, 1986, Nguyen, 1987, Klir, 1989, Goodman *et al.*, 1991, Maggi, 1991, Weber, 1991, and others).

On the other hand, Hisdal (1982, 1988) particularized Lindley's assertion by saying that "... a membership value of an exact element to a fuzzy set is identified with the subject's estimate of the probability that the label or property defining the fuzzy set would be assigned to that element ...". The purpose of the analysis in the present paper is to conclude whether or not membership functions can properly be identified with probabilities when fuzziness is considered to model the uncertainty in some of the stages in random experiments, and to discuss advantages and inconveniences of managing fuzziness as a kind of randomness in those stages.