

Application of Choquet Integral Calculus to Nonlinear Statistics

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Abstract. In this study we apply Choquet integral calculus to nonlinear statistics. Throughout the study we take a constructive approach to derive analytical solutions. We first give a brief introduction to Choquet integral calculus. Next we consider a non-additive distorted probability space on the nonnegative real line for nonlinear statistics. A distorted probability measure is obtained from a conventional additive probability measure by a generator as a monotone transformation; in this study we deal with two classes of parametric generators. We explore some properties of the Choquet integral of non-negative continuous functions with respect to distorted probabilities. Then we analytically calculate elementary statistics such as the distorted mean and variance of a random variable for uniform, exponential and Gamma distributions. Finally we consider Choquet integral calculus of real-valued functions to deal with a distorted probability space on the real line where we calculate elementary statistics for uniform and normal distributions. In addition we mention about relations our distorted distributions with conventional skew distributions.



Michio Sugeno after graduating from the Department of Physics, the University of Tokyo, he worked at a company for three years. Then, he served the Tokyo Institute of Technology as Research Associate, Associate Professor and Professor from 1965 to 2000. After retiring from the Tokyo Institute of Technology, he worked as Laboratory Head at the Brain Science Institute, RIKEN from 2000 to 2005 and, then as Distinguished Visiting Professor at Doshisha University from 2005 to 2010. Finally, he worked as Emeritus Researcher at the European Centre for Soft Computing in Spain from 2010 to 2015. He is Emeritus Professor at the Tokyo Institute of Technology. He was President of the Japan Society for Fuzzy Theory and Systems from 1991 to 1993, and also President of the International Fuzzy Systems Association from 1997 to 1999. He is the first recipient of the IEEE Pioneer Award in Fuzzy Systems with Zadeh in 2000. He also received the 2010 IEEE Frank Rosenblatt Award and Kampé de Fériét Award in 2012.