

## Abstract

This research examines multi-criteria decision-making under fuzzy environment by conducting two studies. The first study explained claim ratio of general life insurance sectors in India. 400 individuals participated from KIIT University, Bhubaneswar in that study. A questionnaire assessed with 12 insurance companies certified by *Insurance Regulatory and Development Authority* and 10 criteria of each company for selection of insurance. All the life insurance companies were selected on the basis of average claim ratio of the year 2015. In this study, the linguistic variables were defined from very low (VL) to very high (VH) for define criteria ratings, similarly very poor (VP) to very good (VG) define for ratings of alternatives. All the linguistics variables are adopted using triangular membership function. Then, Fuzzy TOPSIS is implemented and results revealed that LIC of India having highest ranking. Finally, sensitive analysis conducted to measure the stability of the adopted model. The second experimental study is carried out on health sector to classify diabetes disease. In that study, 200 individuals participated from local Bhubaneswar city. This study proposes on the prediction and classification of Diabetes disease and comparative analysis is carried out on Back Propagation Neural Network (BPNN) and Scaled Conjugate Back Propagation. A Hybrid Adaptive Neuro-Fuzzy Inference System (ANFIS) and Support Vector Machines (SVM) also discussed in this study. To begin, 200 participants responded to questions developed by experts in endocrinology. 60 % data were trained, 30 % data were tested and last 10% data were validated. Comparing all machine learning approach, ANFIS results quite acceptable with low error and high accuracy as compared to other machine learning approach due to hybrid in nature.

Keywords: TOPSIS, Fuzzy Decision-making, SVM, BPNN, ANFIS