Abstract   In the traditional statistical approach, we assume that we know the exact cumulative distribution function (CDF) F(x). In practice, we often only know the envelopes [F(x), F(x)] bounding this CDF, i.e., we know the interval-valued "p-box" which contains F(x). P-boxes have been successfully applied to many practical applications. In the p-box approach, we assume that the actual CDF can be any CDF F(x) in [F(x), F(x)]. In many practical situations, however, we know that the actual distribution is smooth. In such situations, we may wish our model to further restrict the set of CDFs by requiring them to share smoothness (and similar) properties with the bounding envelopes F(x) and F(x). In previous work we used ideas from Info- Gap Decision Theory to propose heuristic methods for selecting such distributions. In this paper, we provide justifications for this heuristic approach.

Keywords   probability box, uncertainty representation, info-gap decision theory, statistical approach, cumulative distribution function, p-box.