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Conformity Assessment of a Sample of Items

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A document of the Joint Committee for Guides in Metrology [JCGM 106:2012 - Evaluation of measurement data –The role of measurement uncertainty in conformity assessment] provides a Bayesian approach to perform conformity assessment (CA) of a scalar property of a single item (a product, material, object, etc.). It gives a methodology to calculate specific and global risks of false decisions for both the consumer and the producer. Specific risks, which are conditional probabilities, are related to a specific item whose property has been measured. Global risks, which are probabilities of joint events, refer to an item that could be randomly drawn from that population of items.

The JCGM 106 approach can be extended to assess the properties of a sample of N items rather than a single item at a time. In this work, the probability of truly conforming items within a finite sample is modelled. This probability is a quality index of the sample as a whole. Resorting to appropriate discrete random variables, two probabilistic models are developed, employing the above-mentioned specific and global risks as the distributional parameters of those variables. The first model is based on a Poisson binomial distribution that can infer the number of items within the sample having a good (conforming) true property value. The second model, based on a multinomial distribution, allows evaluating probabilities of incorrect decisions on CA of the items within the sample (false positives and negatives), as well as probabilities of correct decisions (true positives and negatives).

Keywords

Conformity assessment, finite sample, risk

Classification

Both methodology and application

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