

Yakov Ben-Haim, 2023, Measured averages and inferred extremes: Info-gap analysis of deep uncertainty, *SN Computer Science*, 4:60. <https://doi.org/10.1007/s42979-022-01463-9>.

Abstract Averages are measured for diagnosis, prediction, or surveillance. However, averages reveal nothing about fluctuations, and extreme values may be more significant than the average. The analyst can choose decision variables: path length and other parameters. This paper explores the choice of decision variables to achieve robustness against pernicious uncertainty when interpreting an average, in face of uncertain fluctuations of the averaged variable. We also explore the choice of decision variables to achieve opportuneness from propitious uncertainty. Trade-offs and “trade-ons” between robust and opportune decision variables are identified. Three examples are developed: enforcing speed limits; inferring levels of economic activity; and statistical hypothesis testing. We use concepts of robustness and opportuneness from info-gap decision theory. We also explore the relation between the probability of success and the non-probabilistic robustness to uncertainty, demonstrating conditions where robustness is a proxy for probability.

Keywords Averages, Extremes, Info-gaps, Uncertainty, Robustness, Opportuneness, Speed limits, Economic activity, Statistical inference