Physics’ Need for Interval Uncertainty and How It Explains Why Physical Space Is (at Least) 3-Dimensional

Olga Kosheleva and Vladik Kreinovich
University of Texas at El Paso
500 W. University
El Paso, TX 79968, USA
olgak@utep.edu, vladik@utep.edu

One of the fundamental problems of modern physics is the problem of divergence: e.g., when we try to compute the overall energy of the electric field generated by a charged elementary particle, we get a physically meaningless infinite value. In this paper, we show that one way to avoid these infinities is to take into account that measurements are always imprecise – and thus, we never get the exact values of the physical quantities, only intervals of possible values. We also show that 3-dimensional space is the simplest one in which such interval uncertainty is inevitable. This may explain why the physical space is (at least) 3-dimensional.