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The unreasonable effectiveness of quantum theory: a logical inference approach

We develop the thesis that logical inference provides a framework to establish a bridge between data gathered through experiments and its description in terms of human-made concepts. It is shown that logical inference applied to experiments for which the observed events are independent and for which the frequency distribution of these events is robust with respect to small changes of the conditions under which experiments are carried out yields, without introducing any concept of quantum theory, the quantum theoretical description in terms of the Schrödinger or the Pauli equation, the Stern-Gerlach or Einstein-Podolsky-Rosen-Bohm experiments etc. [1,2]. The extraordinary descriptive power of quantum theory then follows from the fact that it is plausible reasoning, that is common sense, applied to reproducible and robust experimental data.
[1] H. De Raedt, M.I. Katsnelson, and K. Michielsen, “Quantum theory as the most robust description of reproducible experiments”, Ann. Phys. 347, 45 - 73 (2014).
[2] H. De Raedt, M.I. Katsnelson, H.C. Donker, and K. Michielsen, “Quantum theory as a description of robust experiments: Derivation of the Pauli equation", Ann. Phys. 359, 166 - 186 (2014).

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