Wright, Ron

Statistical structures underlying quantum mechanics and social science. (English)

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Summary: Common observations of the unpredictability of human behavior and the influence of one question on the answer to another suggest social science experiments are probabilistic and may be mutually incompatible with one another, characteristics attributed to quantum mechanics (as distinguished from classical mechanics). This paper examines this superficial similarity in depth using the Foulis-Randall Operational Statistics language. In contradistinction to physics, social science deals with complex, open systems for which the set of possible experiments is unknowable and outcome interference is a graded phenomenon resulting from the ways the human brain processes information. It is concluded that social science is, in some ways, "less classical" than quantum mechanics, but that generalized "quantum" structures may provide appropriate descriptions of social science experiments. Specific challenges to extending "quantum" structures to social science are identified.

MSC:

81P05 General and philosophical questions in quantum theory
00A06 Mathematics for nonmathematicians (engineering, social sciences, etc.)
62P35 Applications of statistics to physics

Keywords:

Foulis-Randall operational statistics; fuzzy trace theory; memory; generalized statistical framework; quantum structures; social science; cognitive framing; packing; subjective probability; quantum mechanics; quantum logic

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