Abstract Submitted
for the OSS21 Meeting of
The American Physical Society

Data Science, Time Complexity, and Spacekime Analytics[1] IVO DINOV, University of Michigan, STATISTICS ONLINE COMPUTATIONAL RESOURCE (SOCR) TEAM — There is a substantial need to develop, validate, productize, and support novel mathematical techniques, advanced statistical computing algorithms, transdisciplinary tools, and effective artificial intelligence applications. Extracting actionable information from complex, multi-source, and time-varying observable processes uncovers an interesting synergy between quantum mechanics, artificial intelligence (AI) and data science. Spacekime analytics is a new technique for modeling high-dimensional longitudinal data. This approach relies on extending the physical notions of time, events, particles, and wavefunctions to their AI counterparts; complex-time (kime), complex-events (kevents), data, and inference-functions. We will illustrate how the kime-magnitude (longitudinal time order) and kime-direction (phase) affect the subsequent predictive analytics and the induced scientific inference. The mathematical foundation of spacekime calculus reveal various statistical implications including inferential uncertainty and a Bayesian formulation of spacekime analytics. Complexifying time allows the lifting of all commonly observed processes from the classical 4D Minkowski spacetime to a 5D spacekime manifold, where a number of interesting mathematical problems arise. Direct data science applications of spacekime analytics will be demonstrated using simulated data and clinical observations (e.g., structural and fMRI).

[1]NSF 1916425, 1636840, and NIH R01CA233487, R01MH121079

Ivo Dinov
University of Michigan

Date submitted: 25 Mar 2021 Electronic form version 1.4