Modeling and Simulation of High Frequency Wind Vectors

Winds, unlike many other meteorological quantities, can vary substantially on fine time scales. As part of the Atmospheric Radiation Measurement Program run by the US Department of Energy, the horizontal surface wind vector has been measured at one-minute resolution at a site in Lamont, Oklahoma for nearly 30 years. Although most statistical analyses of winds have focused on wind speeds, the wind vector is relevant in some applications such as aviation and air pollution dispersal. This talk focuses on attempts to model the minute-by-minute fluctuations of the horizontal wind vector over June with the primary goal of producing realistic simulations of the wind vector at this time resolution. Such stochastic weather generators are commonly used as inputs into engineering models for weather impacts. The main difficulty in modeling this process is capturing the complex diurnal cycle in the conditional distribution of the wind vector given the past in a way that leads to simulations that do not yield unrealistic wind speeds. The speaker will discuss the lengthy and iterative process used to arrive at my current "best" model. The speaker will then talk more generally about the utility of such a labor-intensive approach to stochastic modeling in an era in which tools such as deep neural nets are routinely used in a largely automated fashion to model complex processes.

Michael Stein, Ph.D.

Distinguished Professor
Department of Statistics
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Date: Tuesday, April 05, 2022
Time: 1:50 – 2:40 p.m. US Central Time
Zoom Meeting ID: 998 4499 3279
Passcode: 724615
Faculty host: Rui Tuo, ISEN

Biography

Dr. Michael Stein has served on the faculty of Rutgers University since 2019, where he is a Distinguished Professor in the Department of Statistics. He was on the faculty at the University of Chicago from 1985-2019. Dr. Stein received his PhD in Statistics from Stanford in 1984. For most of his career, his research focused on statistical models and methods for spatial and spatial-temporal processes with applications to environmental processes. More recently he has mainly worked on statistical extremes and their application to climatology and meteorology. Dr. Stein is a fellow of the American Association for the Advancement of Science, the American Statistical Association and the Institute of Mathematical Statistics. He is the author of Spatial Interpolation: Some Theory for Kriging (1999), a highly influential book on spatial statistics, and has authored over 120 papers. He has directed or co-directed the doctoral dissertations of 27 students. Dr. Stein is currently the Applications & Case Studies Editor at the Journal of the American Statistical Association.

You can also click this link to join the seminar https://tamu.zoom.us/j/99844993279?pwd=TkJodWFVRURyMmkwakI4SWZGeVJTQT09

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