

MICHIGAN STATE UNIVERSITY
Department of Statistics and Probability

JAMES FRANCIS HANNAN LECTURE SERIES

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Emulation of computer models II: Models with massive output and coupled models

Thursday, April 18, 2019
3:00 PM - 4:00 AM
C405 Wells Hall

Abstract

Often computer models yield massive output; e.g., a weather model will yield the predicted temperature over a huge grid of points in space and time. Emulation of a computer model is the process of finding an approximation to the computer model that is much faster to run than the computer model itself (which can often take hours or days for a single run). Many successful emulation approaches are statistical in nature, but these have only rarely attempted to deal with massive computer model output; some approaches that have been tried include utilization of multivariate emulators, modeling of the output (e.g., through some basis representation, including PCA), and construction of parallel emulators at each grid point, with the methodology typically based on use of Gaussian processes to construct the approximations. These approaches will be reviewed, with the startling computational simplicity with which the last approach can be implemented being highlighted and its remarkable success being illustrated and explained; in particular, the surprising fact that one can ignore spatial structure in the massive output is explained. All results will be illustrated with a computer model of volcanic pyroclastic flow, the goal being the prediction of hazard probabilities near active volcanoes. As time permits, work on emulating coupled computer models (e.g., the computer model of pyroclastic flow, coupled with a computer model assessing damage to buildings from such flows) will be discussed.

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