Mathematics, Statistics, and Computer Science **@ UIC**

Analysis and Applied Mathematics Seminar

How Warm is it Getting?'' and Other Tales in Uncertainty Quantification

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Abstract: In the statistics community "Big Data" science is meant to suggest the combining of inferential and computational thinking. We also speak of big data in the geosciences. However, the problems pursued in geoscience are often extreme in the number of degrees of freedom, and in many instances, non-stationary in its statistics. This usually means that we are working with sparse observational data sets, even if the number of observations is large. The Bayesian framework is a natural inferential data assimilation strategy in geosciences, to some extent because the degrees of freedom in the problem vastly outnumber observations but more critically, because the models we use to represent nature have considerable predictive power.Looking toward the future, we expect improvements in computational efficiency and finer resolutions in models, as well as improved field measurements. This will force us to contend with physics and statistics across scales and thus to think of ways to couple multiphysics and computational resolution, as well as to develop efficient methods for adaptive statistics and statistical marginalization.How this coupling is exploited to improve estimates that combine model outcomes and data will be described in tracking hurricanes and improving the prediction of the time and place of coastal flooding due to ocean swells. Estimating the trend of Earth's temperature from sparse multi-scale data will be used as an example of adaptivity in time series analysis.Other open challenges in non-stationary big data problems will be described, where progress could result from "Big Data Geoscience," the tighter integration of geoscience, computation, and inference.

Monday, October 8 at 4:00 PM in 636 SEO