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INFINITE SERIES, STOCHASTIC PROCESSES, FUNCTION OPTIMIZATION AND THE BAYESIAN PANACEA

Abstract

This thesis aims to solve important problems in topics as varied as deterministic and random infinite series, stochastic processes and function optimization, by embedding the objects in appropriate Bayesian characterization frameworks and then providing the equivalent Bayesian solution. The key philosophy is to view even the deterministic objects as the series elements of deterministic infinite series as realizations of stochastic processes, which facilitates the Bayesian treatment.

Our Bayesian embedding perspective led to Bayesian characterizations of convergence, divergence and oscillations of deterministic and random infinite series; stationarity, nonstationarity, oscillations of general stochastic processes, and also a novel function optimization theory driven by posterior Gaussian derivative process.

Advantages of our Bayesian characterization approach includes equivalent Bayesian solutions to questions of convergence, divergence, oscillations of infinite series where all existing methods fail to provide conclusive answers, equivalent Bayesian assessment of strong and weak stationarity and nonstationarity in time series, spatial and spatio-temporal processes, along with equivalent Bayesian appraisals of complete spatial randomness, strong and weak stationarity and the Poisson assumption in point process analysis. Furthermore, such Bayesian characterization led to method for Bayesian frequency determination in oscillating time series and a reliable method for convergence diagnostics of Markov Chain Monte Carlo algorithms, apart from the novel and accurate function optimization method.

Special mention must be reserved for Bayesian characterization of infinite series, as this attempted to provide solutions to two problems of great importance. One such problem is the celebrated Riemann Hypothesis, the most elusive problem of classical mathematics, whose solution is the most sought after. The other is related to the global climate change debate, the specific question being the validity of the portentous future global warming projections. The respective results of our Bayesian characterizations of deterministic and random infinite series support neither Riemann Hypothesis, nor future global warming.

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