A surrogate modeling journey through Gaussian processes modeling for computer simulation experiments

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This talk begins with an overview of Gaussian process (GP) surrogate modeling, and my favorite application: active learning for the (Bayesian) optimization of a blackbox function. I shall then survey some important, recent methodological developments targeting specific situations that increasingly arise in practice: large simulation campaigns, noisy observations/stochastic simulation, nonstationary modeling, and the calibration of computer models to field data. The presentation concludes with an in-depth description of a recent application: contour location for reliability in an airfoil simulation experiment using deep GPs. Throughout, there will be reproducible visuals and demos supported by code, both run live and embedded in the slides. These are biased toward my own work, in part because I understand that code best. But along the way I shall also endeavour to provide an otherwise balanced discussion of myriad alternatives that can be found elsewhere in this fast-moving literature.