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Bayesian failure-rate modeling and preventive maintenance optimization

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Highlights

- We develop and present novel stochastic optimization algorithms, based on both a nonparametric and parametric Bayesian model–a first in the literature. The interface between stochastic optimization and modern Bayesian methods using Markov chain Monte Carlo is gaining momentum in recent years, and our paper advances this research agenda.
- The relabeled Proposition 1 in the paper holds for any bathtub hazard rate model; that is, the attendant optimization methods encapsulate virtually all types of reliability functions one observes in practice–another theoretical first in the operations literature. Indeed, it is for these reasons that our industry sponsor (South Texas Nuclear Power Operating Company) saw fit to implement these ideas in real time.
- The adaptation of the extended gamma process to better model monotone failure rates within the operations framework is a new contribution.
- All models are exemplified using actual data from industry. The cost savings and the increased efficiency are thus illustrated.

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