Contribution ID: **37** Type: **not specified**

A proposal for multiresponse Kriging optimization

Tuesday, June 28, 2022 10:30 AM (20 minutes)

Physical experimentation for complex engineering and technological processes could be too costly, or in certain cases, impossible to be performed. Thus, computer experiments are increasingly used in such context. Specific surrogate models are adopted for the analysis of computer experiments which are statistical interpolators of the simulated input-output data. Among such surrogate models, a widely used one is the Kriging. The main objective of Kriging modelling is the optimal prediction of the output (i.e. the response variable) through a statistical model involving a deterministic part, named trend function, and a stochastic part, namely a Gaussian random field with zero mean and stationary covariance function. In this talk, we deal with a proposal for multiresponse Kriging optimization with anisotropic covariance function. We consider the Universal Kriging model which entails a non-constant trend function, and allows to improve the accuracy of the estimated surface. The suggested optimization procedure involves the definition of a single objective function which takes account of the adjustment to the objective values for each response (i.e. targets), the predicted Kriging mean and variance. In addition, we consider tolerance intervals for the targets, rather than fixed values, and weights to take care of the different importance of each response variable. We apply our proposal to a case-study on freight trains reported in Nikiforova et al. (2021). The final results are currently in progress, and further developments will be also carried out by considering the choice of the covariance function, and other suitable optimization measures.

REFERENCES:
1) Nikiforova N. D., Berni R., Arcidiacono G., Cantone L. and Placidoli P. (2021). Latin hypercube designs based on strong orthogonal arrays and Kriging modelling to improve the payload distribution of trains. Journal of Applied Statistics, 48 (3): 498-516, DOI: 10.1080/02664763.2020.1733943.

Keywords

computer experiments, Kriging modelling, anisotropic covariance

Primary authors: NIKIFOROVA, Nedka Dechkova (Department of Statistics Computer Science Applications "G.Parenti"- University of Florence); BERNI, Rossella; Prof. CANTONE, Luciano (Department of Engineering for Enterprise "Mario Lucertini", University of Rome "Tor Vergata", Rome, Italy)

Presenter: BERNI, Rossella

Session Classification: CONTRIBUTED Design of Experiment 3

Track Classification: Design and analysis of experiments