



**Joint MUMS Program Transition - SPUQ Workshop**  
**May 14-17, 2019**  
**SPEAKER/ABSTRACT**

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*“Bayesian Smoothing Spline with a Generalized Constraint Operator”*

**Abstract:**

Smoothing spline is one of the most popular curve-fitting methods because of its flexibility and a natural Bayesian interpretation. However, the extrapolation of smoothing spline in data missing case is subject to a high variation and may produce meaningless results. Meanwhile, people can usually obtain prior information about the underlying function, such as, mean or reasonable range of the initial or boundary values. Our intention is to incorporate such prior information to improve the extrapolation performance by extending the minimization problem of classical spline model. This new model is a generalization to classical smoothing spline by introducing the constraint operator. We solved the minimizer via reproducing kernel Hilbert space theory and Green's function. Like Wahba (1978), we also proposed a stochastic process on the functions of objective function space prior on the functions of objective function space. The main difference to Wahba's prior is that our prior, with respect to the polynomial space, is proper rather than diffused. We would have two tuning parameters, instead of a single tuning parameter. To perform full Bayesian analysis, independent Pareto priors, and bivariate Pareto prior on these two tuning parameters are assumed separately. The simulation result will also be presented in our talk.