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

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*"A Sequential Design Approach for Calibrating a Dynamic Population Growth Model"*

**Abstract:**
A comprehensive understanding of the population growth of a variety of pests is often crucial for efficient crop management. Our motivating application comes from calibrating a two-delay blowfly (TDB) model which is used to simulate the population growth of Panonychusulmi (Koch) or European red mites that infest on apple leaves and diminish the yield. We focus on the inverse problem, that is, to estimate the set of parameters/inputs of the TDB model that produces the computer model output matching the field observation as closely as possible. The time series nature of both the field observation and the TDB outputs makes the inverse problem significantly more challenging than in the scalar valued simulator case.

In spirit, we follow the popular sequential design framework of computer experiments. However, due to the time-series response, a singular value decomposition based Gaussian process model is used for the surrogate model, and subsequently, a new expected improvement criterion is developed for choosing the follow-up points. We also propose a new criterion for extracting the optimal inverse solution from the final surrogate. Three simulated examples and the real-life TDB calibration problem have been used to demonstrate higher accuracy of the proposed approach as compared to popular existing techniques.