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INFORMS Seminar Series

Sequential Prevalence Estimation with Pooling and Continuous Test Outcomes under Limited Resources

SEMINAR SESSION INFORMATION

DATE: Wednesday, Feb. 1

TIME: 12:15pm

LOCATION: Durham 260

PROVIDED: Pizza and Soda

SPEAKER INFORMATION

Ngoc Nguyen
PhD Candidate

Grado Department of Industrial & Systems Engineering

MEMBERSHIP INFORMATION

Fees are as follows and include all weekly seminars (12+) & workshops.

FIRST MEETING: FREE

MEETING: $5

SEMESTER: $25

Prevalence estimation is crucial for controlling the spread of infections and diseases, and for planning of health care services. Prevalence estimation is typically conducted via pooled, or group, testing due to limited testing budgets. We study a sequential estimation procedure that utilizes continuous pool readings and considers the dilution effect of pooling so as to efficiently estimate an unknown prevalence rate. Embedded into the sequential estimation procedure is an optimization model that determines the optimal pooling design (number of pools and pool sizes) under a limited testing budget, considering the trade-off between testing cost and estimation accuracy. Our numerical study indicates that the proposed sequential estimation procedure with dual-pool configurations outperforms single-stage procedures, or procedures that utilize binary test outcomes, and provides consistent prevalence estimates that significantly reduce the mean squared error (MSE) of the estimate, especially in cases where the prior on the unknown prevalence rate is an underestimate. This is due to the ability of the sequential procedure to mitigate the effect of a poor prior on the unknown prevalence rate, through the use of the pooling optimization model with updated estimates of the prevalence rate.

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Questions? Comments? Send an e-mail to shafae1@vt.edu