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Adaptive Risk-based Pooling in Public Health Screening

SEMINAR SESSION INFORMATION

DATE: Wednesday, October 26

TIME: 12:15pm

LOCATION: Durham 260

PROVIDED: Pizza and Soda

SPEAKER INFORMATION

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PhD Candidate

Grado Department of Industrial & Systems Engineering

MEMBERSHIP INFORMATION
Fees are as follows and include all weekly seminars (22+) & workshops.

FIRST MEETING: FREE
MEETING: $5
SEMESTER: $25
YEAR: $40

Pooled (group) testing has seen many applications, especially in the context of public health screening, donated blood screening, and genetics. We consider a special form of pooled testing called "array pooling," which takes advantage of overlapping pools. We propose an adaptive risk-based pooling scheme which offers a unified treatment of both two-tier Dorfman pooling and two-tier array pooling (i.e., each arises as a special case of our formulation), and that considers important test and population level characteristics, including imperfect tests, the dilution effect, and subject specific risk characteristics, and determines the structure of the optimal testing design and optimal assignment of the heterogeneous subjects to the pools. Our analytical results, under a general form of the sensitivity function, characterize the properties of optimal pooling design and pool construction policies, and provide valuable insights on the structural properties of an optimal solution. Moreover, our extensive numerical results and case studies, demonstrate the effectiveness and power of an adaptive risk-based testing scheme, with the expected number of false classifications reduced substantially over the traditional models proposed in the literature. Our findings underscore the importance of taking into account population level characteristics both in the pooling design stage and the pool construction stages, as failing to do so can lead to testing schemes with high probability of misclassification of the subjects. Lastly, our study accentuates the importance of a unifying framework, as our results show that optimal designs for various budget levels are often not Dorfman.

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