Speaker: Luana Boumendil (University of Bath)

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Title: Drug combinations screening using a Bayesian ranking approach based on dose-response models

Abstract:
Drug combinations have gained increasing interest in recent years for treating complex diseases such as cancer, as they may reduce the risk of drug resistance and address tumor heterogeneity. However, identifying effective combinations remains challenging due to the high cost and feasibility constraints of exploring the full dose-response matrix, especially when biological material is limited and varies across patients.
To address this challenge, we developed a rank-based screening approach tailored for drug combination studies with restricted biological resources. Our method relies on a hierarchical Bayesian 4-parameter log-logistic model to estimate dose-response curves using a parsimonious diagonal matrix design. We computed several activity and synergy ranking metrics, including the area under the dose-response curve and the Bliss synergy score. To derive a comprehensive ranking of drug combinations, we used posterior rank distributions and the surface under the cumulative ranking curve (SUCRA).
Based on simulations, our approach showed good performance in identifying promising treatments across various scenarios with limited sample sizes and interpatient variability. We illustrate its application on real data from a drug combination screening experiment in acute myeloid leukemia.

Short bio:
Luana Boumendil received her PhD in 2024 from Paris Cité University, and is joining Bath this month as a postdoctoral research associate. Her PhD research focused on Bayesian methods for clinical and pre-clinical studies in onco-hematology. Her research interests encompass Bayesian approaches, hierarchical models, and adaptive designs for clinical trials.