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HEALTHCARE OPERATIONS & INFORMATION MANAGEMENT

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12:00 PM – 2:00 PM
Bronfman Bldg., Rm. 310
1001 Sherbrooke St. West, Montreal

A POMDP Approach to Personalize Mammography Screening Decisions

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Abstract

Breast cancer is the most common non-skin cancer and the second leading cause of cancer-death in US women. Although mammography is the most effective modality for breast cancer diagnosis, it has several potential risks, including high false positive rates, which are not very rare. Therefore, the balance of benefits and risks, which depend on personal characteristics, is critical in designing a mammography screening schedule. In contrast to prior research and existing guidelines which consider population-based screening recommendations, we propose a personalized mammography screening policy based on the prior screening history and personal risk characteristics of women.

We formulate a finite-horizon partially observable Markov decision process (POMDP) model for this problem. Our POMDP model incorporates two methods of detection (self or screen), age-specific unobservable disease progression, and age-specific mammography test characteristics. We use a validated micro-simulation model based on real data in estimating the parameters and solve this POMDP model optimally for individual patients. Our results show that our proposed personalized screening schedules outperform the existing guidelines with respect to the total expected quality-adjusted life years, while significantly decreasing the number of mammograms. We further find that the mammography screening threshold risk increases with age. We derive several structural properties of the model, including the sufficiency conditions that ensure the existence of a control-limit policy.

A light lunch will be served

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