Project title:
AI-Enhanced Strategies for Cancer Detection and Monitoring

Project Summary:
Early detection and post-treatment monitoring are cornerstones of effective cancer control, yet both screening and recurrence surveillance strategies are often suboptimally designed. This project proposes the development of a data-driven, AI-enhanced framework for optimizing cancer screening and post-treatment surveillance protocols.

The project will use large-scale, routinely collected cancer data—such as those available through the National Cancer Registration and Analysis Service (NCRAS)—to model the natural history of cancer and the timing of disease progression or recurrence. Access to NCRAS or similar datasets must be applied for by the fellow or institutional collaborator via standard procedures.

Multistate models will be constructed to simulate transition dynamics across preclinical, clinical, and post-treatment phases. These models will be integrated with statistical learning and machine learning (ML) techniques to predict individual and population-level risk patterns. Mathematical optimization methods will then be applied to identify screening and surveillance strategies that maximize clinical benefit (e.g., early detection, survival gains) while minimizing unnecessary interventions and resource use.

This work directly supports CRUK's strategic priorities:

- Advancing early detection through risk-stratified screening and monitoring strategies,
- Promoting convergence science by integrating cancer epidemiology, AI, and health policy,
- Driving innovation in the use of real-world data to inform personalized and sustainable cancer care.

Supervisory Team:
The lead supervisor brings expertise in cancer natural history modeling, statistics, machine learning, and optimization. This will be complemented by a co-supervisor with clinical oncology expertise, who will ensure the clinical relevance and feasibility of the proposed strategies. The fellow will benefit from comprehensive interdisciplinary training, equipping them for a leadership role in translational cancer research.

Clinical Specialities:

Oncology, public health or epidemiology, data science with clinical training.