Canadian Association of Physicists
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Big Data and Machine Learning in Medical Imaging

Tuesday 10 June 2025 16:15 (45 minutes)

Advances in medical imaging have ushered in an era of unprecedented data generation, presenting both opportunities and challenges for modern healthcare. We will explore how big data and machine learning are transforming the field of medical imaging—from accelerating diagnostics to enabling predictive and personalized medicine. Drawing on examples from radiology and multi-modal imaging platforms, the talk will highlight how machine learning algorithms are being trained on vast imaging datasets to detect patterns imperceptible to the human eye. Key topics will include modelling brain aging, handling large image acquisitions, synthetic data generation using generative models, and integrating imaging data with lifestyle and genomic information. Examples will show the image synthesis of amyloid beta positron emission tomography from structural medical imaging using conditional generative adversarial network models and diffusion models for stroke segmentation stroke, and how we use these advanced methods to provide practically useful information. The presentation will also discuss practical considerations, including model interpretability and regulatory pathways for AI-enabled tools. Emphasis will be placed on high-performance computing for data analysis and machine learning.

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