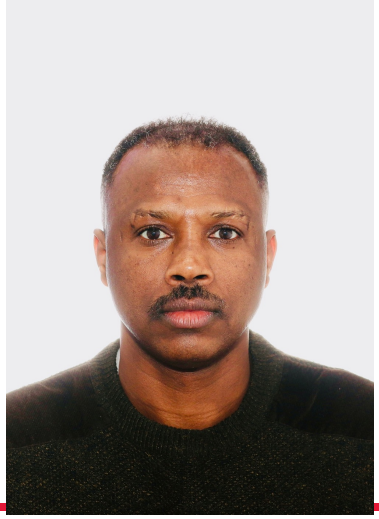
AIPHA/LIAM 2026 Summer Program

Distinguished Lecture By:



Dr. Woldegebriel Assefa Woldegerima

Title: PINNs for Inverse Problems in Time-Dependent Compartmental Models: Parameter Estimation and Forecasting of COVID-19 Dynamics in Canada

Date: Friday, August 14, 2026
Time: 10:30 - 12:00 PM
Location: Rm 277, LIAM, Kinsmen Building

Abstract: In this talk, I will present a Physics-Informed Neural Network (PINN) framework for the inverse problem of an SVVEAIHR compartmental model calibrated to Canadian COVID-19 surveillance data. The governing DEs are embedded directly into the training loss alongside data-misfit and initial-condition terms, enabling the network to simultaneously approximate compartmental trajectories and recover unknown epidemiological parameters without a conventional numerical solver. On synthetic benchmarks, the framework recovers dominant parameters within 5% of their true values and achieves an aggregate R^2=0.9994 across all compartments, outperforming a classical L-BFGS-B baseline in trajectory accuracy while remaining competitive in parameter precision. When calibrated on real Canadian data, the model yields epidemiologically consistent estimates. The recovered time-varying $\alpha(t)$ reflects documented non-pharmaceutical intervention and variant timelines without requiring manual wave segmentation. Ablation studies show that the ODE physics weight and network architecture jointly govern in-sample fit and out-of-sample regularisation.

Assefa's Short Bio

Woldegebriel Assefa Woldegerima is an Associate Professor in the Department of Mathematics and Statistics at York University as of Jul 1, 2026. He is the founding director of the Disease-Informed Modelling, Methods & Systems Lab (DIMMS Lab) and also serves as Associate Director of the Laboratory for Industrial and Applied Mathematics (LIAM), and founding member of the Center of Excellence in Artificial Intelligence for Public Health Advancement (AIPHA). Dr. Woldegerima continues to advance the integration of mathematics, data science, and AI in understanding and controlling infectious diseases, contributing to both theoretical developments and real-world public health applications.

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