

AIPHA/LIAM WEEKLY SEMINAR

Presented by : **Prof. Nathaniel Osgood**
University of Saskatchewan



Title : **Applied Cellular Sheaves for Public Health,
an Informal Tutorial: Motivation,
Background & Applications**

Time : 1:30 PM-2:30 PM, Thursday, October 15, 2026

Location : Room 277, LIAM Lab, Kinsmen Building

Zoom Meeting ID : 416 736 5757

Abstract

At a very rough, informal level, we can think of sheaves as providing ways of rigorously reasoning about the problem of consistently assigning behaviour to a space in a manner that is consistent with how it is connected. We can think of sheaf theory as helping to solve a puzzle – to fit together the pieces in a such a way that the image fragment depicted on each piece jibes with that shown on neighbouring pieces, and such that the puzzle as a whole displays a fully consistent picture. We focus here on the case of cellular sheaves – sheaves defined on cellular complexes, such as simplicial complexes, which generalize graphs to higher dimensions. As Robinson has observed, such sheaves provide a canonical means for reasoning about data integration problems, where we have a need to combine diverse sources of empirical data regarding different overlapping areas in space and time in a way that they provide a consistent (or minimally inconsistent) picture of the underlying situation throughout the space. Within this thoroughly interactive tutorial geared towards mathematical epidemiologists being exposed to sheaves for the first time, we provide a decidedly informal introduction the concept of sheaves, and relate sheaves to concepts introduced informally at in the previous talk (simplicial complexes, boundary and coboundary maps, and cohomology), in a way that seeks to convey the main ideas and intuitions and motivations for their use, without seeking to provide the categorical or topological background needed for a formal introduction. We further survey a set of uses for sheaves within public health, including with Ghrist Hansen’s discourse sheaves, Bumpus et al.’s and Niu et al.’s (pre)sheaves for temporal data analysis for public health, and work in sheaf-based deep learning by Gebhart, Bodnar and others. We also note in passing the close relationship between categories (pre)sheaves and (Grothendieck) topos, and how topoi can offer added value for some public health applications.

About The Speaker

Dr. Osgood’s research focuses on combining tools from Systems Science, Data Science, Computational Science, Higher & Applied Mathematics to inform decision making in health & health care. This includes extensive applications of agent based & other dynamic modeling in diverse areas, contribution of innovations to improve dynamic modeling quality transparency and efficiency particularly using category theory and novel modeling languages, techniques hybridizing simulation approaches with a variety of machine learning tools as well with topological data analysis, leveraging such hybrid models with data from high-velocity data sources. He is further the co-creator of diverse epidemiological surveillance and data collection systems, most prominently the Android-, iPhone- and web-based Avicenna platform applied by thousands of health researchers around the world.