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# School of Computer Science

## Ph.D. Defense

**Monday, June 29, 2020 at 8:30 am on Teams**

**(If you would like to view the defense please contact Joseph Sawada at jsawada@uoguelph.ca)**

# A Decision Support Framework for the Surveillance and Prediction of Avian Influenza

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## Abstract

The complicated and global spread of avian influenza poses a serious threat to the poultry industry and public health. To respond to these threats and reduce the risk of introduction and spread of avian influenza virus, surveillance tools are required for situational awareness. Such tools provide decision-makers with timely insights on high-priority regions to perform control policies. To date, several surveillance systems of avian influenza have been proposed. The existing systems usually utilize limited data sources and are mostly unable to provide a timely and comprehensive understanding of the situation. Additionally, the transparency of surveillance systems and their outcomes has received less attention in the literature. Addressing the timeliness, comprehensiveness and interpretability of predictions would be of great value for making on-time, accurate and explainable decisions.

This research proposes the development of a framework that comprises of three main parts, including (1) Data management for acquiring, pre-processing and integrating of data; (2) Knowledge management for building a knowledge base by extracting rules and facts from data; and (3) User interface for creating reports for questions that users can inquire about the risk of avian influenza in different geographical scales. The framework combines patterns from two main approaches.

In the first approach, the Twitter disease-related data was used to identify the date, severity and virus subtypes of official outbreak reports. In the second approach, several covariates data sources were combined to build a spatiotemporal dataset. Then, underlying patterns explaining the risk of introduction and spread of avian influenza were discovered. The novelty of the present study lies in utilizing several data sources which could contribute to the timeliness and accuracy of extracted patterns. Moreover, rule discovery techniques are used to assist in automation, transparency and speed of predictions. The present study is intended to build a novel analytics framework that can provide insights into the space-time occurrence and spread of avian influenza. The implications can assist in determining the prioritized areas to apply control policies and consequently hinder the further spread of disease across the world.