

**DISCOVER · ACHIEVE · BELONG**



**The University of  
Winnipeg's Faculty of  
Graduate Studies  
Fourth Annual  
Three-Minute Thesis  
Competition**

**April 11, 2017: Eckhardt-Gramatté Hall**



## Three Minute Thesis Presentation Schedule

	Name	Program
1	Orlando Simpson	ACS
2	Ana Breit	BioScience
3	Jiajie Yu	ACS
4	Adrienne Ducharme	BioScience
5	Andrew Habrich	BioScience
6	Martine Balcaen	BioScience
7	Guo Ben	ACS
8	Nicole Dorville	BioScience
9	Marcel Nwali	ACS
10	Aliraza Alidina	MDP

### Judges:

- ◇ Christina Weise, CEO, Research Manitoba
- ◇ Shaneen Robinson, Reporter, Winnipeg Bureau, APTN
- ◇ James Currie, Deputy Provost and Associate Vice-President, Academic

### View past 3MT videos here:

<http://www.uwinnipeg.ca/graduate-studies/research/three-minute-thesis-videos.html>

Orlando Simpson - *Applied Computer Science & Society*: “Agent Based Modeling of Cardiovascular Diseases.” In this study, we developed an Agent-Based Model (ABM) that simulated the emergence and progression of Cardiovascular diseases (CVDs) in Jamaica. The preliminary results presented demonstrate that the model has merits. Therefore, it can assist policy makers to understand the complex interdependency of the risk factors and how that translates to the emergence of CVDs in the population. The model is applicable to low and middle income countries which accounts for 80% of CVD related deaths globally.

Ana Breit— *Bioscience, Technology and Public Policy*: “The Pathogen transmission and torpor expression in little brown bats (*Myotis lucifugus*).” Pathogen transmission can be influenced by host traits and environmental characteristics. Bats select warm roosts, huddle with conspecifics, or enter torpor, a state of reduced body temperature and metabolic rate, to reduce the amount of energy they need to spend to stay warm. Torpor expression and solitary roosting could reduce an individual’s risk of contracting pathogens from infected bats. We tested the hypothesis that torpor expression and huddling would influence risk of pathogen transmission for little brown bats (*Myotis lucifugus*). We housed bats in flight tents and manipulated habitat quality by providing either heated or unheated roosts. We quantified the influence of torpor expression, huddling behaviour, and bat activity on transmission of a proxy pathogen (ultraviolet fluorescent powder). We assessed torpor expression by attaching temperature dataloggers to each individual. This study has implications for understanding pathogen transmission in temperate-zone bats in the context of zoonotic and conservation pathogens.

3MT 2016 student presenters



Jiajie Yu— *Applied Computer Science & Society*: “**A Descriptive Topological Framework for Performing Visual Search.**” The focus of this work is on simulating human visual search in automated systems. Human visual attention can be simulated using either bottom-up or top-down models. The bottom-up approach directs attention based on salient objects in the visual field determined by low level visual features. Further, it can be used to identify candidate salient objects, which form a basis for making high-level comparisons regarding the presence of objects of interest. Similarly, the top-down model assumes some a-prior information is present that is necessary to rule out salient regions of the visual field that are not similar to the object of interest. This research investigates the use of descriptive topological spaces for generating patterns from salient regions in order to make decisions on the whether a digital image contains the desired object. Further, the tolerance-based descriptive set intersection operator between patterns is the main mechanism used to determine similarity.

Adrienne Ducharme— *BioScience, Technology & Public Policy*: “**The Effect of Topography and Hydrology on DOC Export to Streams at the Experimental Lakes Area in Northwestern Ontario.**” The water quality of streams and lakes is affected by when and where water moves across the landscape. In particular, carbon is transported from watersheds to aquatic ecosystems, where it is important for processes such as plant and microbe growth. Lakes and streams in the Northern Hemisphere have been getting browner as a result of increased dissolved organic carbon (DOC) concentrations. The causes of this ‘browning’ are debated within the scientific community. My research will examine how the variability in water flow in a watershed during high-flow and low-flow conditions (‘when’) due to the shape of the landscape (‘where’) may influence DOC export. To do this, I am using long-term stream flow and chemistry records from three streams to understand trends and variability in stream DOC dynamics. In addition, I am collecting water samples at higher frequency during storms to understand how DOC might behave differently during these events.

Andrew Habrich— *BioScience, Technology & Public Policy*: **“Shouldering the ‘Shoulder season’: Spring activity and torpor expression of the endangered little brown bat (*Myotis lucifugus*).”** North American bats experience, seasonal changes in the environment and resource availability. Low resource availability requires bats to optimize their energy usage until insect abundance increases in the late spring. The physiology, behaviour and ecology of hibernation in bats has been studied extensively in recent years, but less is known about what bats do immediately before and after hibernation when they are migrating between hibernacula and summer habitats. These periods, which I term ‘shoulder seasons’, are of critical importance for reproduction, but we know virtually nothing about energy balance, habitat selection and behaviour during the spring. This shoulder-season knowledge gap may limit our ability to protect and manage populations of endangered hibernating bats. I aim to elucidate the patterns of migration, thermoregulation, and energy usage of little brown bats during the critically important life stage in the spring, with the goal of providing information to ongoing and future conservation efforts.

Martine Balcaen— *BioScience, Technology & Public Policy*: **“Shouldering Dispersal behaviour and environmental modelling of the spatial distribution of adult nuisance mosquitoes in Winnipeg, Manitoba.”** Mosquitoes present a serious nuisance in Winnipeg, Manitoba, where impermeable clay soils, heavy rainfall and warm summers present optimal conditions for the establishment of mosquito populations. For decades, the City of Winnipeg has monitored local populations of mosquitoes and undertaken control measures based on their surveillance data. However, the long-range movement patterns of mosquitoes and their spatial relationships to the landscape are still poorly understood. By marking and recapturing adult mosquitoes, my research will measure the dispersal capabilities and other population parameters of mosquitoes in Winnipeg. This information will be integrated with climate and landscape data to generate mosquito distribution models, which will predict and map adult mosquito populations for use by insect control organizations in Manitoba. These contributions to the framework of mosquito modelling will be valuable to all organizations with insect control responsibilities, for which there are public health implications in areas at risk of mosquito-borne disease outbreaks.

Bin Guo— *Applied Computer Science & Society*: **“Pattern Match Query In a Large Graph Database .”** The graph databases have been wildly used in so many areas, such as social networks, biological networks and World Wide Web, which bring challenging data management problems including subgraph search, shortest-path query, reachability verification, and pattern match. Among these, a pattern match query is more general and flexible compared with others. In this paper, we address pattern match problems over a large data graph  $G$ . Specifically, given a query graph  $Q$ , we want to find all matches in  $G$  that have the similar connections as those in  $Q$ . In order to reduce the search space significantly, we propose a novel algorithm to eliminate all unqualified vertices based on converting a pattern match problem to an arc consistency problem. We also propose a strategy to speed up the distance-based join over two lists of vertices. Extensive experiments show that our approach makes a breakthrough in running time compared with existing ones.

Nicole Dorville— *BioScience, Technology & Public Policy*: **“Two Potential Treatments for White-Nose Syndrome in affected bat species.”** Wildlife diseases can cause extinctions, and are increasingly important for conservation management. Treatments can target pathogen virulence factors, or pathogen growth. White-nose syndrome (WNS) is an emerging fungal disease that has devastated populations of hibernating bats in North America. Several treatments for WNS have been proposed and tested *in vitro*, but few have been tested on live bats. My objective is to evaluate two WNS treatments that target either fungal virulence (i.e., protease inhibitors) or fungal growth (i.e., polyethylene glycol ). I will capture hibernating, WNS-negative bats from the wild. Subsets of bats will be inoculated with the fungus or a sham inoculum, and WNS-inoculated bats will be treated with one or the other potential treatments. Bats will be housed in climate-controlled incubators to maintain hibernation conditions. My thesis will help identify, or rule out potential treatments for a wildlife disease causing devastating impacts on North American wildlife.



2016 3MT winner, MSc in ACS student Oluwayemisi Olugboji with Dean of Graduate Studies, Dr. Mavis Reimer, and Chair of The University of Winnipeg Board of Regents, Eric Johnstone.

Marcel Nwali—*Applied Computer Science & Society*: **“Separable Two Dimensional Orthogonal Moments and their Application.”** Separable moments have recently become major topics in image processing and pattern recognition. Separable moments are the combinations of different orthogonal polynomials that generate a series of new moment families. Some of the separable moments are Krawtchouk-Tchebichef, Tchebichef-Krawtchouk, Hahn-Tchebichef, Tchebichef-Hahn etc. Separable moments can be very useful in many area of image processing and pattern recognition, some area where separable moments are currently used are image/text watermarking, image recognition and image reconstruction. The proposed research on watermarking has been found to be very effective in protecting an original image from attack such as copyright violation, money counterfeit, stamp forgery etc. Also, using separable moment on image recognition, was found to be very high up to 98% recognition rate in many standard image databases. The proposed research did so well on image reconstruction. The reconstructed images from separable moments are far more robust to image rotation, image translation and image scaling.

Aliraza Alidina—*Master’s in Development Practice in Indigenous Development* : **“Fostering a safe space for dialogue between Indigenous and newcomer communities.”** Winnipeg is experiencing an interesting period: it has a large Indigenous population, and an increasing newcomer population. The two communities – as diverse as they are – share a lot in common: a history of colonial encounter, socioeconomic challenges, and communal values. There is however, very little interaction between the two communities. This absence of interaction is due to a lack of knowledge, understanding and awareness about each other. As a result, this has pitted the two communities against each other. Hence, there is a need to create a safe space for dialogue. Community organizations (in the settlement sector) have a responsibility to institutionalize dialogue. It is of prime importance that newcomers understand the colonial history of Canada and some of its contemporary legacies, as well as basic awareness on the First peoples of this land. This is the essence of Truth and Reconciliation calls to action #93.



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