The VADA Program
Visual and Automated Disease Analytics Graduate Training Program

NEWSLETTER

LETTER FROM THE PRINCIPAL INVESTIGATOR

Welcome back to the fall term! I hope you had a relaxing summer and are settling into the new term well.

The VADA Program is now in its third year and I would like to share some of our accomplishments this past year as well as our vision for the coming year.

I would like to welcome our new students as well as new faculty members – Drs. Natalie Knox and Depeng Jiang. We are excited to have them on board and look forward to collaborating. I would also like to congratulate our graduates this year – Olawale Ayilara, Ali Neshati, Shannon Tracey, Abdulmonem Shennat, Tom Arjannikov, Kenny Hong, Marcello Nesca, Matthew Parker and Viktoriya Vasylkiv. We wish you all the best in your next steps!

Over the last year we focused on building out the program – creating structures and processes to meet the needs of a bigger cohort and our funder NSERC's requirements. This included formalizing the internship process by creating agreement and appraisal processes for students and hosts to use as well as formalizing the process for conference and internship support funding. The Foundations of Disease Analytics course also evolved to meet the needs of a larger cohort and focused on three components – types of data, analysis of data and visualization.

I am especially proud of the summer school that took place June 10th – 14th, 2019 which was hosted by the George and Fay Yee Centre for Healthcare Innovation (CHI) at the University of Manitoba. The five full days were packed with the big data challenge where we were lucky to be able to use a live dataset from Dr. Meghan Azad's lab as well as sessions on Github, Jupyter Notebook and predictive modelling. These were among wonderful lunch round table sessions hosted by a variety of speakers from both near and far.

Our upcoming year is an exciting one in which we hope to build on existing successes and strengthen our program further. A large area of focus this year will be on fostering a culture of research excellence by establishing a journal club for second year PhD students. We would also like to work to collect more comprehensive information on degree milestones of students and identify opportunities for collaboration for both students and faculty.

I would like to sincerely thank the VADA Program leadership team and all of the faculty members for their time and dedication to program committees and assistance in making the VADA Program an excellent opportunity for students and faculty to collaborate and innovate.

Sincerely,
Pourang Irani
VADA Program Principal Investigator

VADA Program in the News!

- The VADA Program's Summer School Big Data Challenge was featured in UM Today. The article interviewed Dr. Meghan Azad about her participation in the challenge and the opportunity that students had to parse through the CHILD Lab Data.

2019/2020 VADA Program Student Cohort

This spring the recruitment and selection committee had the difficult task of deciding upon the next cohort of students to be admitted into the VADA Program. The committee received 27 applications (17 MSc applicants and 10 PhD applicants) and admitted 18 new students (11 MSc and 7 PhD students). The program also welcomed back 6 PhD students to participate in the program for a second year for a total cohort of 24 trainees.

2019-2020 University of Manitoba Trainees

MSc Students

- **Alexandrea Anderson (Community Health Sciences)** - Alexandrea's research will use population-based cohorts of Manitobans and Ontarians living with cancer to identify whether there are disparities in cancer outcomes by HIV status. To do this, she will develop an algorithm to identify HIV cases using the Manitoba Centre for Health Policy's administrative data, and will explore methods of model automation and data visualization across two jurisdictions.
- **Barret Monchka (Community Health Sciences)** - Barret's research involves comparing different techniques for constructing disease networks to improve the use of network analysis to model multimorbidity data based on electronic health data.
- **Molly Pratt (Medical Microbiology)** - Molly's research involves taxonomic and functional analysis of the gut microbiome in IBD patients. She will analyze and compare Next Generation Sequencing (NGS) data in order to investigate potential disease mechanisms.
- **Samar Sallam (Computer Science)** - Samar's research aims at using technology to enhance users' health. To achieve this, he will be working on new techniques for health data analysis that depends on data mining and predictive analytics. The ultimate goal of his research is to provide users with health related information/advice in a new form of data visualization and persuasive techniques that encourage them to change their behavior.
- **MD Hosne Al Waid Shaiket (Computer Science)** - Walid's research will focus on developing collaborative and immersive analytics tools that can aid in the process of extracting insight from spatio-temporal health datasets using virtual and augmented reality technologies.

- **Ruiyan (Abigail) Yao (Community Health Sciences)** - Ruiyuan's research will develop and compare parametric and non-parametric methods to test the equivalence of chronic disease case definitions for administrative health data.
- **Ritesh Udhani (Computer Science)** - Ritesh's research will focus on using augmented reality in data visualization for real-time monitoring and coaching chronic illness patients.
- **Aaron Petkau (Computer Science)** - Aaron's research will focus on the development of a system for automated monitoring and detection of infectious disease outbreaks though the use of genomics data derived from microbial pathogens.

PhD Students (* denotes returning student)

- **Azizur Rahman (Community Health Sciences)** - Azizur's research is developing and applying statistical learning methods to automate the analysis of patient reported mental health data for early screening and prevention of mental disorders.
- **Adriana-Stefania Ciupeanu (Interdisciplinary Studies)** - Adriana's research deals with mathematical and statistical modelling of the global spread of infectious diseases.
- **Jillian Rumore (Medical Microbiology)**
- **Qian Liu (Biochemistry and Medical Genetics)** - Qian's research focuses on developing and using machine learning methods to process medical image data and then solve some clinical questions like predicting patients' outcome or treatment effectiveness.
- ***Shamsia Sobhan (Community Health Sciences)** - Shamsia's research involves developing and applying semi-competing models for population health risk prediction. Major objectives of her research includes developing automated covariate selection tools for high-dimensional data and addressing the effects of covariate measurement error on semi-parametric models.
- ***Mohaiminul Islam (Computer Science)** - Mohaiminul's research is highly interdisciplinary. It requires knowledge from artificial intelligence, genome science, data science, and statistical science. This research will develop transfer learning and visualization techniques using deep learning for integrating multi-omics data for precision medicine.
- ***Naomi Hamm (Community Health Sciences)** - Naomi's research focuses on developing and applying new methods for imeasuring chronic disease incidence within electronic health databases.
- ***Roya Lotfi (Computer Science)** - The major goal of Roya's research is to identify unhealthy habits by applying machine learning algorithms wearable device data.

2019-2020 University of Victoria Students

MSc Students

- **Amr Farghali (Health Information Science)** – Amr's research focuses on pharmacy informatics and the impact of electronic prescribing on medication errors and the productivity in community pharmacies. His research also examines utilizing automated methods for analyzing and visualizing clinical data and patient records to optimize wait times in secondary and primary care settings.
- **Yang (Simon) Guo (Statistics)** - Yang's research will involve developing relevant machine learning algorithms and software to solve big data problems, with a focus on health informatics and data mining.
- **Songwan Joun (Statistics)** - Songwan's research involves studying covariate adjusted Bayesian hierarchical model for GWAS. Her major interests are machine learning and biostatistics.

PhD Students (* denotes returning student)

- **Dillon Chrimes (Health Information Science)** - Hailing from Victoria BC, Dillon's research focus is on analytical platform and technical middleware influences on health informatics and operational decision making of healthcare. Having worked previously on big data of simulated metadata framework of hospital system, Dillon will also research on using functionality of commercialized analytical tools to query large data sets within patient data models.
- **Yudi Santoso (Computer Science)** - Yudi's research will use graph computational methods to learn how diseases cluster and propagate. In particular, he is interested in finding the roles of the small scale communities in the dynamics of the whole system.
- ***Eugene Opoku (Statistics)** - Eugene's research focuses on Bayesian joint-multi modal analysis, computation and predictive analysis on disease data using neural networks.
- ***Hoi Suen Wong (Statistics)** - Hoi's research will involve developing statistical methodology and computational tools for discovering genetic variants underlying longitudinal disease progression.

Foundations of Disease Analytics Credit Course

The Foundations of Disease Analytics Course will begin in September 2019 and will be comprised of 15 class sessions over fall 2019 and winter 2020 terms. Second year students will engage with the course differently this year. They will present on their internships on September 20th and January 10th but will spend the remainder of their time in a journal club that will meet six times during the academic year.

VADA Program Returning Student Journal Club

This year returning PhD students will take part in a journal club rather than attend the Foundations of Disease Analytics Course. Each returning student will lead a session, which will also be facilitated by a faculty member who sits on the VADA Program Research Excellence Committee. Every session the student leading it will choose a current paper on a current methodological research paper on automated analytics (e.g., machine-learning) or visualization in health sciences. The student leader will be responsible for introducing the paper in the first 20-25 minutes of the session, and then leading discussion of the paper for the remaining 35-40 minutes of the session

Conference Funding

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The VADA Program has funding available for trainees to attend conferences. Up to $500 annually has been allotted for eligible conference registration, travel and related expenses. For more information please contact the Program Coordinator (vada.program@chimb.ca).

Students have attended:

- Monem Shennat (2nd Year PhD) - 2019 Information Technology & Communications in Health Conference (February 14th – 17th 2019), Victoria, BC
- Shamsia Sobhan (1st Year PhD), Naomi Hamm (1st Year PhD) and Marcello Nesca (MSc) – 2019 Canadian Society for Epidemiology and Biostatistics over May 13th – 15th 2019 in Ottawa, ON.
- Matthew Parker (MSc) and Eugene Opoku (1st Year PhD) attended the Statistics Society of Canada Conference over May 25th – 29th 2019 in Calgary, AB.
- Olawale Ayilara (2nd Year PhD) attended the American Statistical Association's Joint Statistical Meetings over May 25th – 29th 2019 in Denver, Colorado.

NSERC Mid-Term Report

As the VADA Program prepares to enter year 3 (of 6) it is time to report to NSERC on program progress and successes. After extensive work to collect outcomes and gather the requested information, the report was submitted to NSERC by the leadership team on April 1st. A response is expected in the coming months.

VADA Program Orientation

The VADA Program hosted an orientation for new students at both the University of Manitoba and University of Victoria on September 27th 2019. The orientation session provided a chance for the newest cohort of students and faculty to meet. It also provided

an overview of the program components, expectations of students and faculty, and resources available.

VADA Program Internships – Summer 2019

VADA Program students are required to complete internships that are 8 weeks long at the masters' level or 16 weeks long at the doctoral level. Students this year are in the midst of exciting internships with a variety of hosts across Canada:

- Marcello Nesca – Manitoba Centre for Health Policy – (University of Manitoba)
- Kenny Hong – Neonatology, Health Sciences Centre
- Viktoriya Vasylkiv – George and Fay Yee Centre for Healthcare Innovation (University of Manitoba)
- Matthew Parker – Mostafavi Lab (University of British Columbia)
- Shamsia Sobhan – University Health Network (University of Toronto)
- Mohaiminul Md. Islam – Sightline Innovation – (Winnipeg Manitoba)
- Naomi Hamm – Canadian Network for Observational Drug Effect Studies (University of Manitoba)
- Roya Lotfi – George Tzanetakis Lab (University of Victoria)
- Eugene Opoku – Olav Krigolson Lab (University of Victoria)
- Hoi Suen Wong – British Columbia Centre for Disease Control (Vancouver British Columbia)

Recent Student Publications

Boreskie KF, Kehler DS, Costa EC, Hiebert BM, **Hamm NC**, Moffatt TL, Hay JL, Stammers AN, Kimber DE, Kent DE, Cornish DE, Arora RC, Strachan SM, Semenchuk BN, Duhamel TA. (2019). Standardization of the Fried Frailty Phenotype Improves Cardiovascular Disease Risk Discrimination. Experimental Gerontology, 119, 40-44. (Submitted Dec 2018, Accepted Jan 2019)

Kimber DE, Kehler DS, Lytwyn J, Boreskie KF, Jung P, Alexander B, Hiebert BM, Dubiel C, **Hamm NC**, Stammers AN, Clarke M, Fraser C, Pedreira B, Tangri N, Hay JL, Arora RC, Duhamel TA. (2018). Pre-Operative Frailty Status is Associated with Cardiac Rehabilitation Completion: A Retrospective Cohort Study. *Journal of Clinical Medicine, 7*(12), 560. (Submitted Nov 2018, Accepted Dec 2018)

Hamm NC, Pelletier L, Ellison J, Tennenhouse L, Reimer K, Paterson M, Puchtinger R, Bartholomew S, Phillips KAM, Lix LM. (2019). Trends in Chronic Disease Incidence Rates from the Canadian Chronic Disease Surveillance System. *Health Promotion and Chronic Disease Prevention in Canada: Research, Policy and Practice, accepted Feb 2019.*

Hamm NC, Kehler DS, Hay JL, Stammers AN, Strachan SM, Bouchard DR, Duhamel TA. (2019). A quasi-experimental study examining the impact of a fitness-based health risk assessment and a physical activity counseling intervention in the workplace setting on physical activity levels of hospital employees. *Journal of Primary Care & Community Health*

Hamm NC, Lix LM. (May 2019). Improving chronic disease incidence surveillance methods by developing and applying dynamic classification models to administrative health data. *Canadian Society for Epidemiology and Biostatistics,* Ottawa ON, Accepted. (Submitted Feb 2019)

Hamm NC, Pelletier L, Ellison J, Tennenhouse L, Reimer K, Paterson JM, Puchtinger R, Bartholomew S, Phillips KAM, Lix LM. (May 2019). Estimating chronic disease incidence trends using the Canadian Chronic Disease Surveillance System. *Canadian Society for Epidemiology and Biostatistics,* Ottawa ON, Accepted. (Submitted Feb 2019).

University of Manitoba
NSERC CRSNG
University of Victoria

Md. Mohaiminul Islam, Kevin Jeffers, Andrew Hogan, Qian Liu, Rebeca Davis, Silvia Cardona and Pingzhao Hu. "Deep neural network model for predicting gene activity using three-dimensional structures of chemical compounds". Article accepted in Joint Statistical Meeting Proceedings, Statistical Learning and Data Science Section. Vancouver, BC: American Statistical Association. pp.1126-1135. Accepted on December 12, 2018.

William Delamare, **Ali Neshati**, Pourang Irani, Xiangshi Ren: An Analytic Model for Time Efficient Personal Hierarchies. CHI 2019: 368

Ali Neshati, Yumiko Sakamoto, Pourang Irani: Challenges in Displaying Health Data on Small Smartwatch Screens. ITCH 2019: 325-332

Yurii Vasylkiv, **Ali Neshati**, Yumiko Sakamoto, Randy Gomez, Keisuke Nakamura, Pourang Irani: Smart Home Interactions for People with Reduced Hand Mobility Using Subtle EMG-Signal Gestures. ITCH 2019: 436-443

Ali Neshati, Yumiko Sakamoto, Launa Leboe-McGowan, Jason Leboe-McGowan, Marcos Serrano, Pourang Irani: G-Sparks: Glanceable Sparklines on Smartwatches

Graphics Interface 2019

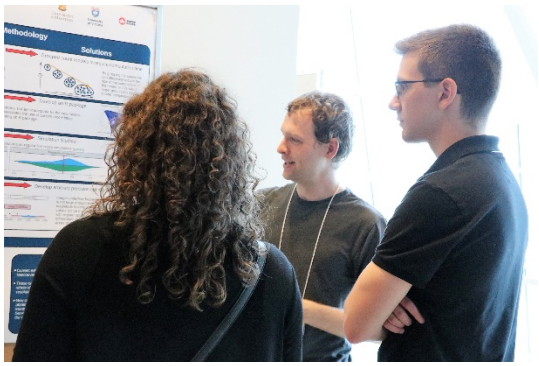
Sobhan, S. and Acar, E. (May 2019). Covariate Influences in Semi-Competing Risks Data: An Application to Heart Transplantation Outcomes. *Canadian Society for Epidemiology and Biostatistics,* Ottawa ON, Accepted.

VADA PROGRAM SUMMER SCHOOL

June 10th – 14th 2019 | Winnipeg, MB

The VADA Program hosted the second annual summer school at the George and Fay Yee Centre for Healthcare Innovation, University of Manitoba. The first two days were devoted to work on the Big Data Challenge, which this year featured real-world data from the CHILD Study; these data were provided by the Azad Lab at the University of Manitoba.

The CHILD Study captures detailed information for independent mother and baby pairs about outcomes such as atopy and allergy. Composition of breast milk, levels of hormones and clinical variables such as age of the mother, body mass index, and supplement use are also captured. Winners of the Big Data Challenge were The Darth VADAs comprised of Shannon Tracey, Kenny Hong and Naomi Hamm. Certificates were presented at a networking reception held at the Canadian Museum for Human Rights on June 12th.



VADA Program Student Matthew Parker (centre) presents his poster to external students who joined for the summer school

The remaining three days of the Summer School featured speakers such as Dr. Linglong Kong (University of Alberta), Dr. Joon Lee (University of Calgary), Dr. Andriy Koval (University of Central Florida), Anamaria Crisan (University of British Columbia), Dr. Michelle Liu (University of Manitoba, Dr. Kaarina Kowalec (University of Manitoba) and Adrian Zetner (Public Health Agency of Canada). In addition to applied sessions on Jupyter Notebook, Github and R there were informal round table luncheon discussions and a career panel session. Social events to facilitate networking were also planned for students, faculty and speakers throughout the week.

VADA Program students celebrate on the last day of Summer School.