Supervisor/Project Information Form

Due February 14 2018 by email to crems.programs@utoronto.ca

PLEASE SUBMIT IN WORD FORMAT ONLY. PDF will not be accepted

Supervisor Name: Thomas L. Forbes, MD, FRCSC, FACS

Hospital/Research Institution: University Health Network/Toronto General Research Institute

Email: thomas.forbes@uhn.ca

Field of Research (2 keywords): Artificial Intelligence, Aneurysm

Department: Surgery

School of Graduate Studies Appointment (IMS, LMP, IHPME etc)? Yes/No: Yes

If YES, please name: IMS

Project Title: Can Artificial Intelligence/Machine Learning Predict Outcomes Following Abdominal Aortic Aneurysm Surgery?

Brief Project Description (<300 words):

Artificial intelligence (AI) is currently being used in many diverse fields to find patterns in data and to assist in making predictions. Through AI, significant advancement has been made in predicting customer behavior, stock prices, interpreting radiographic images, detecting lymph node metastases\textsuperscript{1} and finding sequences of interest in the genome. One of the subfields of AI is Machine Learning (ML) that enables computers to learn and make predictions by recognizing patterns. In comparison to standard programs, ML allows a computer to use partial labeling of data (supervised learning) or the structure detected in the data itself (unsupervised learning) to make predictions about the data without explicit programming.\textsuperscript{2}

In several fields of medicine ML techniques have been used to group similar patients to identify those at high risk, determine patient factors that predict a diagnosis or treatment plan, predict patient outcomes and provide clinical decision support, i.e. the likelihood of success given baseline factors and treatment strategies.

Use of AI and ML techniques in aortic surgery have been limited however.\textsuperscript{3-5} The purpose of this study is to compare the predictive abilities of a traditional risk calculator with ML
techniques in determining outcomes following aortic aneurysm surgery. The University Health Network participates in the Vascular Quality Initiative (VQI) which is a multicenter registry including preoperative patient demographics and risk factors, anatomic criteria and patient outcomes following endovascular and open abdominal aortic aneurysm surgery. The VQI risk calculator has been generated from this dataset using standard statistical methodology. The predictive ability of this risk calculator will be compared against that of multiple ML algorithms.

If human subjects are involved, have Ethics been obtained?
☐ YES ☐ NO ☐ Application Submitted ☒ N/A

Do you expect this work will be published within the 20 months?
☒ YES ☐ NO ☐ Uncertain

Student’s roles and responsibilities (please be specific)

*Please indicate who will serve as the student’s direct report (PI, PhD student, technician etc…)*

The student will participate in study design, data cleansing, data analysis, manuscript preparation and presentation. The research trainee will also be involved in collaboration with the Department of Computer Science. It would benefit the research student to have some programming experience, preferably in MATLAB, Python or R.

The student will be directly supervised by Dr. Lauren Gordon, Vascular Surgery Resident and PhD candidate in Biomedical Engineering (Surgeon-Scientist Training Program), and Dr. Thomas Forbes, Division Chair, Division of Vascular Surgery, University of Toronto.

References


