Summer 2018 NSERC Undergraduate Research Assistantships
Department of Statistical Sciences, University of Toronto

General information:

Applications are invited for Undergraduate NSERC Research Assistantships. These projects provide undergraduate students with an opportunity for research experience during the summer. Each award is for sixteen weeks during May to August 2018, and pays between $1,500 and $2,000 per month, depending on qualifications.

Projects

In this proposal the student will be able to opt for one of the following three projects:

Computer Algebra and Data Sharpening
Supervised by: Professor Patrick Brown

Data sharpening is a kernel smoothing algorithm for fitting curves through points. The algorithm is run twice, the residuals from the first run are added to the data and smoothed in the second run. The properties of data sharpening have been worked out for some simple special cases, and this project will use a computer algebra system (i.e. yacas, axiom) to derive the optimal smoothing parameters in the general case. R code for fitting the algorithm will be written and applied to time series data and spatial data. Once a working algorithm is running, it will be used to get improved estimates of elevation and slope from satellite data. This project will require good computer skills, knowledge of Latex is an asset.

Spatio-Temporal Variation in Bowel Disease in Ontario
Supervised by: Professor Patrick Brown

Using administrative data on individuals having surgery on the lower intestine, this project will seek to find trends in bowel disease over time and understand how the time trends vary throughout Ontario. In particular, regions of Ontario where bowel disease is more common than expected or becoming increasingly prevalent will be identified. A spatio-temporal random effects model will be developed and fit using the INLA software in R. Experience using health data and census data will be required.

Directional Testing in High-Dimensional Regression
Supervised by: Professor Nancy Reid

This project will involve investigation of directional tests, as defined in Fraser et al. (2014, 2016), in high-dimensional settings. We will first review recent work on regularization methods for regression models with large numbers of predictors, including established methods such as ridge regression, and more recent methods such as knockoffs. The research focus will be to explore whether directional tests can be useful in these settings, and how they are related to regularization. A second part of the project will be investigating p-value functions for suitably defined parameters in a vector parameter setting.

Expected background includes courses in statistical theory, linear and non-linear regression, and statistical computing.

How to Apply

Applicants should be undergraduate students in mathematics, statistics or actuarial science with a **"B"** standing. In accordance with NSERC regulations, applicants must hold Canadian citizen or permanent resident of Canada. Students should be registered (at the time of application), in a bachelor's degree program (and not holding higher degrees) at an eligible university in the term immediately before holding the award. If a student already holds a bachelor's degree and is studying towards a second bachelor's degree in the natural sciences or engineering, they are also eligible. Interested students should submit their application(s) to Gillis Aning, Department of Statistical Sciences Room SS 6024 in person or email it as an attachment to gillis.aning@utoronto.ca.

How to submit your application(s):

1. Submit the 1st page of NSERC USRA form, an unofficial transcript from ROSI and a cover letter stating why you want a summer research award, and also state which project you would like to apply for. Students may apply for more than one project. If you are applying for more than one project, please prepare a separate application for each project.

2. **Student applications are due to the department by <u>Monday, March 5th</u>**. The supervisors have one week to decide whether or not to interview the prospective student(s). When the supervisor decides, the student(s) will be contacted to order **an official transcript** and have it sent directly to the department or deliver in person. Please do not open the transcript if delivered in person.

3. Unsuccessful students will be contacted by email regarding the decision.

***Please Note:** USRA application information will be captured from the NSERC On-line System. Therefore, all applications **<u>MUST</u>** be completed by students and their supervisors online (https://ebiz.nserc.ca/nserc_web/nserc_login_e.htm). Applications must be submitted online and then be printed for submission to Research Services. Those prepared by any other means (e.g., handwritten or manually typewritten) will **<u>NOT</u>** be accepted.

<u>Completed applications are due by Friday, March 12th (Supervisors due date to the department.)</u>