# Data Science Seminar Series

Monday, November 6, 9:30-10:30 am, virtual/Teams

**TITLE**

Neural Network Disease Classification Based Feature Extraction for Imaging Genetics

**SPEAKER**

Dr. Farouk Nathoo

**ABSTRACT**

Dealing with the high dimension of both neuroimaging data and genetic data is a difficult problem in the association of genetic data to neuroimaging. In this article, we tackle the latter problem with an eye toward developing solutions that are relevant for disease prediction. Supported by a vast literature on the predictive power of neural networks, our proposed solution uses neural networks to extract from neuroimaging data features that are relevant for predicting Alzheimer's Disease (AD) for subsequent relation to genetics. The neuroimaging-genetic pipeline we propose is comprised of image processing, neuroimaging feature extraction and genetic association steps. We present a neural network classifier for extracting neuroimaging features that are related with the disease. The proposed method is data-driven and requires no expert advice or a priori selection of regions of interest. We further propose a multivariate regression with priors specified in the Bayesian framework that allows for group sparsity at multiple levels including SNPs and genes.

**BIOGRAPHY**

Farouk Nathoo is a Professor and Tier II Canada Research Chair in Biostatistics for Spatial and High-Dimensional Data in the Department of Mathematics and Statistics at the University of Victoria. Nathoo received his B.Sc. (Combined Honors in Mathematics and Statistics) from the University of British Columbia in 1998 where he received the Nash medal upon graduation. He obtained his M.Math degree from the University of Waterloo in 2000 where received an outstanding academic performance award. He began his Ph.D. at Simon Fraser University in 2001, obtaining the degree in 2006. He began a tenure track position at the University of Victoria the same year, was promoted to associate professor with tenure in 2011, was awarded a Tier 2 Canada Research Chair in 2013 (renewed in 2018) and promoted to full professor in 2020.

Nathoo currently sits on the Board of Directors of the Canadian Statistical Sciences Institute (CANSSI) and has served on the NSERC Mathematics and Statistics Evaluation Group (EG 1508) grant panel (2016-2019). He is the President of the Business and Industrial Statistics Section of the Statistical Society of Canada. He is an Associate Editor for the Canadian Journal of Statistics, a Topic Editor for Entropy, has co-edited a special issue of Statistical Methods in Medical Research on the topic of spatial statistics for neuroimaging data, has co-edited a special issue of the Canadian Journal of Statistics on the topic of Neuroimaging Data Analysis and co-edited two special issues for Entropy on Big Data Analytics and Information Science for Business and Biomedical Applications.

Nathoo was a coleader of the CANSSI Collaborative Research Team: "Joint Analysis of Neuroimaging Data: High-dimensional Problems, Spatio-Temporal Models and Computation" (2016 - 2019) and is currently involved in a number of collaborations involving the analysis of novel biomedical imaging and multiomics data towards problems such as the early detection of dementia and the development of immunotherapies for cancer. His statistical research has emphasis on Bayesian methods, spatial and spatiotemporal statistics and statistical modeling.  On these and other topics he has written over 50 papers with collaborators and trainees, co-edited two books, has given over 70 invited talks at Canadian and international venues, and has directly supervised or co-supervised 30 trainees.

https://www.tru.ca/science/masters-degrees/mscds/Data_Science_Seminar_Series.html