

# SAHIR RAI BHATNAGAR

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## EDUCATION

2013–2018	<b>Ph.D. (Biostatistics)</b> McGill University, Montreal QC, Canada <i>Advisors:</i> <a href="#">Dr. Celia Greenwood</a> and <a href="#">Dr. Yi Yang</a> Queen Elizabeth Scholar
2012–2013	<b>Master of Science (Biostatistics)</b> Queen's University, Kingston ON, Canada <i>Advisors:</i> <a href="#">Dr. Paul Peng</a> and <a href="#">Dr. Devon Lin</a> <i>Committee Members:</i> <a href="#">Dr. Dongsheng Tu</a> and <a href="#">Dr. Wenyu Jiang</a>
2011	<b>Associate of the Society of Actuaries</b>
2005–2008	<b>Bachelor of Science (Actuarial Mathematics)</b> Concordia University, Montreal QC, Canada

## APPOINTMENTS

Starting July 1, 2018	Assistant Professor, McGill University Department of Epidemiology, Biostatistics and Occupational Health Department of Diagnostic Radiology
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## RESEARCH INTERESTS

Dimension reduction for predictive models, high-dimensional statistical inference, penalized regression, interaction selection, actuarial statistics, statistical genetics

## PUBLICATIONS

### PUBLISHED ARTICLES

1. Steinberg J, Brooks R, Southam L, Bhatnagar SR, Roumeliotis T, Hatzikotoulas K, Zengini E, Wilkinson JM, Choudhary J, McCaskie AW, Zeggini E (2018). Widespread Epigenomic, Transcriptomic and Proteomic Differences Between Hip Osteophytic and Articular Chondrocytes in Osteoarthritis. *Rheumatology*. Accepted (2018/02).
2. Bhatnagar SR, Yang Y, Khundrakpam B, Evans A, Blanchette M, Bouchard L, Greenwood CMT (2017). An analytic approach for interpretable predictive models in high dimensional data, in the presence of interactions with exposures. *Genetic Epidemiology*. Apr 1;42(3):233-49. DOI [10.1101/102475](https://doi.org/10.1101/102475).

3. Klein Oros K, Oualkacha K, Lafond M, Bhatnagar SR, Tonin PN, Greenwood CMT (2016). Gene co-expression analyses differentiate networks associated with diverse cancers harbouring TP53 missense or null mutations. *Frontiers in Genetics, section Statistical Genetics and Methodology*. Aug 3;7:137. DOI [10.3389/fgene.2016.00137](https://doi.org/10.3389/fgene.2016.00137)
4. Sun J., Bhatnagar SR, Oualkacha K, Ciampi A, Greenwood CMT (2016) Joint analysis of multiple blood pressure phenotypes in GAW19 data by using a multivariate rare-variant association test. *BMC Proceedings*. 2016, 10(Suppl 7):14. DOI [10.1186/s12919-016-0048-3](https://doi.org/10.1186/s12919-016-0048-3)
5. Bhatnagar SR, Greenwood CMT, Labbe A (2016) Assessing transmission ratio distortion in extended families: a comparison of analysis methods. *BMC Proceedings*. 2016, 10(Suppl 7):12. DOI [10.1186/s12919-016-0030-0](https://doi.org/10.1186/s12919-016-0030-0)
6. Wang Y, Murphy O, Turgeon M, Wang ZY, Bhatnagar SR, Schulz J, and Moodie EEM (2015) The perils of Quasi-likelihood Information Criteria. *Stat*. Feb 1;4(1):246-54. DOI: [10.1002/sta4.95](https://doi.org/10.1002/sta4.95)
7. Bhatnagar SR, Atherton J, Benedetti A (2015). Comparing alternating logistic regressions to other approaches to modelling correlated binary data. *Journal of Statistical Computation and Simulation*. Jul 3;85(10):2059-71. DOI [10.1080/00949655.2014.916707](https://doi.org/10.1080/00949655.2014.916707)

#### PAPERS UNDER REVIEW

1. Garfinkle R, Abou-Khalil M, Bhatnagar SR, Wong-Chong N, Azoulay L, Morin N, Vasilevsky CA, Boutros M. A Comparison of Open, Laparoscopic, and Robotic Resections for Rectal Cancer Using the ACS-NSQIP Proctectomy-Targeted Database: A Propensity Score Analysis. *Annals of Surgery*. Submitted (2017/11).
2. Abou Khalil M, Bhatnagar SR, Vasilevsky CA, Morin N, Ghitulescu G, Feldman L, Longtin Y, Boutros M (2017). Development and validation of a clinical risk calculator for fulminant *Clostridium difficile* colitis. *Annals of Surgery*. Submitted (2017/11).
3. Nadig A, Flanagan T, White K, Bhatnagar SR (2017). Results of a RCT on a transition support program for adults with ASD: Effects on Self Determination and Quality of Life. *Autism Research*. Revision requested (2017/11).
4. Kronfli N, Bhatnagar SR, Moodie EEM, Hull MW, Klein MB, for the Canadian Co-infection Cohort Investigators (2017). The early effects of hepatitis C (HCV) treatment on trends in cause-specific mortality in HIV-HCV co-infection. *Clinical Infectious Diseases*. Submitted (2017/08).
5. Hamadani FT, Bhatnagar SR, Balvardi S, Trepanier M, Grushka J, Deckelbaum D, Court O, Fata P (2016). Burnout and Career Satisfaction Among Canadian General Surgeons: Results of the CAGS National Burnout Study. *Canadian Journal of Surgery*. Submitted (2016/08).

#### PAPERS IN PREPARATION

1. Bhatnagar SR, Oualkacha K, Yang Y, Greenwood CMT (2018+). A General Framework for Variable Selection in Linear Mixed Models with Applications to Genetic Studies with Structured Populations.
2. Bhatnagar SR, Yang Y, Greenwood CMT (2018+). Variable Selection in Nonlinear Interactions with the Group Lasso.
3. Bhatnagar SR\*, Turgeon M\*, Yang Y, Hanley JA, Saarela O (2018+). casebase: An Alternative Framework for Survival Analysis. (\*co-first author)

4. Bhatnagar S, Guillemette J, Dugdale M, Bhatnagar SR, Lasry N (2018+). Data Mining for Student Success and Perseverance. Technical Report for the Programme d'Aide à la Recherche en Enseignement et Apprentissage (PAREA). preprint available at [https://github.com/sameerbhatnagar/studentsuccess\\_finalreport/blob/master/docs/studentsuccess\\_final\\_report.pdf](https://github.com/sameerbhatnagar/studentsuccess_finalreport/blob/master/docs/studentsuccess_final_report.pdf).

## SOFTWARE

1. Shiny Application **cdiff**: Interactive, online web application to guide preoperative decision making for patients with fulminant Clostridium difficile colitis (FCDC) being evaluated for surgery. This calculator predicts 30-day postoperative mortality for patients with FCDC based on easily attainable pre-operative parameters. [<https://sahir.shinyapps.io/cdiff/>]
2. R package **sail**: Sparse Additive Interaction Learning with the strong heredity property, i.e., an interaction is selected only if its corresponding main effects are also included. Fits high-dimensional linear models with non-linear interactions via penalized maximum likelihood. [<https://github.com/sahirbhatnagar/sail>][<http://sahirbhatnagar.com/sail/>]
3. R package **eclust**: Dimension reduction technique for analyzing interactions between a high dimensional dataset (e.g. genomics, brain imaging), the environment and a response. [<https://cran.r-project.org/package=eclust>][<http://sahirbhatnagar.com/eclust/>][2046 downloads]
4. R package **casebase**: Fit smooth-in-time parametric hazard functions using case-base sampling. This approach allows the explicit inclusion of the time variable into the model, which enables the user to fit a wide class of parametric hazard functions. [<https://cran.r-project.org/package=casebase>][<http://sahirbhatnagar.com/casebase/>][1172 downloads]
5. R package **manhattanly**: Create interactive Q-Q and manhattan plots that are usable from the R console, in the 'RStudio' viewer pane, in 'R Markdown' documents, and in 'Shiny' apps. [<https://cran.r-project.org/package=manhattanly>][<http://sahirbhatnagar.com/manhattanly/>][5.5k downloads]
6. R package **ggmix**: Implementation of a linear mixed model with group lasso penalty as described in the paper 'A General Framework for Variable Selection in Linear Mixed Models with Applications to Genetic Studies with Structured Populations' [<https://github.com/sahirbhatnagar/ggmix>]
7. R package **gglasso**: A unified algorithm, blockwise-majorization-descent, for efficiently computing the solution paths of the group-lasso penalized least squares, logistic regression, Huberized SVM and squared SVM [<https://cran.r-project.org/package=gglasso>][<https://github.com/emeryyi/gglasso>][16k downloads]
8. R package **acm4r**: Fragment lengths or molecular weights from pairs of lanes are compared, and a number of matching bands are calculated using the Align-and-Count Method [<https://cran.r-project.org/package=acm4r>][13k downloads]

## TEACHING EXPERIENCE

### GRADUATE COURSE

Fall 2017 | MATH697: Mathematical Statistics  
 Department of Mathematics and Statistics, McGill University  
 40 In-class hours  
 12 graduate students  
 Course Webpage: <http://sahirbhatnagar.com/MATH697/>

### SHORT COURSES AND TUTORIALS

2018/02/28 | [Introduction to Regression Trees](#). MATH 680 - Computation Intensive Statistics. Department of Mathematics and Statistics, McGill University.

2018/02/08 | [Modèles d'arbres de régression](#). Mini-cours. Département de mathématiques et de statistique, Université Laval.

2017/03/28 | [Introduction to the R package casebase](#) for fitting smooth-in-time prognostic risk functions for survival data and visualizing incidence density using population time plots. Guest lecturer for BIOS 602 - Epidemiology Regression Models II. Department of Epidemiology, Biostatistics and Occupational Health, McGill University.

2016/05/21 | GitHub for Data Scientists without the Terminal:  
<http://sahirbhatnagar.com/git4ds/>

2016/04/15 | Loops and Simulations in R. Department of Epidemiology, Biostatistics and Occupational Health, McGill University. Sponsored by Epidemiology, Biostatistics and Occupational Health Student Society (EBOSS). <http://www.sahirbhatnagar.com/biosR/>

2016/03/23 | Introduction to the R package casebase for fitting smooth-in-time prognostic risk functions for survival data and visualizing incidence density using population time plots. Guest lecturer for BIOS 602 - Epidemiology Regression Models II. Department of Epidemiology, Biostatistics and Occupational Health, McGill University.

2015/07/29 | [Atelier sur le logiciel en R: Un introduction à la programmation en R](#). GERAD: Groupe d'études et de recherche en analyse, Université de Montréal. Sponsored by HEC Montréal.

2015/05/28 | [Reproducible Research: An introduction to knitr](#). Department of Epidemiology, Biostatistics and Occupational Health, McGill University. Sponsored by the CRM Statistics Laboratory and the Montreal Biostatistics Seminar Series.

2013/05/13 | [Introduction to L<sup>A</sup>T<sub>E</sub>X](#). Queen's University, Department of Mathematics and Statistics.

### TEACHING ASSISTANT

2014 | Teaching Assistant, McGill University

	Inferential Statistics (EPIB 607)
2012–2013	Teaching Assistant, Queen's University Tutorial leader in calculus (MATH 121) Term and exam marker for numerical methods and actuarial mathematics

## AWARDS

2017	UK Genetics Society Training Grant £1,000
2016	McGill University and Genome Quebec Innovation Centre (MUGQIC) Travel Award \$1,000
2016	Graduate Research Enhancement and Travel (GREAT) Award \$1,000
2016	Quantitative Biology and Medical Genetics for the World Queen Elizabeth II Scholarship \$6,000
2016	Best Student Oral Presentation - 28th International Biometric Society Meeting
2016	SSC Biostatistics Section Travel Award \$250
2015	Best Poster Presentation - 4th Annual Canadian Human and Statistical Genetics Meeting \$1,000
2014	Genetic Analysis Workshop 19 Travel Award \$1,000
2013	McGill Graduate Excellence Award \$18,000
2012	MSc Queen's Graduate Studies Award \$20,000

## PRESENTATIONS

\* indicates the person that gave the presentation

### KEYNOTE ADDRESSES

2018/03/16	Bhatnagar SR: <a href="#">Pick your favorite buzzword: Data Science, Big Data, Machine Learning, Data Science, Big Data, Machine Learning</a> . 14th Annual McGill Epidemiology, Biostatistics and Occupational Health Research Day.
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### PRESENTATIONS AT UNIVERSITIES OR RESEARCH INSTITUTES (INVITED)

2018/03/01	McGill University, Department of Epidemiology, Biostatistics and Occupational Health. <a href="#">Betting on Sparsity</a> .
2018/02/08	Université Laval, Département de mathématiques et de statistique. <a href="#">Miser sur la sparsité</a> .
2017/12/18	Université de Montréal, Département de mathématiques et de statistique. <a href="#">Miser sur la sparsité</a> .
2017/11/16	HEC Montréal, Department of Decision Sciences. <a href="#">Betting on Sparsity</a> .

### CONTRIBUTED CONFERENCE PRESENTATIONS

2017/09/13	Abou Khalil M*, Bhatnagar SR, Vasilevsky CA, Morin N, Ghitulescu G, Feldman L, Longtin Y, Boutros M: Development and validation of a clinical risk calculator for fulminant <i>Clostridium difficile</i> colitis. Resident Research Retreat, Canadian Surgical Forum, Victoria, British Columbia, Canada.
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- 2017/07/24 Kronfli N\*, Bhatnagar SR, Moodie EEM, Hull M, Klein MB: Trends in Cause-Specific Mortality in HIV-hepatitis C (HCV) co-infected patients in Canada (2003–2016): Possible Beneficial impact of HCV therapy. 9th IAS Conference on HIV Science, Paris, France.
- 2017/06/12 Bhatnagar SR\*, Yang Y, Jolicoeur-Martineau A, Wazana A, Greenwood CMT: [Variable Selection in Nonlinear Interactions with the Group Lasso](#). 45th Annual Meeting of the Statistical Society of Canada, Winnipeg, Canada.
- 2016/11/18 Bhatnagar SR: [Genomic Visualisations for Biologists in R](#). Plotcon 2016, New York City, NY. [YouTube video of presentation](#).
- 2016/11/03 Bhatnagar SR\*, Yang Y, Khundrakpam B, Evans A, Blanchette M, Bouchard L, Greenwood CMT: [An analytic approach for interpretable predictive models in high dimensional data, in the presence of interactions with exposures](#). 25th Annual International Genetic Epidemiology Society Meeting, Toronto, Canada.
- 2016/09/09 Hamadani FT\*, Bhatnagar SR, Balvardi S, Trepanier M, Grushka J, Deckelbaum D, Court O, Fata P: Burnout and Career Satisfaction Among Canadian General Surgeons: Results of the CAGS National Burnout Study. Canadian Surgery Forum, Toronto, Canada.
- 2016/07/10 Bhatnagar SR\*, Yang Y, Blanchette M, Greenwood CMT: [Strong Heredity Models in High Dimensional Data](#). 28th International Biometrics Conference, Victoria, Canada.
- 2016/04/18 Bhatnagar SR\*, Yang Y, Blanchette M, Greenwood CMT: [A Model for Interpretable High-Dimensional Interactions](#). 5th Annual Canadian Human and Statistical Genetics Meeting, Halifax, Canada.
- 2015/04/19 Bhatnagar SR\*, Houde A, Voisin G, Bouchard L, Blanchette M, Greenwood CMT: [DNA methylation and Expression to predict childhood obesity](#). 4th Annual Canadian Human and Statistical Genetics Meeting, Vancouver, Canada.

## POSTER PRESENTATIONS

- 2017/10/22 Abou Khalil M\*, Bhatnagar SR, Vasilevsky CA, Morin N, Ghitulescu G, Feldman L, Longtin Y, Boutros M: A Nomogram for Prediction of Mortality in Patients who Undergo Surgery for Fulminant Clostridium Difficile Colitis: Results from the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) Database. American College of Surgeons' 2017 Clinical Congress, San Diego, CA, USA.
- 2017/09/10 Bhatnagar SR\*, Oualkacha K, Yang Y, Forest M, Greenwood CMT: [Estimation for High-Dimensional Multivariate Linear Mixed Models in Structured Populations](#). 2017 International Genetic Epidemiology Society Meeting, Cambridge, UK.
- 2017/05/13 Nadig A\*, Flanagan T, Bhatnagar SR, White K: Results of a RCT on a Transition Support Program for Adults with ASD: Effects on Quality of Life and Self-Determination. 2017 International Meeting for Autism Research, San Francisco, California, USA.
- 2016/05/12 Hull M\*, Bhatnagar SR, Moodie EEM, Klein M: Trends in causes of mortality in the Canadian Co-infection cohort (CCC) 2005 – 2015. 25th Annual Canadian Conference on HIV/AIDS Research, Winnipeg, Canada.
- 2016/04/17 Bhatnagar SR\*, Yang Y, Blanchette M, Greenwood CMT: [A Model for Interpretable High Dimensional Interactions](#). 5th Annual Canadian Human and Statistical Genetics Meeting, Halifax, Canada.

- 2015/04/19 Bhatnagar SR\*, Houde A, Voisin G, Bouchard L, Blanchette M, Greenwood CMT: [Integrating DNA Methylation and Gene Expression data in Placenta Tissue to Predict Childhood Obesity](#). 4th Annual Canadian Human and Statistical Genetics Meeting, Vancouver, Canada. *\$1,000 Award for Best Poster*
- 2014/08/24 Bhatnagar SR\*, Greenwood CMT, Labbe A: [Transmission Ratio Distortion in Extended Families](#). Genetic Analysis Workshop 19, Vienna, Austria.
- 2014/08/25 Sun J, Bhatnagar SR\*, Oualkacha K, Ciampi A, Greenwood CMT: [Joint analysis of multiple blood pressure phenotypes in GAW19 data by using a multivariate rare-variant association test](#). Genetic Analysis Workshop 19, Vienna, Austria.
- 2014/05/26 Bhatnagar SR\*, McGregor K\*, Turgeon M\*: [Effect of economy on TV time use](#). 42nd Annual Meeting of the Statistical Society of Canada, Toronto, Ontario.

## SEMINAR PRESENTATIONS

- 2017/07/12 Bhatnagar SR, Forest M, Keller-Baruch J: [Statistics vs. Machine Learning: Why can't we be friends?](#) Lady Davis Institute, Montreal Jewish General Hospital.
- 2016/05/19 Bhatnagar SR: [Methods for High Dimensional Interactions](#) Ludmer Centre for Neuroinformatics and Mental Health, Montreal Neurological Institute.
- 2015/08/12 Bhatnagar SR: [Introduction to knitr and R Markdown](#). Montréal UseR Group, Notman House, Montréal.
- 2015/03/12 Bhatnagar SR: [Imputing the Epigenome](#). Lady Davis Institute, Montreal Jewish General Hospital.
- 2015/03/05 Bhatnagar SR: [Making sense of Methylation & Expression data in Cordblood and Placenta Tissues](#). Lady Davis Institute, Montreal Jewish General Hospital.
- 2014/04/07 Bhatnagar SR: [Estimation and Accuracy after Model Selection by Bradley Efron](#). Department of Mathematics and Statistics, McGill University.
- 2014/01/23 Bhatnagar SR: [Reproducible Research and Biostatistics](#). Biostatistics Reading Group, McGill University.
- 2014/08/07 Bhatnagar SR\*, Greenwood CMT, Labbe A: [Transmission Ratio Distortion in Extended Families](#). Lady Davis Institute, Montreal Jewish General Hospital.
- 2013/08/30 Bhatnagar SR: [Absolute Risk Estimation in a Case Cohort Study of Prostate Cancer](#). Department of Mathematics and Statistics, Queen's University.
- 2013/03/06 Bhatnagar SR: [Colorectal Cancer Screening in Visible Minorities in Canada](#). Department of Public Health Sciences, Queen's University.
- 2012/11/27 Bhatnagar SR: [Computational Methods for the Case-Cohort Design](#). Department of Public Health Sciences, Queen's University.



## EXPERIENCE

2016 – 10/2016 – 03/2017	Data Science Blogger at <a href="#">Plotly</a> Queen Elizabeth Scholar - Wellcome Trust Sanger Institute, UK.  Working with Dr. Eleftheria Zeggini on integration methods for methylation, transcription and protein expression data in osteoarthritis patients undergoing knee replacement surgery.
2015 –	Statistical Consultant, <a href="#">iMD Research</a>
2012 – 2013	Research Assistant, McGill University Working with Dr. Andrea Benedetti in the Respiratory Epidemiology and Clinical Research Unit at McGill, where our research is focused on methods for correlated data, as well as developing an R package for the clustering of DNA fingerprint data
2008 – 2012	Actuarial Analyst, Aon Hewitt Preparation and verification of annual reports, financial reports, annual statements, valuation reports, budget projections, and pension costs for clients balance sheets. Responsible for translation of pension plan status to clients

## OTHER CONTRIBUTIONS

### REVIEWER OF JOURNAL ARTICLES

| International Journal of Epidemiology

### ADMINISTRATIVE RESPONSIBILITIES AND COMMITTEES

2015–	International Genetic Epidemiology Society Communications Committee Member
2014–2015	Post-Graduate Students' Society (PGSS) Councillor

### PROFESSIONAL ASSOCIATIONS

2011–	Society of Actuaries
2013–	Statistical Society of Canada
2016–	International Genetic Epidemiology Society

### VOLUNTEER SERVICE

2010–Present	Math Teacher, Aditya Youth Trust Fund Teaching mathematics to a group of elementary and high school students who are financially under resourced. Motivate and inspire students to place a high value on education while promoting wholesome social involvement, and to encourage them to achieve their maximum potential
2011–2013	MAB - Mackay Rehabilitation Center Working with elderly patients diagnosed with Retinitis Pigmentosa. Accompaniment to perform everyday tasks that would be difficult to do independently such as grocery shopping, banking transactions, and outdoor activities



## REFERENCES

**Celia M.T. Greenwood, PhD**

Senior Investigator  
Centre for Clinical Epidemiology  
Lady Davis Institute  
Professor  
Department of Epidemiology, Biostatistics and Occupational Health  
Division of Cancer Epidemiology  
McGill University

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**Marylise Boutros, MD, FRCSC**

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