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Professor Hong Gu

Correspondence language: English

Contact Information

The primary information is denoted by (*)

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Primary Affiliation (*)

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Professor Hong Gu

Language Skills

Language	Read	Write	Speak	Understand	Peer Review
Cantonese	Yes	No	Yes	Yes	No
English	Yes	Yes	Yes	Yes	Yes
French	No	No	No	No	No
Mandarin Chinese	Yes	Yes	Yes	Yes	Yes

Degrees

- 2001/7 Post-doctorate, Data Mining, University of Waterloo
Supervisors: Hugh Chipman, 1999/8 - 2001/7
- 1999/5 Doctorate, statistics, University of Hong Kong
Supervisors: Wing K. Fung, 1995/12 - 1999/5
- 1994/7 Master's Thesis, Stochastic differential equation, Beijing University
Supervisors: Minping Qian, 1991/9 - 1994/7
- 1989/7 Bachelor's, Pure Math., Beijing Normal University

User Profile

Research Specialization Keywords: Microbial metagenomic data analysis, statistical modelling and inference, model selection and sensitivity analysis, supervised and unsupervised learning, bioinformatics, Data visualization, computational molecular evolution, inference of evolutionary process, phylogenetic analysis

Employment

- 2016/7 Professor
Mathematics and Statistics, Science, Dalhousie University
Full-time
Tenure Status: Tenure
- 2007/7 - 2016/6 Associate Prof.
Mathematics and Statistics, Science, Dalhousie University
Full-time, Associate Professor
Tenure Status: Tenure

2002/4 - 2007/6	Assistant Prof. Mathematics and Statistics, Science, Dalhousie University Full-time, Assistant Professor Tenure Status: Tenure Track
2001/8 - 2002/3	Post-doctoral Fellow and part-time lecturer Mathematics and Statistics, Science, Dalhousie University Full-time, Lecturer Tenure Status: Non Tenure Track
1999/8 - 2001/7	Post-doctoral Fellow and part-time lecturer Statistics and Actuarial Science, mathematics, University of Waterloo Full-time, Lecturer Tenure Status: Non Tenure Track

Leaves of Absence and Impact on Research

2012/1 - 2012/5	Parental, Dalhousie University My second baby was born on Dec. 28th 2011, right after my PhD student finished her thesis defence in Nov. 2011. As with my first leave, the reduction to my research time extended beyond the end of the leave period.
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Research Funding History

Awarded [n=4]

2017/4 - 2022/3 Principal Applicant	Statistical modeling, inference and methodology in microbial metagenomics data analysis and computational molecular evolution, Grant Funding Sources: Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Total Funding - 120,000 Portion of Funding Received - 120,000 Funding Competitive?: Yes
2018/10 - 2019/3 Principal Applicant	Real-time statistical anomaly detection in video., Grant Funding Sources: Natural Sciences and Engineering Research Council of Canada (NSERC) ENGAGE Total Funding - 24,960 Portion of Funding Received - 24,960 Funding Competitive?: Yes
2012/4 - 2017/3 Principal Applicant	Development of statistical modeling, inference and methodology in computational molecular evolution, Grant Funding Sources: Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant Total Funding - 60,000 Portion of Funding Received - 60,000 Funding Competitive?: Yes
2016/5 - 2016/10 Principal Applicant	Structured information extraction for mining free-text radiology reports, Grant Funding Sources: Natural Sciences and Engineering Research Council of Canada (NSERC)

Engage Grants for universities
 Total Funding - 24,768
 Portion of Funding Received - 24,768
 Funding Competitive?: Yes

Student/Postdoctoral Supervision

Bachelor's Equivalent [n=2]

2015/6 - 2015/8 Yanxia Sun (Completed) , Ocean University of China
 Principal Supervisor Thesis/Project Title: Modeling the seasonal effects of Microbiome OTUs in ocean.
 Present Position: Master of Science in Basic Medicine, Peking Union Medical College

2014/7 - 2014/10 Mengying Wu (Completed) , Zhejiang University
 Principal Supervisor Thesis/Project Title: Optimization of cost efficiency in multi-stage tests,application in drug-discovery process
 Present Position: Masters of Finance, MIT Sloan School of Management

Bachelor's Honours [n=4]

2016/9 - 2017/4 Molly Hayes (Completed) , Dalhousie University
 Co-Supervisor Thesis/Project Title: *Generalization of removing unwanted variance methods for mining the metagenomics data from multiple resources.*
 Present Position: Honours student, Dalhousie University

2016/6 - 2016/12 Qi Li (Completed) , Dalhousie University
 Principal Supervisor Thesis/Project Title: *Timeseries modelling and prediction for the patient emergency visits on different hospitalsites.*
 Present Position: Honours student, Dalhousie University

2016/5 - 2017/5 Ziwei Jin (Completed) , Dalhousie University
 Principal Supervisor Thesis/Project Title: *Common lineardiscriminant analysis (CLDA) as a prediction method by removing unwantedsources of metagenomics variance.*
 Present Position: Honours student, Dalhousie University

2013/9 - 2014/4 Jing Zhang (Completed) , Dalhousie University
 Principal Supervisor Thesis/Project Title: *Analyzing the Impact of OceanAcidification on Bacterial CommunityStructure Using Clustering analysis.*
 Present Position: Risk analyst, GV Funds, China

Master's Thesis [n=17]

2018/9 - 2020/8 Mia Parenteau (In Progress) , Dalhousie University
 Principal Supervisor Thesis/Project Title: Real-timestatistical anomaly detection in video.
 Present Position: student

2018/9 - 2020/8 Wanru Jia (In Progress) , Dalhousie University
 Principal Supervisor Thesis/Project Title: Classifying Osteoarthritis Grades fromMulti-View X-Ray Images Using Convolutional Neural Network Models
 Present Position: student

2017/10 - 2019/8 Junqiu Gao (In Progress) , Dalhousie University
 Co-Supervisor Student Degree Expected Date: 2019/8
 Thesis/Project Title: Stochastic models for the microbiome time course data
 Present Position: student

- 2017/9 - 2019/12
Co-Supervisor Paul Bjordahl (In Progress) , Dalhousie University
Thesis/Project Title: Modelling the dynamics of subcommunities of ocean microbiome.
Present Position: student
- 2017/9 - 2019/9
Principal Supervisor Mary Molly Hayes (In Progress) , Dalhousie University
Student Degree Expected Date: 2019/8
Thesis/Project Title: Bayesian estimation of covariance matrix for high-dimensional log-normal distribution, with application for microbiome data analysis
Present Position: student
- 2015/9 - 2017/8
Co-Supervisor Tianshu Huang (Completed) , Dalhousie University
Thesis/Project Title: Generalized principal component analysis formicrobial and metagenomics count data.
Present Position: MSc student, Dalhousie University
- 2014/9 - 2016/8
Co-Supervisor Chang Chen (Completed) , Dalsousie University
Thesis/Project Title: Negative binomialmodelling and applications for microbial count data.
Present Position: MSc student, Dalhousie University
- 2014/9 - 2016/4
Co-Supervisor Hao He (Completed) , Dalsousie University
Thesis/Project Title: Robust Ranking and selection with heavy-tailpriors and its applications in market basket analysis.
Present Position: Research associate, Dalhousie University
- 2014/9 - 2016/4
Co-Supervisor Chongci Tang (Completed) , Dalsousie University
Thesis/Project Title: Statistical approaches for matching the componentsof complex microbial communities.
Present Position: Working in a company in Beijing
- 2014/9 - 2016/5
Co-Supervisor Chaoyue Liu (Completed) , Dalsousie University
Thesis/Project Title: Gene clustering basedon co-occurrence with correction for common evolutionary history.
Present Position: PhD student, Dalhousie University
- 2013/9 - 2016/8
Co-Supervisor Rana Bashwih (Completed) , Dalhousie University
Thesis/Project Title: Inference andinvestigation of marine microbial community structures in the global oceans
Present Position: unknown
- 2013/9 - 2014/8
Co-Supervisor Yun Cai (Completed) , Dalhousie University
Thesis/Project Title: Developing the goodness-of-fit tests to test model adequacy for phylogenetic codon models
Present Position: PhD student, Dalhousie University
- 2013/9 - 2014/8
Principal Supervisor Michael Butler (Completed) , Dalhousie University
Thesis/Project Title: Development of an expert system for patient diagnosis in emergency departments
Present Position: Medical school student, Dalhousie University
- 2011/9 - 2016/4
Co-Supervisor Li Li (Completed) , Dalhousie University
Thesis/Project Title: Alikelihood based clustering method for detection of recombination for DNA andAmino Acid sequences.
Present Position: Statistical Analyst, Canadian Center for Vaccinology
- 2010/9 - 2013/8
Co-Supervisor Wei Dai (Completed) , Dalhousie University
Thesis/Project Title: A new test to build confidence region using balanced minimum evolution method
Present Position: student

- 2010/9 - 2012/8
Principal Supervisor Jiachi Zhu (Completed) , Dalhousie University
Thesis/Project Title: Impact of hedging on the firm value and stock return
Present Position: IAM Technical Assistant/Analyst, Feedlot Health Management
- 2010/9 - 2012/12
Co-Supervisor Wei Chen (Completed) , Dalhousie University
Thesis/Project Title: The exploration of effect of model misspecification and development of an adequacy-test for substitution model in phylogenetics
Present Position: Research and Statistics officer, NS Dept. of Health & Wellness
- Doctorate [n=4]**
- 2016/5 - 2020/5
Co-Supervisor Chaoyue Liu (In Progress) , Dalhousie University
Student Degree Expected Date: 2020/5
Thesis/Project Title: Pattern recognition in microbial ecology
Present Position: PhD student, Dalhousie University
- 2014/9 - 2019/5
Co-Supervisor Yun Cai (In Progress) , Dalhousie University
Student Degree Expected Date: 2018/10
Thesis/Project Title: Non-negative matrix factorization, with application in analysis of microbiome data.
Present Position: PhD student, Dalhousie University
- 2014/9 - 2019/5
Co-Supervisor Shen Ling (In Progress) , Dalhousie University
Student Degree Expected Date: 2018/12
Thesis/Project Title: Building an automatic diagnostic system for hospital emergency care
Present Position: PhD student, Dalhousie University
- 2014/1 - 2019/5
Co-Supervisor Lihui Liu (In Progress) , Dalhousie University
Student Degree Expected Date: 2018/5
Thesis/Project Title: Joint statistical modelling of metagenomic-genetics data and inference of their associations with inflammatory bowel disease.
Present Position: PhD student, Dalhousie University
- Post-doctorate [n=2]**
- 2018/9 - 2021/8
Co-Supervisor Wei Zhou, Dalhousie University
Thesis/Project Title: Prediction for the upcoming cyanobacteria bloom in lakes based on the lake microbial community analysis.
Present Position: post-doc
- 2011/8 - 2012/8
Co-Supervisor Mahdi Shafiei (Completed) , Dalhousie University
Thesis/Project Title: Network modelling of complex microbial communities
Present Position: Senior Software Engineer, LinkedIn
- Research Associate [n=1]**
- 2016/5 - 2016/8
Co-Supervisor Hao He (Completed) , Dalhousie University
Thesis/Project Title: *Modelling and inference on the impact of ocean acidification on bacterial community structure with a model based two-way clustering methods.*
Present Position: unknown

Editorial Activities

- 2016/6 - 2019/4 reviewer, PLOS computational Biology, Journal
- 2017/6 - 2017/12 reviewer, Biometrics, Journal
- 2017/1 - 2017/12 reviewer, Microbiome, Journal

2016/2 - 2016/2	reviewer, PLoS ONE, Journal
2015/9 - 2015/9	Reviewer, PLOS ONE, Journal
2013/1 - 2013/1	reviewer, Statistical applications in Genetics and Molecular Biology, Journal
2012/10 - 2012/11	reviewer, Molecular Biology and Evolution, Journal

Organizational Review Activities

2015/12 - 2016/1	Reviewer, Natural Sciences and Engineering Research Council of Canada (NSERC) NSERC Discovery grant proposal review
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International Collaboration Activities

2016/3 - 2020/3	advisor, China I have an ongoing collaboration with the joint lab "micro-ecology and children health" co-founded by the company "WehealthGene" (WehealthGene.com) and Shenzhen Children Hospital. My role as an advisor of the lab includes Evaluating research proposals for multi-center projects, from the angle of clinical significance and reasonability, analytical strategy and guiding analysis and output. Other advisors include several experts in Group of Beijing Children Hospital (including 18Province-level Children Hospitals) in the joint lab. Several important projects, initiated by the advisors and experts team, are under designing or sampling, including gut microbiota maturation for Chinese infants and children.
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Committee Memberships

2018/3	Committee Member, AARMS Industrial Collaboration Committee, Atlantic Association for Research in the Mathematical Sciences
2013/1 - 2016/6	Chair, Statistics division, Dalhousie University Responsible for all administrative and curriculum matters in statistics, including making academic timetable, teaching assignment for faculty members and TAs, editing academic calendar, overlooking all students issues, developing new programs and courses etc..
2015/4 - 2015/5	Chair, Limited Term Instructor Position in Mathematics search committee, Dalhousie University Review applications, interview applicants and make recommendation for the position.
2015/4 - 2015/5	Chair, Limited Term Instructor Position in Statistics search committee, Dalhousie University Review applications, interview applicants and make recommendation for the position.
2013/9 - 2014/8	Co-chair, AARMS summer school, Atlantic association for research in the mathematical science In charge of the statistics part of the 2014 AARMS summer school, including deciding the two topic courses, finding the two lecturers to teach the two courses, helping to arrange accommodations for the lecturers, Applying for support from various funding agencies to cover the summer school cost, arranging local accommodations and meal options for all students, organizing excursions, reviewing all applicants' applications and admitting the best candidates, signing and sending the final grades to all students' home universities etc..
2014/5 - 2014/6	Committee Member, Mathematics director search committee, Dalhousie University Search and make recommendation for the new director of Mathematics division

- 2014/5 - 2014/6 Chair, Limited Term Instructor Position in Statistics search committee, Dalhousie University
Review applications, interview applicants and make recommendation for the position.
- 2013/10 - 2013/12 Committee Member, Chair advisory committee for Biology Department, Dalhousie University
Search and make recommendation for the new chair of Biology department.

Other Memberships

- 2016/4 PhD committee member, Dalhousie University
PhD committee member for PhD candidate Ahmad Pesaranghader (CS, Dalhousie).
External examiner for Ahmad Pesaranghader's PhD RAD defense. 2016/07
- 2013/7 PhD committee member, Dalhousie University
PhD committee member for Philippe Fullsack (Statistics, Dalhousie), PhD proposal defense 2013/12.
- 2016/8 - 2016/10 External examiner, Acadia University
External examiner for Thomas Bennett's MSc thesis (Mathematics and Statistics, Acadia University).
- 2016/7 - 2016/7 Committee member/thesis reader, Dalhousie University
Committee member/thesis reader for Michael Hall (CS, Dalhousie) MSc thesis.
- 2016/4 - 2016/5 PhD external examiner, University of Melbourne
PhD thesis external examiner for Ling Ding (Statistics, University of Melbourne).
- 2016/4 - 2016/4 Committee member/thesis reader, Dalhousie University
Committee member/thesis reader for Laura (Dong) Lin (Statistics, Dalhousie) MSc thesis.
- 2016/4 - 2016/4 Committee member/thesis reader, Dalhousie University
Committee member/thesis reader for Hongyue Wang (Statistics, Dalhousie)'s MSc thesis.
- 2015/6 - 2015/8 Committee member/thesis reader, Dalhousie University
Committee member/thesis reader for Jie Ning (CS, Dalhousie) MSc thesis.
- 2014/6 - 2014/8 Committee member/thesis reader, Acadia University
Committee member/thesis reader for Khatoon Alobaidan (Statistics, Acadia) MSc thesis
- 2014/6 - 2014/7 committee member/thesis reader, Dalhousie University
Committee member/thesis reader for Shen Ling (Statistics, Dalhousie)'s MSc thesis.
- 2012/7 - 2012/8 PhD committee member, Dalhousie University
PhD thesis examiner for Siyuan Hou (Chemistry, Dalhousie), PhD thesis defense.

Presentations

- (2019). Poisson Measurement Error corrected PCA for Microbiome Data. CANSSI Mathematical and Statistical methods for public health epidemiology workshop, Vancouver, Canada
Main Audience: Researcher
Invited?: Yes, Keynote?: No
- (2017). Statistical learning methods in emergency diagnoses and human microbiome analysis. The Science Atlantic AARMS workshop 2017, Fredericton, Canada
Main Audience: Researcher
Invited?: Yes, Keynote?: No

3. (2017). Learning Microbial Community Structures with Supervised and Unsupervised methods. 13th Annual Guelph Biomathematics and Biostatistics Symposium, Waterloo, Canada
Main Audience: Researcher
Invited?: Yes, Keynote?: No
4. (2017). Prior distributions for ranking problems. The 1st International Conference on Econometrics and Statistics (EcoSta 2017), Hong Kong, China
Main Audience: Researcher
Invited?: No, Keynote?: No
5. (2017). Data exploratory methods for microbiome data analysis. 2017 ICSA Applied Statistics Symposium., Chicago, United States
Main Audience: Researcher
Invited?: Yes, Keynote?: No
6. (2016). Robust Ranking Using Heavy-tailed Prior Distributions. The International Conference on Robust Statistics (ICORS) 2016, Geneva, Switzerland
Main Audience: Researcher
Invited?: No, Keynote?: No
7. (2015). Machine learning diagnoses on patients presenting abdominal pain. The International Federation of Classification Societies (IFCS) 2015 conference, Bologna, Italy
Main Audience: Researcher
Invited?: No, Keynote?: No
8. (2015). Machine learning diagnoses on patients presenting abdominal pain. Statistical society of Canada annual meeting 2015, Halifax, Canada
Main Audience: Researcher
Invited?: Yes, Keynote?: No
9. (2014). Non-negative Matrix Factorisation for Analysis of Metagenomic Data. The 2nd International Society for NonParametric Statistics (ISNPS) conference 2014, Cadiz, Spain
Main Audience: Researcher
Invited?: Yes, Keynote?: No
10. (2013). Development of an Adequacy-Test for the Substitution Models in Phylogenetic Analysis. IMS-China International Conference on Statistics and Probability 2013, Beijing, China
Main Audience: Researcher
Invited?: Yes, Keynote?: No

Publications

Journal Articles

1. Katherine A. Dunn, Toby Kenney, Hong Gu and Joseph P. Bielawski. (2019). Improved inference of site-specific positive selection under a generalized parametric codon model when there re multinucleotide mutations and multiple nonsynonymous rates. BMC Evolutionary Biology.
Published
Refereed?: Yes
2. Wei Chen, Toby Kenney, Joseph Bielawski and Hong Gu. (2019). Testing adequacy for DNA substitution models. BMC Bioinformatics.
Submitted
Refereed?: Yes, Open Access?: Yes

3. Lihui Liu, Hong Gu, Johan Van Limbergen and Toby Kenney. (2019). SuRF: a New Method for Sparse Variable Selection, with Application in Microbiome Data Analysis. *Biometrics*.
Revision Requested
Refereed?: Yes
4. Chaoyue Liu, Benjamin Wright, Emma Allen-Vercoe, Hong Gu and Robert Beiko. (2018). Phylogenetic clustering of genes reveals shared evolutionary trajectories and putative gene functions. *Genome Biology and Evolution*.
Published
Refereed?: Yes
5. Moamen Bydoun, Andra Sterea, Henry Liptay, Andrea Uzans, Weei-Yuan Huang, Gloria J. Rodrigues, Ian Weaver, Hong Gu, David M Waisman. (2018). S100A10, a Novel Biomarker in Pancreatic Ductal Adenocarcinoma. *Molecular Oncology*. *Molecular Oncology*.12(11): 1895-1916.
Published
Refereed?: Yes
6. Yun Cai, Hong Gu and Toby Kenney. (2017). Learning Microbial Community Structures with Supervised and Unsupervised Non-negative Matrix Factorization. *Microbiome*. DOI 10.1186/s40168-0: 5:110.
Published
Refereed?: Yes, Open Access?: Yes
7. Nidhin Nandhakumar, Ehsan Sherkat, Evangelos E.Milios, Hong Gu and Michael Butler. (2017). Clinically Significant Information Extraction from Radiology Report. *Proceedings of the 2017 ACM Symposium on Document Engineering (DocEng 2017)*. doi>10.1145/3103010.: 153-162.
Published
Refereed?: Yes
8. Shafiei M*, Dunn KA, Boon E, MacDonald SM, Walsh DA, Gu H, Bielawski JP. (2015). BioMiCo: a supervised Bayesian model for inference of microbial community structure. *Microbiome*. 3(3): 1-15.
Published
Refereed?: Yes, Open Access?: Yes
9. Abeysundera M.*, Kenney T., Field C., Gu H. (2014). Combining Distance Matrices on Identical Taxon Sets for Multi-gene Analysis with Singular Value Decomposition. *PLOS ONE*. 9(4): 1-14.
Published
Refereed?: Yes, Open Access?: Yes
10. Mahdi Shafiei*, Katherine A. Dunn, Hugh Chipman, Hong Gu, Joseph P. Bielawski. (2014). BiomeNet: A Bayesian Model for Inference of Metabolic Divergence among Microbial Communities. *PIOS computational Biology*. 10(11): 1-17.
Published
Refereed?: Yes, Open Access?: Yes

Conference Publications

1. Nidhin Nandhakumar, Ehsan Sherkat, Evangelos E.Milios, Hong Gu and Michael Butler. (2017). Clinically Significant Information Extraction from Radiology Report. *DocEng '17 Proceedings of the 2017 ACM Symposium on Document Engineering. The 17th ACM Symposium on Document Engineering (DocEng 2017)*, Valletta, Malta, (153-162)
Conference Date: 2017/9
Paper
Published
Refereed?: Yes, Invited?: No