Brian David Williamson

Curriculum Vitae

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Education

2019 **Ph.D., Biostatistics**, *University of Washington*.
Committee: Marco Carone (co-chair), Noah Simon (co-chair), Scott Emerson, Peter Gilbert
Dissertation: *A unified approach to model-agnostic variable importance*

2017 **M.S., Biostatistics**, *University of Washington*.

2014 **B.A., Mathematics**, *Pomona College*.

Work Experience

Interests: statistical methods for vaccine efficacy trials; statistical methods for biomarker discovery and validation; semiparametric efficiency theory; nonparametric statistics; data science; statistical machine learning

01/2020–Present **Post-doctoral research fellow**, *Vaccine and Infectious Disease Division, Fred Hutchinson Cancer Research Center*, Supervisor: Ying Huang.

2015–2019 **Research Assistant**, *Statistical Center for HIV/AIDS Research and Prevention, Fred Hutchinson Cancer Research Center*, Supervisor: James Hughes.

06/2013–08/2013 **Integrative Cancer Biology Program Research Fellow**, *Stanford University*, Supervisor: Sylvia Plevritis.

Funding

09/2018–12/2019 *Evaluating predictors of HIV vaccine efficacy: Statistical methods for estimation, testing, and inference*

Principal Investigator: Williamson

NIH award F31AI140836, $86,459, Impact Score: 10

Honors and Awards

Research Communication and Travel Awards

04/2019 Nonparametrics Section Travel Award, American Statistical Association (ASA)

01/2018 Biometrics Section Travel Award, ASA

06/2017 Most Outstanding Oral Paper Award, Western North American Region (WNAR) of the International Biometric Society

06/2017 Graduate School Fund for Excellence and Innovation Travel Award, University of Washington (UW)

06/2017 Graduate and Professional Student Senate Travel Grant, UW

06/2013 Best Insight Award, UCLA DataFest

Teaching and Service Awards

06/2019 Exceptional Service in Biostatistics Award, UW Department of Biostatistics

09/2018 Excellence in Teaching Award, UW Department of Biostatistics

Academic Honors and Awards

09/2014 Top Scholar Incoming Student Award, UW Department of Biostatistics

05/2014 Distinction in the Senior Exercise, Pomona College

Publications

* denotes joint first-author contribution

11. **Williamson BD**, Gilbert PB, Carone M, and Simon N. Rejoinder to "Nonparametric variable importance assessment using machine learning techniques". *Biometrics*, 2020+

10. **Williamson BD**, Gilbert PB, Carone M, and Simon N. Nonparametric variable importance assessment using machine learning techniques. *Biometrics*, 2020+. doi: 10.1111/biom.13392

9. Duke ER, **Williamson BD**, Borate B, Golob JL, Wychera C, Stevens-Ayers T, Huang M-L, Cossrow N, Wan H, Mast CT, Marks MA, Flowers ME, Jerome KR, Corey L, Gilbert PB, Schiffer JT, and Boeckh MJ. Cytomegalovirus viral load kinetics as surrogate endpoints after allogeneic transplantation. *The Journal of Clinical Investigation*, 2020. doi: 10.1172/JCI133960

8. ***Williamson BD** and *Feng J. Efficient nonparametric statistical inference on population feature importance using Shapley values. In *Proceedings of the 37th International Conference on Machine Learning*, volume 119 of *Proceedings of Machine Learning Research*, 2020. URL https://arxiv.org/abs/2006.09481

7. Neidich SD, Fong Y, Li SS, Geraghty DE, **Williamson BD**, Young WC, Goodman D, Seaton KE, Shen X, Sawant S, Zhang L, deCamp AC, Blette BS, Shao M, Yates NL, Feely F, Pyo CW, Ferrari G, Frank I, Karuna ST, Swann E, Mascola J, Graham BS, Hammer SM, Sobieszczyk ME, Corey L, Janes H, McElrath MJ, Gottardo R, Gilbert PB, and Tomaras GD. Antibody Fc effector functions and IgG3 associate with decreased HIV-1 risk. *The Journal of Clinical Investigation*, 2019. doi: 10.1172/JCI126391

6. *Magaret CA, *Benkeser DC, ***Williamson BD**, Borate BR, Carpp LN, Georgiev IS, Setliff I, Dingens AS, Simon N, Carone M, Simpkins C, Montefiori D, Alter G, Yu WH, Juraska M, Edlefsen PT, Karuna S, Mgodi NM, Edugupanti S, and Gilbert PB. Prediction of VRC01 neutralization sensitivity by HIV-1 gp160 sequence features. *PLOS Computational Biology*, 2019. doi: 10.1371/journal.pcbi.1006952

5. Hanscom B, Hughes JP, **Williamson BD**, and Donnell D. Adaptive non-inferiority margins under observable non-constancy. *Statistical Methods in Medical Research*, 2018. doi: 10.1177/0962280218801134

4. *Feng J, ***Williamson BD**, Carone M, and Simon N. Nonparametric variable importance using an augmented neural network with multi-task learning. In *Proceedings of the 35th International Conference on Machine Learning*, volume 80 of *Proceedings of Machine Learning Research*, pages 1495–1504, 2018. URL http://proceedings.mlr.press/v80/feng18a.html

3. Anchang B, Davis KL, Fienberg H, **Williamson B**, Bendall SC, Karacosta L, Tibshirani R, Nolan GP, and Plevritis SK. DRUG-NEM: optimizing drug combinations using single-cell perturbation response to account for intratumoral heterogeneity. *Proceedings of the National Academy of Sciences*, 115 (18):E4294–E4303, 2018. doi: 10.1073/pnas.1711365115

2. Safren SA, Hughes JP, Mimiaga MJ, Moore AT, Friedman RK, Srithanaviboonchai K, Limbada M, **Williamson BD**, Elharrar V, Cummings V, Magidson JF, Gaydos CA, Celentano D, and Mayer KH for the HPTN063 Study Team. Frequency and predictors of estimated HIV transmissions and bacterial STI acquisition among HIV-positive patients in HIV care across three continents. *Journal of the International AIDS Society*, 19, 2016. doi: 10.7448/IAS.19.1.21096

1. Ritchwood TD, Hughes JP, Jennings L, MacPhail C, **Williamson B**, Selin A, Kahn K, Gómez-Olivé XF, and Pettifor A. Characteristics of age-discordant partnerships associated with HIV risk among

young South African women (HPTN 068). *Journal of Acquired Immune Deficiency Syndromes*, 72: 423–429, 2016. doi: 10.1097/QAI.0000000000000988

Preprints

* denotes joint first-author contribution

3. *Benkeser D, ***Williamson BD**, Magaret CA, Nizam S, and Gilbert PB. Super LeArner Prediction of NAb Panels (SLAPNAP): a containerized tool for predicting combination monoclonal broadly neutralizing antibody sensitivity. *bioRxiv*, 2020. doi: 10.1101/2020.06.23.167718

2. **Williamson BD**, Gilbert PB, Simon NR, and Carone M. A unified approach for inference on algorithm-agnostic variable importance. *arXiv*, 2020. URL https://arxiv.org/abs/2004.03683

1. **Williamson BD**, Hughes JP, and Willis AD. A multi-view model for relative and absolute microbial abundances. *bioRxiv*, 2019. doi: 10.1101/761486

Software

`vimp` perform inference on algorithm-agnostic variable importance (available on CRAN)

`vimpy` perform inference on algorithm-agnostic variable importance in Python (available on PyPI)

`paramedic` Predicting Absolute and Relative Abundance by Modeling Efficiency to Derive Intervals and Concentrations

SLAPNAP Super Learner Predictions using NAb Panels (available on DockerHub)

Teaching Experience

University of Washington

Spring 2018 Pre-Doctoral Instructor, Biostatistics 311 – Regression Methods in the Health Sciences (Enrollment: 12; median evaluation: 4.9/5.0; co-taught with Kelsey Grinde)

09/2018, 09/2017, 09/2016 University of Washington School of Public Health Math and R Skills Preparatory Workshop (Enrollment: 175; numerical evaluation not conducted; co-taught with Jessica Williams-Nguyen [2018, 2017] and Gillian Tarr [2016])

Fall 2017 Lead Teaching Assistant, Biostatistics 511 – Medical Biometry I (Enrollment: 149; numerical evaluation not conducted.)

Spring 2017 Teaching Assistant, Biostatistics 311 – Regression Methods in the Health Sciences (Enrollment: 22; numerical evaluation not conducted.)

Winter 2017 Teaching Assistant, Biostatistics 571 – Advanced Regression Methods for Dependent Data (Enrollment: 45; numerical evaluation not conducted)

Pomona College

Spring 2014 Teaching Assistant, Math 58b – Introduction to Biostatistics

Fall 2013 Teaching Assistant, Math 58b – Introduction to Statistics

Intramural Service

Fred Hutchinson Cancer Research Center

03/2020–Present Hutch United Outreach Committee

Department of Biostatistics, University of Washington

02/2019–06/2019 Chair's Task Force on Professionalism

09/2016–12/2019 Equity, Diversity, and Inclusion Committee

09/2016–12/2019 Peer Mentor

09/2015–09/2018 Educational Policy and Teaching Evaluation Committee

Extramural Service

Mentoring

2020 Mentor, Graduate Student Mentorship Initiative, Científico Latino

06/2015–Present Alumni Mentor, SagePost 47, Pomona College

Manuscript Reviewer

2020 Epidemiology

2019 International Journal of Biostatistics

Conferences

2020 Program Committee Member, 15th Machine Learning in Computational Biology Meeting

2019 Program Committee Member, 14th Machine Learning in Computational Biology Meeting

2017 Session chair, "Quantification, Association Testing, and Integration of the Microbiome", Joint Statistical Meetings

Invited Presentations

2018 "Assessing Variable Importance Nonparametrically using Machine Learning Techniques". University of Washington Department of Biostatistics Colloquium. Seattle, WA

Seminars and Contributed Presentations

2020 "A Unified Approach to Inference on Algorithm-Agnostic Variable Importance". Vanderbilt University Department of Biostatistics Seminar. Virtual.

2020 "Efficient Nonparametric Statistical Inference on Population Feature Importance using Shapley Values". Thirty-seventh International Conference on Machine Learning. Virtual.

2020 "Guiding HIV-1 Antibody Regimen Down-Selection and Prevention Efficacy Trial Design Using Machine Learning". 27th International Dynamics and Evolution of HIV and Other Human Viruses Meeting. Virtual.

2019 "A Unified Approach to Nonparametric Variable Importance Assessment". Joint Statistical Meetings. Denver, CO (selected for an ASA Nonparametrics Section Travel Award).

2018 "Assessing Variable Importance Nonparametrically using Machine Learning Techniques". Joint Statistical Meetings. Vancouver, BC, Canada (selected for an ASA Biometrics Section Travel Award).

2018 "Nonparametric Variable Importance Using an Augmented Neural Network with Multi-Task Learning". Thirty-fifth International Conference on Machine Learning. Stockholm, Sweden.

2017 "Assessing Variable Importance Nonparametrically using Machine Learning Techniques". WNAR of the International Biometric Society. Santa Fe, NM (selected as the Most Outstanding Oral Paper).

2017 "Assessing Variable Importance Nonparametrically using Machine Learning Techniques". University of Washington Department of Biostatistics Student Seminar. Seattle, WA.

2017 "An Introduction to Targeted Learning". University of Washington Department of Biostatistics Student Seminar. Seattle, WA.

2014 "Shrinkage Estimators for High-Dimensional Covariance Matrices". Pomona College Mathematics Seminar. Claremont, CA.

2013 "Automating Cell Gating and Creating a Nested Effects Model to Compare Drug Effects". Stanford University Center for Cancer Systems Biology Meeting. Stanford, CA.

Poster Presentations

2018 "Nonparametric Variable Importance using an Augmented Neural Network with Multi-Task Learning". Thirty-fifth International Conference on Machine Learning. Stockholm, Sweden.

2018 "HIV-1 Sequence Predictors of VRC01 Neutralization Sensitivity". 25th International Dynamics and Evolution of HIV and Other Human Viruses Meeting. Leavenworth, WA.

2017 "Assessing Variable Importance Nonparametrically using Machine Learning Techniques". University of Washington Biostatistics Department Retreat. Seattle, WA.

2017 "Assessing Variable Importance Nonparametrically using Machine Learning Techniques". Joint Statistical Meetings. Baltimore, MD.

2015 "Assessing Variable Importance Nonparametrically". University of Washington Biostatistics Department Retreat. Blaine, WA.

Professional Societies

08/2014–Present WNAR of the International Biometric Society

03/2013–Present American Statistical Association

05/2014–Present Sigma Xi: the Scientific Research Honor Society

References

(listed in alphabetical order by family name)

Marco Carone, PhD, *Associate Professor of Biostatistics, University of Washington*.
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Peter Gilbert, PhD, *Professor, Vaccine and Infectious Disease Division and Public Health Sciences Division, Fred Hutchinson Cancer Research Center*.
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Noah Simon, PhD, *Associate Professor of Biostatistics, University of Washington*.
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