Hong Zhang

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Education

Worcester Polytechnic Institute **Worcester, MA**
PhD, Statistics *08/2013 – 04/2018*
Dissertation: Goodness-of-Fit Tests for Signal Detection and Genetic Association Studies.

Johns Hopkins University **Baltimore, MD**
MS, Financial Mathematics *08/2011 – 12/2012*

Wuhan University **Wuhan, China**
BA and BS, Mathematics and Finance *08/2007 – 06/2011*

Current Position

Merck Research Laboratories **Rahway, NJ**
Senior Scientist *05/2018 – present*

- Conducted pharmacogenetics (PGx) studies on more than twenty clinical trials in oncology, neuroscience, and infectious diseases to identify genetic markers for various clinical endpoints;
- Developed multiple statistical methodologies to combine different signal sources that improve the power of biomarker discovery.

Publications

1. Hong Zhang, Jiashun Jin and Zheyang Wu. "Distributions and Statistical Power of Optimal Signal Detection Methods in Finite Samples". *IEEE Transactions on Signal Processing*, vol. 68 (2020), pp. 1021-1033, doi: 10.1109/TSP.2020.2967179.
2. Hong Zhang, Ni Zhao, Devan Mehrotra and Judong Shen. "Composite Kernel Association Test (CKAT) for SNP-set Joint Analysis of Genotype and Genotype-by-treatment Interaction in Pharmacogenetics Studies". *Bioinformatics*, vol. 36, no. 10 (2020), pp. 3162–3168. doi: 10.1093/bioinformatics/btaa125.
3. Lan Luo, Judong Shen, Hong Zhang, Aparna Chhibber, Devan Mehrotra and Zheng-zheng Tang. "Multi-trait analysis of rare-variant association summary statistics using MTAR". *Nature Communications*, 11:2850 (2020). doi: 10.1038/s41467-020-16591-0.
4. Hong Zhang, Tiejun Tong, John Landers and Zheyang Wu. "TFisher Tests: Optimal and Adaptive Thresholding for Combining p-Values." *Annals of Applied Statistics*, vol. 14, no. 1 (2020), pp. 178–201. doi: 10.1214/19-AOAS1302.
5. Hong Zhang, and Roger Lui. "Releasing Wolbachia-infected Aedes aegypti to prevent the spread of dengue virus: a mathematical study". *Infectious Disease Modelling*, vol. 5 (2020), pp. 142-160. doi: 10.1016/j.idm.2019.12.004.

Preprints

1. Hong Zhang, Qing Li, Devan V. Mehrotra and Judong Shen. "CauchyCP: a powerful test under non-proportional hazards using Cauchy combination of change-point Cox regressions". *Submitted.* arXiv: 2101.00059
2. Hong Zhang, Judong Shen and Zheyang Wu. "An efficient and accurate approximation to the distribution of quadratic forms of Gaussian variables". *Submitted.* arXiv: 2005.00905.
3. Hong Zhang and Zheyang Wu. "A Generalized Family of Fisher's Combination Tests and Their Null Distributions Under Correlation". *Submitted.* arXiv: 2003.01286.
4. Hong Zhang and Zheyang Wu. "Generalized Goodness-Of-Fit Tests for Correlated Data". *Submitted.* arXiv: 1806.03668.
5. Chibber Aparna, Lingkang Huang, Hong Zhang, et al. "Germline human leukocyte antigen landscape and efficacy of pembrolizumab monotherapy across solid tumor types". *Submitted, manuscript available upon request.*
6. Hong Zhang, Aparna Chhibber, Peter Shaw, Devan Mehrotra and Judong Shen. "A statistical perspective on baseline adjustment in pharmacogenomic genome-wide association studies of quantitative change". *Ready to submit, manuscript available upon request.*

Review Services

Computational Statistics and Data Analysis; *Statistics and Its Interface*; *Statistics & Probability Letters*; *Statistica Sinica*.

Bioinformatics; *PLOS Computational Biology*; *PLOS ONE*; *BMJ Open*; *Frontier in Genetics*.

IEEE International Conference on Big Data; *IEEE Internet of Things Journal*; *IEEE Open Journal of Signal Processing*; *IEEE Transactions on Computational Social Systems*.

Presentations

1. A Generalized Family of Fisher's P-Value Combination Tests and Their Null Distributions Under Correlation.
   JSM 2020, Virtual Conference, August 2020.
2. Advancing Pharmacogenomics Analysis of Drug Response in Early-Phase Clinical Trials.
   JSM 2019 (*Invited Session*), *Denver, CO,* July 2019.
3. Novel Statistical Methods for Polygenic Prediction of Drug Responses in PGx Studies.
   Merck Princeton/Branchburg Seminar, Princeton, NJ, November 2018.
4. A Novel Subgroup Identification Method: Exhaustive Search with Repeated Cross-validation.
   ICSA Applied Statistics Symposium, New Brunswick, NJ, June, 2018.
5. Novel P-value Combination Methods with Application to Genetic Association Studies.
   WPI Bioinformatics & Computational Biology Seminar, Worcester, MA, March, 2018.
6. Power of a Family of Optimal Detection Methods.
   The 10th ICSA International Conference, Shanghai, China, December, 2016.
7. Detecting Crohn's Disease by Risk Locus Identified by a Novel Multiple Testing Procedure.
   WPI Bioinformatics & Computational Biology Seminar, Worcester, MA, March, 2016.

Posters

1. CC-CKAT: A fast and powerful method for SNP set joint test of prognostic and predictive effects in pharmacogenomics studies.
   American Society of Human Genetics 2019 Conference, Houston, TX, October 2019.
2. Exhaustive Search for Patient Subgroup with Repeated Cross-validation.,
   Merck Data Science Symposium, Upper Gwynedd, PA, May 2019.
3. Thresholding Fisher's P-Value Combination Method (TFisher) for Set-based Genetic Association Studies.
   American Society of Human Genetics 2018 Conference, San Diego, CA, October 2018.
4. CK-SKAT: Composite Kernel Machine Association Test for Biomarker Discovery in PGx Studies.
   Institute for Mathematics and its Applications Workshop: Innovative Statistics and Machine Learning for Precision Medicine, Twin Cities, MN, September 2017.

Teaching Experiences

Worcester Polytechnic Institute

- Instructor of *Calculus I* (both in-class and online sections), Summer 2015.
- Teaching assistant of the following courses during 2013 - 2017,
  graduate-level: *Probability and Mathematical Statistics II*,
  undergraduate-level: *Applied Statistics I, Applied Statistics II, Applied Statistics for the Life Sciences*, *Probability*, *Calculus II* and *Calculus III*.
- Tutor of the Math Tutoring Center, 2013 - 2017.

Johns Hopkins University

- Teaching assistant of undergraduate-level *Differential Equation*, Fall 2012.

Software

Authored the following R packages on CRAN.

- *SetTest*: Group Testing Procedures for Signal Detection and Goodness-of-Fit.
- *TFisher*: Thresholding Fisher's P-value Combination Methods.
- *CKAT*: Composite Kernel Association Test for Pharmacogenetics Studies.
- *Qapprox*: Approximation to the Survival Functions of Quadratic Forms of Gaussian Variables.
- *CauchyCP*: Powerful Test for Survival Data under Non-Proportional Hazards.

Awards and Honors

- PhD Research Achievement Prize, Math Department WPI, 2018.
- Institute for Mathematics and its Applications PI Travel Fund, WPI, 2017.
- Graduate Student Travel Fund, WPI, 2016.
- Teaching Assistant of the Year, Math Department WPI, 2015.

References

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