Eugene Katsevich

Assistant Professor of Statistics and Data Science March 9, 2024

Academic Research Building 311
265 South 37th Street
Philadelphia, PA 19104-1686

Phone: (650) 250 3331
Email: ekatsevi@wharton.upenn.edu
Homepage: https://ekatsevi.github.io/

Employment

University of Pennsylvania, Department of Statistics and Data Science, Assistant Professor, 2020-present.

- Member of the graduate group in Applied Mathematics and Computational Science (AMCS)
- Member of the graduate group in Genomics and Computational Biology (GCB)

Carnegie Mellon University, Department of Statistics and Data Science, Postdoctoral Researcher, 2019-2020.
Advisors: Kathryn Roeder and Aaditya Ramdas.

Education

Stanford University, Ph.D. in Statistics, 2019.
Thesis Advisor: Chiara Sabatti.

Princeton University, A.B. in Mathematics (with Highest Honors), 2014.
Thesis Advisor: Amit Singer.

Publications

Manuscripts under review

17. T. Barry, K. Roeder, **E. Katsevich**. Robust differential expression testing for single-cell CRISPR screens. Major revision under review at *Genome Biology.* Available on bioRxiv.

16. T. Barry, **E. Katsevich**, and K. Roeder. Exponential family measurement error models for single-cell CRISPR screens. Major revision under review at *Biostatistics.* Available on arXiv.

Published or forthcoming papers

15. Z. Niu, A. Chakraborty, O. Dukes, and **E. Katsevich**. Reconciling model-X and doubly robust approaches to conditional independence testing. Accepted at *Annals of Statistics*, 2024. Available on arXiv.

14. J. A. Morris, Z. Daniloski, J. Domingo, T. Barry, M. Ziosi, D. A. Glinos, S. Hao, E. Mimitou, P. Smibert, K. Roeder, **E. Katsevich**, T. Lappalainen, and N. E. Sanjana. Discovery of target genes and pathways of blood trait loci using pooled CRISPR screens and single cell RNA sequencing. *Science*, 2023. Available at Science.

13. J. Tian, X. Chen, **E. Katsevich**, J. Goeman, and A. Ramdas. Large-scale simultaneous inference under dependence. *Scandinavian Journal of Statistics*, 50(2): 750-796, 2023. Available at Wiley.

12. **E. Katsevich**, C. Sabatti, and M. Bogomolov. Filtering the rejection set while preserving false discovery rate control. *Journal of the American Statistical Association*, 118(541): 165-176, 2023. Available at Taylor and Francis Online.

11. **E. Katsevich** and A. Ramdas. On the power of conditional independence testing under model-X. *Electronic Journal of Statistics*, 16(2): 6348-6394, 2022. Available on Project Euclid.

10. M. Liu, **E. Katsevich**, L. Janson, and A. Ramdas. Fast and powerful conditional randomization testing via distillation. *Biometrika*, 109(2):277–293, 2022. Available at Oxford University Press.

9. T. Barry, X. Wang, J. A. Morris, K. Roeder, and **E. Katsevich**. SCEPTRE improves calibration and sensitivity in single-cell CRISPR screen analysis. *Genome Biology*, 22:344, 2021. Available at Genome Biology.

8. **E. Katsevich** and A. Ramdas. Simultaneous high-probability bounds on the false discovery proportion in structured, regression, and online settings. *Annals of Statistics*, 48(6):3465–3487, 2020. Available at Project Euclid.

7. M. Sesia, **E. Katsevich**, S. Bates, E. Candès, C. Sabatti. Multi-resolution localization of causal variants across the genome. *Nature Communications*, 11:1093, 2020. Available at nature.com.

6. J. Zhu, Q. Zhao, **E. Katsevich**, C. Sabatti. Exploratory Gene Ontology Analysis with Interactive Visualization. *Nature Scientific Reports*, 9:7793, 2019. Available at nature.com.

5. **E. Katsevich** and C. Sabatti. Multilayer Knockoff Filter: Controlled variable selection at multiple resolutions. *Annals of Applied Statistics*, 13(1):1–33, 2019. Available at Project Euclid.

4. J. Anden, **E. Katsevich**, and A. Singer. Covariance estimation using conjugate gradient for 3D classification in cryo-EM. In *IEEE Int Symp Biomed Imaging*, New York, New York, April 2015. Available at PubMed.

3. **E. Katsevich**, A. Katsevich, A. Singer. Covariance matrix estimation for the cryo-EM heterogeneity problem. *SIAM Journal on Imaging Sciences*, 8(1):126–185, 2015. Available at PubMed.

2. B. Shi, **E. Katsevich**, B. Chiang, A. Katsevich, and A. Zamyatin. Image registration for motion estimation in cardiac CT. In *SPIE Medical Imaging*, San Diego, California, February 2014. Available at SPIE digital library.

1. **E. Katsevich**, A. Katsevich, and G. Wang. Stability of the interior problem for polynomial region of interest. *Inverse Problems*, 28(6), 2012. Available at PubMed.

Software

- `sceptre`: `R` package for rigorously identifying regulatory relationships based on single-cell CRISPR screen experiments (webpage).

Awards

- Wharton Teaching Excellence award (2021)
- Jerome H. Friedman Applied Statistics Dissertation Award (2019).
- Statistics Department Teaching Assistant Award (2016).
- Hertz Fellowship (2014-2019).

- National Defense Science and Engineering Fellowship, declined (2014-2017).
- George B. Covington Thesis Prize in Mathematics (2014).
- Early election to Phi Beta Kappa (2013).
- Barry Goldwater Scholarship (2012).
- Shapiro Prize for Academic Excellence (2011, 2012).
- Freshman First Honor Prize (2011).

Teaching

Courses Taught at University of Pennsylvania

- STAT 9610: Statistical Methodology, Fall '21, Fall '22 – PhD Level.
- STAT 4710: Modern Data Mining, Spring '21, Fall '21, Fall '22 – Undergraduate Level.

Courses Taught at Stanford

- STATS 302: Qualifying Exams Workshop, Summer '17 – PhD Level.

Training

Doctoral Student Supervision

- Ziang Niu; jointly with Bhaswar Bhattacharya (Wharton Statistics and Data Science; Fall 2023 – present)
- Joseph Deutsch (Wharton Statistics and Data Science; Summer 2023 – present)
- Timothy Barry; jointly with Kathryn Roeder (Carnegie Mellon University; Summer 2020 – Fall 2023)

Dissertation Committee Membership

- Abhinav Chakraborty (Wharton Statistics and Data Science; Spring 2024 – present)
- Jeffrey Zhang (Wharton Statistics and Data Science; Spring 2024 – present)

Doctoral Student Research Mentorship (Informal)

- Sophia Lu (Stanford University Statistics; Summer 2021)
- Abhinav Chakraborty (Wharton Statistics and Data Science; Fall 2021 – present)
- Jeffrey Zhang (Wharton Statistics and Data Science; Spring 2023 – present)
- Kaishu Mason (Wharton Statistics and Data Science; Spring 2023)

Master's Student Research Mentorship (Informal)

- Jyotishka Ray Choudhury (Indian Statistical Institute; Summer 2023 – present)
- Ziang Niu (University of Pennsylvania AMCS; Spring 2022 – Summer 2023)

Professional Service Activities

- *Member*, Statistics departmental postdoc selection committee (2021-22, 2022-23)
- *Member*, Statistics PhD admissions committee (2021-22, 2022-23, 2023-24)
- *Organizer*, Wharton statistics departmental seminar (Spring 2022, Spring 2024)
- *Reviewer* (35 manuscripts): Annals of Statistics (6), Journal of the Royal Statistical Society (Series B) (4), Journal of the American Statistical Association (5), Biometrika (3), Annals of Applied Statistics (1), Statistical Science (1), Proceedings of the National Academy of Sciences (1), Biometrics (2), Statistics and Probability Letters (1), Statistics and Computing (1), Journal of Computational and Graphical Statistics (1), Annals of the Institute of Statistical Mathematics (1), Journal of Multivariate Analysis (1), Electronic Journal of Statistics (1), Nature Methods (1), Cell Systems (1), American Journal of Human Genetics (1), Genetics (1), Genome Medicine (1), BMC Bioinformatics (1).
- *Organizer*, Stanford statistics department orientation program for PhD students (2018).
- *Organizer*, Hertz West Coast Retreat (2017).
- *Academic chair*, Princeton Math Club (2012).
- *Head problem writer*, Princeton University Math Competition (2011).

Presentations

Invited talks

- *Reconciling model-X and doubly robust approaches to conditional independence testing.*
  International Conference on Statistics and Data Science in Lisbon, Portugal, Dec. 18-21, 2023.
- *Robust differential expression testing for single-cell CRISPR screens.*
  EMBL-EBI industry workshop: Perturb-Seq data analysis and integration in Cambridge, MA, Jun. 21-22, 2023.
- *Robust differential expression testing for single-cell CRISPR screens.*
  New England Statistics Symposium in Boston, MA, Jun. 6, 2023.
- *Robust differential expression testing for single-cell CRISPR screens.*
  Impact of Genomic Variation on Function (IGVF) Consortium CRISPR focus group, May 19, 2023, held virtually.
- *Model-X versus doubly robust conditional independence testing.*
  Statistics Seminar at Stanford University, May 2, 2023.
- *Model-X versus doubly robust conditional independence testing.*
  Causal Inference Reading Group at Cambridge University, Apr. 28, 2023, held virtually.
- *Reconciling model-X and doubly robust approaches to conditional independence testing.*
  International Seminar on Selective Inference, Mar. 1, 2023, held virtually.
- *Statistical Analysis of Single Cell CRISPR Screens.*
  Joint Statistical Meetings in Washington, D.C., Aug. 8, 2022.
- *Statistical Analysis of Single Cell CRISPR Screens.*
  Statistics seminar at the Data Science and Operations department at the University of Southern California, Apr. 22, 2022, held virtually.

- *Statistical Analysis of Single Cell CRISPR Screens.*
  Biostatistics seminar at Yale University,
  Feb. 2, 2021, held virtually.
- *Statistical Analysis of Single Cell CRISPR Screens.*
  Open Insights in Biomedical Data Science Seminar at the University of Pennsylvania,
  Nov. 13, 2020, held virtually.
- *Finite-sample optimality and large-sample power analysis of the conditional randomization test.*
  Young Data Science Researcher Seminar at ETH Zurich, Nov. 6, 2020, held virtually.
- *Statistical analysis of single cell CRISPR screens.*
  Stanford Biostatistics Workshop, Oct. 8, 2020, held virtually.
- *The conditional randomization test in theory and in practice.*
  International Seminar on Selective Inference, Aug. 20, 2020, held virtually.
- *A theoretical treatment of conditional independence testing under Model-X.*
  Joint Statistical Meetings, Aug. 2–6, 2020, held virtually.
- *Multiple testing for modern data: structure, curation, and replicability.*
  U.C. San Diego Halicioglu Data Science Institute Special Seminar, Feb. 12, 2019.
- *Multiple testing for modern data: structure, curation, and replicability.*
  Rutgers University Statistics Seminar, Feb. 5, 2019.
- *Multiple testing for modern data: structure, curation, and replicability.*
  Wharton Statistics Seminar, University of Pennsylvania, Jan. 30, 2019.
- *Multiple testing for modern data: structure, curation, and replicability.*
  University of Chicago Statistics Colloquium, Jan. 24, 2019.
- *Controlling FDR while highlighting distinct discoveries, with applications to GO enrichment analysis.*
  Stanford University Biostatistics Workshop, Oct. 11, 2018.
- *Controlling FDR while highlighting distinct discoveries, with applications to GO enrichment analysis.*
  U.C. Berkeley Statistics and Genomics Seminar, Sep. 27, 2018.

Invited discussions

- *"Simultaneous FDP bounds via knockoffs and closed testing"* by Jinzhou Li.
  International Seminar on Selective Inference, Jan. 25, 2023, held virtually.
- *"Detecting Multiple Replicating Signals using Adaptive Filtering Procedures"* by Jingshu Wang.
  International Seminar on Selective Inference, May 28, 2020, held virtually.

Contributed talks

- *A theoretical treatment of conditional independence testing under Model-X.*
  Bernoulli-IMS One World Symposium, Aug. 24–28, 2020, held virtually.
- *Simultaneous High-Probability Bounds on the False Discovery Proportion for Nested Sequences of Rejection Sets.*
  International Conference on Multiple Comparison Procedures, Dec. 13–15, 2019, in Taipei, Taiwan.
- *Gene Ontology enrichment testing: Reconciling FDR control with filtering.*
  Joint Statistical Meetings, Jul. 28–Aug. 2, 2018, in Vancouver, Canada.
- *The multilayer knockoff filter: Controlled multi-resolution variable selection.*
  International Conference on Multiple Comparison Procedures, Jun. 20–23, 2017, in Riverside, California.

Poster Presentations

- *Perturbation-expression association analysis in low-MOI single-cell CRISPR screens with SCEPTRE.*
  Biology of Genomes, May 9 - 13, 2023, in Cold Spring Harbor Laboratory, New York.
- *SCEPTRE improves calibration in single-cell CRISPR screen analysis.*
  Biology of Genomes, May 10 - 14, 2022, in Cold Spring Harbor Laboratory, New York.
- *Conditional resampling improves sensitivity and specificity of genome-wide CRISPR regulatory screens.*
  American Society for Human Genetics, Oct. 27–30, 2020, held virtually.
- *Controlling FDR While Highlighting Selected Discoveries.*
  International Conference on Multiple Comparison Procedures, Dec. 13–15, 2019, in Taipei, Taiwan.
- *Multi-resolution association analysis for exome-wide sequencing.*
  American Society for Human Genetics, Oct. 16–20, 2018, in San Diego, California.
- *Controlling FDR while highlighting distinct discoveries.*
  Workshop on Higher-Order Asymptotics and Post-Selection Inference, Sep. 8–10 2018, in St. Louis, Missouri.
- *Multilayer FDR control for genetic association studies.*
  Graybill Conference on Statistical Genomics and Genetics, Jun. 5–7 2017, in Fort Collins, Colorado. Best student poster award.
- *The multilayer knockoff filter: Multilayer FDR control for association studies.*
  Probabilistic Modeling in Genomics, Sep. 12–14, 2016, in Oxford, United Kingdom.

Grant activity

Current

Name	**Funding agency**	**Period**	**Type**	**Role**	**Annual direct cost**	**Annual indirect cost**
Testing and estimation for multi-modality single cell genomics	National Science Foundation	08/01/2021-07/31/2024	External	PI	$37,948	$23,718
Statistical Software for Single Cell CRISPR Screens	Analytics at Wharton	2021-2023	Internal	PI	$25,000	$0
Doubly-robust variable selection in high dimensions	National Science Foundation	09/1/2023 - 08/31/2026	External	PI	$46,154	$28,846