Mykhaylo M. Malakhov

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Education

University of Minnesota **Minneapolis, MN**
PhD in Biostatistics *09/2020 – 07/2025*
- Committee: Wei Pan (advisor), Eric F. Lock, Thierry Chekouo, Arslan A. Zaidi
- Dissertation: "Accounting for Interactions and Uncertainty in Multi-Omic Association Studies"

Andrews University **Berrien Springs, MI**
BS in Mathematics (minor in Computing) *08/2016 – 05/2020*
- *Summa Cum Laude* and J. N. Andrews Honors Scholar
- Honors thesis: "Managing White-nose Syndrome in Bats: A Spatially Dynamic Modelling Approach"

Budapest Semesters in Mathematics **Budapest, Hungary**
Study abroad *09/2019 – 12/2019*
- Selective study abroad program focusing on advanced mathematics

Experience

Research

Stanford University School of Medicine **Stanford, CA**
Postdoctoral Scholar, Department of Epidemiology and Population Health *08/2025 – present*
- Developing personalized biomarkers for precision disease screening by integrating genomics, proteomics, and health history through machine learning
- Analyzing the impact of germline mutations and RNA splicing on multiple myeloma

University of Minnesota School of Public Health **Minneapolis, MN**
Graduate Research Assistant, Division of Biostatistics and Health Data Science *09/2023 – 07/2025*
- Introduced the co-expression-wide association study (COWAS) method for identifying genes and proteins whose genetically regulated co-expression is associated with complex traits
- Explored the impact of aging on the genetic regulation of protein expression and co-expression, as well as the downstream effects of age-related dysregulation on Alzheimer's disease
- Contributed to the development of Mendelian randomization methods for causal inference with multiple correlated exposures (MVMR-cML-SuSiE) and multiple related outcomes (MR2-SuSiE)
- Contributed to a study showing that imputation of Alzheimer's disease can enhance the performance of nonlinear TWAS and PWAS

Denali Therapeutics **South San Francisco, CA**
Intern, Human Genetics *06/2023 – 08/2023*
- Built cloud-based software that enabled scientists across the company to easily clean, store, and access genome-wide association study (GWAS) data
- Leveraged public GWAS data to better understand the molecular mechanisms of genetic variants associated with neurodegenerative diseases

University of Minnesota School of Public Health **Minneapolis, MN**

Predoctoral Trainee, Division of Biostatistics *09/2020 – 05/2023*

- Was funded by a T32 Training Grant from the National Institutes of Health (NIH)
- Proposed and implemented the differential regulation analysis by bootstrapping (DRAB) framework, a statistical approach for identifying genes with context-specific patterns of local genetic regulation
- Contributed to the first study demonstrating nonlinear effects of gene expression on complex traits

UCLA Institute for Pure and Applied Mathematics **Los Angeles, CA**

Researcher and Project Manager, RIPS program *06/2019 – 08/2019*

- Worked on the Air Force Research Laboratory (AFRL) team in the Research in Industrial Projects for Students (RIPS) program
- Proposed novel attractor reconstruction and model calibration methods
- Inferred reaction rate coefficients for hydrogen-oxygen combustion from a time series of one observable

Williams College **Williamstown, MA**

Student Researcher, SMALL REU program *06/2018 – 08/2018*

- Project 1: demonstrated how to improve management outcomes for white-nose syndrome in bats by considering metapopulation dynamics
- Project 2: established guidelines for transboundary infectious disease management when multiple administrative jurisdictions set different objectives

Andrews University **Berrien Springs, MI**

Research Assistant, Department of Mathematics *06/2017 – 08/2017*

- Modeled the effects of climate change on seabird behavior and population dynamics
- Proved that egg cannibalism and egg-laying synchrony can yield strong Allee effects, which allow gull colonies to survive at higher sea surface temperatures than otherwise possible

Teaching

Andrews University **Berrien Springs, MI**

Teaching Assistant, Department of Mathematics *01/2017 – 04/2020*

- Tutored students of all levels in the Mathematics Center
- Led a short course on LaTeX
- Graded for Foundations of Advanced Mathematics
- Served as a substitute lecturer for Calculus I and II

Publications

*The * symbol denotes equal contributions.*

Working papers and preprints

1. **Malakhov**, **M. M.** & Pan, W. Age-dependent regulation of protein expression and its impact on Alzheimer's disease. In preparation.
2. **Malakhov**, **M. M.** & Henson, S. M. Backward bifurcations in a low-dimensional model of seabird population dynamics. In preparation.
3. Chan, L. S., **Malakhov**, **M. M.** & Pan, W. A multi-response Mendelian randomization framework for identifying shared and distinct causes of related traits. In preparation.

Peer-reviewed journal articles

4. **Malakhov**, **M. M.** & Pan, W. Co-expression-wide association studies link genetically regulated interactions with complex traits. *Nature Communications* **16,** 11061. https://doi.org/10.1038/s41467-025-66039-6 (Dec. 2025).
5. He*, R., Ren*, J., **Malakhov**, **M. M.** & Pan, W. Enhancing nonlinear transcriptome- and proteome-wide association studies via trait imputation with applications to Alzheimer's disease. *PLOS Genetics* **21,** e1011659. https://doi.org/10.1371/journal.pgen.1011659 (Apr. 2025).
6. Chan, L. S., **Malakhov**, **M. M.** & Pan, W. A novel multivariable Mendelian randomization framework to disentangle highly correlated exposures with application to metabolomics. *The American Journal of Human Genetics* **111,** 1834–1847. https://doi.org/10.1016/j.ajhg.2024.07.007 (Sept. 2024).
7. **Malakhov**, **M. M.**, Dai, B., Shen, X. T. & Pan, W. A bootstrap model comparison test for identifying genes with context-specific patterns of genetic regulation. *The Annals of Applied Statistics* **18,** 1840–1857. https://doi.org/10.1214/23-AOAS1859 (Sept. 2024).
8. Lin, Z., Xue, H., **Malakhov**, **M. M.**, Knutson, K. A. & Pan, W. Accounting for nonlinear effects of gene expression identifies additional associated genes in transcriptome-wide association studies. *Human Molecular Genetics* **31,** 2462–2470. https://doi.org/10.1093/hmg/ddac015 (July 2022).
9. Blackwood, J. C., **Malakhov**, **M. M.**, Duan*, J., Pellett*, J. J., Phadke*, I. S., Lenhart, S., Sims, C. & Shea, K. Governance structure affects transboundary disease management under alternative objectives. *BMC Public Health* **21,** 1782. https://doi.org/10.1186/s12889-021-11797-3 (Oct. 2021).
10. Duan*, J., **Malakhov***, **M. M.**, Pellett*, J. J., Phadke*, I. S., Barber, J. & Blackwood, J. C. Management efficacy in a metapopulation model of white-nose syndrome. *Natural Resource Modeling* **34,** e12304. https://doi.org/10.1111/nrm.12304 (Aug. 2021).

Theses and technical reports

11. **Malakhov**, **M. M.** *Accounting for Interactions and Uncertainty in Multi-Omic Association Studies.* PhD Dissertation (University of Minnesota, July 2025). https://hdl.handle.net/11299/277379.
12. **Malakhov**, **M. M.**, Fitzpatrick, B. R., Lopez, R. A. & Shivkumar, A. *Attractor Reconstruction and Empirical Parameter Inference for Hydrogen-Oxygen Chemistry.* Technical Report AD1098889 (Air Force Research Laboratory, Aug. 2019). https://apps.dtic.mil/sti/citations/AD1098889.
13. **Malakhov**, **M. M.** *Managing White-nose Syndrome in Bats: A Spatially Dynamic Modelling Approach.* Honors Thesis (Andrews University, Apr. 2019). https://doi.org/10.32597/honors/216.

Honors and awards

National and international

- Roger Williams Memorial Award, International Genetic Epidemiology Society (IGES) (11/2024)
- Reviewers' Choice Abstract Award, American Society of Human Genetics (ASHG) (11/2024)
- Goldwater Scholarship, Barry Goldwater Scholarship & Excellence in Education Foundation (03/2018)

University of Minnesota

- Audience Favorite Student Poster Award, Division of Biostatistics & Health Data Science (05/2025)
- Student Member of the Delta Omega Honorary Society in Public Health, Pi Chapter (05/2025)
- People's Choice Poster Award, School of Public Health Research Day (04/2022)
- 2nd Place Best Poster Award, School of Public Health Research Day (04/2022)
- 3rd Place, University of Minnesota Interdisciplinary Health Data Competition (04/2022)
- Dean's PhD Scholars Award (09/2020)

Andrews University

- Harold T. Jones Scholarship for highest excellence in mathematics (04/2018)
- Louis Ulloth Scholarship for most significant leadership contributions (04/2018)
- Member of Pi Mu Epsilon, Michigan Gamma Chapter (03/2018)
- Four-year full tuition ACT/SAT scholarship (08/2016)
- Excellence awards for 12 mathematics courses (2016 – 2020)
- Dean's List (awarded every semester 2016 – 2020)
- Highest score in the Putnam Competition among students at Andrews University (2018, 2019)

Presentations

Conference talks

1. "Genetic Dysregulation of Protein Expression in Aging and Neurodegeneration." Platform Presentation Session on Omics; International Genetic Epidemiology Society (IGES) Annual Meeting; Cologne, Germany. (Sept. 2025)
2. "Co-expression-wide association studies link genetically regulated interactions with complex traits." Contributed Session on Genetics; STATGEN Conference; Minneapolis, MN. (May 2025)
3. "Co-expression-Wide Association Studies Implicate Protein-Protein Interactions in Complex Disease Risk." Session on Leveraging Transfer Learning and AI for Complex Data and Predictions; ENAR Spring Meeting; New Orleans, LA. (Mar. 2025)
4. "Co-expression-Wide Association Studies Implicate Protein-Protein Interactions in Complex Disease Risk." Williams Award Platform Presentation Session; International Genetic Epidemiology Society (IGES) Annual Meeting; Denver, CO. (Nov. 2024)
5. "A bootstrap model comparison test for identifying genes with context-specific patterns of genetic regulation." Session on Mediation and Interaction in Genomics; Joint Statistical Meetings (JSM); Toronto, ON, Canada. (Aug. 2023)

6. "Accounting for nonlinear effects of gene expression in transcriptome-wide association studies." Andrews Research Conference (ARC); Andrews University; Berrien Springs, MI. (May 2022)
7. "Modeling the impact of bat dispersal on white-nose syndrome control strategies." Mathematics Section; Michigan Academy of Science, Arts, and Letters (MASAL); Alma College; Alma, MI. (Mar. 2019)
8. "Federalism in Epidemic Modeling: Multi-objective Management of Interconnected Populations." AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates and Students in Post-Baccalaureate Programs; Joint Mathematics Meetings (JMM); Baltimore, MD. Jointly with Ishan Phadke. (Jan. 2019)
9. "Cannibalism and synchrony in a periodic matrix seabird population model." Mathematics Section; Michigan Academy of Science, Arts, and Letters (MASAL); Central Michigan University; Mount Pleasant, MI. (Mar. 2018)
10. "Backward Bifurcations in a Periodic Matrix Model of Seabird Population Dynamics." MAA General Contributed Paper Session on Modeling and Applications; Joint Mathematics Meetings (JMM); San Diego, CA. (Jan. 2018)

Seminar and symposium talks

1. "Accounting for interactions and uncertainty in statistical genetics." Eigen* Mathematics and Physics Seminar; Andrews University; Berrien Springs, MI. (Feb. 2025)
2. "An introduction to AWK for biostatistics." Division of Biostatistics and Health Data Science Student Seminar; University of Minnesota; Minneapolis, MN. (Dec. 2024)
3. "Identifying genes with tissue-specific patterns of genetic regulation." Genomic Data Science Mini-Symposium; Masonic Institute for the Developing Brain (MIDB); University of Minnesota; Minneapolis, MN. (Oct. 2022)
4. "Attractor Reconstruction and Empirical Parameter Inference for Hydrogen-Oxygen Chemistry." Projects Day; Institute for Pure and Applied Mathematics (IPAM); University of California, Los Angeles; Los Angeles, CA. Jointly with Brianna Fitzpatrick, Rebecca Lopez, and Abhishek Shivkumar. (Aug. 2019)
5. "Application of Convergent Cross Mapping to Chemical Reactions." Edwards Air Force Base; Boron, CA. Jointly with Brianna Fitzpatrick, Rebecca Lopez, and Abhishek Shivkumar. (Aug. 2019)
6. "Managing White-nose Syndrome in Bats: A Spatially Dynamic Modelling Approach." Honors Thesis Symposium; Andrews University; Berrien Springs, MI. (Apr. 2019)

Poster presentations

1. "Co-expression-wide association studies link genetically regulated interactions with complex traits." National Graduate Student Symposium; St. Jude Children's Research Hospital; Memphis, TN. (Mar. 2025)
2. "Co-expression-wide association studies implicate protein-protein interactions in complex disease risk." Statistical Genetics and Genetic Epidemiology Poster Session; American Society of Human Genetics (ASHG) Annual Meeting; Denver, CO. (Nov. 2024)
3. "Leveraging Public GWAS Data to Inform Discovery." Summer Research Symposium; Denali Therapeutics; South San Francisco, CA. (Aug. 2023)
4. "Identifying genes with tissue-specific patterns of genetic regulation." School of Public Health Research Day; University of Minnesota; Minneapolis, MN. (Apr. 2023)

5. "Governance structure affects transboundary disease management under alternative objectives." School of Public Health Research Day; University of Minnesota; Minneapolis, MN. (Apr. 2022)
6. "Data-driven Attractor Reconstruction and Parameter Inference for Hydrogen-Oxygen Chemistry." MAA Student Poster Session; Joint Mathematics Meetings (JMM); Denver, CO. (Jan. 2020)
7. "Managing White-nose Syndrome in Bats: A Spatially Dynamic Modeling Approach." Honors Scholars and Undergraduate Research Poster Symposium; Andrews University; Berrien Springs, MI. (Mar. 2019)
8. "Efficacy of Control in a Spatially Dynamic Model of White-nose Syndrome." Summer Science Poster Session; Williams College; Williamstown, MA. Jointly with Ishan Phadke. (Aug. 2018)
9. "A Periodic Matrix Model of Seabird Behavior and Population Dynamics." Honors Scholars and Undergraduate Research Poster Symposium; Andrews University; Berrien Springs, MI. (Mar. 2018)

Volunteering and academic service

Peer reviewer for:
- *Human Heredity* (1)
- *The American Journal of Human Genetics* (1)
- *Biogerontology* (1)
- *Scientific Reports* (1)
- *Ecology and Evolution* (1)

International Genetic Epidemiology Society (IGES) **Remote**
Communications and Young Investigators Committee Member *01/2025 – present*
I am serving on the Communications Committee and on the Young Investigators Committee of the International Genetic Epidemiology Society (IGES). In these roles, I manage the society's social media presence and help organize events for early career researchers.

University of Minnesota School of Public Health **Minneapolis, MN**
BCOE Member *08/2022 – 05/2024*
As a member of the Biostatistics Community Outreach and Engagement Committee (BCOE), I mentored high school students in clinical trial design and data analysis. I also participated in and helped coordinate a wide range of volunteering opportunities for students, faculty, and staff in the Division of Biostatistics and Health Data Science.

Pi Mu Epsilon: The National Mathematics Honor Society **Berrien Springs, MI**
President, Michigan Gamma Chapter *08/2018 – 05/2020*
In my role leading the Pi Mu Epsilon chapter at Andrews University, I arranged game nights and social gatherings for math majors, planned an annual Pi Day party, and conducted our chapter's induction ceremonies. After one year as President I was reelected for a second term.

Engineers Without Borders USA **Berrien Springs, MI**
Vice President, Andrews University Chapter *08/2018 – 05/2019*
I coordinated outreach activities, assisted with engineering design, and planned travel itineraries for a student-led solar energy project at a remote school in Madagascar. The summer of 2018 I traveled to Madagascar to help conduct the assessment phase of our project.

Andrews University **Berrien Springs, MI**

Eigen Mathematics President* *08/2017 – 05/2018*

As Mathematics President of Eigen*, the math/physics student organization at Andrews University, I planned seminar series, weekend retreats, and other social and educational events. I also helped organize our university's first preparation course and team for the Putnam Competition, the most prestigious undergraduate mathematics competition in the world.

Engineers Without Borders USA **Berrien Springs, MI**

Treasurer, Andrews University Chapter *08/2017 – 05/2018*

I oversaw expenditures, wrote grant applications, and organized fundraising efforts for the Andrews University chapter of Engineers Without Borders. Under my leadership, our chapter raised about $20,000 for a solar energy project in Madagascar.