Gabriel Loewinger

Washington, DC | gabriel.loewinger@nih.gov
gabeloewinger.com | github.com/gloewing | linkedin.com/in/gabrielloewinger

EDUCATION

Harvard University — Boston, MA
Ph.D., Biostatistics — May 2022
National Institutes of Health PhD Fellowship (NRSA: F31)

Pitzer College — Claremont, CA
B.A., Neuroscience with Honors — May 2012

SELECTED RESEARCH & TEACHING EXPERIENCE

National Institutes of Health — Bethesda, MD
Machine Learning Research Scientist — Aug 2022-Present
- Develop causal inference and functional data analysis statistical/ML methods and open-source software
- Consult with neuroscientists, psychiatrists, and mental health research on machine learning and statistics applications

Harvard University, Department of Biostatistics — Boston, MA
Graduate Researcher & Teaching Assistant — August 2017-Present
- Create mixed-integer optimization-based methods for interpretable, high dimensional, sparse multi-task learning
- Develop nonlinear optimization-based transfer learning method to integrate multiple datasets and improve estimation of COVID-19 excess mortality
- Create ensemble domain adaptation method to improve prediction accuracy of high dimensional, neuroscience datasets
- Spearhead collaborations, serve as sole statistician on 3 neuroscience studies and 1 longitudinal clinical study
- Serve as teaching assistant for 4 graduate-level statistics courses

National Institutes of Health — Bethesda, MD
Postbaccalaureate IRTA Research Fellow — Feb 2015-July 2017
- Proposed, designed and conducted a study on dopamine activity in decision-making using electrochemical techniques
- Wrote extensive Python code to analyze data and conducted statistical analyses (e.g., PCA, mixed effects modeling)
- Built data preprocessing and statistical analysis pipelines in Python and R for postdoctoral fellows

Fulbright Fellowship — Kathmandu, Nepal
Research Fellow — Aug 2013-Nov 2014
- Designed research methodology and questionnaire for study of HIV risk among drug users
- Hired, trained and led 3 researchers, using Nepali language skills, to conduct over 700 participant interviews
- Conducted extensive statistical analysis of survey response data (e.g., generalized linear models)
- Secured funding from and submitted final research report to the United Nations Office on Drugs and Crime

Thomas J. Watson Fellowship — Peru, Brazil, Thailand, Vietnam
Research Fellow — Aug 2012-July 2013
- Conducted qualitative research on international treatments for chemical dependence
- Established research contacts in international settings and conducted participant interviews in 3 languages

SELECTED AWARDS, FELLOWSHIPS & GRANTS

- Teaching Award, Department of Biostatistics, Harvard University — May 2022
- Best Abstract Award, Harvard Medical School Computational Data Neuroscience Symposium — Oct 2020
- National Institutes of Health (NIDA) PhD Fellowship: National Research Service Award (F31) — Aug 2020
- Rose Fellowship, Harvard School of Public Health — Nov 2019
- National Institutes of Health Technical Intramural Research Training Award — Feb 2015
- Fulbright Research Fellowship — May 2013
- Thomas J. Watson Fellowship — May 2012
- Amgen Scholarship — Mar 2011
- Claremont Colleges Summer Neuroscience Research Fellowship — Mar 2011

OPEN-SOURCE SOFTWARE

***fastFGEE* | Under Development**
- Developed *fastFGEE* R package for fast functional generalized estimating equations for big datasets. Applies a one-step semi-parametric penalized estimator.

***SeqEx* | Under Development**
- Developed *SeqEx* R package for nonparametric estimation of sequential causal excursion effects (marginal structural models) for sequentially randomized experiments with dynamic treatment regimes/policies.

***fastFMM* | CRAN Package**
- Co-developed the *fastFMM* R (CRAN) package, which implements functional mixed models with general random effects
- Package has over 4,600 downloads

***sMTL* | CRAN Package**
- Co-developed the Sparse Multi-Task Learning package using Mixed Integer Optimization in R (CRAN) and Julia
- Package has over 4,200 downloads and was named one of R View's "Top 40" New R Packages, February 2023

***studyStrap* | CRAN Package**
- Developed the *studyStrap* R (CRAN) package, which implements domain generalization machine learning methods
- Package has over 14,600 downloads and was named one of R View's "Top 40" New R Packages, February 2020

RELEVANT COURSEWORK

Harvard University and MIT
- Statistical Methods I-II, Statistical Inference, Probability, Advanced Regression and Statistical Learning, Machine Learning, Analysis of Multivariate and Longitudinal Data, Bayesian Methodology, Dimension Reduction, Machine Learning through a Modern Optimization Lens, Advanced Optimization, Nonlinear Optimization

SKILLS

- **Relevant Software and Computing:** *R*, *Python*, *Julia*, *LaTex*, High Performance Computing Cluster (*Bash*)
- **Applied Statistics:** Causal Inference, Functional Data Analysis, Cross-Sectional, Longitudinal, Transfer Learning
- **Optimization:** Linear, Non-Linear, and Mixed-Integer Optimization with *Julia JuMP*, *Gurobi*, *MOSEK, CVXR*
- **Languages:** Nepali (advanced), Spanish (intermediate), Portuguese (intermediate)
- **Interests:** Brazilian Jiu Jitsu, Chess, Vipassana Meditation

PUBLICATIONS & MANUSCRIPTS

Statistics & Machine Learning Methodology

Behdin K*, **Loewinger G***, Parmigiani G, Mazumder R (2025). Multi-Task Learning for Sparsity Pattern Heterogeneity: A Discrete Optimization Approach. *arXiv:2212.08697*. *Journal of the Royal Statistical Society B* (To Appear).

Xin A, Cui E, Pereira F, **Loewinger G**. Capturing Instantaneous Neural Signal–Behavior Relationships with Concurrent Functional Mixed Models. *Biorxiv:2025.09.08.671383.*

Loewinger G, Stensrud M, Nayak S, Yaden D, Levis A. Causal Inference in Randomized Studies with Functional Unmasking. *In preparation*.

Loewinger G, Cui E, Levis, A, Pereira F. Fast Penalized Generalized Estimating Equations for Large Longitudinal Functional Datasets. *arXiv:2506.20437*.

Levis A*, **Loewinger G***, Pereira F (2024). Causal Inference in the Closed-Loop: Marginal Structural Models for Sequential Excursion Effects. *NeurIPS*.

Loewinger G*, Levis A*, Pereira, F (2024). Nonparametric causal inference for optogenetics: sequential excursion effects for dynamic regimes. *arXiv:2405.18597*. Major Revisions at *Journal of the American Statistical Association.*

Loewinger G, Cui E, Lovinger D, Pereira, F (2024). A Statistical Framework for Analysis of Trial-Level Temporal Dynamics in Fiber Photometry Experiments. *eLife*.

Loewinger G, Acosta R, Mazumder R, Parmigiani, G (2024). Optimal Ensemble Construction for Multi-Study Prediction with Applications to COVID-19 Excess Mortality Estimation. *Statistics in Medicine.* 43, 1774-1789.

Loewinger G, Patil P, Kishida K, Parmigiani G (2022). Hierarchical Resampling for Bagging in Multi-Study Prediction with Applications to Human Neurochemical Sensing. *Annals of Applied Statistics.* 16, 2145-2165.

Applications

Machen B, Miller S, Xin A, Lampert C, Assaf L, Tucke Jr, Pereira F, **Loewinger G**, Beas S. The encoding of interoceptive-based predictions by the paraventricular nucleus of the thalamus D2+ neurons. *Biorxiv:642469.*

Beas S, Khan I, Gao C, **Loewinger G**, Macdonald E, Bashford A, Rodriguez-Gonzalez S, Pereira F, Penzo M. (2024). Dissociable encoding of motivated behavior by parallel thalamo-striatal projections. *Current Biology. 34*, 1549–1560.

Dafflon J, Moraczewski D, Earl E, Nielson D, **Loewinger G**, McClure P, Thomas A, Pereira F. (2024). Reliability and predictability of phenotype information from functional connectivity in large imaging datasets. *arXiv:2405.00255v1*.

Márquez I, **Loewinger G**, Vargas J, López J, Díaz E, Esber G. Surprise-Induced Enhancements in the Associability of Pavlovian Cues Facilitate Learning across Behavior Systems. *Behavioral Neuroscience*. 136: 285-292.

Rush B, Marcus O, García S, Loizaga-Velder A, **Loewinger G**, Spitalier A, Mendive F (2021). Protocol for Outcome Evaluation of Ayahuasca-Assisted Addiction Treatment: The Case of Takiwasi Center. *Frontiers in Pharmacology, 12*.

Augustin S, **Loewinger G**, O'Neal T, Kravitz A, Lovinger D (2020). Dopamine D2 Receptor Signaling on iMSNs is Required for Initiation and Vigor of Learned Actions. *Neuropsychopharmacology.* 45, 2087–2097.

Johnson K, Voyvodic L, **Loewinger G**, Mateo Y, Lovinger D (2020). Operant Self-Stimulation of Thalamic Terminals in the Dorsomedial Striatum is Constrained by Metabotropic Glutamate Receptor 2. *Neuropsychopharmacology.* 45, 1454–1462.

Loewinger G, Sharma B, Karki D, Khatiwoda P, Kainee S, Poudel K (2016). Low Knowledge and Perceived Hepatitis C Risk Despite High Risk Behaviour among Injection Drug Users in Kathmandu, Nepal. *Int J. of Drug Policy.* 33:75-82.

Loewinger G*, Oleson E*, Cheer J (2013). Using Dopamine Research to Generate Rational Cannabinoid Drug Policy. *Drug Testing and Analysis.* 5(1):22-26.

Wassum K, Ostlund S, **Loewinger G**, Maidment N (2013). Phasic Mesolimbic Dopamine Release Tracks Reward Seeking During Expression of Pavlovian-to-Instrumental Transfer. *Biological Psychiatry.* 73(8):747-755.

Loewinger G, Beckert M, Tejeda H, Cheer J (2011). Methamphetamine-Induced Dopamine Terminal Deficits in the Nucleus Accumbens are Exacerbated by Reward-Associated Cues and Attenuated by CB1 Receptor Antagonism. *Neuropharmacology.* 62(7):2192-2201.

REVIEWER

- Journal of the Royal Statistical Society Series A (JRSSA)
- Journal of the Royal Statistical Society Series C (JRSSC)
- Journal of Business and Economic Statistics (JBES)

PROFESSIONAL REFERENCES

Francisco Pereira, Machine Learning Core Lead
National Institute of Mental Health, NIH
francisco.pereira@nih.gov

Giovanni Parmigiani, Professor
Department of Biostatistics, Harvard School of Public Health
gp@jimmy.harvard.edu

Rahul Mazumder, Professor
Operations Research and Statistics, Massachusetts Institute of Technology
rahulmaz@mit.edu