Daniel J. Eck

Curriculum Vitae

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Experience

2019– **Assistant Professor**, *Department of Statistics, University of Illinois at Urbana-Champaign*.

2017–2019 **Postdoctoral Associate**, *Biostatistics, Yale University*.
Mentor: Forrest W. Crawford

Education

2013–2017 **Ph.D. in Statistics**, *University of Minnesota*.
Advisors: Charles J. Geyer and R. Dennis Cook

2009 **BS in Mathematics**, *Southern Illinois University at Carbondale*, Magna Cum Laude honors.

Research Interests

My recent research is in reliable variance reduction in multivariate settings, inference in evolutionary systems, forecasting in the presence of destabilizing shocks, and sports analytics. My focus is placed on both the theoretical and computational aspects of these methodological projects. To better understand relevant real-world problems, I work closely with scientists and researchers across a variety of disciplines. Writing technical research papers, or an accompanying technical report, that can be understood by the intended scientific audience is central to my research mission.

Specific topics include: parametric and agnostic approaches to inference, asymptotic theory and finite sample properties of estimators, inference in evolutionary systems, maximum likelihood estimation, exponential family theory, generalized linear models, envelope methodology, causal inference, model averaging, bootstrap techniques, infectious disease epidemiology, life history analysis in ecology, design of experiments, physics applications, and baseball

Professional Honors and Recognitions

- 2021 Jack Youden Prize for Best Expository Paper appearing in the 2020 issue of *Technometrics*: **Daniel J. Eck**, R. Dennis Cook, Cristopher J. Nachtsheim, and Thomas A. Albrecht. Dimensional analysis in multivariate design of experiments. *Technometrics*, **62**, 1, 6–20.

Submitted/Working Papers

* - indicates student author.

Daniel J. Eck (2022+). General model-free weighted envelope estimation. Revision requested at *Electronic Journal of Statistics*.
Preprint: `https://arxiv.org/abs/2002.01003`

Daniel J. Eck, Olga Morozova, and Forrest W. Crawford (2022+). Randomization for infectious disease interventions in clustered study populations. Revision requested at *Journal of Mathematical Biology*.
Preprint: `https://arxiv.org/abs/1808.05593`

Ellen S. Fireman, Zachary S. *Donnini, **Daniel J. Eck**, and Michael Weissman (2022+). Are in-person lectures beneficial for all students? A Study of a Large Statistics Class. Submitted.
Preprint: `https://arxiv.org/abs/2101.06755`

*Suyoung Park, Alexander E. Lipka, and **Daniel J. Eck** (2022+). Robust model-based estimation for binary outcomes in genomics studies.
Preprint: `https://arxiv.org/abs/2110.15189`

*Charles Young, David Dalpiaz, and **Daniel J. Eck** (2022+). SEAM methodology for context-rich player matchup evaluations in baseball.
Preprint: `https://arxiv.org/abs/2005.07742`
Website: `https://seam.stat.illinois.edu`

Publications

Journal Publications

12. Georgiana May, Ruth G. Shaw, Charles J. Geyer, and **Daniel J. Eck** (2021+). Do defensive symbionts cause selection for greater pathogen virulence? Accepted at *The American Naturalist*.

11. *Jilei Lin and **Daniel J. Eck** (2021). Minimizing post-shock forecasting error through aggregation of outside information. *International Journal of Forecasting*, **37**, 4, 1710–1727.
Preprint: `https://arxiv.org/abs/2008.11756`

10. **Daniel J. Eck** and Charles J. Geyer (2021). Computationally efficient likelihood inference in exponential families when the maximum likelihood estimator does not exist. *Electronic Journal of Statistics*, **15**(1): 2105–2156. *Preprint*: `https://arxiv.org/abs/1803.11240`

9. **Daniel J. Eck**, R. Dennis Cook, Cristopher J. Nachtsheim, and Thomas A. Albrecht (2020). Dimensional analysis in multivariate design of experiments. *Technometrics*, **62**, 1, 6–20.

8. Si Cheng, **Daniel J. Eck**, and Forrest W. Crawford (2020). Estimating the size of a hidden finite set: large-sample behavior of estimators. *Statistics Surveys*, **14**, 1–31.

7. **Daniel J. Eck**, Charles J. Geyer, and R. Dennis Cook (2020). Combining envelope methodology and aster models for variance reduction in life history analyses. *Statistical Planning and Inference*, **205**, 283–292.

6. **Daniel J. Eck** (2020). Challenging nostalgia and performance metrics in baseball. *CHANCE*, **33**, 1, 16–25.
Shiny app: `https://deck13.shinyapps.io/challenging_baseball_nostalgia/`

5. **Daniel J. Eck** (2018). Bootstrapping for multivariate linear regression models. *Statistics and Probability Letters*, **134**, 141–149.

4. Rickard J. Kohler, Susan A. Arnold, **Daniel J. Eck**, Christopher B Thomson, Matthew A Hunt, G Elizabeth Pluhar (2018). Short-term complications and risk factors in dogs undergoing craniotomy for intracranial neoplasia: 160 cases (2009-2015). *Journal of the American Veterinary Medical Association*, **253**, 12, 1594–1603.

3. **Daniel J. Eck** and R. Dennis Cook (2017). Weighted envelope estimation to handle volatility in model selection. *Biometrika*, **104**, 743–749.

2. **Daniel J. Eck** and Ian W. McKeague (2016). Central limit theorems under additive deformations. *Statistics and Probability Letters*, **118**, 156–162.

1. **Daniel J. Eck**, Ruth G. Shaw, Charles J. Geyer, and Joel G. Kingsolver (2015). An integrated analysis of phenotypic selection on insect body size and development time. *Evolution*, **69**, 2525–2532.

Mainstream Publications

Daniel J. Eck (2020). Challenging WAR and other statistics as era-adjustment tools.
Source: `https://community.fangraphs.com/challenging-war-and-other-statistics-as-era-adjustment-`

Daniel J. Eck with *Charles Young and David Dalpiaz (2020). SEAM Methodology for Player Matchup Evaluations.
Source: `https://community.fangraphs.com/seam-methodology-for-player-matchup-evaluations/`

In Progress

Olga Morozova, **Daniel J. Eck**, and Forrest W. Crawford (2022+). Regression and stratification for contagious outcomes.

*Shen Yan and **Daniel J. Eck** (2022+). The Full House Model with an application on comparing

baseball players across eras.

Technical Reports

Daniel J. Eck and Charles J. Geyer (2021). Computationally efficient likelihood inference in exponential families when the maximum likelihood estimator does not exist. `https://arxiv.org/abs/1803.11240`

Daniel J. Eck and Forrest W. Crawford (2020). Efficient and minimal length parametric conformal prediction regions. *Preprint*: `https://arxiv.org/abs/1905.03657`.

Daniel J. Eck, Ruth G. Shaw, Charles J. Geyer, and Joel G. Kingsolver (2015). Supporting Data Analysis for "An Integrated Analysis of Phenotypic Selection on Insect Body Size and Development Time." Technical Report No. 698. School of Statistics, University of Minnesota. `http://conservancy.umn.edu/handle/11299/172272`

Daniel J. Eck (2015). Supporting Data Analysis for "An Application of Envelope Methodology and Aster Models." Technical Report No. 699. School of Statistics, University of Minnesota. `http://conservancy.umn.edu/handle/11299/178384`

Software

Daniel J. Eck (2018). `R` package **conformal.glm** (Conformal Prediction for Generalized Linear Regression Models). Current version 0.2. `https://github.com/DEck13/conformal.glm`

Charles J. Geyer and **Daniel J. Eck** (2016). `R` package **glmdr** (Exponential Family Generalized Linear Models Done Right). Current version 0.1. `https://github.com/cjgeyer/glmdr`

Daniel J. Eck (2016). `R` package **envlpaster** (envelope estimators of aster model parameters). Current version 0.1-2. `https://cran.r-project.org/web/packages/envlpaster/index.html`

Teaching and Appointments

University of Illinois

Classroom Teaching

Instructor for STAT 528 *Advanced Regression II*.
Spring 2021.

Instructor for STAT 385 *Statistical Programming Methods*.
Spring 2021, Spring 2020, Fall 2019.

University of Minnesota

Classroom Teaching
Instructor for STAT 3011 *Introduction to Statistics*.
Summer 2014, Fall 2013.

Teaching Assistant
TA for STAT 8054 *Advanced Statistical Computing*, Spring 2015.

TA for STAT 8112 *PhD Asymptotic Statistics*, Spring 2015.

TA for STAT 5303 *Masters level Design of Experiments*, Fall 2014.

TA for STAT 3011 *Introduction to Statistics*, Spring 2014.

TA for STAT 5102 *Masters level Statistical Theory*, Spring 2013.

TA for STAT 4101 *Statistical Theory*, Fall 2012.

Research Assistant
Ruth G. Shaw Lab, University of Minnesota, Summer 2016.

Georgiana May, University of Minnesota, Summer 2015.

Consulting
University of Minnesota Statistical Consulting Center, Spring 2016.

Mentoring

PhD Students
David Lundquist 2021-present (primary advisor).
Shen Yan 2020-present (primary advisor).
Yihe Wang 2020-2021 (dissertation committee).

Masters Students
Anurag Anand 2021
Suyoung Park 2020-2021.
Jilei Lin 2019-2021.

Undergraduate Students
Sicong He 2021-present
Julia Wapner 2021-present
Christian Chase 2021-present
Danyu Sun 2020-2021
Charles Young 2019-2020. Current appointment: Houston Astros.

Presentations

"Minimizing post-shock forecasting error through aggregation of outside information"
December 2021: School of Business, University of Kansas.

"Multivariate Design of Experiments for Engineering Dimensional Analysis"
November 2021: Invited talk for the Fall Technical Conference.

"Statistics Demonstration."
October 2021: Long Lab, University of Illinois Urbana-Champaign.

"Challenging nostalgia and performance metrics in baseball."
August 2021: Invited talk for the Chance section at JSM.

"Do defensive symbionts cause selection for greater pathogen virulence? (an aster analysis)"
October 2020: Program of Ecology, Evolution, and Conservation Biology, University of Illinois.

"Model-free Weighted Envelope Methodology"
July 2020: The 4th International Conference on Econometrics and Statistics, Seoul. [Cancelled]

"Computationally efficient likelihood inference in exponential families when the maximum likelihood estimator does not exist"
May 2020: 2020 MEETING OF ISDSA, Notre Dame.

"Efficient and minimal length parametric conformal prediction regions"
December 2019: 12th International Conference of the ERCIM, London.

"Agnostic and parametric approaches to inference: conformal prediction and randomized control trials"
December 2018: Department of Statistics, University of Illinois at Urbana-Champaign.
November 2018: Department of Statistics, Texas A& M University.
October 2018: Department of Biostatistics, Rutgers University.
October 2018: Department of Biostatistics, Indiana University.
September 2018: Crawford Lab, Yale University.

"Weighted Envelope Estimation to Handle Variability in Model Selection"
August 2018: Joint Statistical Meetings, Vancouver.

"Conformal prediction for generalized linear models"
April 2018: Crawford Lab, Yale University.

"Reproducible Research"
November 2017: Crawford Lab, Yale University.

"Maximum Likelihood Estimation in Exponential Families"
May 2017: Student Seminar, University of Minnesota.

"Envelope methodology applied to aster models"
August 2015: Joint Statistical Meetings, Seattle, Washington.

"Central limit theory under additive deformations"
November 2015: Student Seminar, University of Minnesota.

"Enveloping the Aster Model"
October 2015: poster at the ASA Fall Research Conference, Mayo clinic, Rochester, MN.

Service

Departmental

Committees
2021-2022: PhD admissions, Undergraduate research, PhD Qualifying Exam, Undergraduate Research Experience in Statistics (URES), Bohrer workshop
2020-2021: PhD admissions, Curriculum, URES
2019-2020: Seminar chair, PhD admissions, mentor for Illini Analytics

Courses
2020: Developed the STAT 528 course
2019: Revamped the STAT 385 class (with Christopher Kinson)

Field

Junior Liaison Contact, NISS, 2020-

Session organizer for: "Modern Methods for Semi-Parametric Regression", The 32nd New England Statistics Symposium (2018), University of Massachusetts, Amherst.

Reviewer for: *The American Statistician*, *The Annals of Statistics*, *Biometrics*, *Biometrika*, *Econometric Reviews*, *Journal of Official Statistics*, *Journal of the Royal Statistical Society series B*, *Journal of Statistical Planning and Inference*, *Punjab University Journal of Mathematics*, *SIAM/ASA Journal on Uncertainty Quantification*, *Statistica Sinica*, *Statistics and Probability Letters*, *Statistical Science*, *United States Geological Survey*

Community

Volunteer mathematics tutoring through the Hennepin County Library system (2016-2017).

Funded Research

"Understanding Cultural Impacts Through Novel Statistical Methodology," National Science Foundation (MMS), Principal Investigator, under review

Student Awards and Honors

Summer Research Fellowship, 2013. This summer work led to the paper "An Integrated Analysis of Phenotypic Selection on Insect Body Size and Development Time".

Southern Illinois University at Carbondale undergraduate student tuition waiver, a scholarship awarded on the basis of academic achievement.

received Fall 2009, Fall 2008, and Spring 2008.