

Research Statement – John Kolassa

I investigate techniques for inference on small data sets. These techniques include asymptotic methods, and in particular saddlepoint techniques, and the relationship of these techniques to exact inferential techniques and order-restricted techniques.

Salient papers are at <http://stat.rutgers.edu/home/kolassa/SelectedPapers> . Of particular interest are these recent papers:

1. Kolassa, J.E. (2003), Multivariate Saddlepoint Tail Probability Approximations, *Annals of Statistics*, is the first paper to approximate multivariate tail probabilities in dimensions greater than two. Li, J., and Kolassa, J.E. (2010), Multivariate Marginal and Conditional Saddlepoint Tail Probability Approximations, *Bernoulli*, improves upon the previous paper, in the same manner that Lugannani, R., and Rice, S. (1980), *Advances in Applied Probability*, improved on Robinson, J. (1982), *Journal of the Royal Statistical Society Series B*, in the univariate case. Li and Kolassa begin with the integral inverting the multivariate cumulant generating function, and reparameterize the exponent in the integrand to be exactly quadratic. This research was continued with a more recent Ph.D. student, Yaoshi Wu.
2. Kolassa, J.E., and Robinson, J. (2011), *Annals of Statistics* was the first paper to approximate tail probabilities for multivariate likelihood ratio statistics with uniform relative error.
3. Kuffner, T., and Kolassa, J.E. (2020), On the validity of of the Formal Edgeworth Expansion for Posterior Densities, *Annals of Statistics* investigates foundational issues in Edgeworth approximation to posterior distributions.
4. Kolassa, J.E. (2017), Inference in the Presence of Likelihood Monotonicity for Polytomous and Logistic Regression, *Advances in Pure Mathematics*, is the first in a series of two papers, which corrects for infinite parameter estimates in multinomial regression, extending Kolassa, J.E. (1997), *Scand. J. Statist.* The second paper is under review with *Statistics in Medicine*, and was presented at the Third Workshop on Higher Order Asymptotics and Post Selection Inference as a poster, and at the Seventh International Conference on Biostatistics and Bioinformatics as a keynote presentation.

My applied research has most recently included applications in nursing; earlier work included applications in psychiatry, neurology, pulmonology, and criminal justice.

I am a former associate editor for the *Journal of the American Statistical Association*, served as General Methodology Co-Chair for the Joint Statistical Meetings, am currently an editor for the journal *Stat*, an associate editor for *Journal of Biopharmaceutical Statistics*, and am guest-editor for two issues of *Statistical Methods for Biopharmaceutical Research*.

My most recent PhD student, Dewei Zhong, completed his thesis in early October 2020. Dr. Zhong's thesis is primarily concerned with demonstrating accuracy of multivariate tilted bootstrap tests. His thesis also concerns approximation to various topics in multivariate nonparametric analysis, built around two-stage designs for Wilcoxon rank sum testing.

My current NSF-sponsored research agenda applies saddlepoint and other higher-order approximation techniques to the problem of inference after model selection. These activities are synergistic with my leadership helping to organize the four Workshops on Higher-Order and Post-Selection Inference, held at Washington University in St. Louis. I was on the organizing committee for all four of these workshops, and in two of these years this committee

had only two members.

My research is primarily motivated by biostatistical problems. My recent text *Nonparametrics* is an example of my interests. At the request of my editor, this volume represents the curriculum of a traditional MS level course in rank-based and more modern nonparametric methods, but includes asymptotic approaches to power and sample size calculations not found elsewhere either in monographs nor in journal articles. I am co-chair of a recurring biostatistical conference, the Nonclinical Biostatistics conference, held here at Rutgers twice, and to be held virtually in June 2021.

I am a fellow of the American Statistical Association and the Institute for Mathematical Statistics. I am an elected member of the International Statistical Institute. I have served as a grant reviewer for the National Science Foundation, the National Institute of Health, and the GEM Consortium. I was appointed to a three-year term as a grant reviewer for the National Science and Engineering Research Council, one of a very few non-Canadian members on the Probability and Statistics panel. I was invited to serve for an additional year, but had to decline due to a family illness.