

# Jakob R. Jürgens

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**University of Wisconsin-Madison**  
**Department of Economics**

April 18, 2022

Dear Members of the Admissions Committee,

I am writing to express my interest in pursuing a Ph.D. in Economics at the University of Wisconsin-Madison. In 2016, I began studying mathematics at Bonn University, switching to economics the following year to combine a mathematical approach to problem-solving with the study of fascinating questions concerning social interactions. Naturally, I took a keen interest in statistics and econometrics, which evolved into a passion during my master's degree in Bonn. I finished my bachelor's degree in the top 2.5% of my class and am expected to graduate from my master's program in July 2022 with the highest GPA in my graduating class. Since 2016, the German Academic Scholarship Foundation, which supports outstanding students at German universities, has supported my efforts.

My research interests lie in the field of econometrics and mainly consist of three aspects.

First, I am interested in the opportunities that modern computing created in econometrics. This interest began while working as a research assistant for Lena Janys and Joachim Freyberger at Bonn University. My work consists of implementing new statistical methods for simulations, which are run on computing clusters because of their computational scope. For example, in a project by Lena Janys on nonparametric corrections for misspecification in the estimation of hazard functions, I generalized and optimized a multidimensional cross-validation procedure. Because of my contributions, I have been made a coauthor of the corresponding paper, which is in its early stages.

The second aspect is functional data analysis and its applications to economics. Previously, research on functional data analysis was conducted mainly by statisticians, but I believe that it will become increasingly important in econometrics. Because of the emergence of atypical data such as functional, spatial, or network data, object-oriented data analysis and, in particular, functional data analysis could become important tools to understand economic interactions in modern societies. Functional data can already be found in areas such as stock markets, yield curves, or electricity consumption, and I expect it to become more common in the future. A third topic I am interested in is non- and semiparametric statistics. Already more established in econometrics than the previous two, I learned to enjoy the flexibility and distributional agnosticism that methods such as local polynomial regression entail. In the past, I worked on topics from these fields together with Lena Janys and during courses such as Computational Statistics.

Recent examples of independent research are my bachelor's thesis and two term projects. My bachelor's thesis was supervised by Joachim Freyberger and studied multiple testing problems in regression discontinuity estimation. Thus, I devised a Monte Carlo simulation in which I fitted different polynomial models to data under the incorrect assumption of a discontinuity in the data generating process. Testing the corresponding discontinuity estimates revealed that this procedure inflates the family-wise error rate and could thereby contribute to p-hacking. In the final project for Computational Statistics, I compared feature selection methods for random forests and their finite sample properties and biases. Therefore, I analyzed different variable importance measures and permutation tests constructed

based on these. A simulation confirmed known biases and revealed additional problems that can occur when specific importance measures are combined with permutation test frameworks. In Microeconomics, I was chosen in a competitive selection process for a cooperation project with Daimler AG. This project dealt with the identification of abnormal observations in data generated during a production process. I chose an approach based on functional depth measures and created a framework that identifies abnormal observations with a subsampling approach as an analysis of the whole data set was infeasible because of its size.

These projects and an ongoing project on functional linear regression motivated the choice for my master's thesis that I am going to write with Dominik Liebl during the next semester. The thesis will be based on a working paper by Federico Bugni and Joel Horowitz called "Permutation Tests for Equality of Distributions of Functional Data" and will combine my previous experience with functional data and permutation tests.

In the future, I want to work in the field of econometrics. Specifically, I would like to explore the statistical methods in non- and semiparametric statistics and functional data analysis that became computationally feasible in the last years and their applications in economics. Pursuing a Ph.D. in Economics would allow me to look at all facets of these developments — theory, implementation, and application — while improving my understanding of the underlying economic questions. This passion for econometrics is my primary motivation to pursue a Ph.D.

The University of Wisconsin-Madison would be a great place to work towards that dream because of multiple factors. First, the work of econometricians such as Harold D. Chiang on nonparametric and machine learning methods or Xiaoxia Shi on model selection in non- and semiparametric models is close to the topics I want to work on and could lead to opportunities for research on shared interests. On a more personal note, I would be excited to study under Bruce Hansen as his books have influenced my academic journey at almost all stages. As I would choose econometrics as my doctoral field of study, a second aspect would be cooperations with the Department of Statistics, such as courses in Mathematical Statistics. As I want to concentrate on the applications of statistics in economics, these courses could greatly enrich the experience of pursuing a Ph.D. Additionally, these cooperations could help facilitate interdisciplinary projects, which I hope to become a part of in the future. Third, the environment created by the strong econometrics group at the University of Wisconsin-Madison, manifesting in events such as the Juli Plant Grainger Econometrics Workshop, would be perfect to become part of research at the forefront of econometrics. Therefore, I would be very excited to continue my academic journey at the University of Wisconsin-Madison.

Thank you for considering my application.

Sincerely,

Jakob R. Jürgens