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University of Illinois at Urbana-Champaign
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EDUCATION

Sep 2013 – Present	**University of Illinois**, Ph.D. in Economics, expected 2019 **Committee:** Roger Koenker (Chair), Anil Bera, Minchul Shin, JiHyung Lee
Sep 2011 – May 2013	**University of Missouri**, M.A. Economics
Sep 2007 – May 2011	**University of Iowa**, B.S. Economics, B.S. Mathematics, B.A. International Studies

RESEARCH INTERESTS

Nonparametric Econometrics, Applied Microeconomics, Industrial Organization

WORKING PAPERS

Job Market Paper: Shape Constrained Density Estimation Via Optimal Transport

The Health Effects of Having A Third Child (joint with Elizabeth Powers)

A Nonparametric Modal Regression

RESEARCH

Jan 2017 – May 2017	**Research Assistant** to Roger Koenker
Sep 2017 – Present	**Research Assistant** to Chen Yeh

TEACHING

University of Illinois:

Sep 2017 – Present	**Intermediate Microeconomics** (Undergraduate) Teaching Assistant
Fall Semesters 2014 – 2016	**Microeconomics** (Graduate) Assistant Instructor
Spring Semesters 2015 – 2016	**Econometric Analysis II** (Ph.D.) Teaching Assistant

University of Missouri

Sep 2011 – May 2012	**Principles of Microeconomics** (Undergraduate) Teaching Assistant
Sep 2012 – May 2013	**Principles of Microeconomics** (Undergraduate) Head Teaching Assistant

AWARDS / SCHOLARSHIPS

Summers of 2015 – 2016	Summer Research Fellowship, University of Illinois
Fall 2014, Fall 2015, and Spring 2016	List of Teachers ranked as Excellent, University of Illinois
Sep 2013 – May 2014	Economics Department Fellowship, University of Illinois
Sep 2011 – May 2013	Clay Anderson Jr. Memorial Scholarship, University of Missouri

PERSONAL INFORMATION

Languages: English

Programming Languages: R, Python, Mathematica, Matlab

Gender: Male

Citizenship: United States

REFERENCES

Roger Koenker (Chair)
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Shape Constrained Density Estimation Via Optimal Transport:

Constraining the maximum likelihood estimator to satisfy a sufficiently strong constraint, log-concavity being a common example, has the effect of restoring consistency without requiring additional parameters. Since many results in economics require densities to satisfy a shape constraint, these estimators are also attractive for the structural estimation of economic models. In all the examples provided by Bagnoli and Bergstrom (2005) and Ewerhart (2013), log-concavity is sufficient to ensure that the density satisfies the required conditions. However, in many cases log-concavity is far from necessary, and it has the unfortunate side effect of ruling out sub-exponential tail behavior.

In this paper, we use optimal transport to formulate a shape constrained density estimator. We initially describe the estimator using a ρ-concavity constraint. In this setting we provide results on consistency, asymptotic distribution, convexity of the optimization problem defining the estimator, and formulate a test for the null hypothesis that the population density satisfies a shape constraint. Afterward, we provide sufficient conditions for these results to hold using an arbitrary shape constraint. This generalization is used to explore whether the California Department of Transportation's decision to award construction contracts with the use of a first price auction is cost minimizing. We estimate the marginal costs of construction firms subject to Myerson's (1981) regularity condition, which is a requirement for the first price reverse auction to be cost minimizing. The proposed test fails to reject that the regularity condition is satisfied.

A Nonparametric Modal Regression:

We propose a nonparametric estimator of the mode of a dependent variable conditional on covariates, or a modal regression. Methods from graph theory are used to provide a consistency result and a computationally efficient algorithm. We then apply the regression to a dataset from the Office of Undergraduate Admissions at the University of Illinois at Urbana-Champaign (UIUC) that consists of UIUC GPA, high school GPA, and the ACT scores for all UIUC undergraduate students from 2000 to 2010. There are three primary advantages of the proposed estimator. First, given a dataset consisting of n observations, the proposed algorithm has a worst-case time complexity of $O(n^2)$. We also provide a generalization of this algorithm that calculates an approximation of the regression at a strictly faster rate, which depends on the desired level of accuracy of the approximation. This approximation converges to the proposed estimator with probability one as n diverges, and, since it simply adds a constraint on the distance between subsequent points in the paths, it is itself a reasonable estimate of the mode. Second, the accuracy of the method compares favorably to the classic methods when the modal regression and the value of the joint density along the regression are both nonlinear. Third, when the conditional mode can be expressed as a function of the covariates, the estimator does not require the specification of smoothing parameters.