Max Vilgalys

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Education

Massachusetts Institute of Technology 2017-2022
PhD, Social and Engineering Systems
Committee: Jing Li, Namrata Kala, Whitney Newey
Dissertation: Essays on Measuring Climate Change Damages and Adaptation
Fields: Energy and environmental economics, nonparametric statistics, structural econometrics, machine learning, industrial organization

Stanford University 2013-2017
B.S. in Electrical Engineering, with minor in German Studies
Stanford in Berlin, Fall 2015; Stanford in Washington, DC, Spring 2016

Experience

Research Assistant for Prof. Nikhil Agarwal	2020-2021
Research Assistant for Prof. Jing Li	2019-2020
Research Assistant for Prof. Dava Newman	2018
Data Analyst Intern, Western Interstate Energy Board, Denver, CO	2017
Software Development Intern, Lichtblick Renewable Energy, Hamburg	2016
Policy Intern, U.S. Department of Energy, Washington, D.C.	2016

Research

Estimating Continuous Treatment Effects in Panel Data using Machine Learning with an Agricultural Application (with Sylvia Klosin,2022)
This paper introduces and proves asymptotic normality for a new semi-parametric estimator of continuous treatment effects in panel data. Specifically, we estimate an average derivative of the regression function. Our estimator uses the panel structure of data to account for unobservable time-invariant heterogeneity and machine learning methods to flexibly estimate functions of high-dimensional inputs. We construct our estimator using tools from double de-biased machine learning (DML) literature. We show the performance of our method in Monte Carlo simulations and also apply our estimator to real-world data and measure the impact of extreme heat in United States (U.S.) agriculture. We use the estimator on a county-level dataset of corn yields and weather variation, measuring the elasticity of yield with respect to a marginal increase in extreme heat exposure. The difference between the estimates from OLS and our method is statistically and economically significant. We find that damages from extreme heat will correspond to an additional $1.18 billion in annual damages by the year 2050 under median climate scenarios. We find little evidence that this elasticity is changing over time.

A Machine Learning Approach to Measuring Climate Adaptation (2022)
I measure adaptation to climate change by comparing elasticities from short-run and long-run changes in damaging weather. I propose a debiased machine learning approach to flexibly measure these elasticities in panel settings. In a simulation exercise, I show that debiased machine learning has considerable benefits relative to standard machine learning or ordinary least squares, particularly in high-dimensional settings. I then measure adaptation to damaging heat exposure in United States corn and soy production. Using rich sets of temperature and precipitation variation, I find evidence that short-run impacts from damaging heat are significantly offset in the long run. I show that this is because the impacts of long-run changes in heat exposure do not follow the same functional form as short-run shocks to heat exposure.

Prepared for oral qualifying exams, June 2020. Presented at Harvard Environmental and Energy Economics Workshop (Fall 2021), MIT Social and Engineering Systems Seminar (Spring 2020)

Equity and Adaptation to Wildfire Risk: Evidence from California Public Safety Power Shutoffs (2022)
In the past decade, California investor-owned electric utilities have begun implementing Public Safety Power Shutoffs (PSPS) as part of their effort to adapt to increasing risk of catastrophic wildfires. I examine the extent that these decisions are correlated with two measures of community vulnerability: health risk factors and socioeconomic status (SES). I first construct a dataset linking weather, vulnerability indices, and PSPS decisions for electric circuits in California's three largest investor-owned utilities. I show that PSPS is used more frequently in circuits with lower average SES among two of California's major utilities, and circuits with higher average health risk in one of the major utilities. To focus on utilities' decisions, rather than other sources of inequality that may place vulnerable communities in areas with higher wildfire risk, I repeat this analysis after controlling for weather variation. The results are qualitatively similar. I then model the utility's decision problem, as reported in regulatory filings, and measure which components of the model may be responsible for the PSPS decisions. After controlling for weather variation, I find that ignitions are more frequent in low-SES circuits and in lower health risk circuits for one utility. I cannot reject that utilities' estimated costs from declaring PSPS shutoffs or expected damages from wildfires are equitably distributed.
Presented at Harvard Environmental and Energy Economics Workshop (Spring 2022)

The Changing Role of Coal-fired Generation in the Western Interconnection (2017; with Maury Galbraith, Dian Grueneich, and Ben Lim)
Electric system operators have provided anecdotal evidence that in the 21st century, coal-fired generation is transitioning from providing baseload power to meeting demand more flexibly. We support these claims with an analysis of coal plant generation schedules in the American West. Using a nonparametric clustering algorithm on hourly emissions data from the EPA, we demonstrate that baseload operation in coal plants in the Western Interconnection decreased from 52% of operating days in 2000 to only 22% of operating days in 2016, and that the number of coal plants that spent the majority of their operating days providing baseload power declined over 75% over the same period.
Work completed at the Western Interstate Energy Board, 2017.
Presentation available here: https://westernenergyboard.org/2017/08/wieb-webinar-on-the-role-of-coal-in-the-west/

Teaching

TA for 17.310, Science, Technology and Public Policy	2022
TA for IDS.131 and IDS.131X, Statistics, Computation and Applications	2021
TA for 6.431X, Probability	2020
Tutor in Probability and Statistics, Stanford Office of Accessible Education	2016-2017

Fellowships

MIT Center for International Studies Summer Study Fellowship	2021
U.C. Berkeley/Sloan Summer School in Environmental and Energy Economics Diversity Fellowship	2020
MIT Exxon Mobil Energy Fellow	2019-2020
MIT Presidential Fellow	2017-2018

Service

Organizing Committee, IDSS Graduate Application Assistance Program	2020-2021
Leadership Committee, MIT Energy for Human Development	2018-2020
SES Student Representative, IDSS Student Council	2018-2019

Citizenship	U.S., Germany
Languages	English (native), German (conversational)
Coding	Python, MATLAB, Julia, Stata, C#/C/C++