Max Vilgalys

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Education

Massachusetts Institute of Technology — 2017-
PhD, Social and Engineering Systems
Dissertation: Flexible Measurement of Adaptation to Climate Change
Fields: Energy and environmental economics, nonparametric statistics, structural econometrics, 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

Double Machine Learning for Continuous Treatment Effects in Panel Data: An Application to Extreme Heat in Agriculture (with Sylvia Klosin, in progress)
This paper introduces and proves asymptotic normality for a new semi-parametric estimator of continuous treatment effects in panel data. Specifically, we estimate a weighted average derivative of the regression function, or the average causal effect of a marginal increase in treatment. Our estimator uses the panel structure of data to account for unobservable time invariant heterogeneity and machine learning methods to estimate functions of high-dimensional inputs flexibly. We use tools from double debiased machine learning (DML) and automatic double machine learning (ADML) literature to construct our estimator. This estimator is helpful for many questions in climate policy, where it's crucial to measure the economic impacts of weather while accounting for unobservable spatial factors and without imposing strong parametric restrictions. We demonstrate the performance of our estimator in a simulation exercise. We then apply our estimator to study the elasticity of crop yield with respect to extreme heat in the United States.

Measuring Climate Adaptation with Weather-Added Production Functions (with Jing Li, in progress)
Adaptation to climate change is key to reducing overall damages from climate change. Consequently, measuring the degree of adaptation is important for forecasting damages and informing policy. Recent empirical work has largely focused on the extent that such adaptation exists. We introduce a novel approach to decompose overall adaptation to climate change, using a modified Olley-Pakes production function. We show that this production function is nonparametrically identified with standard assumptions and exogenous weather variation. This is an early stage project and we do not yet have empirical results. However, we introduce the likely setting for future work: adaptation to extreme heat among Indonesian farmers.
Presented at Harvard Environmental and Energy Economics Workshop (Spring 2022, scheduled), MIT Industrial Organization Lunch (Spring 2022)

A Machine Learning Approach to Measuring Climate Adaptation (2020; revision in progress)

We introduce a method to estimate the degree of adaptation to climate change in agriculture using a flexible machine learning estimator of average partial derivatives. We follow recent work in economics and define adaptation as the share of short-run damages from extreme weather that are offset over longer exposure. This definition involves comparing a parameter from a simple functional form; we generalize this parameter to an average partial derivative of a general function of high-dimensional variation. We then introduce a machine learning approach to measure this target without imposing parametric functional form, accounting for persistent unobservable heterogeneity. We show via a simulation exercise that this method is able to out-perform linear models in recovering true parameters, particulary when the true parameter is a funciton of many variables. We then use this estimator to measure the extent of adaptation to extreme heat in United States corn and soy production, and find similar results to those from a commonly used linear specification.
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)

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++	