# Program Evaluation with Remotely Sensed Variables

## Davide Viviano

(Harvard University)

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Department of Statistics, Ludwigstr. 33, Room 144
and online via Zoom ([Link](Link))
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Economists often estimate treatment effects in experiments using remotely sensed variables (RSVs), e.g., satellite images or mobile phone activity, in place of directly measured economic outcomes. A common practice is to use an observational sample to train a predictor of the economic outcome from the RSV, and then use these predictions as the outcomes in the experiment. We show that this method is biased whenever the RSV is a post-outcome variable, meaning that variation in the economic outcome causes variation in the RSV. For example, changes in poverty or environmental quality cause changes in satellite images, but not vice versa. As our main result, we nonparametrically identify the treatment effect by formalizing the intuition underlying common practice: the conditional distribution of the RSV given the outcome and treatment is stable across samples. Our identifying formula reveals that efficient inference requires predictions of three quantities from the RSV—the outcome, treatment, and sample indicator—whereas common practice only predicts the outcome. Valid inference does not require any rate conditions on RSV predictions, justifying the use of complex deep learning algorithms with unknown statistical properties. We reanalyze the effect of an anti-poverty program in India using satellite images.

**About the Speaker:**
Davide Viviano is an Assistant Professor at the Department of Economics at Harvard. His research combines economics and data science to develop or justify statistical methods for social-science applications, with a focus on policy design and causal inference. Before joining Harvard, he spent a year at Stanford GSB as a post-doctoral fellow sponsored by Guido Imbens. He received my Ph.D. from the Department of Economics at UC San Diego and a Master's in Data Science from Pompeu Fabra.

**References:**
Rambachan, A., Singh, R., & Viviano, D. (2025). Program evaluation with remotely sensed outcomes. arXiv preprint [https://arxiv.org/abs/2411.10959]