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Macroeconomic Analysis in the Machine Learning Era

This talk summarizes recent usages of machine learning for key macroeconomic problems such as characterizing core inflation, flexibly capturing time-varying macroeconomic relationships, and evaluating the strength of the Phillips curve.

First, we introduce the Assemblage Regression, a generalized nonnegative ridge regression problem that optimizes the price index's subcomponent weights such that the core series is maximally predictive of future headline inflation. Ordering subcomponents according to their rank in each period switches the algorithm to be learning supervised trimmed inflation — or, put differently, the maximally forward-looking summary statistic of the realized price changes distribution.

Second, we develop Macroeconomic Random Forest (MRF), an algorithm adapting the canonical Machine Learning (ML) tool to flexibly model evolving parameters in a linear macro equation. Its main output, Generalized Time-Varying Parameters (GTVPs), is a versatile device nesting many popular nonlinearities (threshold/switching, smooth transition, structural breaks/change) and allowing for sophisticated new ones. Unlike most ML-based methods, MRF is directly interpretable – via its GTVPs.

Third, we design a Hemisphere Neural Network (HNN) whose peculiar architecture yields a final layer where components can be interpreted as latent states within a Neural Phillips Curve. There are benefits. First, HNN conducts the supervised estimation of nonlinearities that arise when translating a high-dimensional set of observed regressors into latent states. Second, computations are fast. Lastly, forecasts are economically interpretable. Among other findings, the contribution of real activity to inflation appears severely underestimated in traditional *linear* econometric specifications.