Title: Opening the black box: Explainable AI for Deeper energy sa

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Abstract: Regression model interpretability is essential in regulated environments such as energy efficiency. This restricts the use of un-interpretable, black box machine learning strategies like gradient-boosted regression trees, even though they significantly outperform ordinary least squares regression methods on hourly or 15-minute interval data. Explainable artificial intelligence (XAI) methods promise the best of both worlds: highly accurate and interpretable models.

To determine if XAI can make advanced regression models accessible to energy analysts, facility managers, and regulators, this paper explores their use with gradient-boosted regression trees for building energy models, using data from several large grocery stores in the American Northeast. The authors convened focus groups to evaluate different XAI charts to determine which visualizations effectively communicate energy modeling results to energy efficiency utility staff and customers. The paper highlights potential pitfalls in using XAI methods and provides recommendations and a list of best practices for using XAI for communicating model results to stakeholders—to drive wider adoption of these methods. The analysis team has found that the promise of XAI for energy efficiency is real, and recommends ways to assess XAI feasibility for use with energy efficiency programs.