Which variables provide independent information about the cross-section of future returns? Portfolio sorts and Fama-MacBeth regressions cannot easily answer this question when the number of candidate variables is large and when cross-terms might be important. We introduce a new method based on regression trees in the machine learning literature that can be used in this context. Applying the method to past-return-based prediction of future returns, short-term returns become the most important predictors. A trading strategy based on our findings has an information ratio twice as high as a Fama-MacBeth regression accounting for two-way interactions. Transaction costs do not explain the results.