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“Almost Matching Exactly for Observational Causal Inference”

Abstract: I will present an approach that aims to match a current situation with almost identical situations from the past, in order to use these past situations to predict the future. This approach has proven invaluable in the study of complex systems where causal effects can easily be confused with correlations. The matching framework I will present, called Almost Matching Exactly, is useful for causal inference in the potential outcomes setting. This framework has several important elements: (1) Its algorithms create matched groups that are interpretable. The goal is to match treatment and control units as closely as possible, or "almost exactly." (2) Its algorithms create accurate estimates of individual treatment effects. This is because we use machine learning on a separate training set to learn which features are important for matching. Variables that are important are “stretched” so that the matched groups agree closely on these variables. (3) Our methods are fast and scalable. In summary, these methods rival black box machine learning methods in their treatment effect estimation accuracy but have the benefit of being interpretable and easier to troubleshoot. Our lab website is here: <https://almost-matching-exactly.github.io>

Biosketch: Cynthia Rudin is a professor of computer science, electrical and computer engineering, statistical science, and biostatistics & bioinformatics at Duke University. She directs the Interpretable Machine Learning Lab, whose goal is to design predictive models with reasoning processes that are understandable to humans. Her lab applies machine learning in many areas, such as healthcare, criminal justice, and energy reliability. She holds an undergraduate degree from the University at Buffalo, and a PhD from Princeton University. She is the recipient of the 2021 Squirrel AI Award for Artificial Intelligence for the Benefit of Humanity from the Association for the Advancement of Artificial Intelligence (the "Nobel Prize of AI"). She is a fellow of the American Statistical Association and a fellow of the Institute of Mathematical Statistics. Her work has been featured in many news outlets including the NY Times, Washington Post, Wall Street Journal, and Boston Globe.