

Application of Machine Learning for Policy Evaluation

MATH 818.01 Midterm Survey

Wonjun Choi

Abstract

This paper surveys recent applications of machine learning(ML) methods in economics and policy evaluation literature. Typical approaches in economics are briefly introduced and recent literatures on the application of ML follow. Suggestions for the final project is given in the final section as well.

1 Introduction

2 Problem at Hand in Policy Evaluation

Before we begin, I introduce typical approaches in economics for policy evaluation.

About causality.

Potential Outcome Framework

2-3 paragraphs

Matching and Propensity Score

2-3 paragraphs.

3 Probabilistic Models in AI/ML

Classification: Tree, SVM, NN, etc...

4 Challenges in Applying AI/ML

Interpretation of parameter

Bias Variance Trade-off

5 Machine Learning Literatures in Economics

Tree related methods: Causal Tree/Forest, Generalized Random Forest - Unbiased for various outcome variable(by modification of the loss function)

DeepIV

Contextual bandit and policy learning: I find this topic very interesting... survey topic or final project may change.

Double Machine Learning

6 Conclusion

Conclusion

Final project

References

- [BBZ16] Imre Bárány, Pavle V. M. Blagojević, and Günter M. Ziegler. Tverberg’s theorem at 50: extensions and counterexamples. *Notices Amer. Math. Soc.*, 63(7):732–739, 2016.
- [Bir59] B. J. Birch. On $3N$ points in a plane. *Proc. Cambridge Philos. Soc.*, 55:289–293, 1959.
- [BZ17] Pavle V. M. Blagojević and Günter M. Ziegler. Beyond the Borsuk-Ulam theorem: the topological Tverberg story. In *A journey through discrete mathematics*, pages 273–341. Springer, Cham, 2017.
- [DLGMM17] Jesus A De Loera, Xavier Goaoc, Frédéric Meunier, and Nabil Mustafa. The discrete yet ubiquitous theorems of Carathéodory, Helly, Sperner, Tucker, and Tverberg. *arXiv preprint arXiv:1706.05975*, 2017.
- [Eck79] Jürgen Eckhoff. Radon’s theorem revisited. In *Contributions to geometry (Proc. Geom. Sympos., Siegen, 1978)*, pages 164–185. Birkhäuser, Basel-Boston, Mass., 1979.
- [Eck93] Jürgen Eckhoff. Helly, Radon, and Carathéodory type theorems. In *Handbook of convex geometry, Vol. A, B*, pages 389–448. North-Holland, Amsterdam, 1993.
- [Mat02] Jiří Matoušek. *Lectures on discrete geometry*, volume 212 of *Graduate Texts in Mathematics*. Springer-Verlag, New York, 2002.
- [Rad21] Johann Radon. Mengen konvexer Körper, die einen gemeinsamen Punkt enthalten. *Math. Ann.*, 83(1-2):113–115, 1921.
- [Tve66] H. Tverberg. A generalization of Radon’s theorem. *J. London Math. Soc.*, 41:123–128, 1966.

- [Tve01] Helge Tverberg. A combinatorial mathematician in Norway: some personal reflections. *Discrete Math.*, 241(1-3):11–22, 2001. Selected papers in honor of Helge Tverberg.