Machine Learning for econometrics

Flexible models for tabular data

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Reminder from previous session

- Statistical learning 101: bias-variance trade-off
- Regularization for linear models: Lasso, Ridge, Elastic Net
- Transformation of variables: polynomial regression
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- 🤔 But… How to select the best model? the best hyperparameters?

Table of contents

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Model evaluation and selection with cross-validation

Model evaluation: example

- We saw the importance to split the data into training and testing sets.

Tree, random forests and boosting

Random Forests for predictive inference

Boosting

Ensemble models

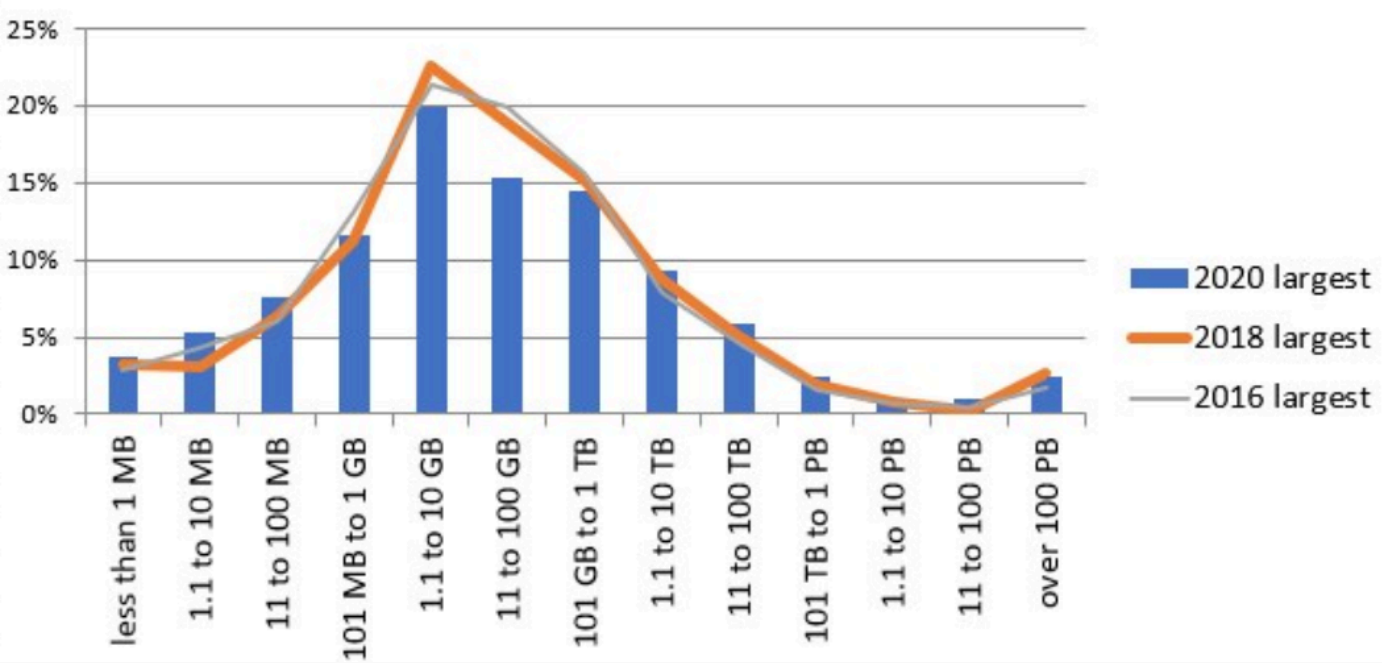
A word on other families of models

Why not use deep learning everywhere?

- Success of deep learning in image, speech recognition and text
- Why not so used in economics?

Limited data settings

- Typically in economics everywhere, we have a limited number of observations

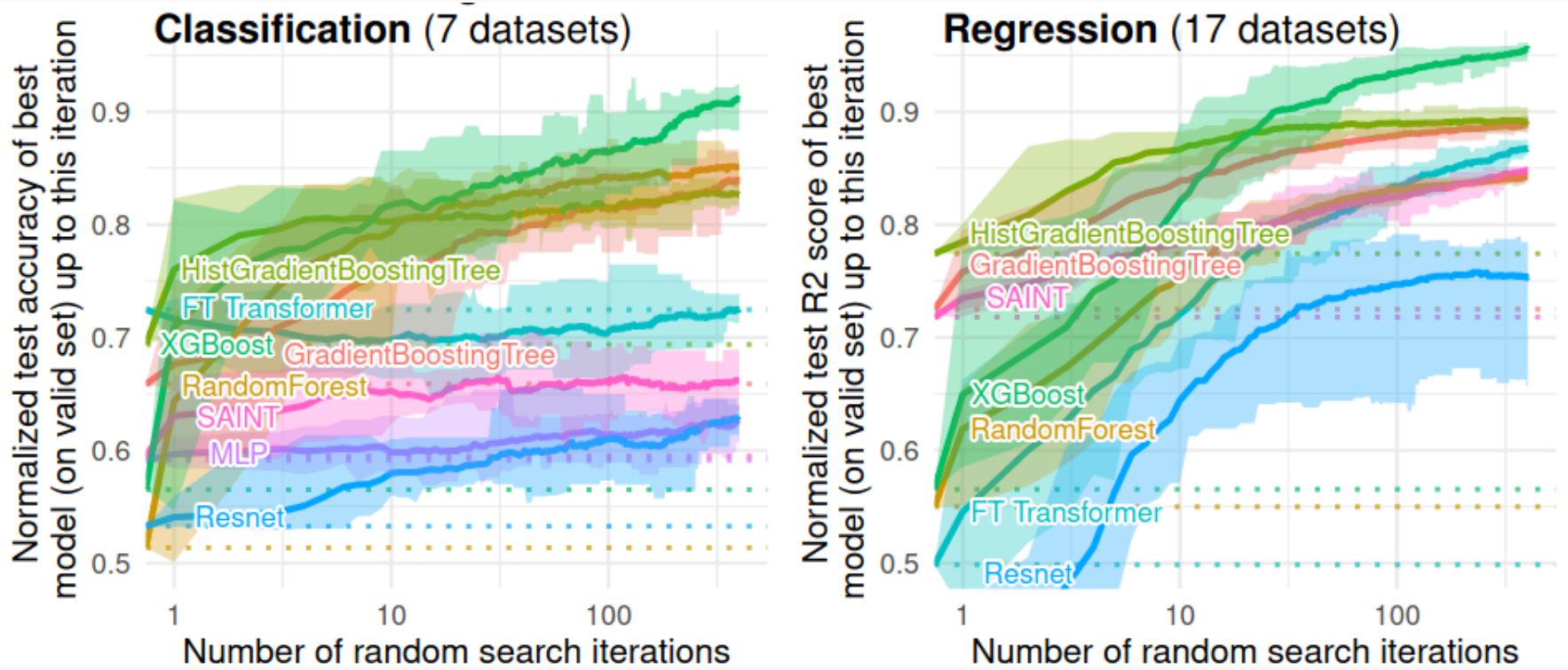


Typical dataset are mid-sized. This does not change with time.[1]

[1] https://www.kdnuggets.com/2020/07/poll-largest-dataset-analyzed-results.html

Deep learning underperforms on data tables

Tree-based methods outperform tailored deep learning architectures (Grinsztajn et al., 2022)



DAG for a RCT: the treatment is independent of the confounders

Other well known families of models

- Generalized linear models:
- Support vector machines:
- Gaussian processes:

Bibliography

Grinsztajn, L., Oyallon, E., & Varoquaux, G. (2022). Why do tree-based models still outperform deep learning on typical tabular data?. Advances in Neural Information Processing Systems, 35, 507–520.