

SHAP in R

github.com/mayer79/demo_shapviz

Miami House Prices

Data

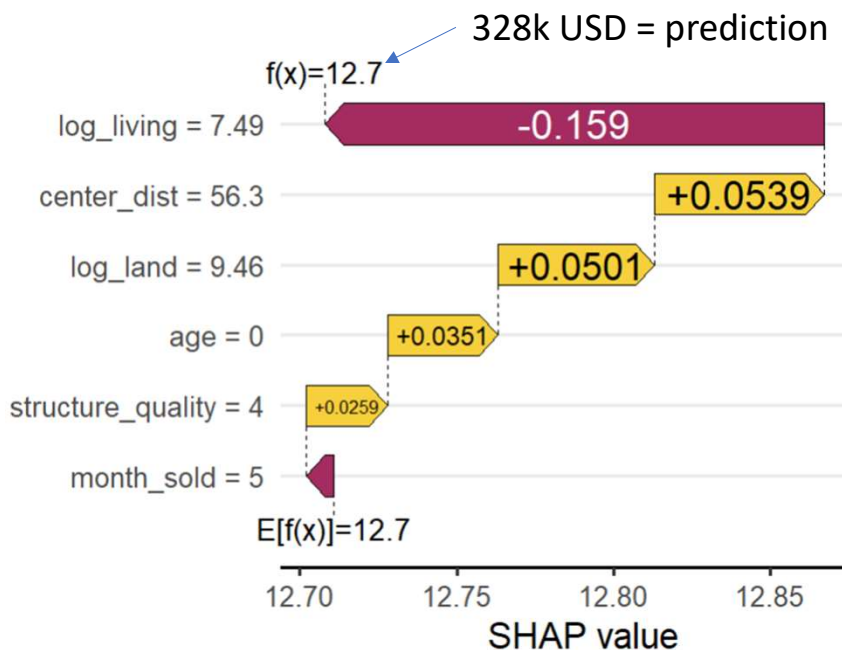
- 14k observations
- Response: $\log(\text{price})$
- Features we will use:
 - center_dist
 - log_living
 - log_land
 - structure_quality
 - age
 - month_sold

Model

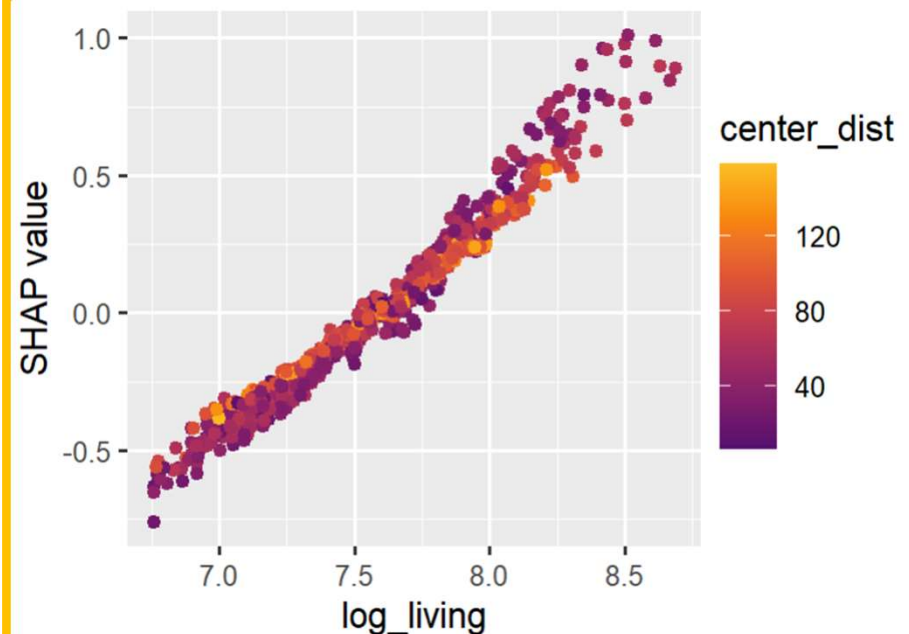
- XGBoost
- 80% training rows
- 20% validation
- Squared error loss
- Could be improved

SHapley Additive exPlanations (Lundberg-Lee, 2017)

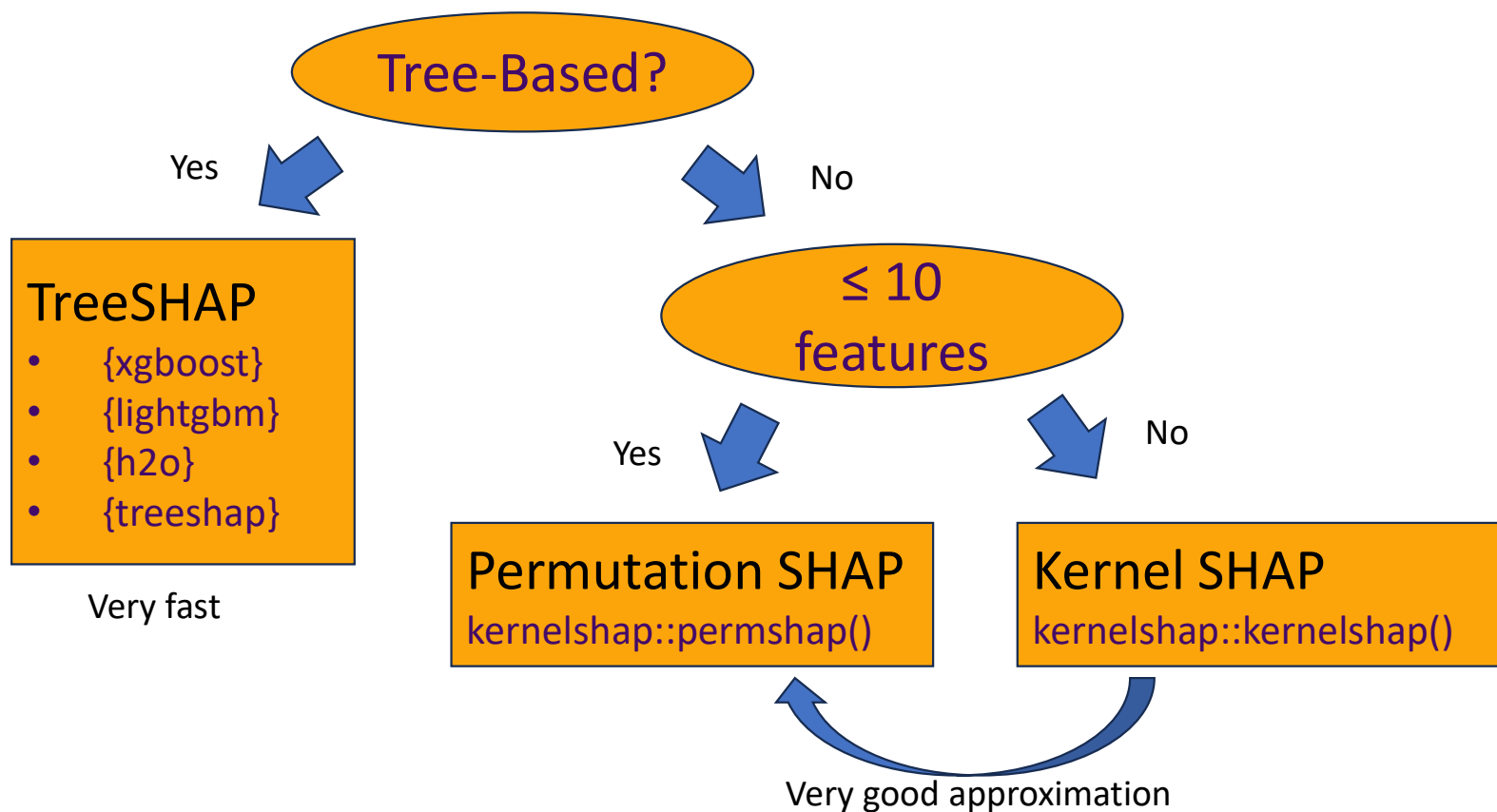
Decompose prediction fairly into contributions of the features



Repeat for many predictions to describe model

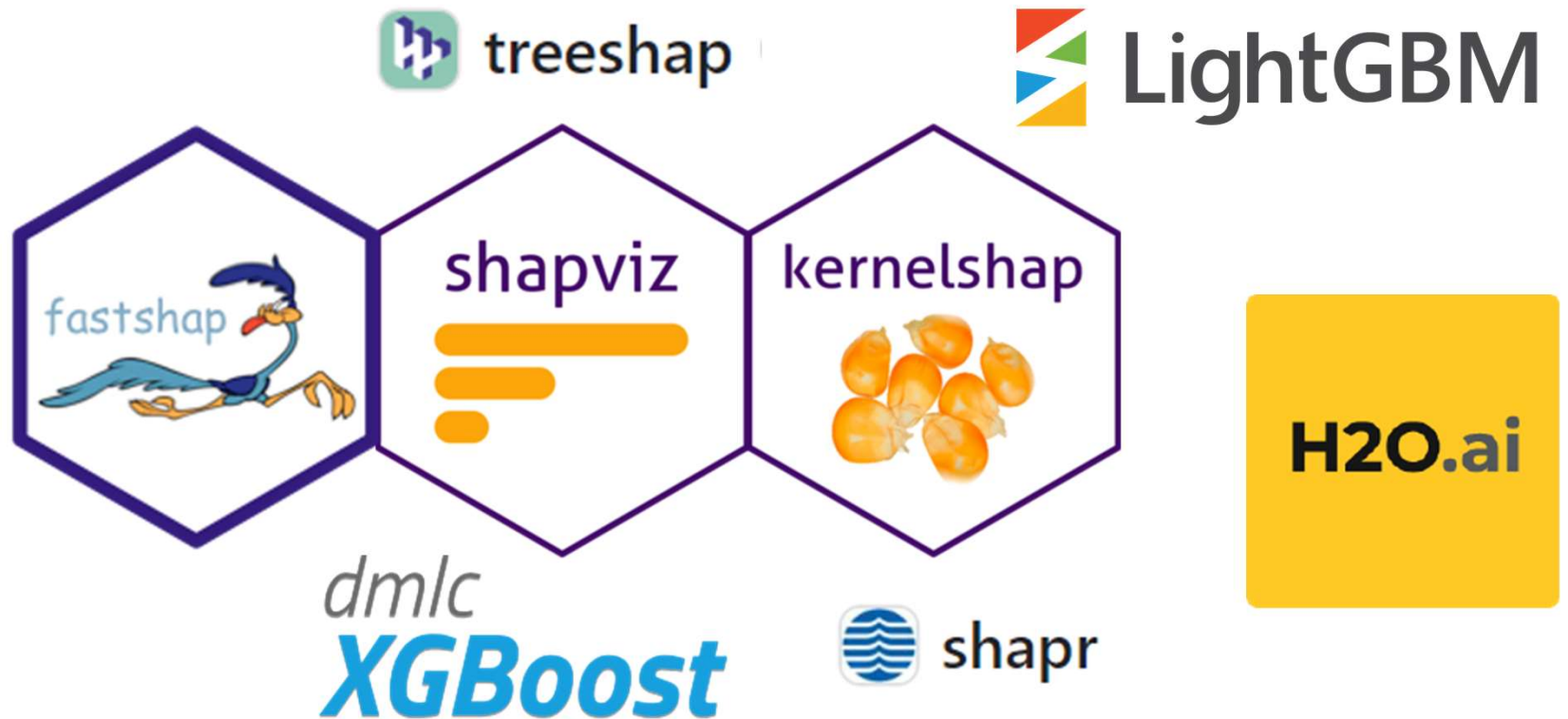


Three Algorithms to Crunch SHAP Values



~~One Ring to Rule them all~~

One Package to Plot them all: {shapviz}



{shapviz} API

data.frame-like with feature values

1. Initialize «shapviz» object

```
shap_values <- shapviz(object, X, ...)
```

- 1. Matrix of SHAP values
- 2. **Model:** XGBoost/LightGBM/h2o-Booster, needs also `X_pred`
- 3. **Output of** {kernelshap}, {fastshap}, {treeshap}, {shapr}, ...

2. Use plot functions (ggplot2)

- `sv_importance(shap_values, ...)`
- `sv_dependence(shap_values, v = «carat»)`
- ...

Demo in R

https://github.com/mayer79/demo_shapviz

Things to Explore

- SHAP interactions
- Multivariate output (e.g., multi-class classification)
- How do TreeSHAP, Permutation SHAP, Kernel SHAP work?
- Feature construction is relevant: not too correlated features!

A SHAP analysis is as good or bad as your model!

Questions?

Resources

- Slides and demo: https://github.com/mayer79/demo_shapviz
- {shapviz}: <https://github.com/ModelOriented/shapviz>
- {kernelshap}: <https://github.com/ModelOriented/kernelshap>
- Python: <https://github.com/shap/shap>
- Theory and code in R and Python:
SHAP for Actuaries: Explain any Model (2023)
Michael Mayer, Daniel Meier, and Mario V. Wüthrich
<http://dx.doi.org/10.2139/ssrn.4389797>
- Original SHAP paper:
A unified approach to interpreting model predictions (2017)
Scott Lundberg and Su-In Lee
NIPS'17: Proceedings of the 31st International Conference on Neural Information Processing Systems