



Story House Sale Prices: eXplainable predictions for house sale

PIOTR GRAŻKA, ANNA KOZAK, PAWEŁ WICHEREK

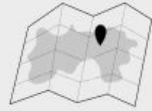
MENTORS: MATEUSZ ZAWISZA, ADAM ZMACZYŃSKI

Take away messages



Glass-box + black-box.

In this work, we use econometric and machine learning models.



The geographical location of the property has a significant impact on the price.

Both linear and machine learning models indicate the importance of variables describing position.



The apartment area of the property has a significant impact on the price.

Both linear and machine learning models indicate the importance of variables describing apartment area.



XAI from global to local.

We start with global model assessment, to be divided into smaller parts with each step.



New possibilities with PDP.

We introduce new possibilities using Partial Dependence Profiles (PDP) such as confidence intervals or comparing PDP with Accumulated Local Effects (ALE) profiles.

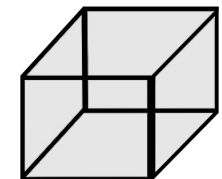
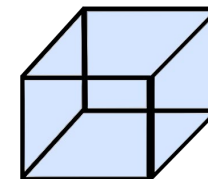
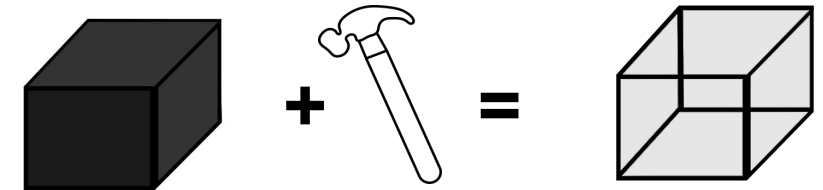
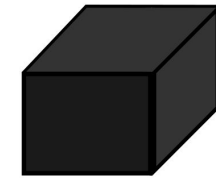
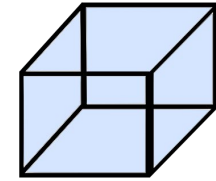


Use case for seller.

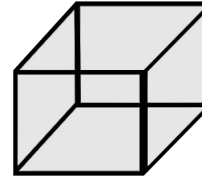
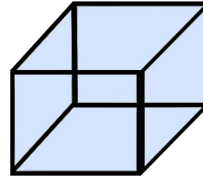
We show how XAI methods can be used to increase or predict the price of the property.

Problem solving strategy

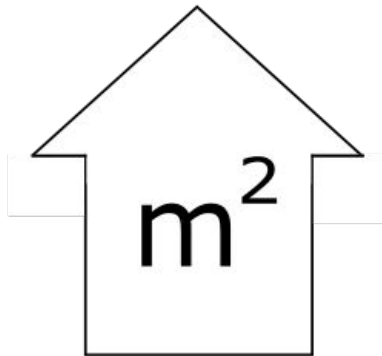
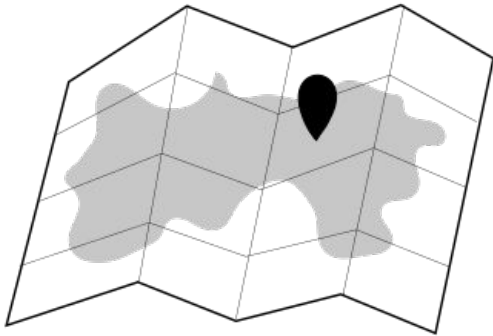
- Build econometric model and understand it.
- Build machine learning models...
- ...and explain them.
- Compare the conclusions.



Comparison



- Similar prediction scores
- Variables importance

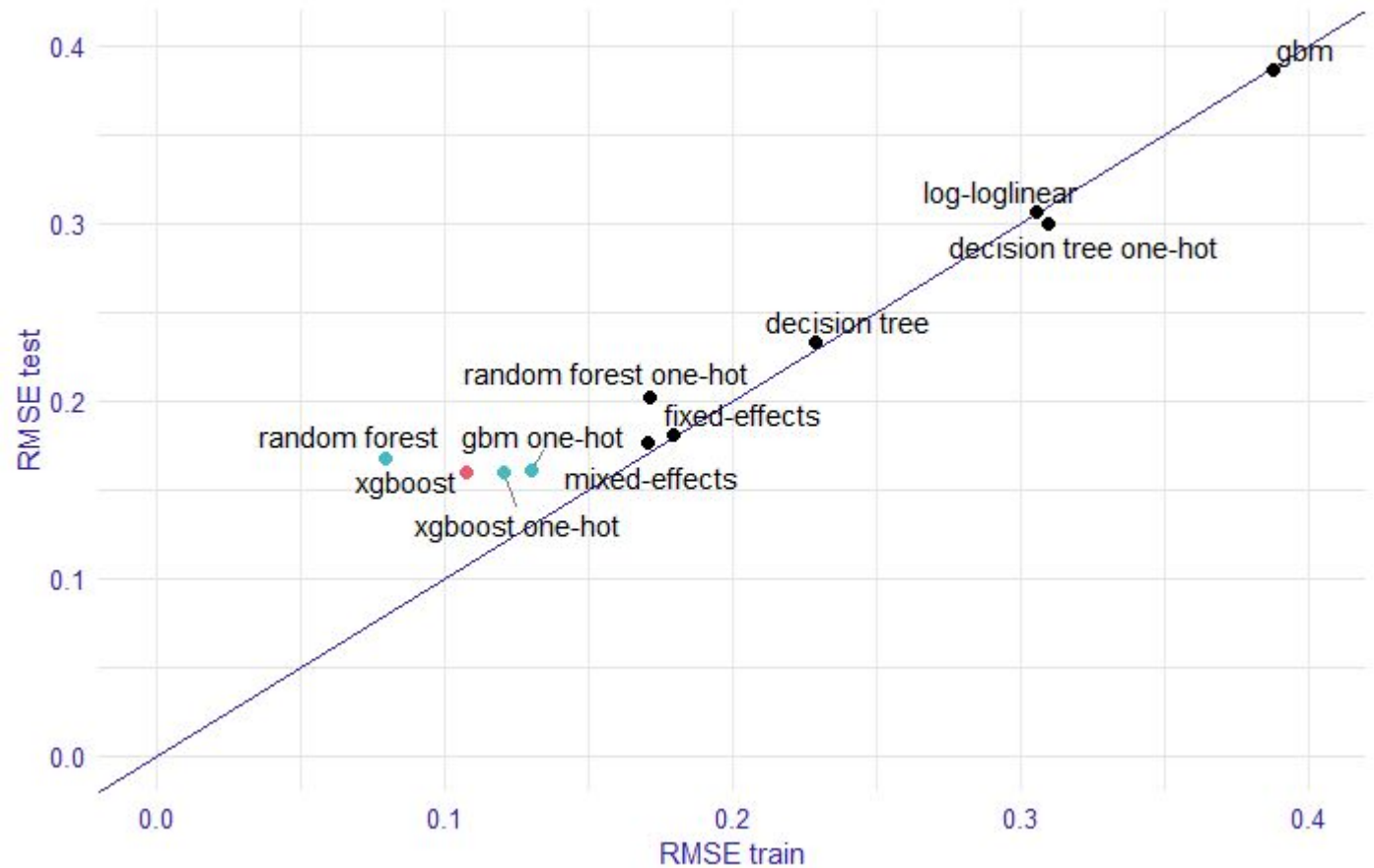


Model selection

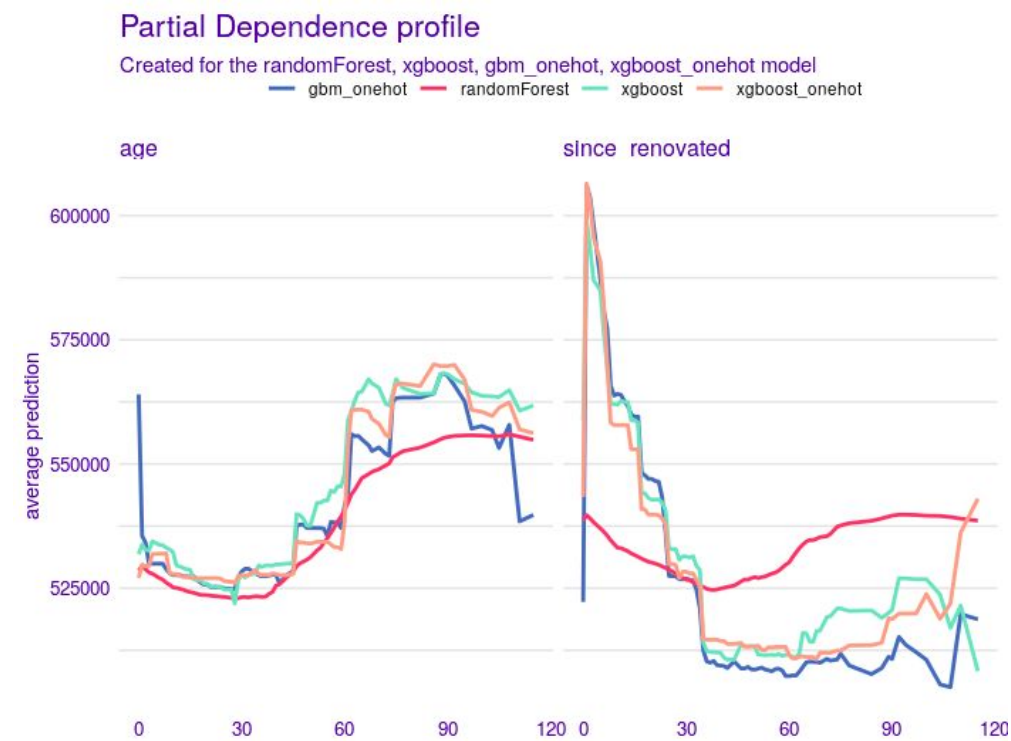
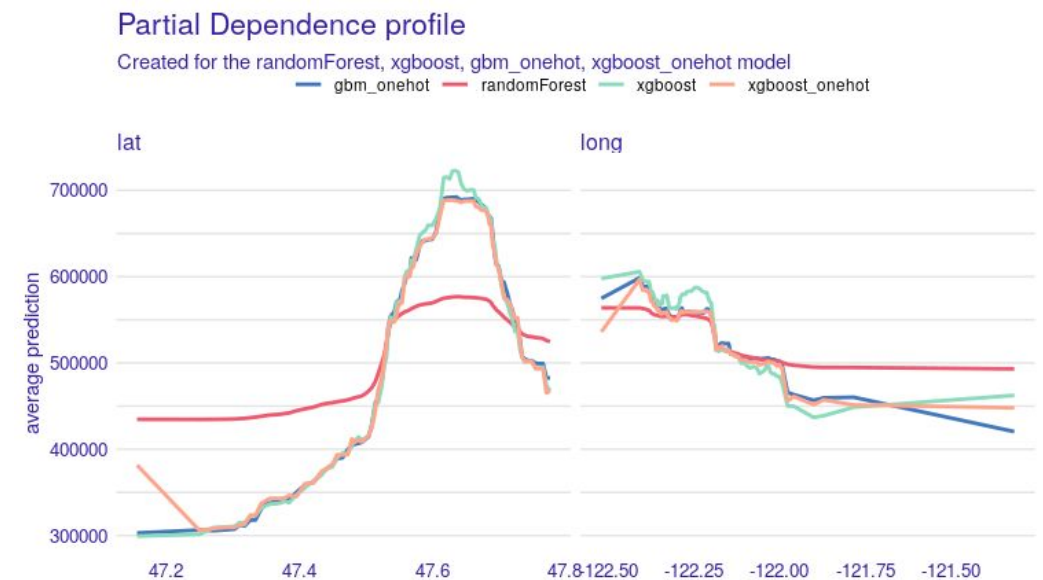
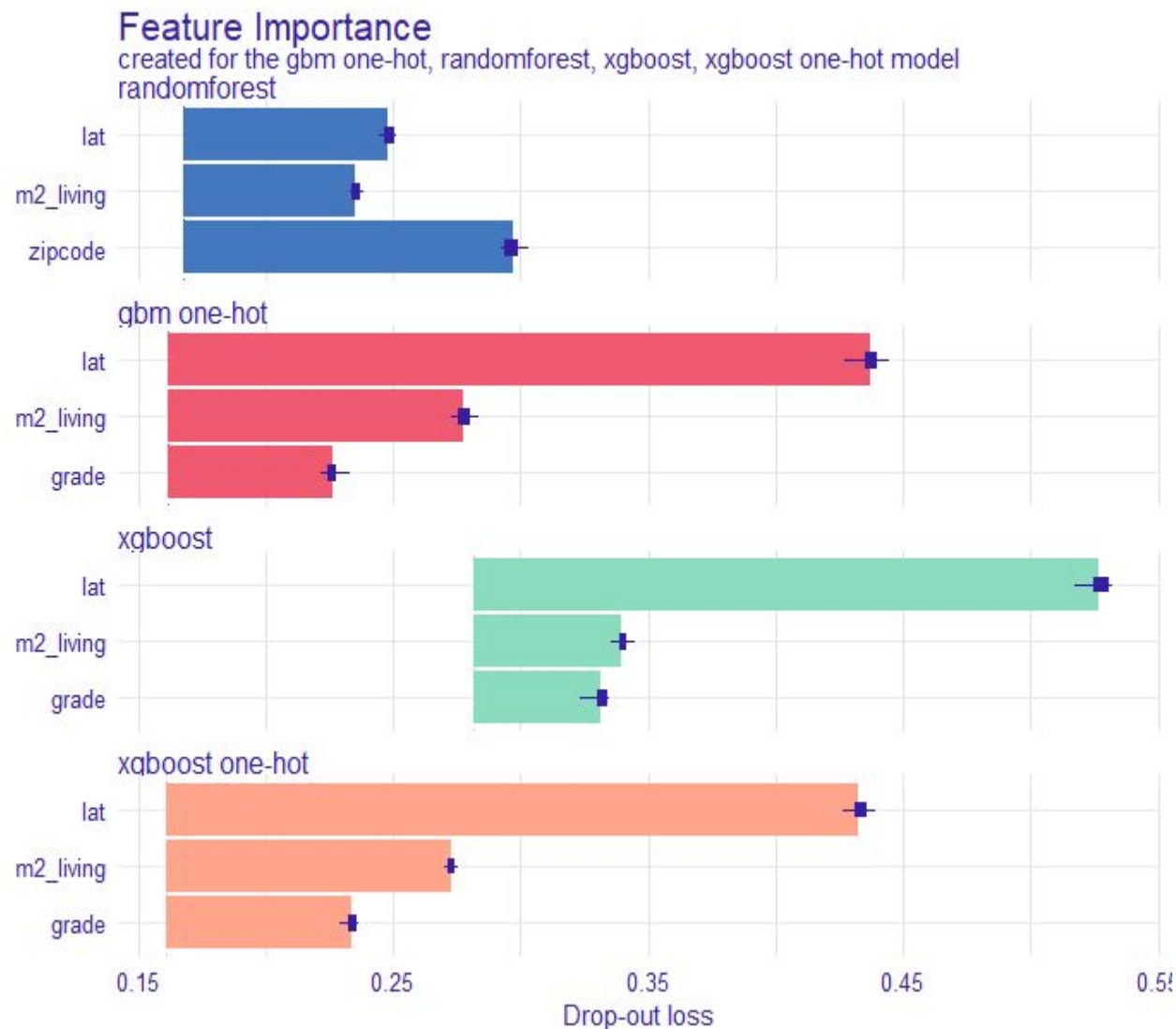
- Random Forest
- XGBoost
- XGBoost one-hot
- GBM one-hot



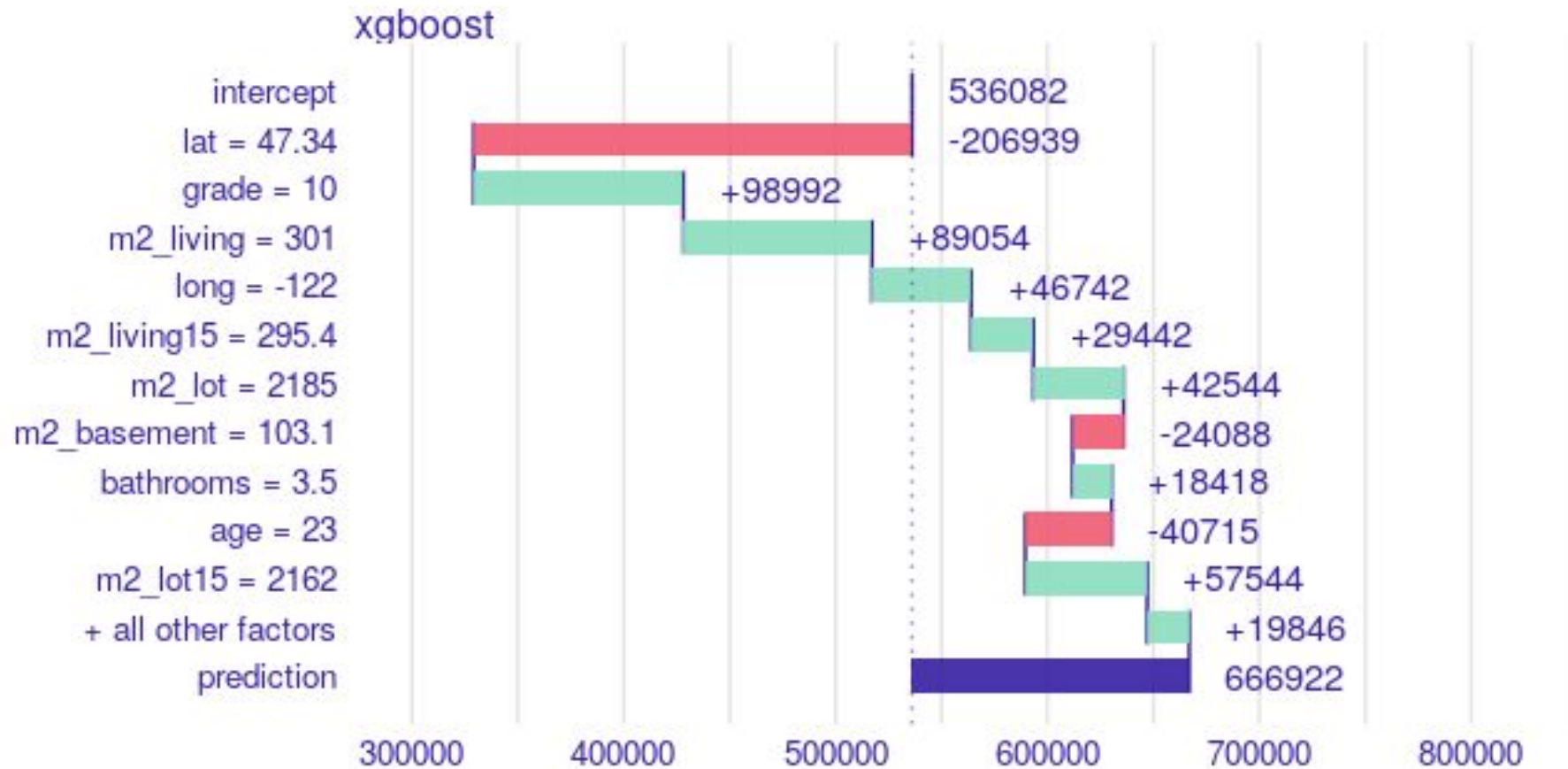
Model of choice



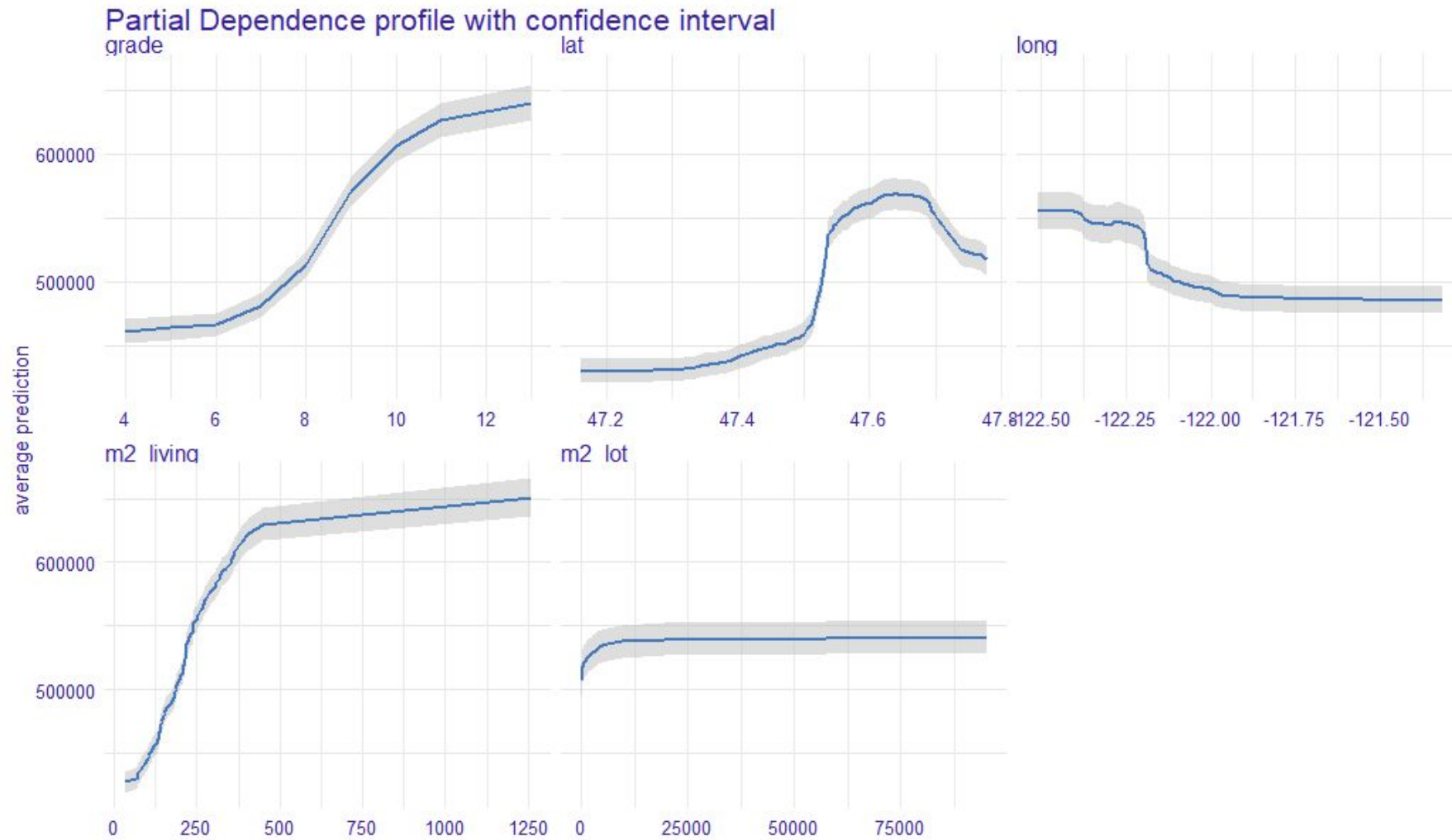
Model selection with PDP



Data Scientist perspective

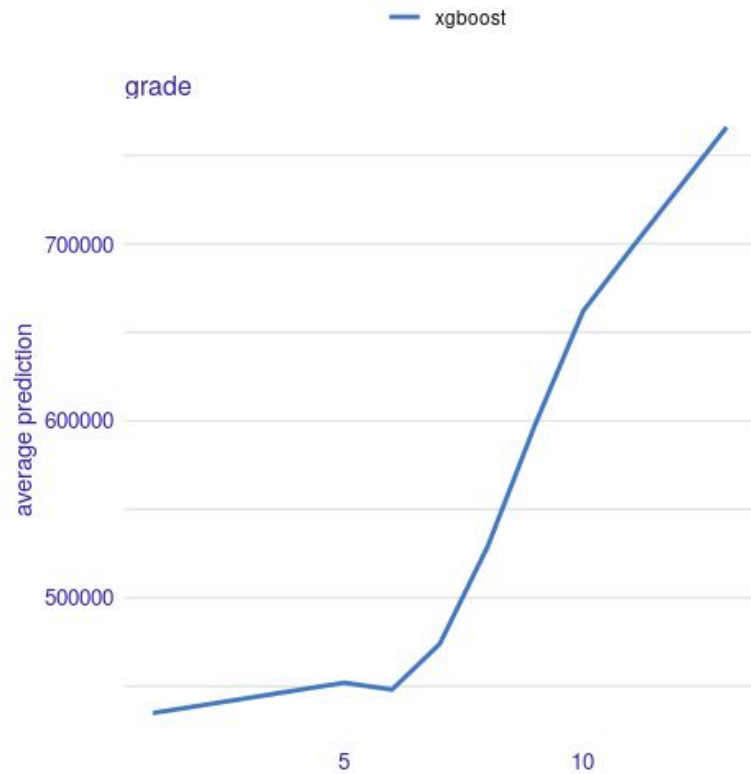


Confidence interval for PDP

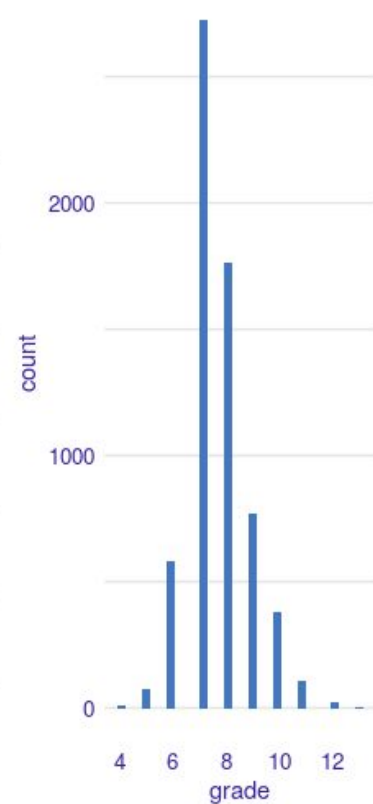


Financial use case

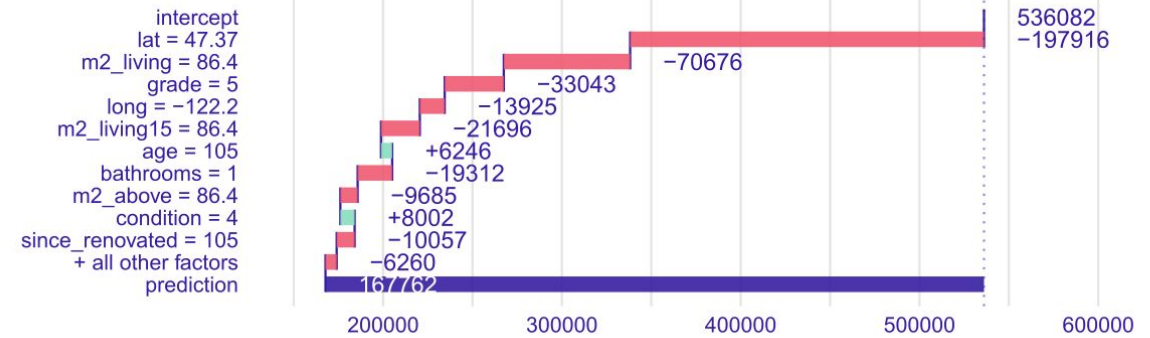
Partial Dependence profile



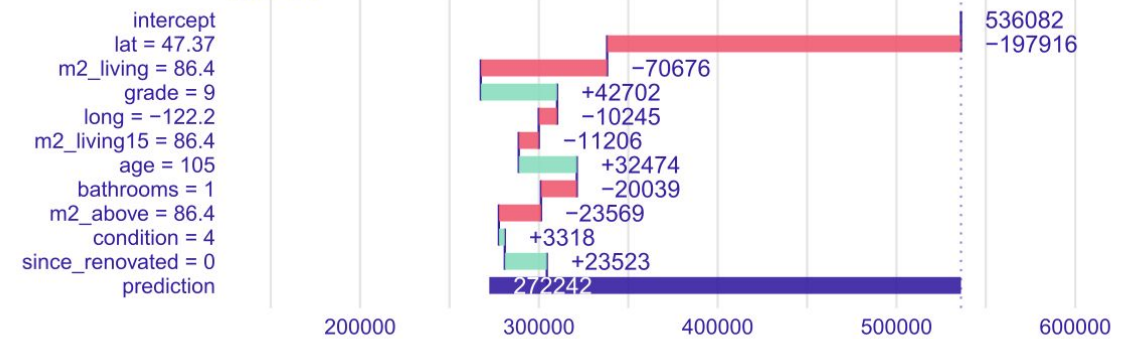
Histogram for grade



Break Down xgboost



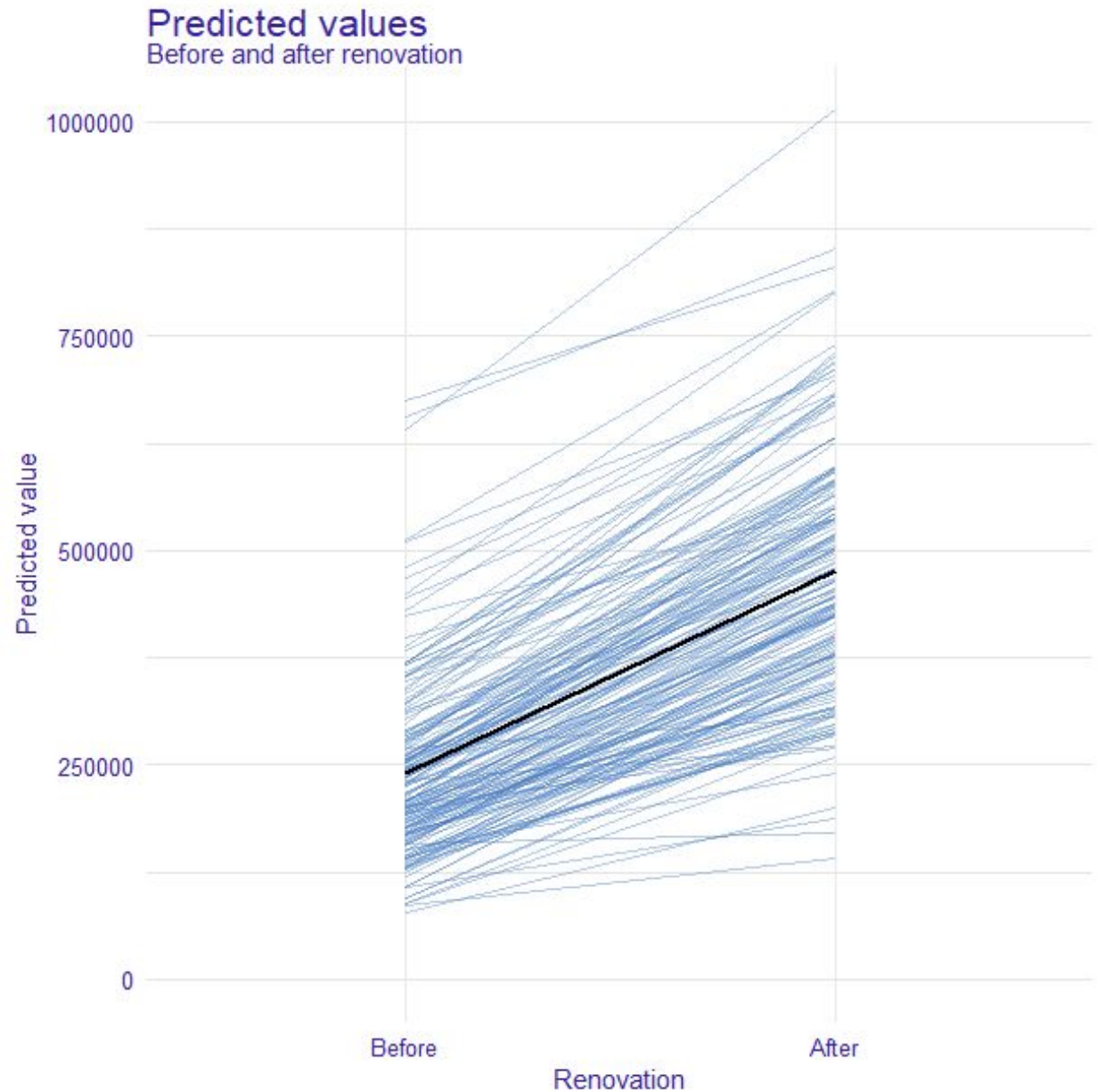
xgboost



Financial use case

Average uplift:

- +235k\$
- +109%



Advertising portal use case

- What features are most important?
- Why is a house standing out?



2100 3rd Ave #1401


Seattle, WA 98121

2 bds

1.75 ba

969 sqft

Listing ID: 1587488

Listing courtesy of Homeworthy 

\$575,000



909 5th Ave #1005

Seattle, WA 98104

1 bds

1 ba

807 sqft

Listing ID: 1592769

Listing courtesy of Pointe3 Real Estate 

\$575,000



 **\$3,354,950**

2 Beds 2 Baths 13 Days on Market

1,785 Sqft

600 Wall St Unit 3905, Seattle, WA 98109

Listing courtesy of NWMLS



 **\$2,638,000**

2 Beds 2.5 Baths 125 Days on Market

2,262 Sqft

583 Battery St Unit 3701N, Seattle, WA 98121

Listing courtesy of NWMLS



 **\$2,080,000**

2 Beds 2 Baths 17 Days on Market

1,564 Sqft

2720 3rd Ave Unit PH5, Seattle, WA 98121

Listing courtesy of NWMLS



 **\$2,049,950**

2 Beds 2 Baths 13 Days on Market

1,188 Sqft

600 Wall St Unit 2708, Seattle, WA 98109

Listing courtesy of NWMLS



 **\$1,950,000**

2 Beds 2 Baths 83 Days on Market

1,523 Sqft

588 Bell St Unit 3106S, Seattle, WA 98121

Listing courtesy of NWMLS





Thank you for your attention!

“That’s all your house is: it’s a place to keep your stuff while you go out and get more stuff.”

George Carlin