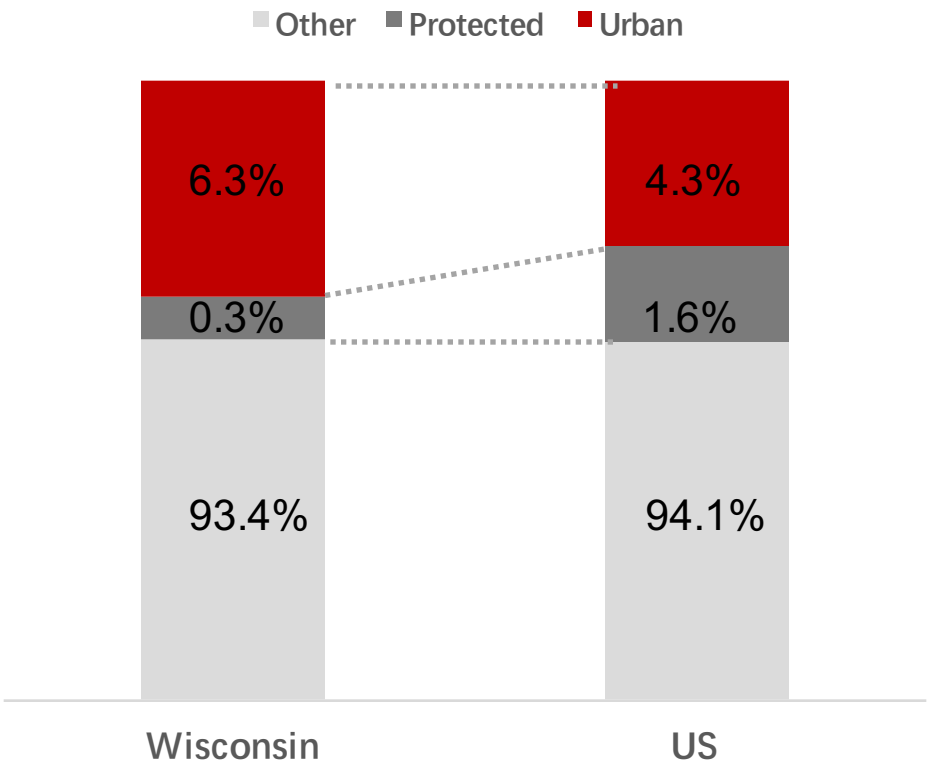
Wisconsin Urban Area Prediction

2020 Bain Data Challenge | Sijia Liu

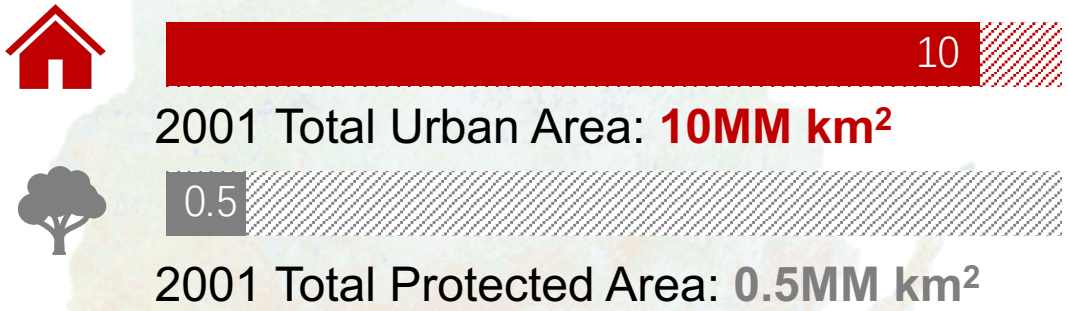
High Urban Land Ration in Wisconsin

Wisconsin's urban area ratio is higher than the average level in US. The ratio of total urban area to protected area in 2001 is 20:1.

Protected and Urban Area in Wisconsin (%), 2001



Source: USDA National Resources Inventory



Question: How much is the evolution of the urban area at a scale of 1km^2 in the US state of Wisconsin from 2001 to 2016?

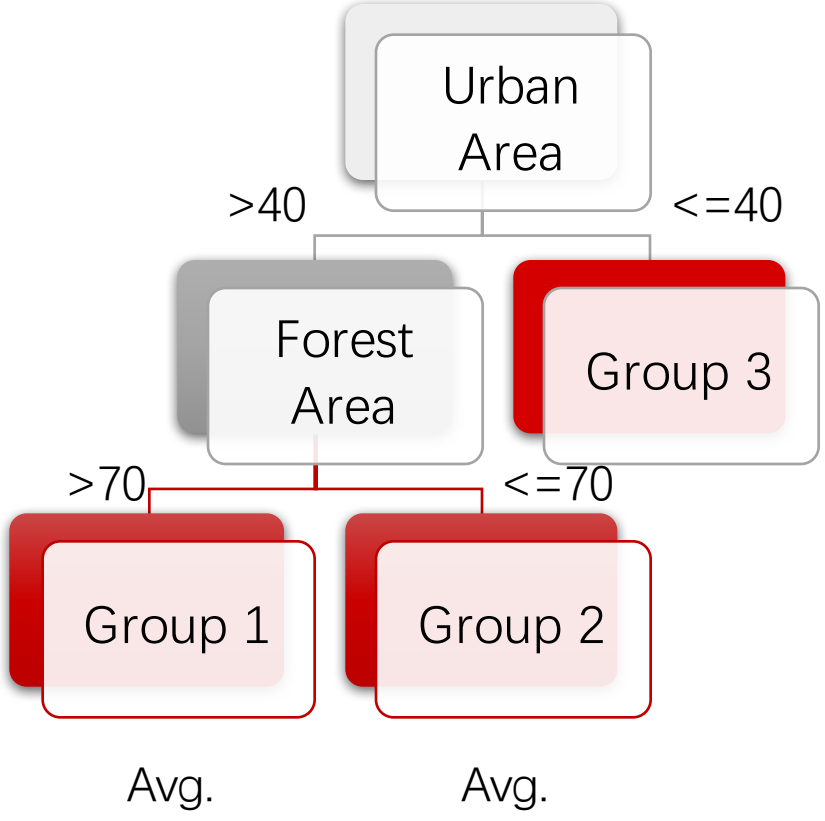
Features Used in Model

Longitude, Latitude

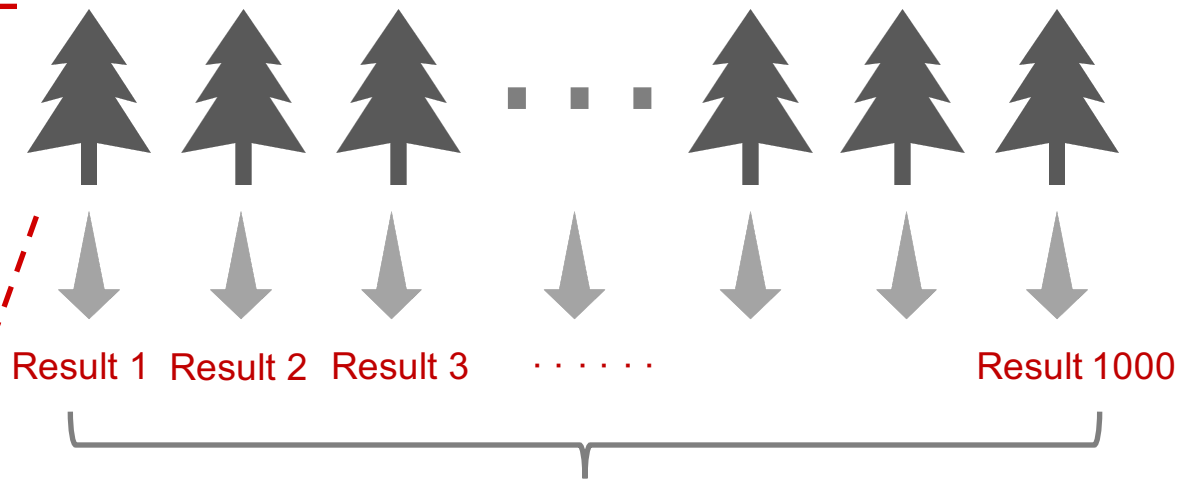
block_size	tile_h	tile_v	empty_area	water_area	urban_area	barren_area	forest_area	…	has_target
33	12672	15147	0	12	31	0	10	…	1
33	11022	7128	0	6	45	0	561	…	0
33	12474	7095	0	0	75	0	107	…	1
33	11913	8349	0	0	38	0	0	…	1
33	13035	6204	0	0	79	0	209	…	1
33	4059	10989	0	0	0	0	960	…	1
33	8382	7194	0	0	38	0	369	…	1
33	9768	5940	0	2	0	0	977	…	1
33	1881	2508	0	0	34	0	638	…	0
33	2277	6501	0	0	47	0	58	…	0

We Use Gradient Boosting for Modelling

Demo of One Decision Tree



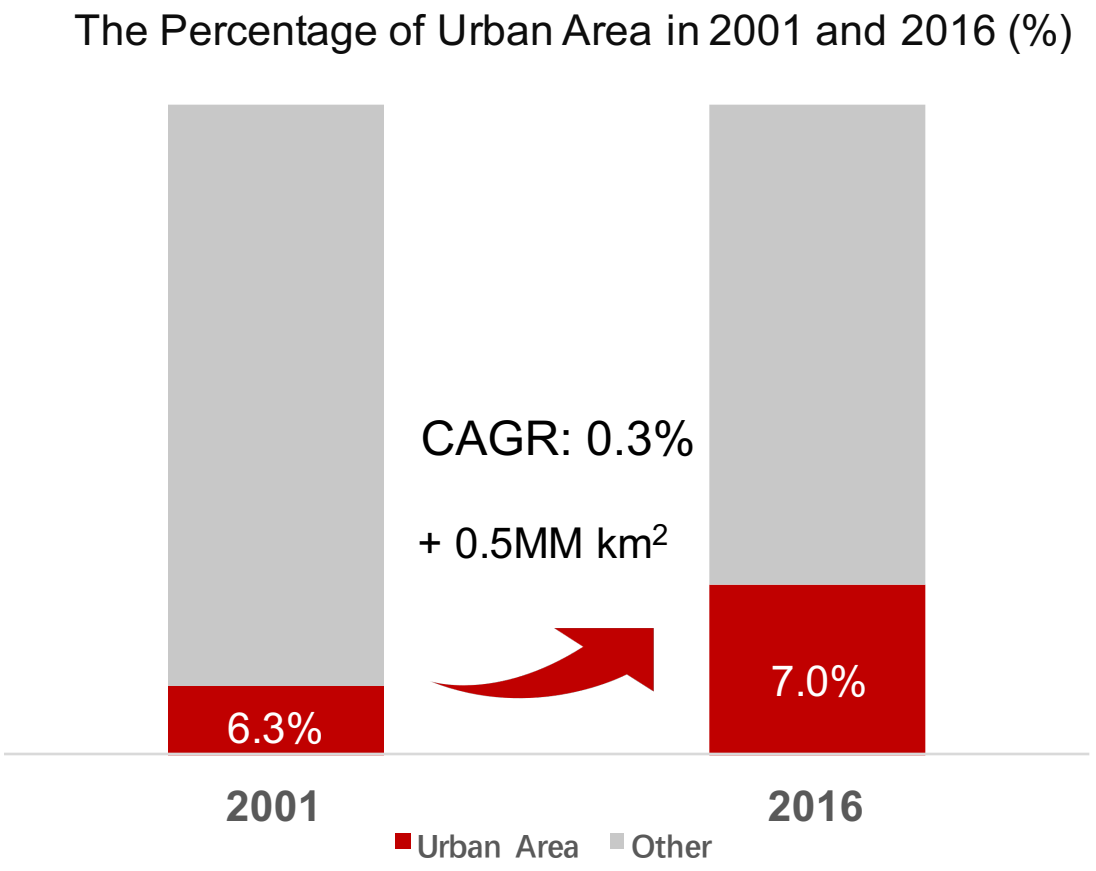
Gradient Boosting



- **1000** Trees make decision
- **>10** observations in a leaf node
- **Grid Search** for Fine tuning

CAGR 0.3% Urban Area Growth from 2001 - 2016

The percentage of urban area in Wisconsin increased to 7% in 2016.

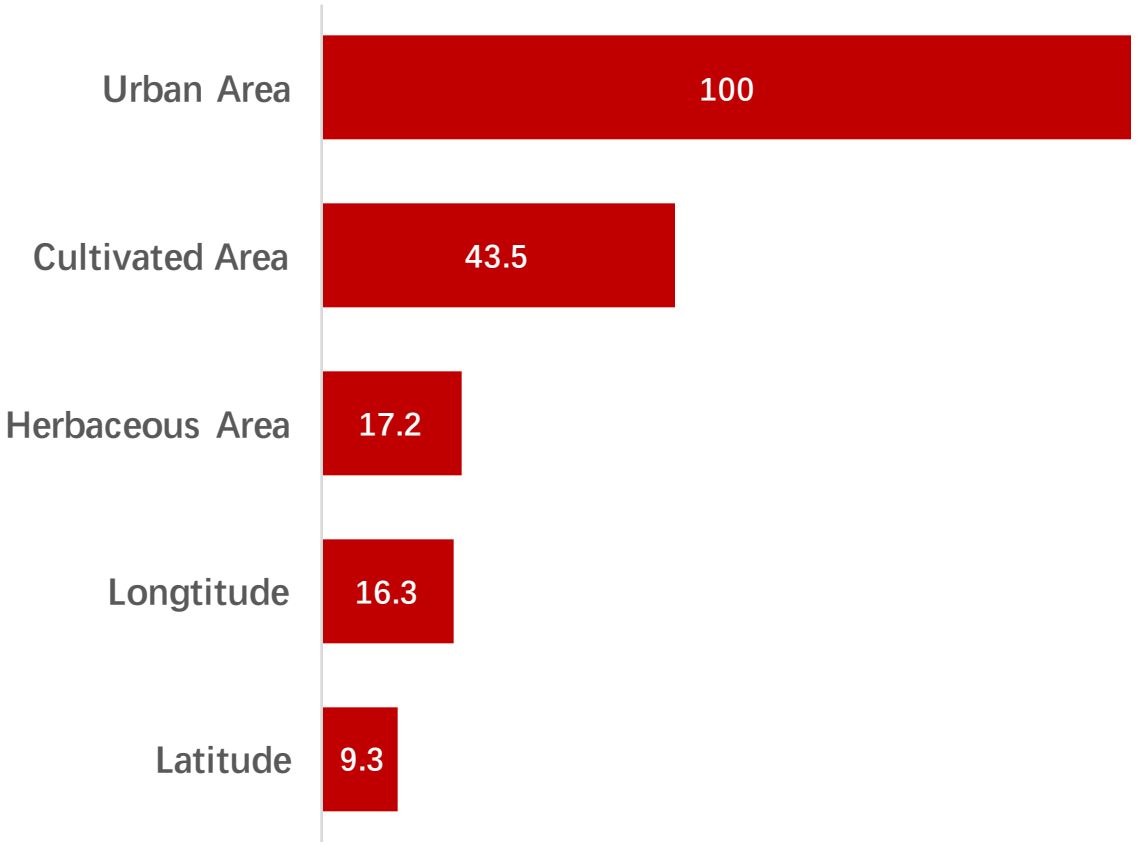


Advantages

- Good with imbalanced data
- Can work with both categorical and numerical variables
- High interpretability

Current Urban & Cultivated Area Matter Most

TOP 5 Most Important Features



Snowball Effect

Once urbanization started, it's likely to keep on

Human Activity

Positive relation between cultivated & urban area

Location Counts

Places in East & North are more likely to be urbanized

Thank you

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