Why Did the Model Decide X?

Interpretability of Controls & Machine Learning

Rain Vagel, Data Scientist, Wise

Who Am I?

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- **Managing a shift from something regulators are familiar with to something they are not**
  Using machine learning has some additional challenges in comparison to rules

What Will We Talk About?

- Why do we need interpretability?
- What are glassbox and blackbox models?
- Interpretability of different controls and models.
- Interpreting controls to different end-consumers

Why Interpretability?

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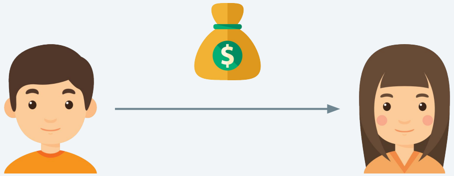

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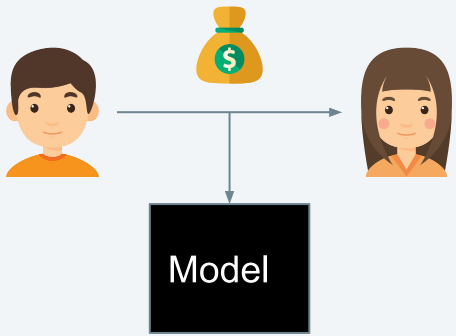

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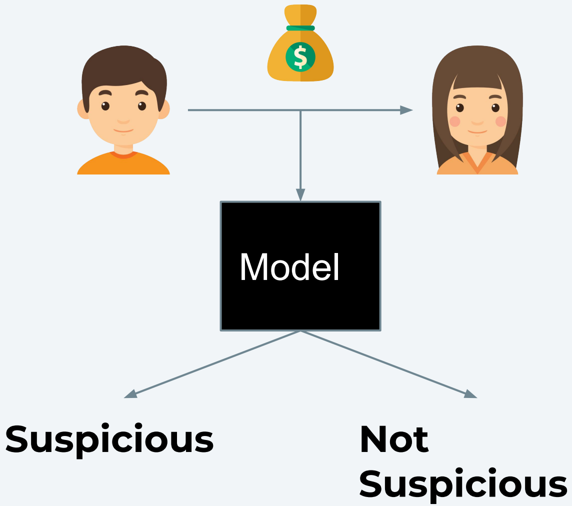

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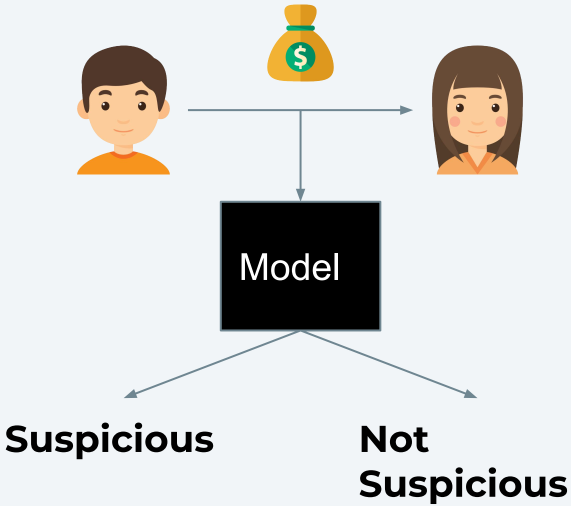

- **Why did the model decide so?**
- **What would happen if you change something about the behaviour?**
- **Important in high-risk areas**
  Such as stopping terrorism financing

Duck Rule

If it looks like a duck,
swims like a duck,
and quacks like a duck,
then it probably is a duck

Duck Rule

If it looks like a duck,] - Condition
swims like a duck,] - Condition
and quacks like a duck,] - Condition
then it probably is a duck] - Result

Glassbox vs. Blackbox.

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Glassbox - Can follow the internal logic

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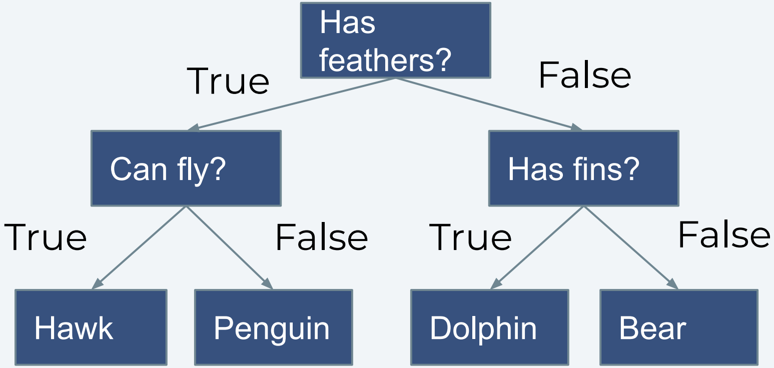

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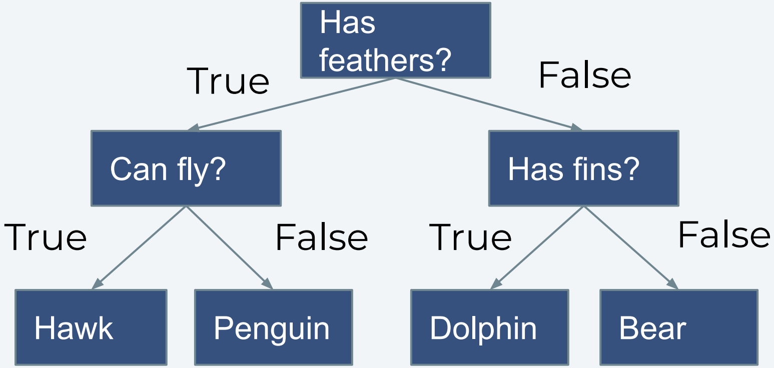

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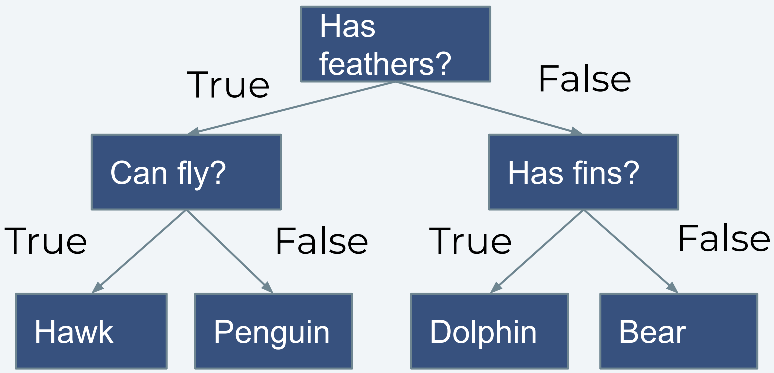

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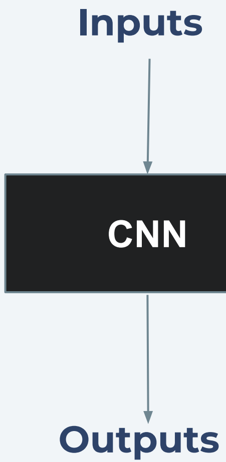
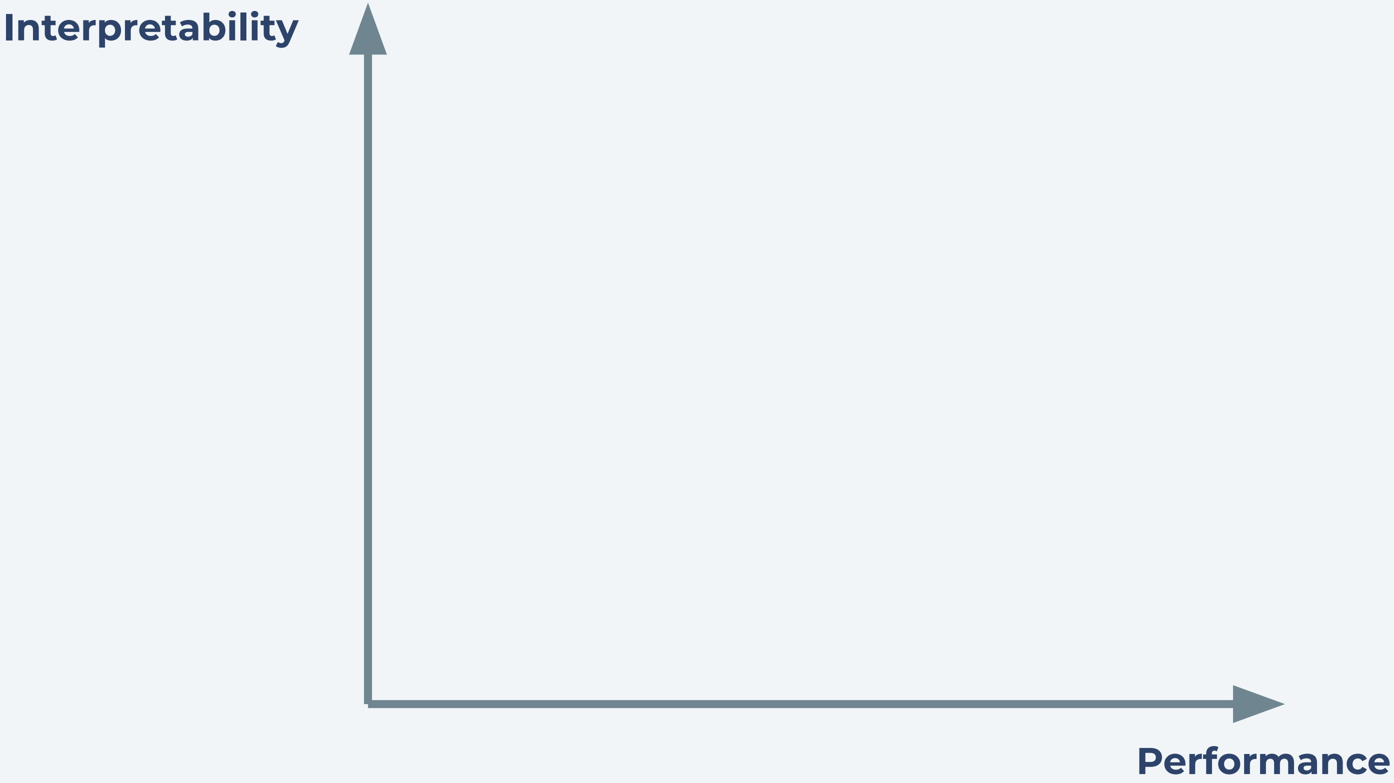


Interpretability of Different Controls.

Performance vs. Interpretability



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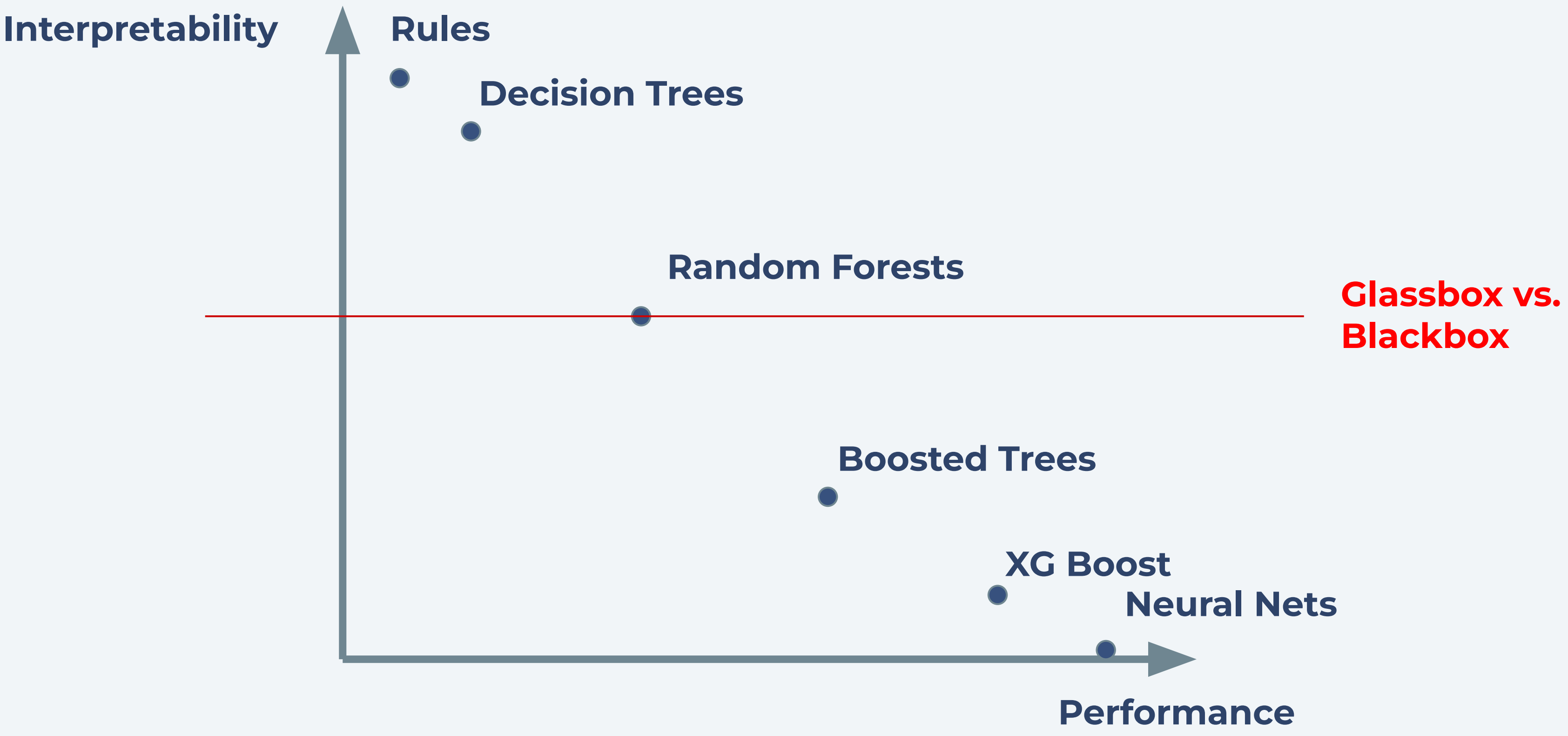

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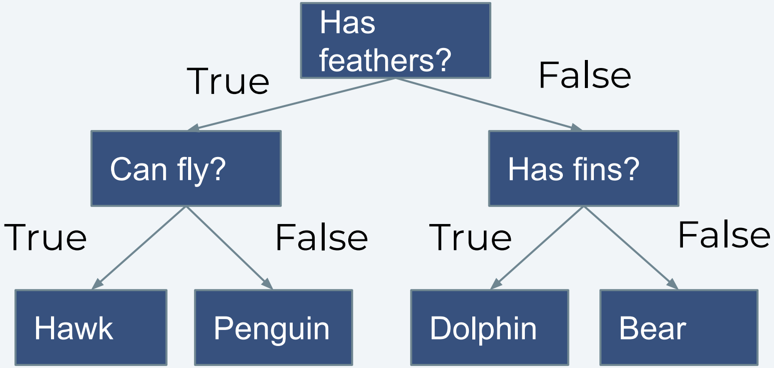
Decision Tree Interpretability



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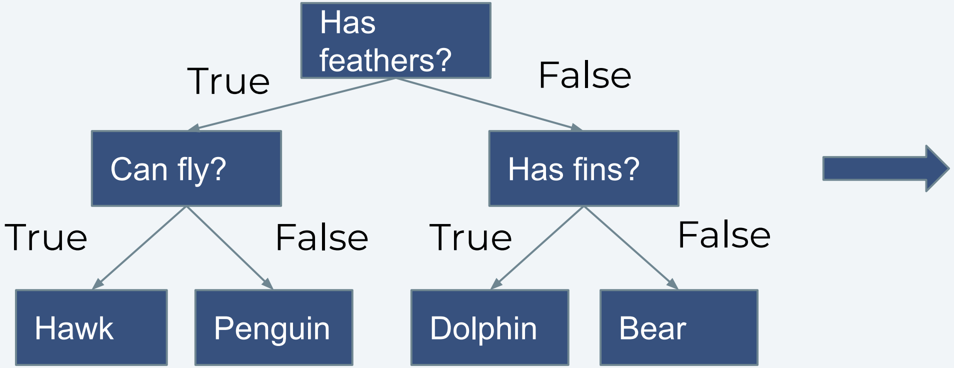

It has feathers AND can not fly. It is a penguin.

Decision Tree Interpretability - Not Always Practical

Tree With 100 Nodes

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Tree With 100 Nodes

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Interpreting Blackboxes

- **Shapley**
  Calculate how to fairly distribute outcome to features

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- **LIME - Local Interpretable Model-agnostic Explanations**
  Train local interpretable models to explain global mode

Interpreting Blackboxes - Shapley

Park Nearby	Floor Area	Cats Allowed	Prediction
Yes	50	Yes	310 000

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No	50	Yes	280 000

280 000 - 260 000 = 20 000

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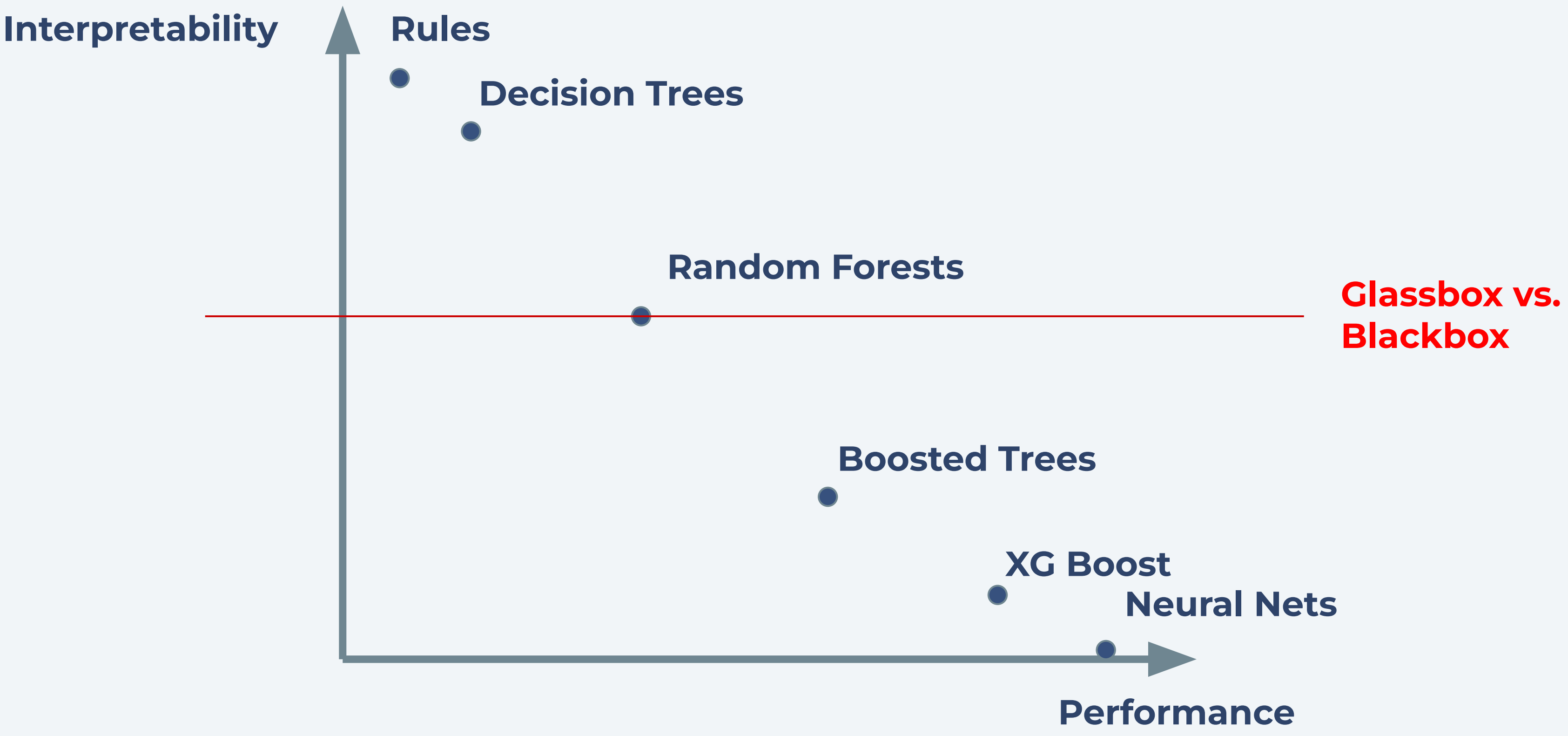
Interpreting Blackboxes - Shapley

- Marginal feature contribution
- Average contributions over all possible coalitions
- Monte-Carlo sampling to keep it efficient

Performance vs. Interpretability



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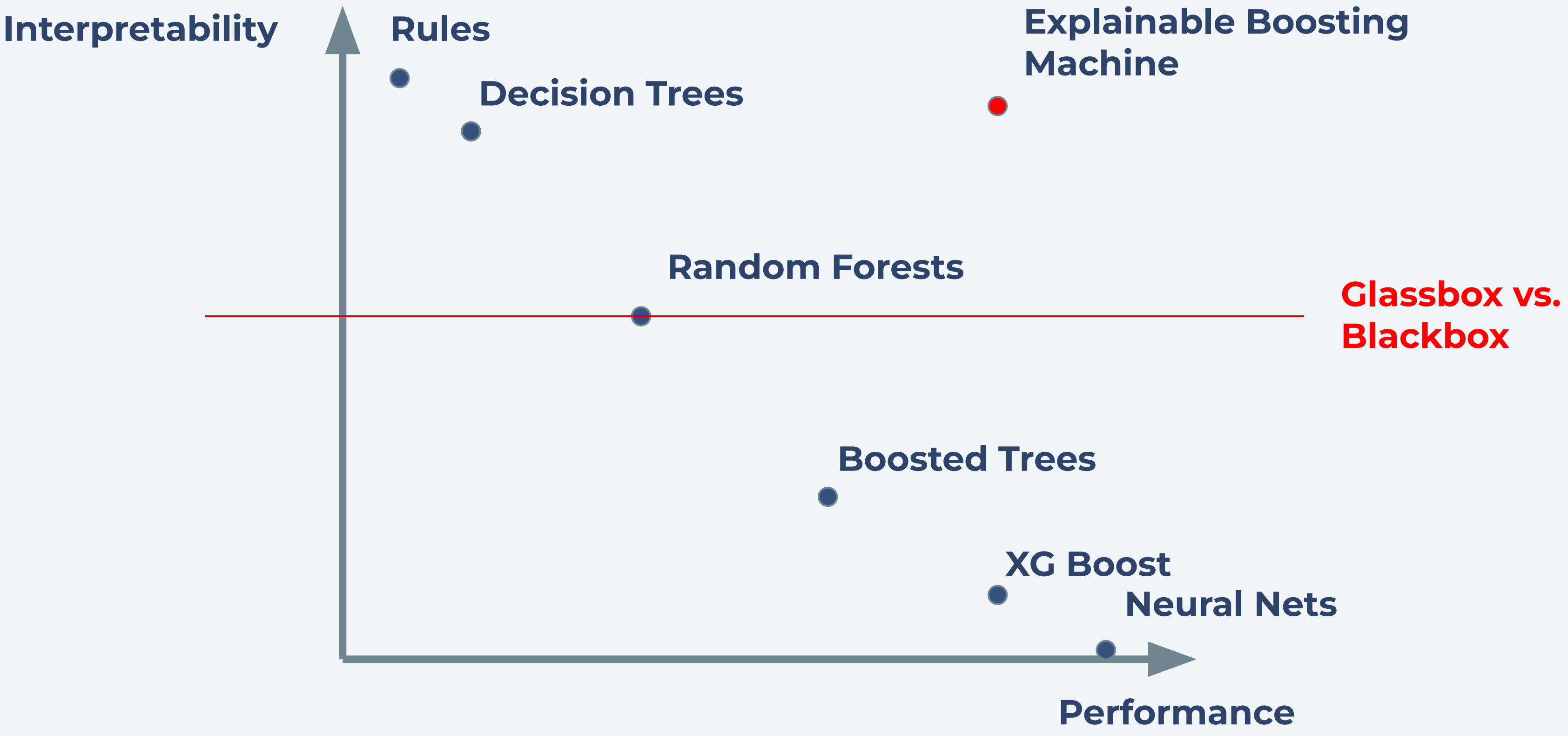

Presenting to End-Consumers.

What Types of Consumers?

- **Data scientists**
  The most technical
- **Other functions working closely with the data scientists**
  For example, product managers, operational agents etc.
- **External consumers**
  Auditors, regulators etc.

Evolution of Interpreting Outcomes

Feature	Cont
Cat: Allowed	20 000
Cat: Banned	-15 000
Apt Size	200 000
Park: Near	40 000
Park: Far	- 25 000
Garage Size	100 000
Nbr of Rooms	45 000

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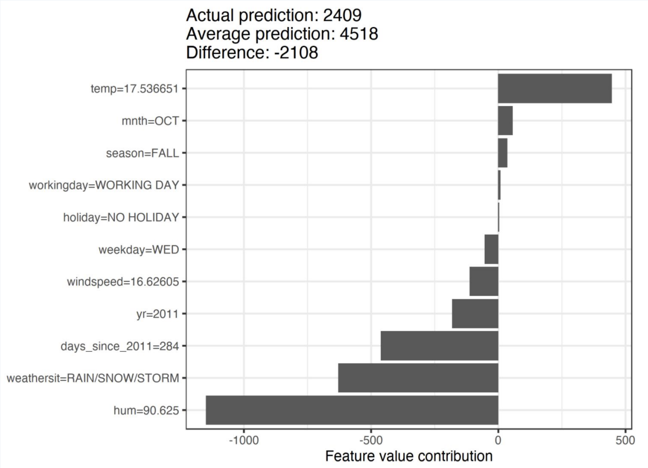

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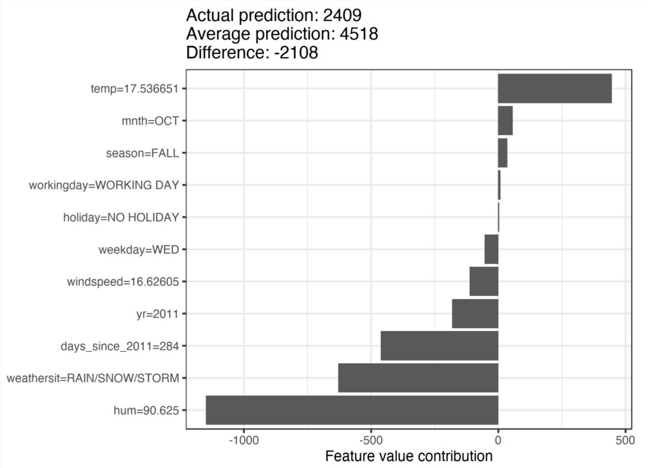

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What makes a good slide deck?

- **Less is more**
  Keep slides as simple as possible

- **Space makes things look good**
  Avoid cramming slides with too much information

- **Tell a story**
  Break up lists and engage the viewer

And you will read this last

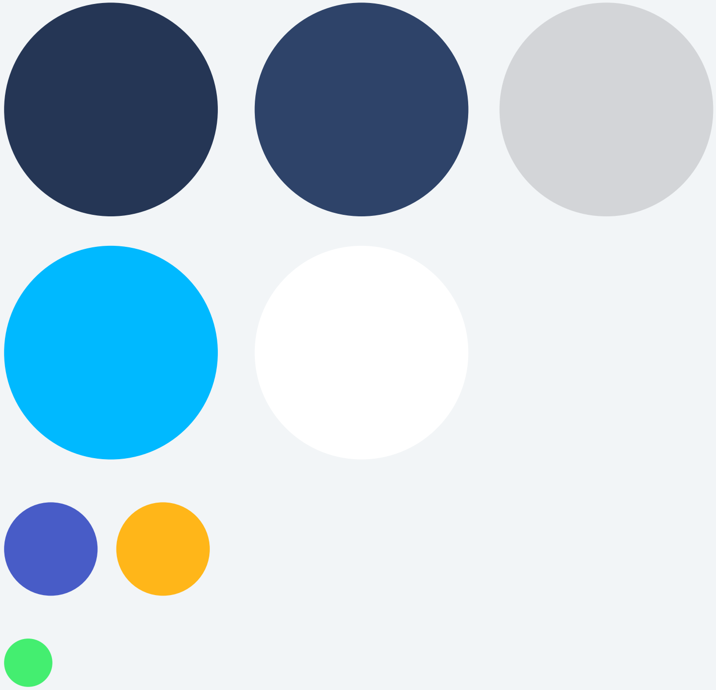
You will read this first.

And then you will read this

Then this one

The only colours you should be using in your deck. The purple, yellow and brand blue are highlights colours — use sparingly.

Green is only for borderless.



Section title here.

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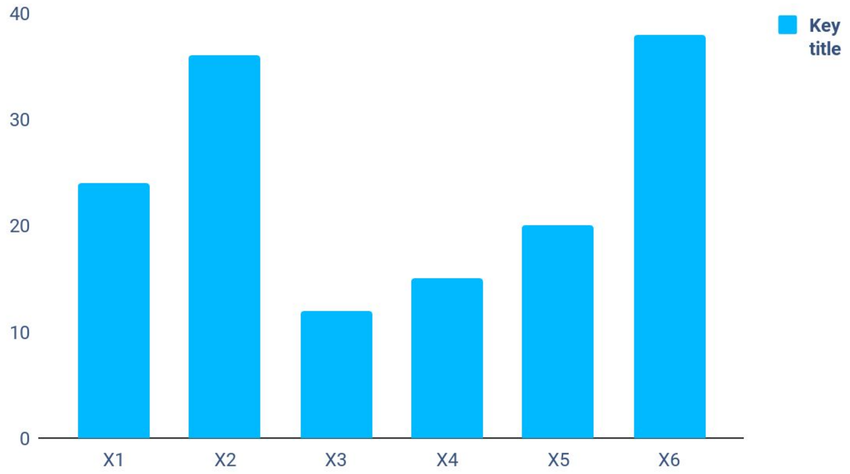
(Click on the chart, then the dropdown)



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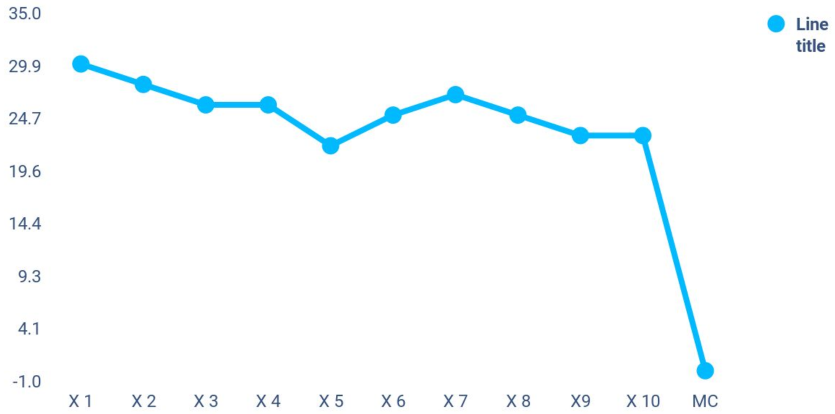

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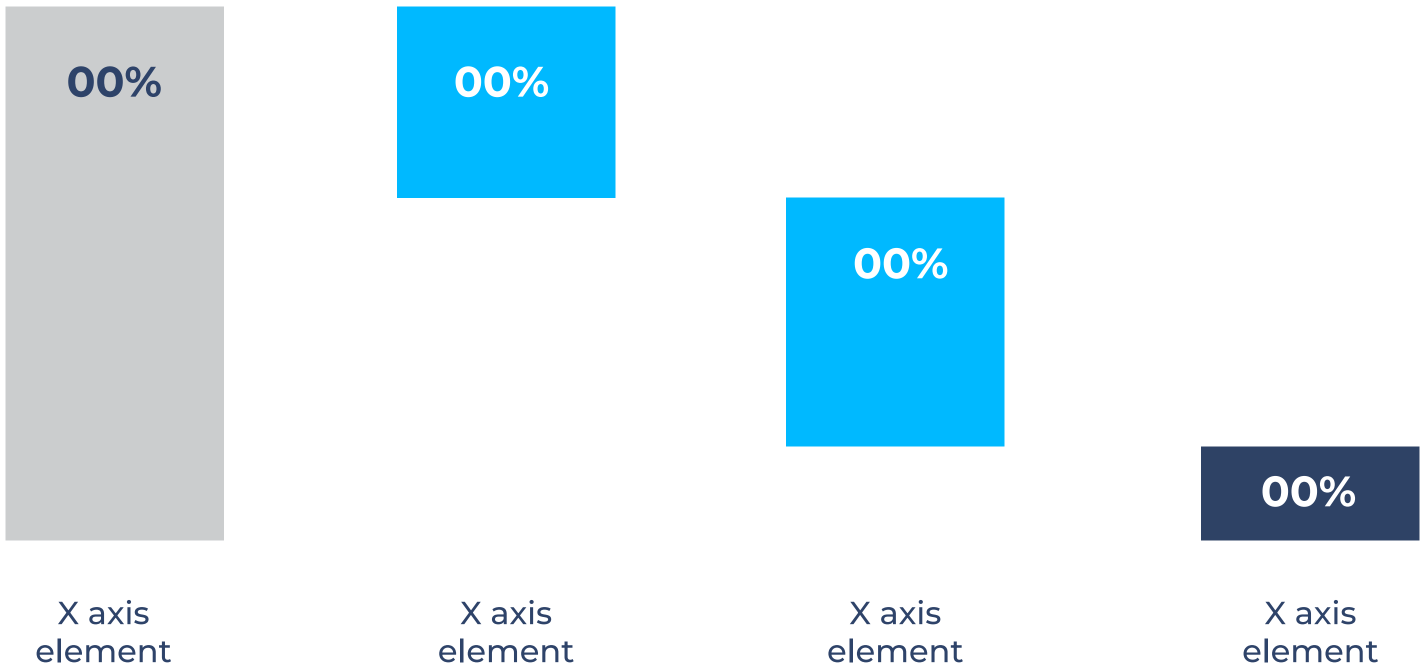

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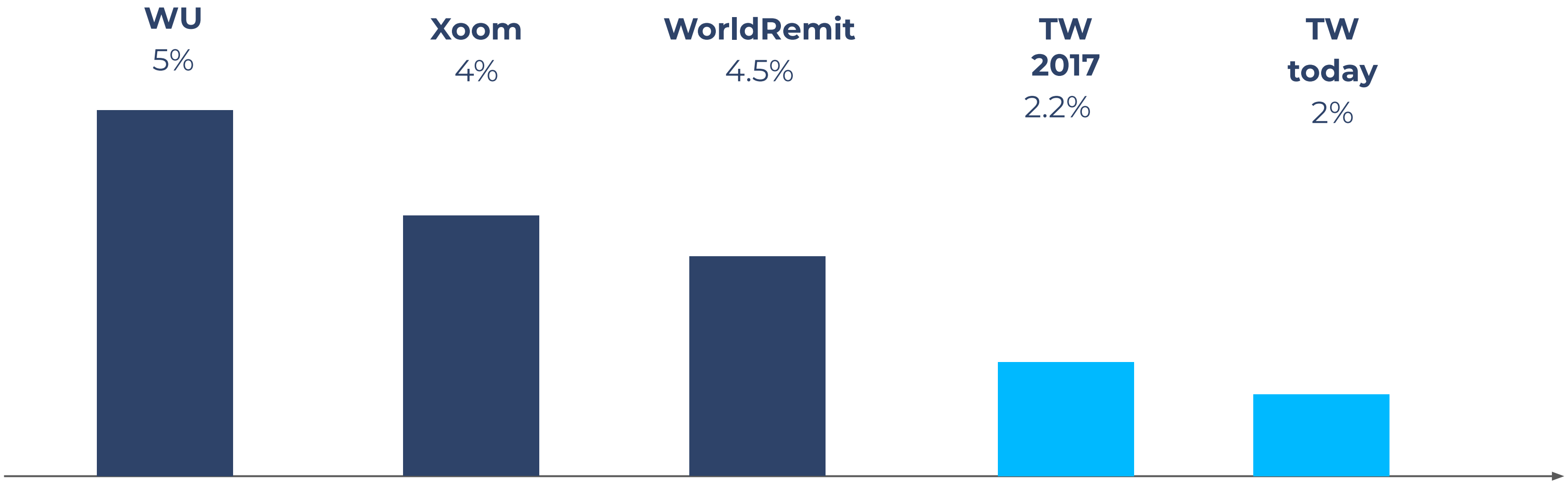

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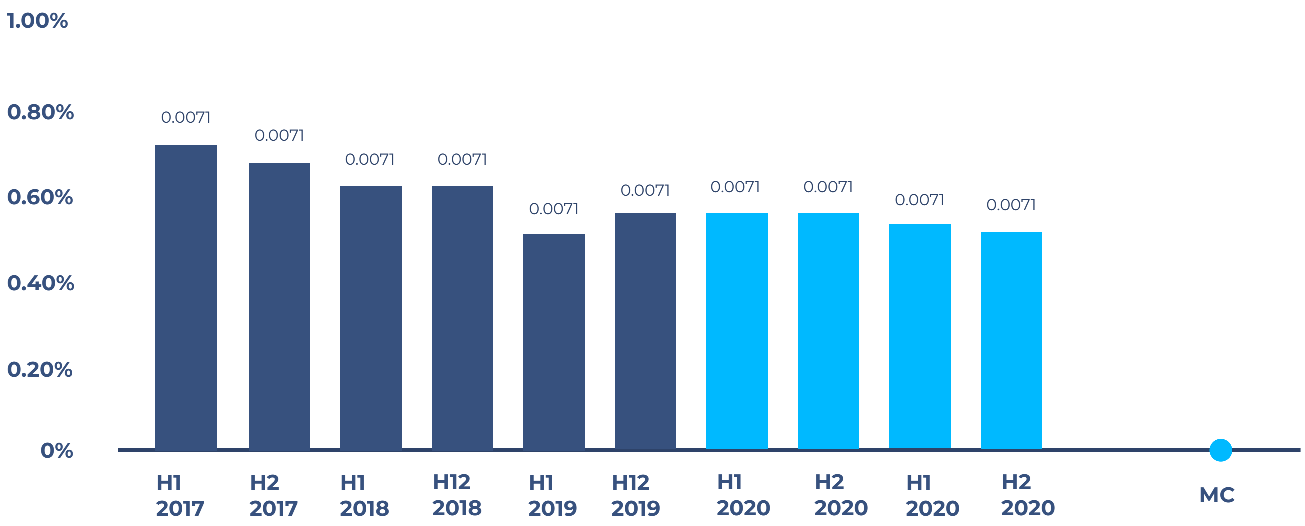

Main point goes here.

Section title here.

Header

Header

100%

Pillars.

Price

Subtitle

Convenience

Subtitle

Speed

Subtitle

Transparency

Subtitle

23.5%

```
if (this) {
    // then that
}
```