Interpretable Machine Learning

What a ML project looks like?

Machine learning students at the beginning of a project

VS.

Machine learning students at the end of a project

Ali Izadi

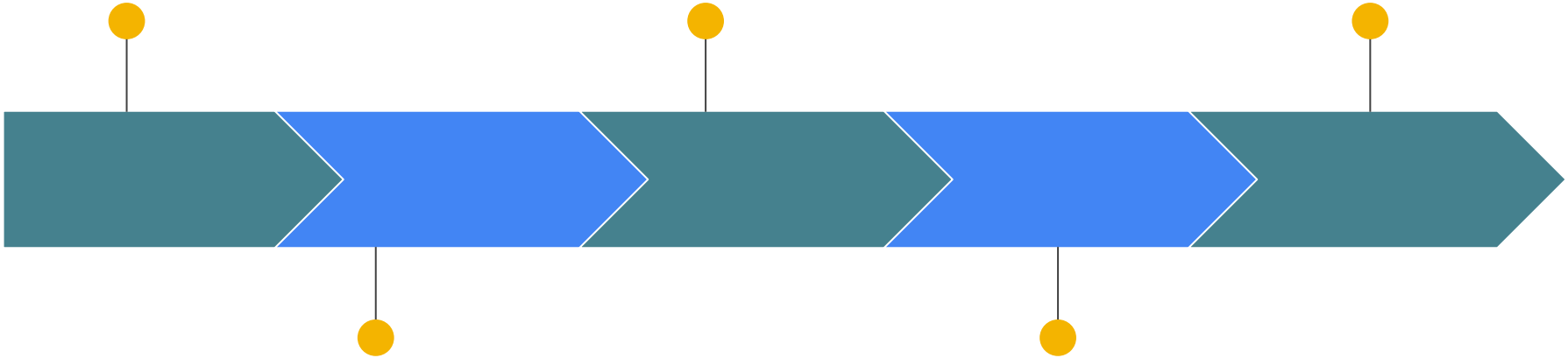
Miras-tech - 1.5 yr

Ceit - 94

My experiences and failures in machine learning projects

Machine Learning Interpretation

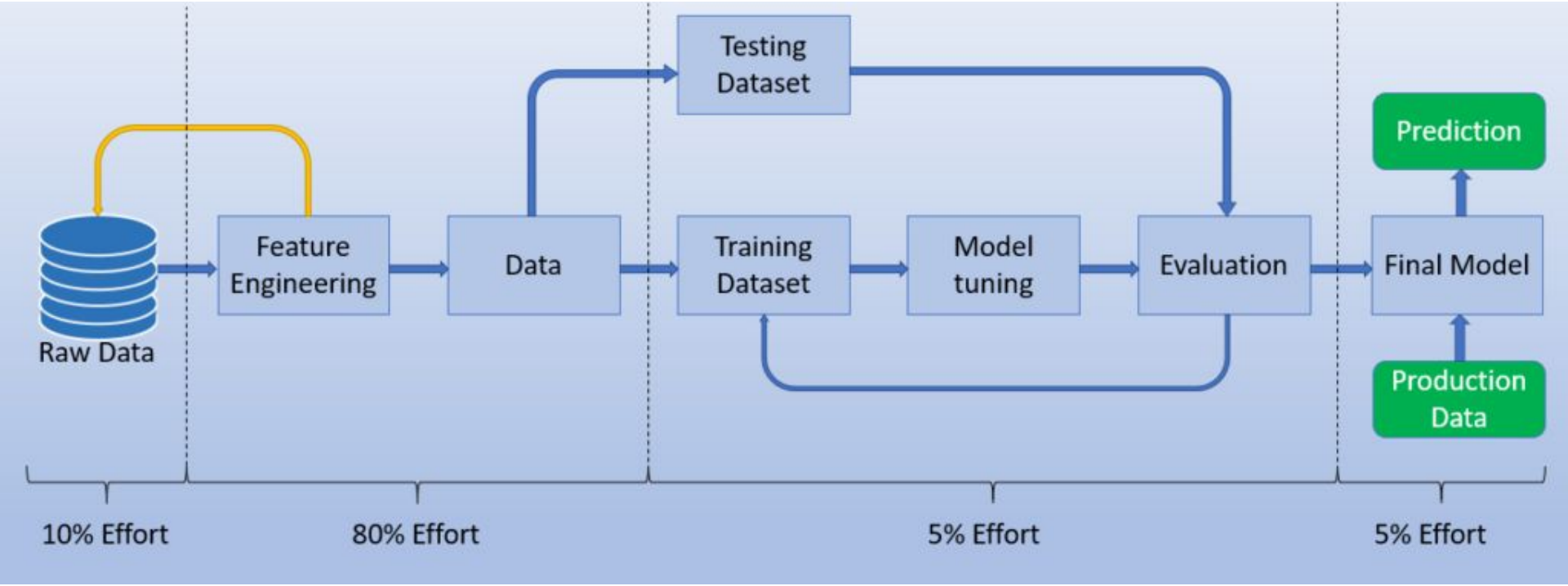
Field of Data Science in Iran



The importance of machine learning interpretation

Machine learning interpretation methods

Machine Learning Projects Steps:



Expectation vs Reality

Just learn machine learning models and how to use tools such as tensorflow or scikit-learn

Expectation vs Reality

Just accuracy or more advanced metrics are important.

Expectation vs Reality

Data Science is just experiment without innovation.

Expectation vs Reality

Most of us believe preparing data is the most time consuming part of data science but I believe feature engineering is the most important one.

Expectation vs Reality

You must learn more about the domain of your problem than software engineers

Expectation vs Reality

PhD vs Msc vs Bsc

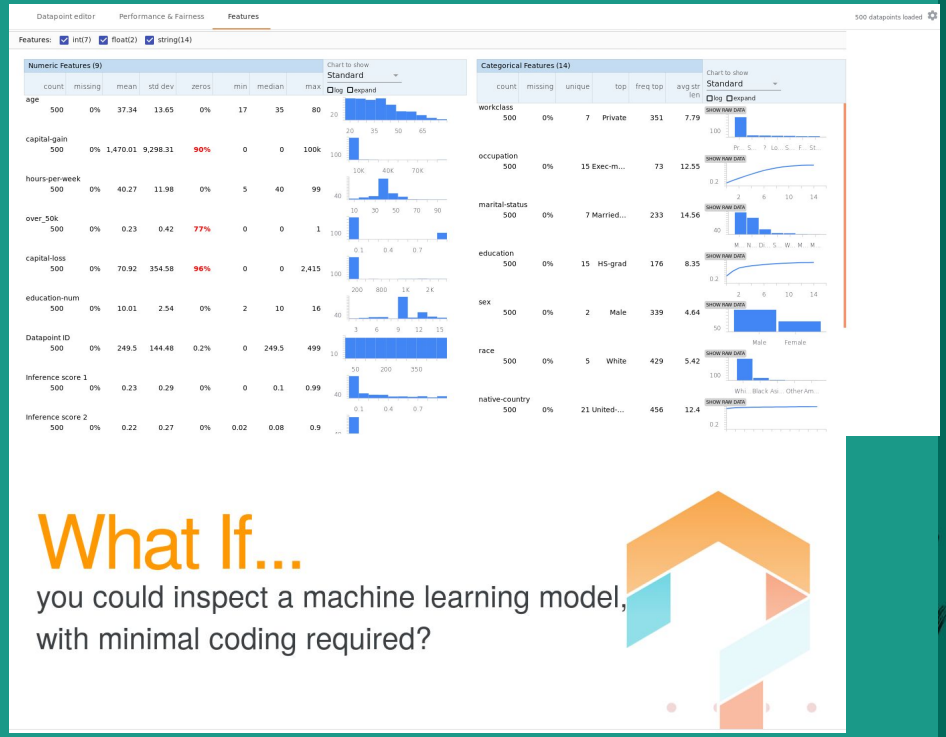
Interpretable Machine Learning

How can I trust your model?
How does your model really make its decision?

The importance of ML interpretation:

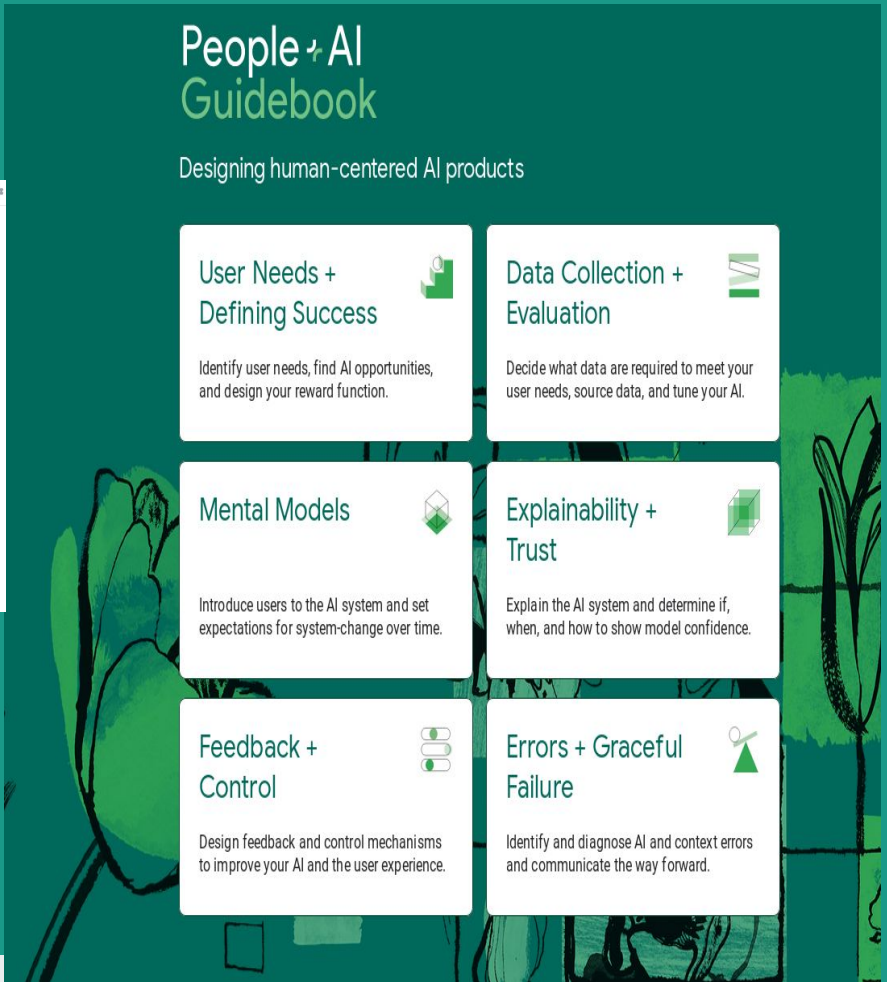
1. Reliability
2. Simplicity
3. Regulations
4. fairness

Google



What If...

you could inspect a machine learning model, with minimal coding required?



McKinsey

Keys to building a data driven strategy:

Companies should repeatedly ask, “What’s the least complex model that would improve our performance?

Leading your organization to responsible AI:

The ability to explain model outputs to stakeholders is a major lever in ensuring compliance with expanding regulatory and public expectations and in fostering trust to accelerate adoption.

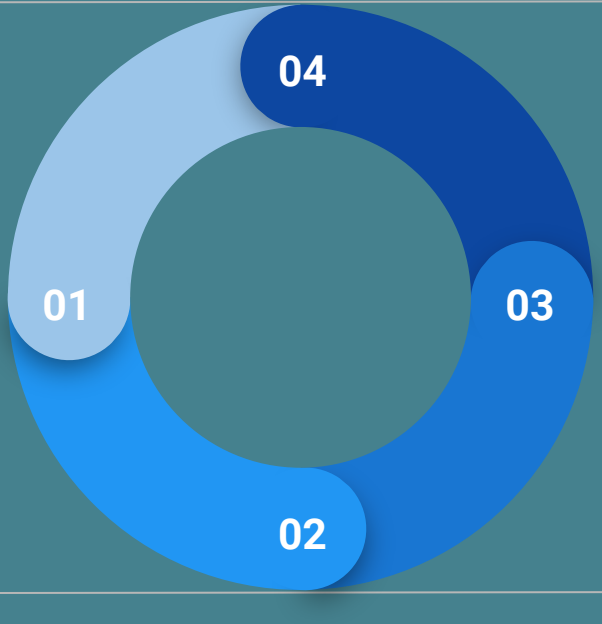
Taxonomy of interpretability methods:

Local

Explains a single prediction

Global

Explains the entire model



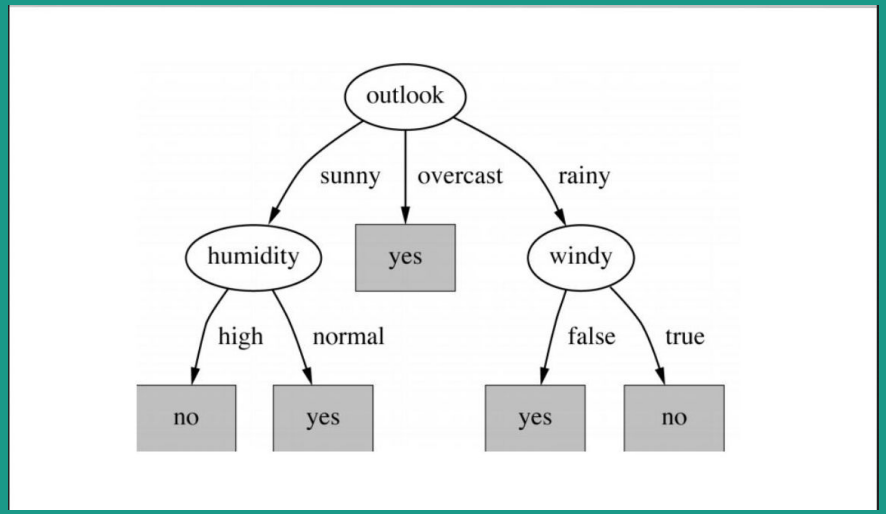
Model agnostic

Can be used by any machine learning models

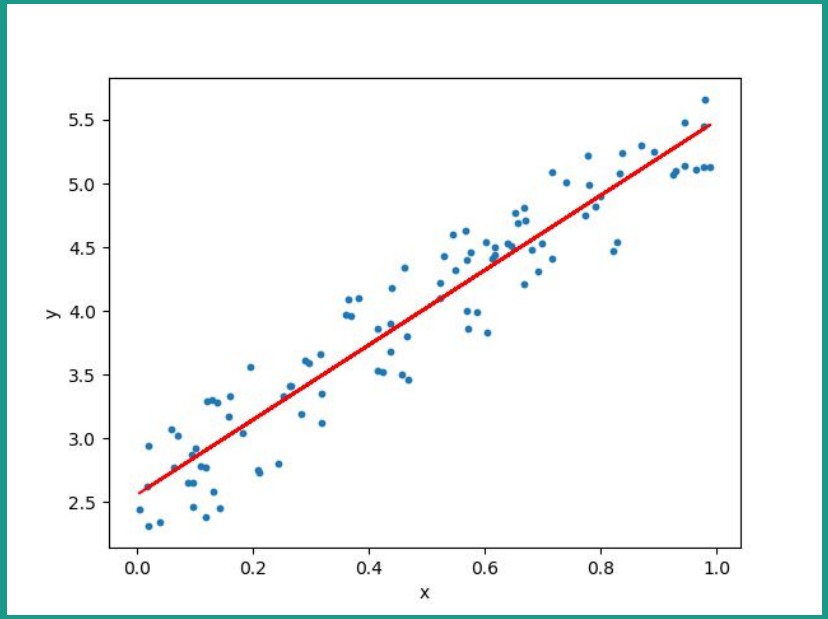
Model Specific

Regression
Decision Tree

Model specific



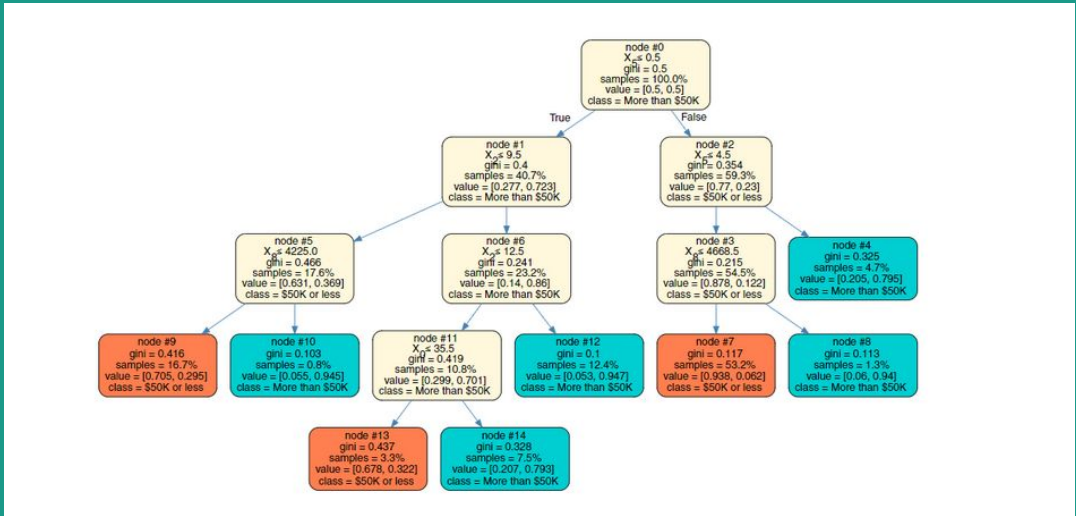
Decision Tree



Regression

Model agnostic:

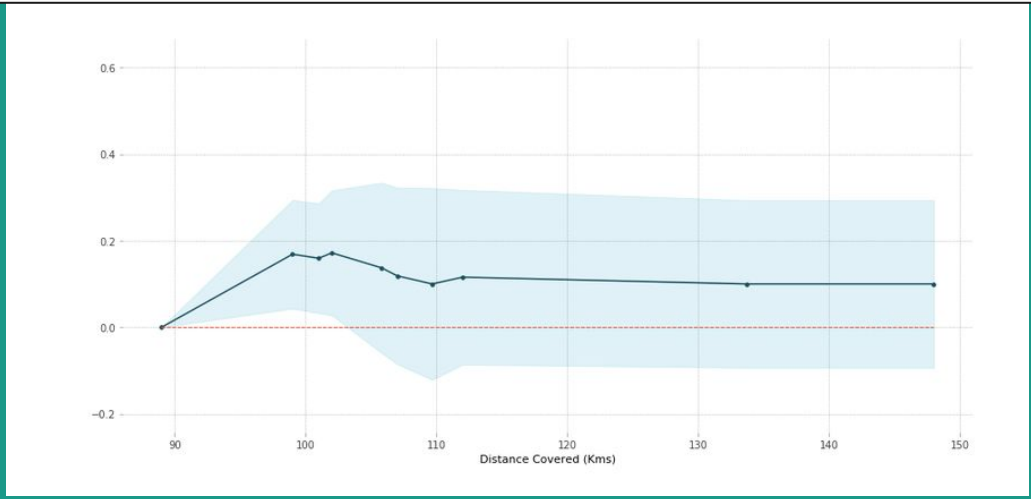
is there a way to build interpretable approximations of really complex models?



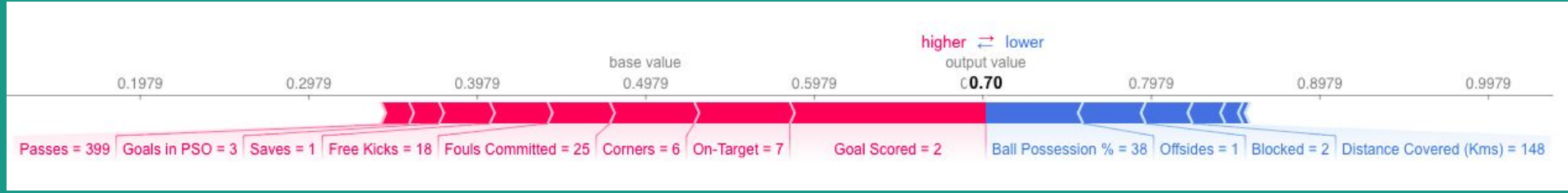
Permutation Importance:

1	165349.2	136897.8	471784.1	192261.83	0
2	162597.7	151377.59	443898.53	191792.06	1
3	153441.51	101145.55	407934.54	191050.39	1
...	...	...	...	...	...
48	0	135426.92	0	42559.73	1
49	542.05	51743.15	0	35673.41	0
50	0	116983.8	45173.06	14681.4	1

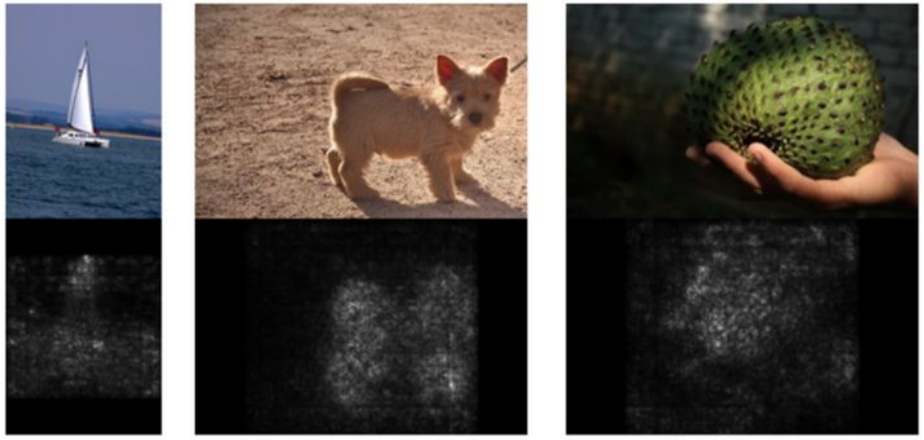
Partial Dependence Plot:



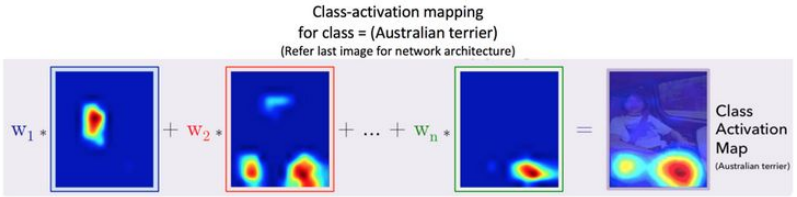
SHAP:
Why model predicts 0.7 instead of 0.5?



Interpretability for deep learning:



Salience Map



Class Activation Map

Will Koehrsen
@koehrsen_will

Develop new algorithms as a PhD student: $30k/year
Use pre-built sklearn models as a data scientist: $120k/year
Build regression models in excel as a hedge fund analyst: $200k/year
Make pie charts as a CEO: $14 million/year

3:48 · 28 Oct 19 · Twitter Web App

5,969 Retweets **27.6K** Likes

Will Koehrsen @koehrsen_will · 28 Oct

On a more serious note, a complicated algorithm does not equal a better algorithm if it's not understood and trusted by people. Helping people make better decisions often means keeping models as simple as possible.

22 211 1,915

Data Science In Iran

YOU A DATA SCIENTIST,
YOU A DATA SCIENTIST
EVERYONE'S A DATA SCIENTIST

Data Scientists

What my mom thinks I do

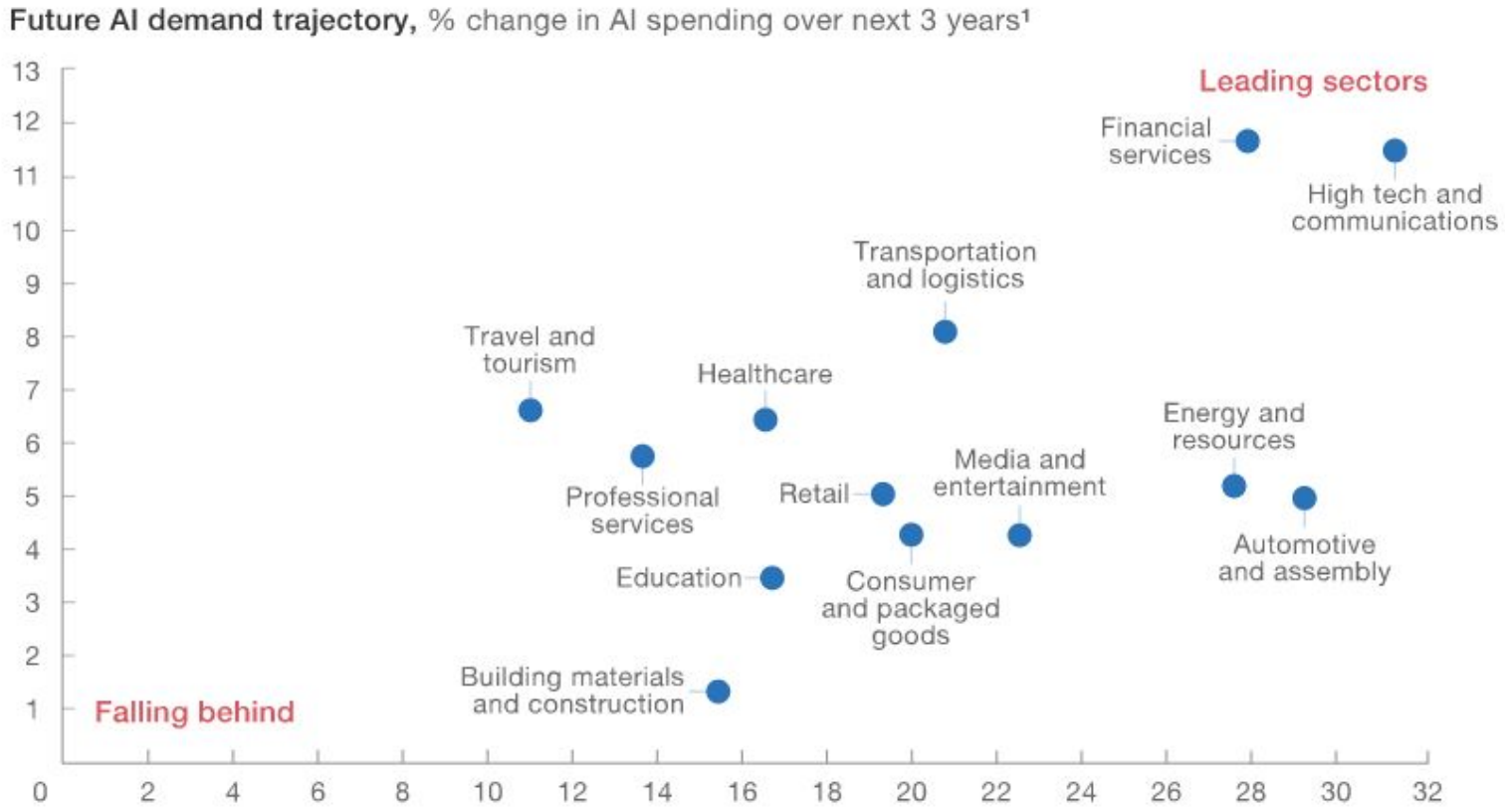
What my friends think I do

What society thinks I do

What investors think I do

What I think I do

What I really do


Future AI demand trajectory, % change in AI spending over next 3 years¹
Leading sectors
Financial services
High tech and communications
Transportation and logistics
Travel and tourism
Healthcare
Energy and resources
Media and entertainment
Professional services
Retail
Automotive and assembly
Education
Consumer and packaged goods
Building materials and construction
Falling behind
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22
24
26
28
30
32
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Recommendations

- www.mckinsey.com
- www.pair.withgoogle.com
- Book: thinking with data, Max Shron
- Book: interpretable machine learning, Christoph Molnar
- Course: machine learning Explainability, kaggle.com

Thank you.

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