

# Fantastic Problems

And Where to Find Them

Daryl Weir\_  
Senior Data Scientist\_

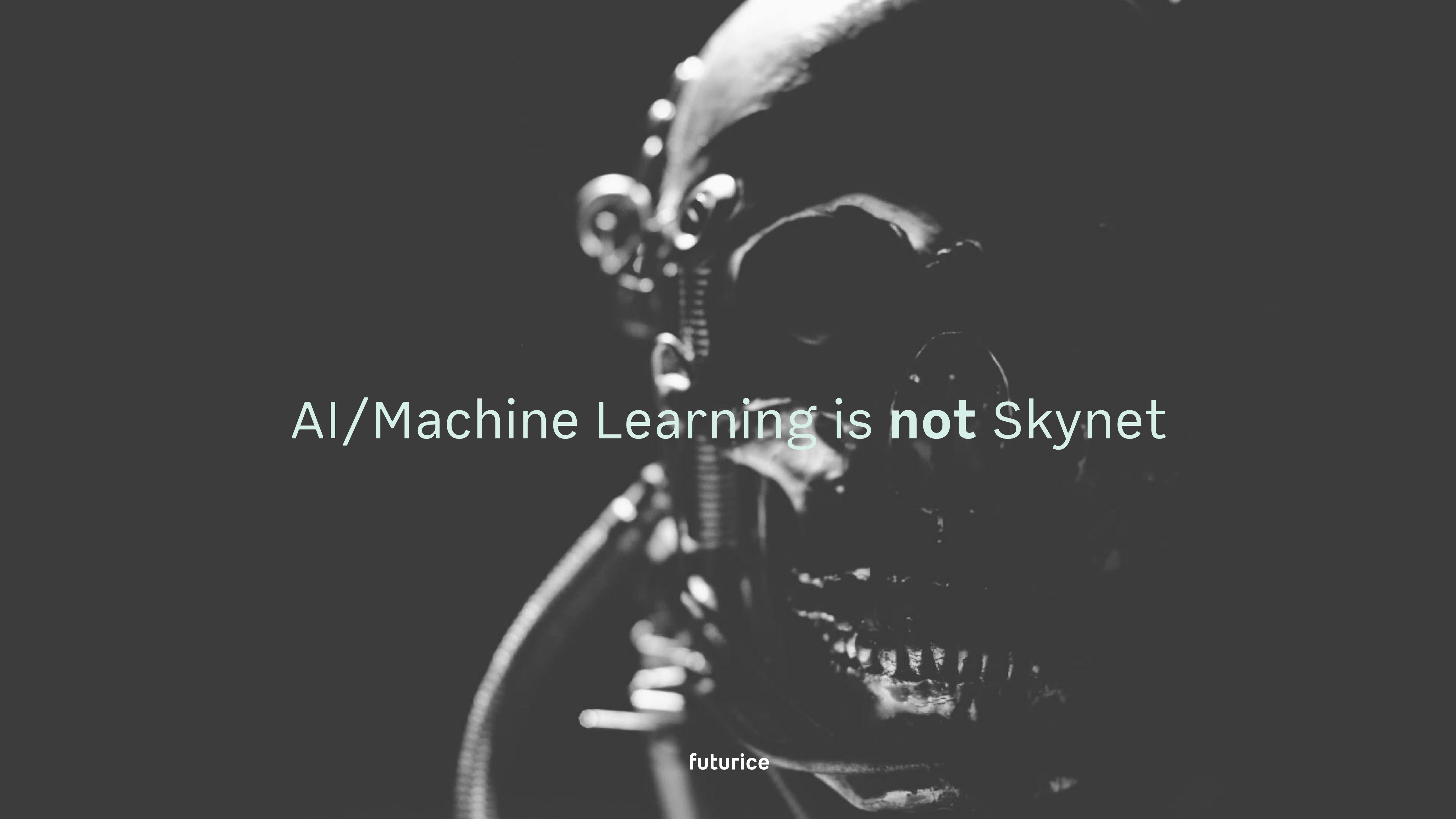
# Machine Learning Hype\_

AI, big data, machine learning... These have been buzz words for years now

This talk tries to answer two key questions:

- What can machine learning actually do?
  - Should I use machine learning to solve my problem?



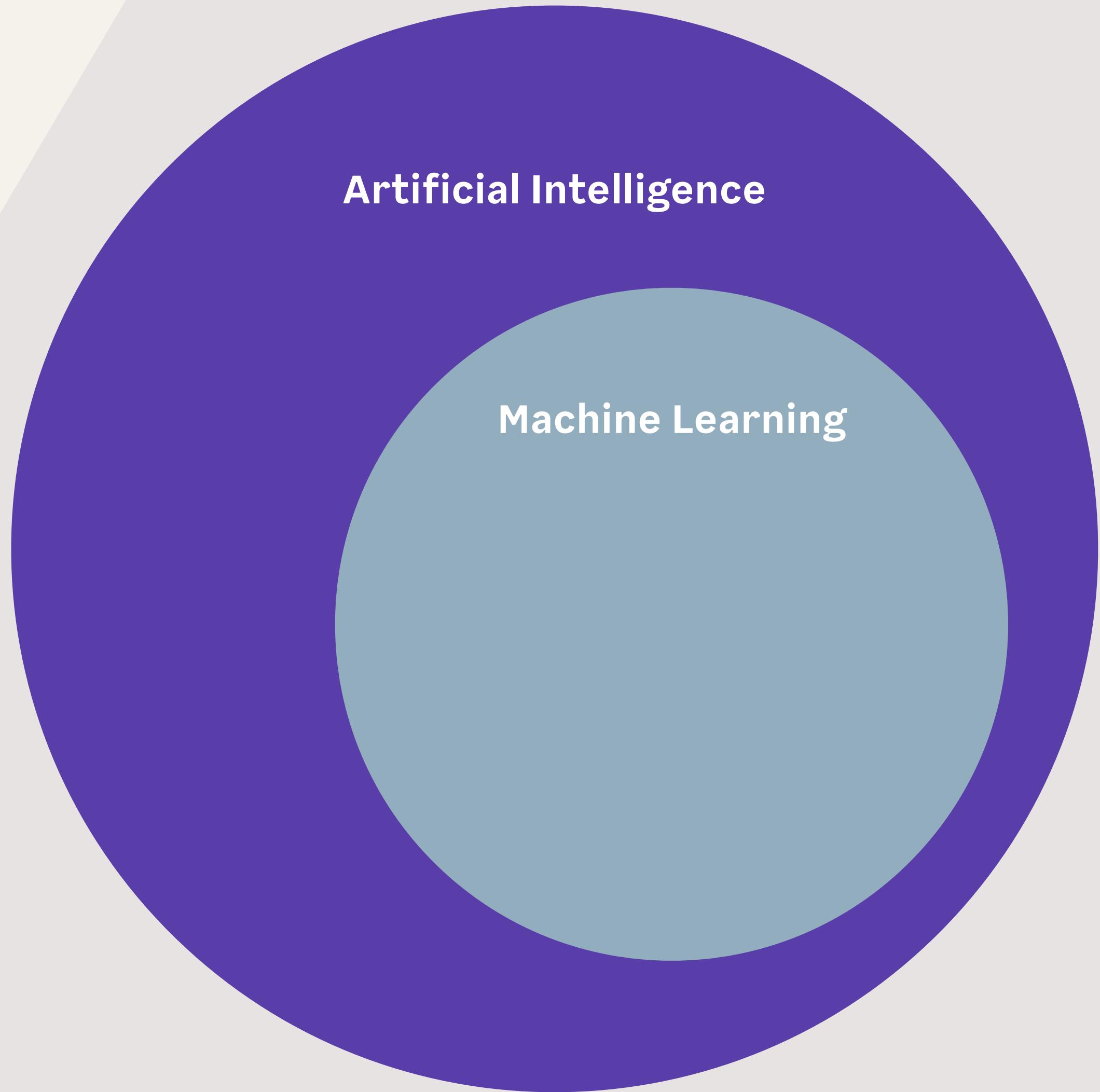


AI/Machine Learning is **not** Skynet

# So what is it?\_

**Artificial intelligence (AI):** computer system that displays **human-like behaviour** in a task

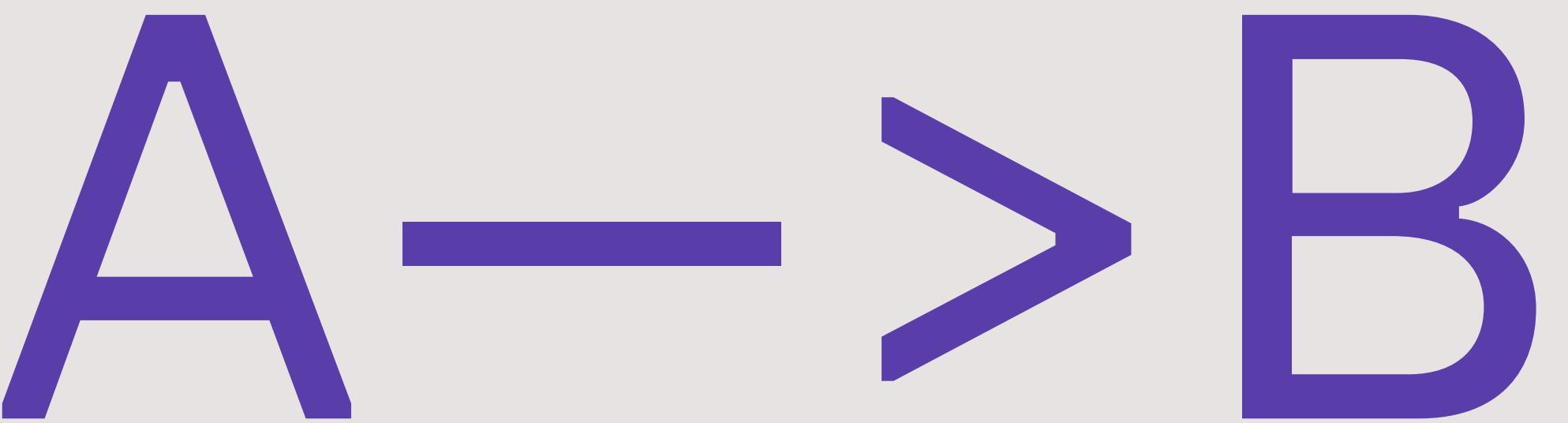
**Machine learning (ML):** toolbox of algorithms and techniques that learn **rules** from **example data**. Used to implement “AI” in **narrow**, well-defined tasks



# Using machine learning –

The most common kind of **narrow question** that ML is used to solve looks like this:

Given a **situation A**, tell me the **outcome B**



# Example: Self driving cars\_

**Narrow question:** given the road looks like this, how should I turn the steering wheel to not crash?

## Data

Given: camera image of the road

Tell me: steering wheel angle

**CMU did this** - the car drove 3000 miles across the US and the machine was in control 98% of the time



The cool part\_



They did it in 1995!

But what kind of problem should we  
look for?\_

**“If a typical person can do a  
mental task with less than one  
second of thought, we can  
probably automate it using AI”**

- Andrew Ng

# Is that a good enough rule?

# Our rule of thumb\_

You might have a machine learning  
problem if:

1 - writing down a set of rules is hard

**BUT**

2 - gathering examples is easy

# Is there a cat in this image?\_

Writing rules for the presence or absence  
of a cat is really, really hard

**BUT**

Finding cat pictures is really, really easy

## One more condition\_

You might have a machine learning problem if:

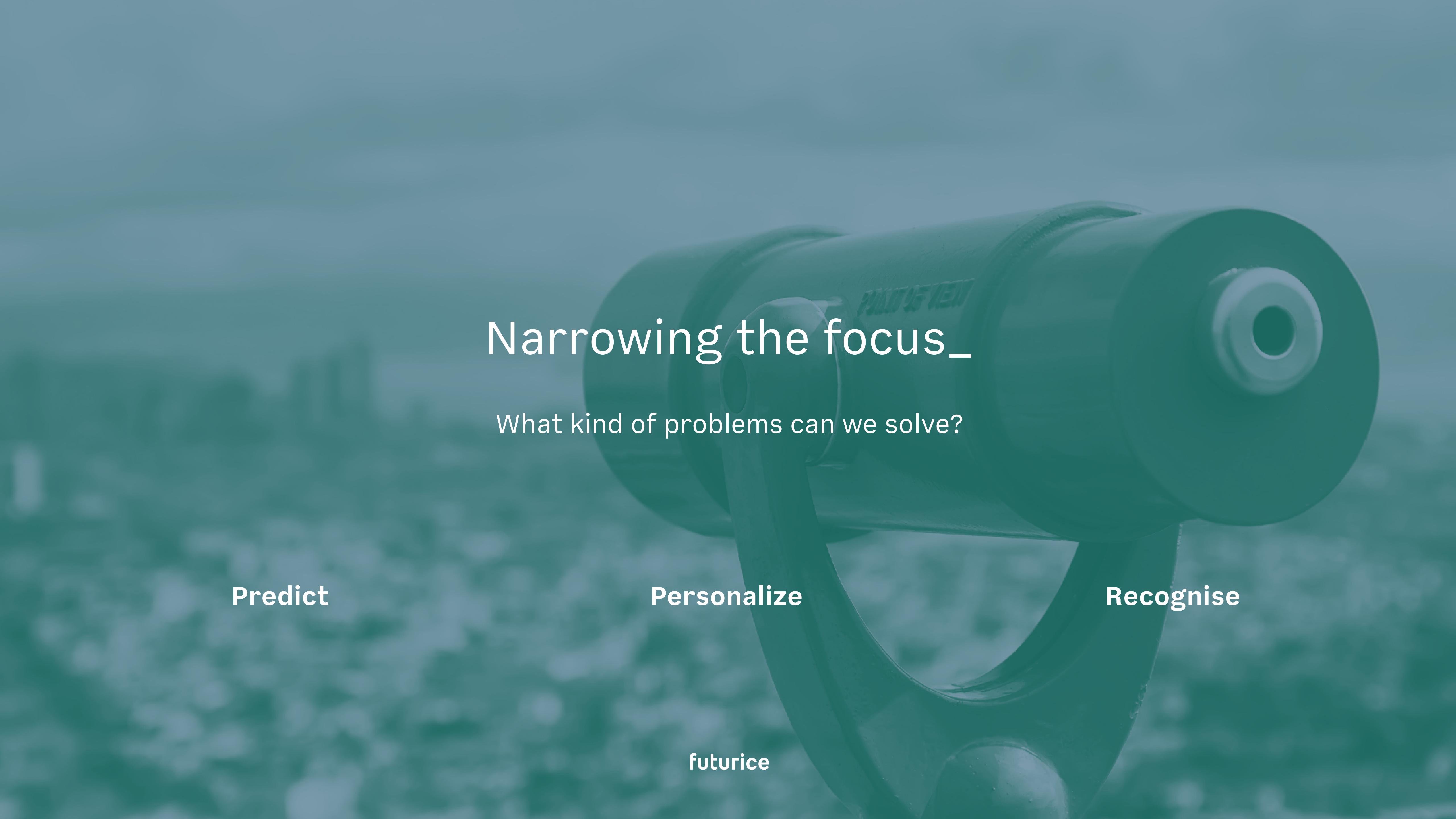
1 - writing down a set of rules is hard

**BUT**

2 - gathering examples is easy

**AND**

3- knowing the rules would allow  
**meaningful action**



## Narrowing the focus\_

What kind of problems can we solve?

Predict

Personalize

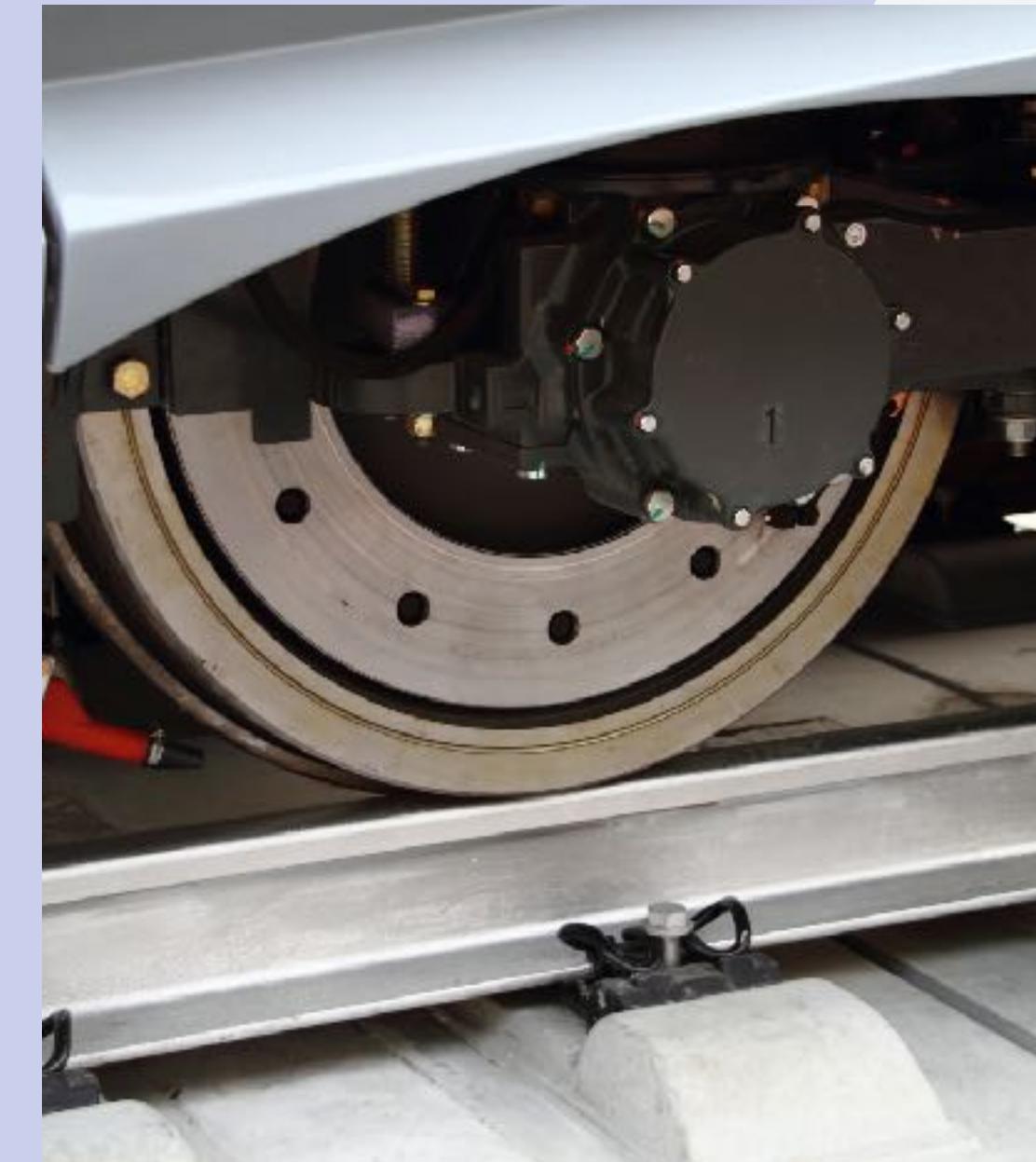
Recognise

# Predict\_

**Predict something about the future, such as:**



A number  
e.g. what will this stock price  
be tomorrow?



A yes/no answer  
e.g. will this wheel fail in the  
next week?



One from a set of options  
e.g. what department will this  
call go to?

# Personalize\_

**Tailor system behaviour to specific users or groups of users**



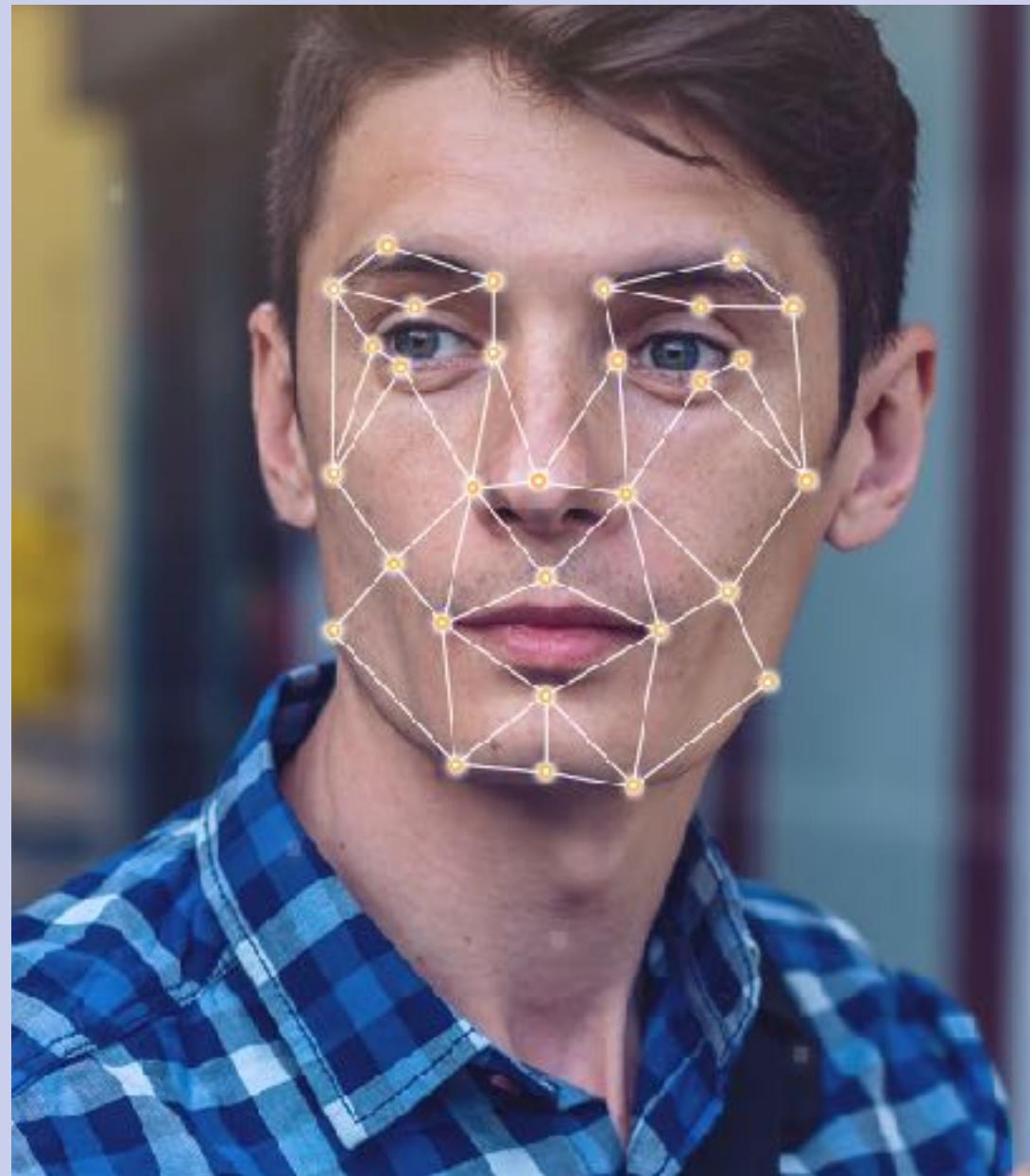
**Recommend content**  
**e.g. YouTube, Amazon, New York Times, Google Ads**



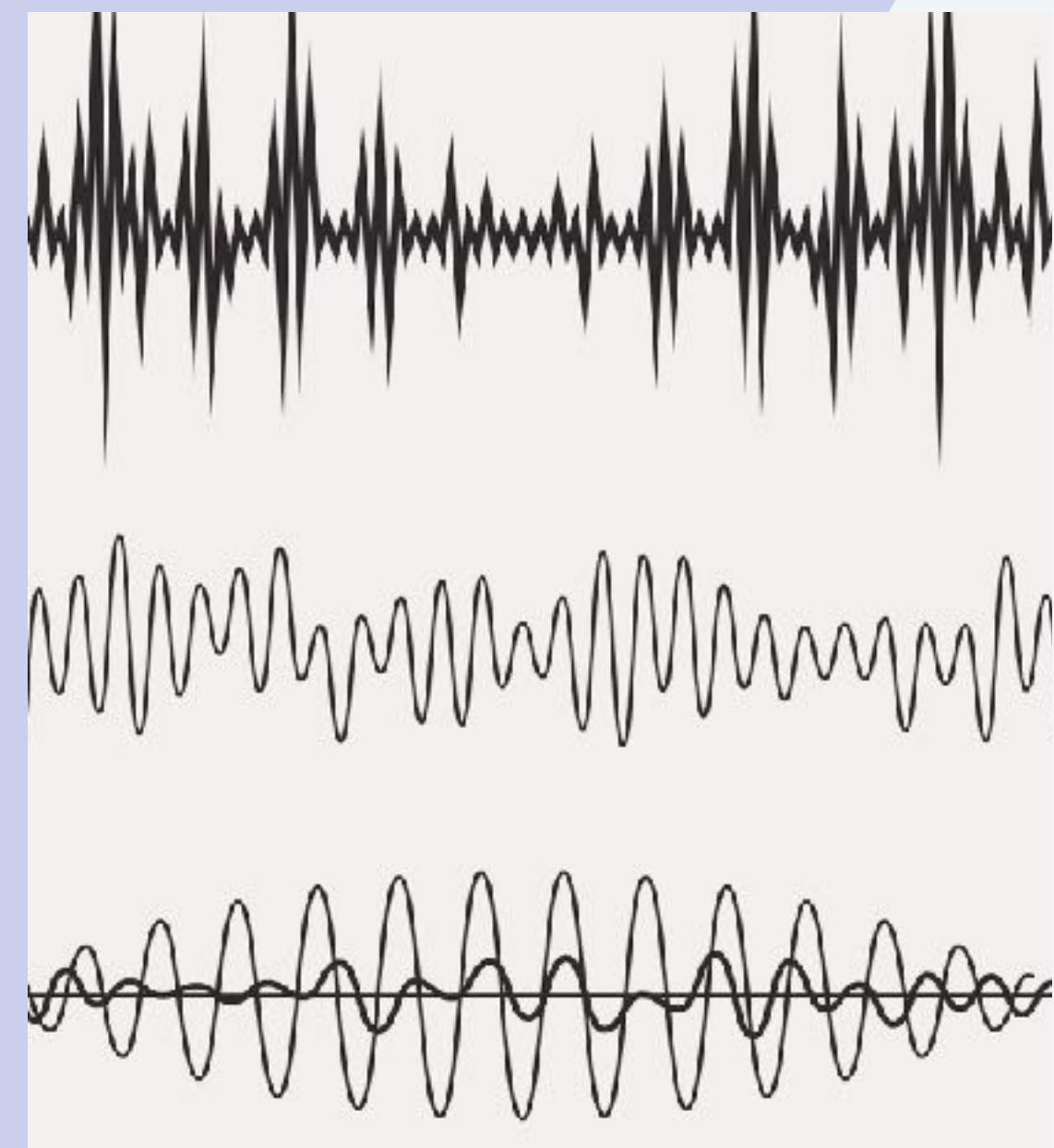
**Target communication**  
**e.g. Send email campaign only to interested users**

# Recognise\_

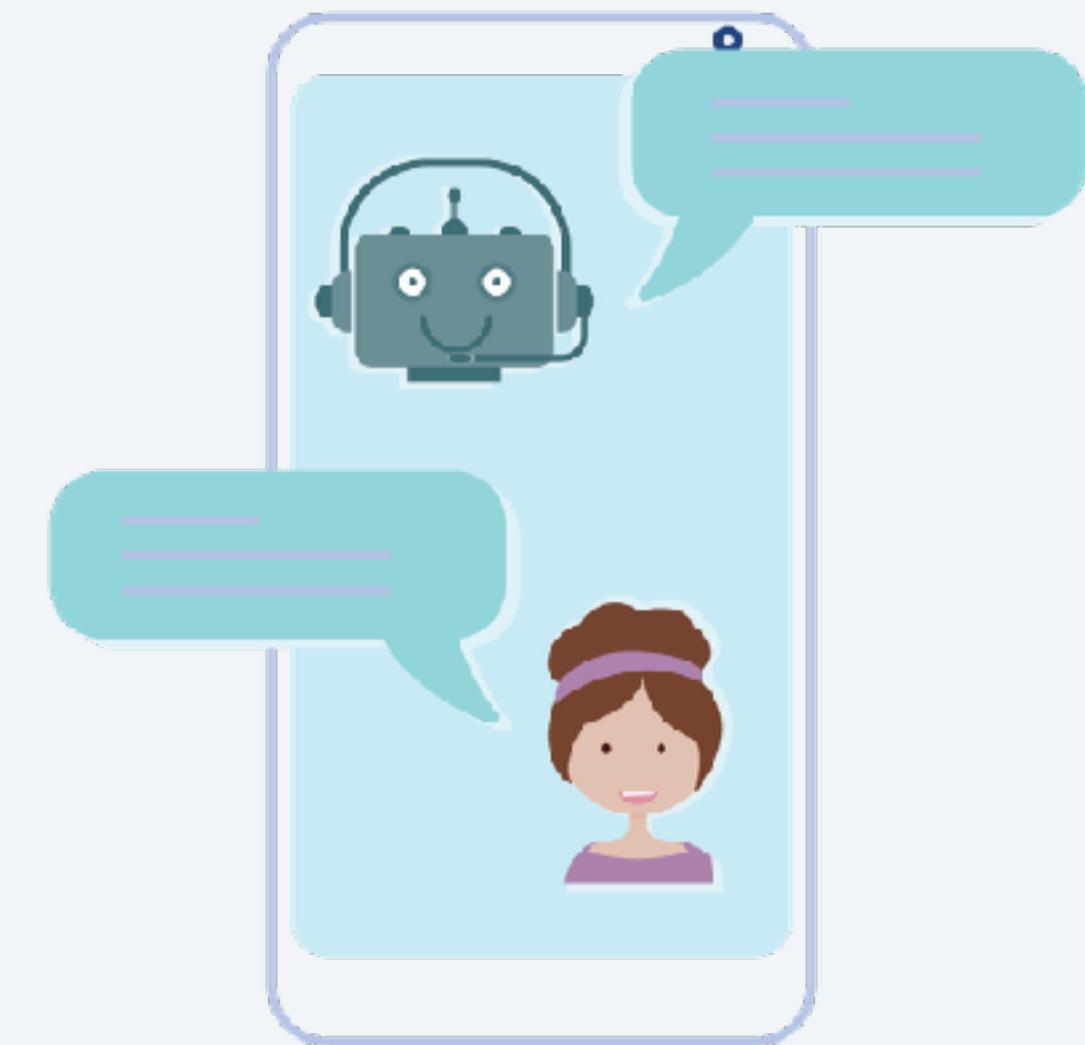
**Identifying information from input sources, such as:**



**Images**  
e.g. face recognition

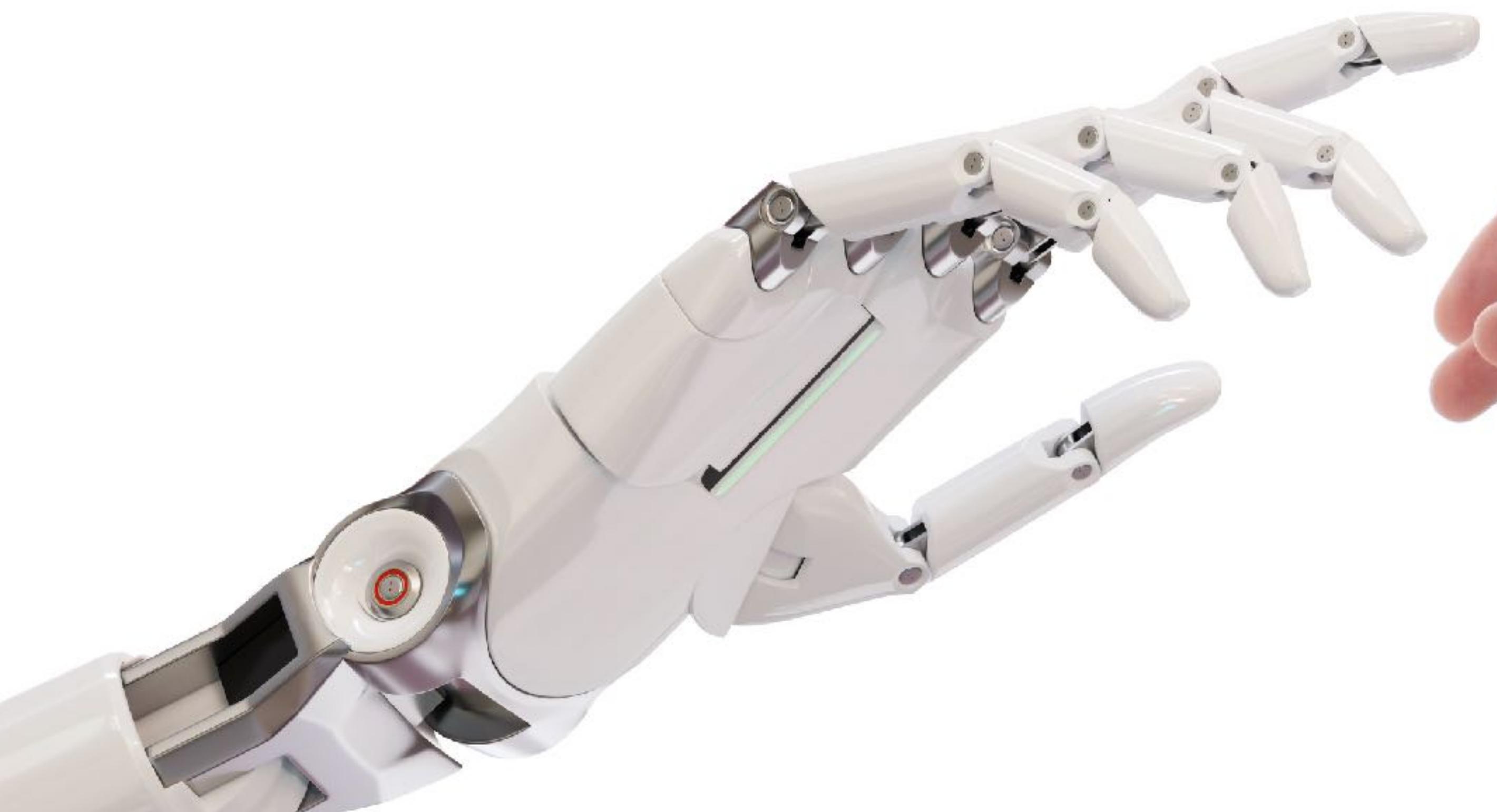


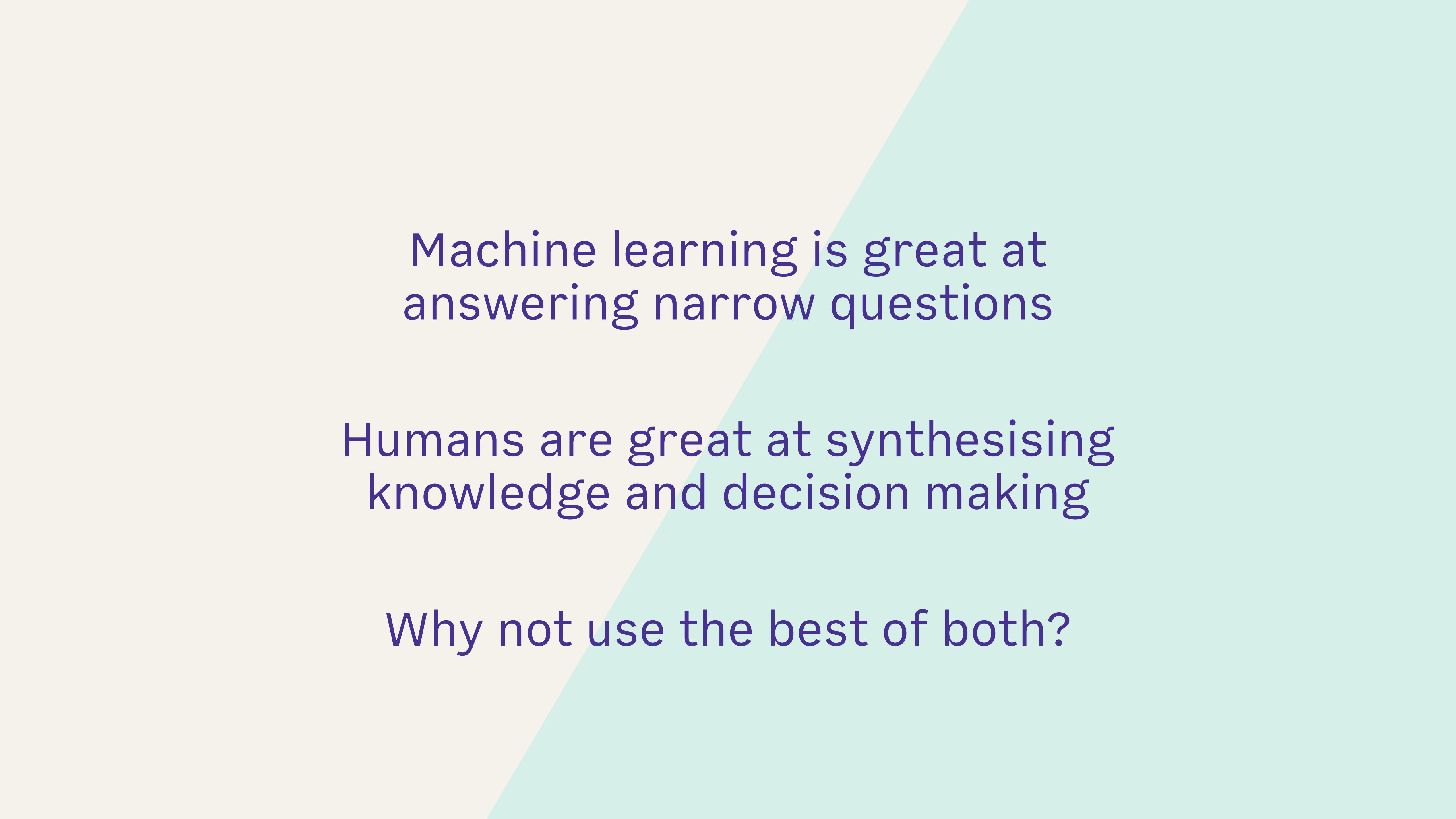
**Sound**  
e.g. song recognition



**Text**  
e.g. chatbot

# Human-machine collaboration\_





Machine learning is great at  
answering narrow questions

Humans are great at synthesising  
knowledge and decision making

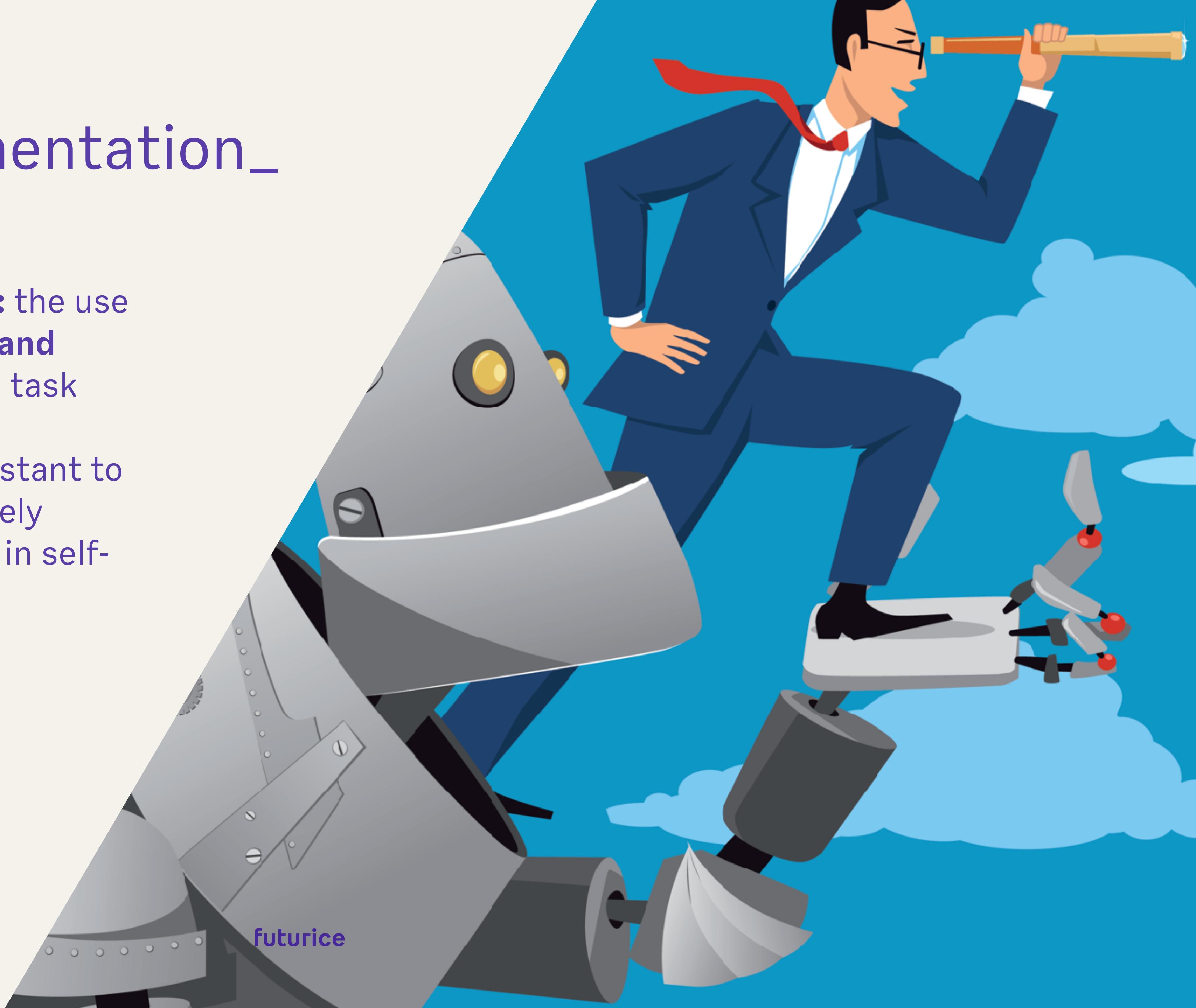
Why not use the best of both?

# Intelligence Augmentation\_

**Intelligence Augmentation (IA):** the use of machine learning to **support and enhance** human capabilities in a task

The system acts as a smart assistant to the human, rather than completely automating the work (as it does in self-driving cars)

- Google Search
- Spotify Discover Weekly
- Siri/Alexa/Cortana/Google Assistant



# Building augmented intelligence\_

Creating a great digital service requires  
**collaboration** - adding machine learning  
doesn't change that

It takes:

- service design
- data science
- UX design
- engineering
- user testing
- ...



# A cautionary tale\_

Google Photos rolled out automatic object tagging a few years ago

The data were not diverse enough, and the system learned to **repeat a bias**

With better design and sanity checks in place, this might have been prevented



# If you remember 3 things\_

- 1) Machine learning is just a tool - define the problems first
- 2) Look for complex rules with plentiful examples
- 3) Design to support and enhance human abilities

Thanks for listening!  
[daryl.weir@futurice.com](mailto:daryl.weir@futurice.com)  
@darylweir