AI Demystification

DialogGesellschaft

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Goals

1. **Know what AI can do and some common examples**
2. **Know what the various terms in the AI glossary mean and how to use them**
3. **Understand what a successful AI project requires how to find good use cases**
4. **Know AI's limitations and where it is not the best tool for the job**

Question

What is AI?

Give your definition

What is AI?

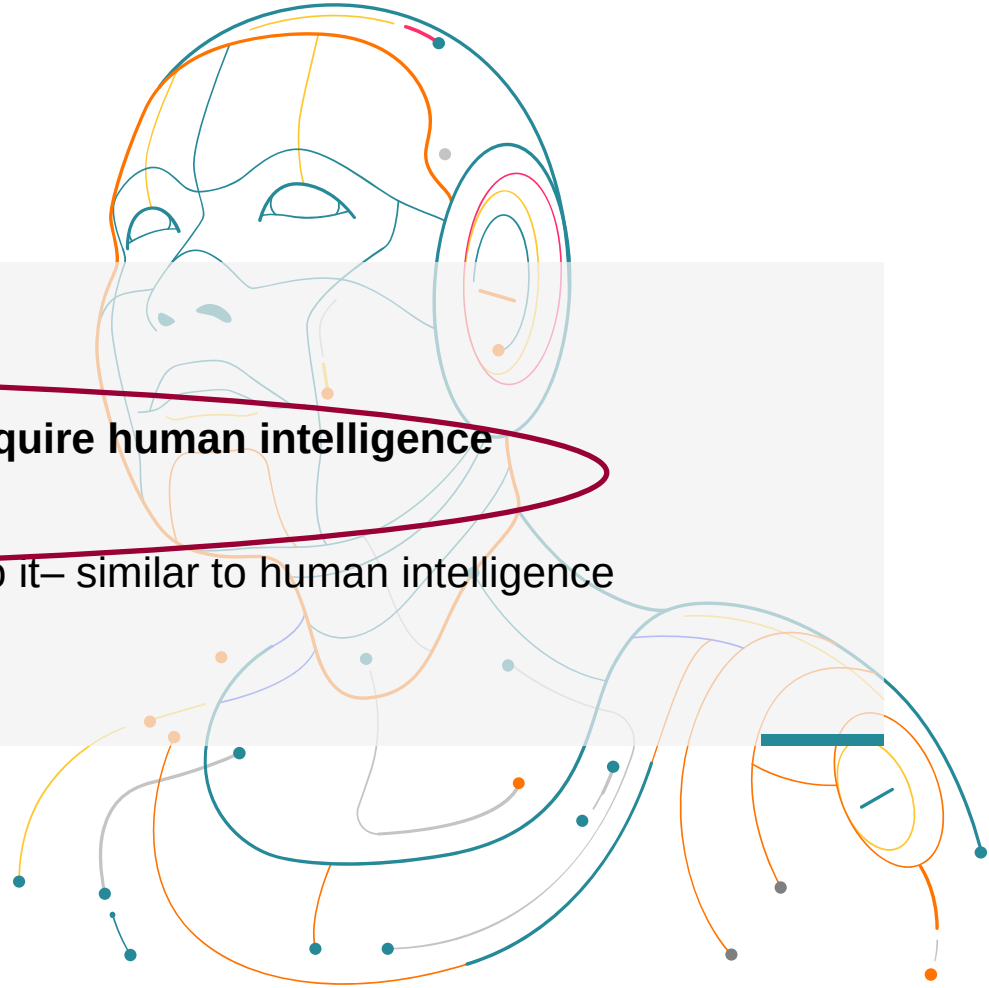
There are many definitions of AI:

Our definition: **Computer systems able to perform <u>tasks</u> that normally require human intelligence**

- Narrow AI

A computer system that is able to cope with any generalized task assigned to it– similar to human intelligence

- General AI



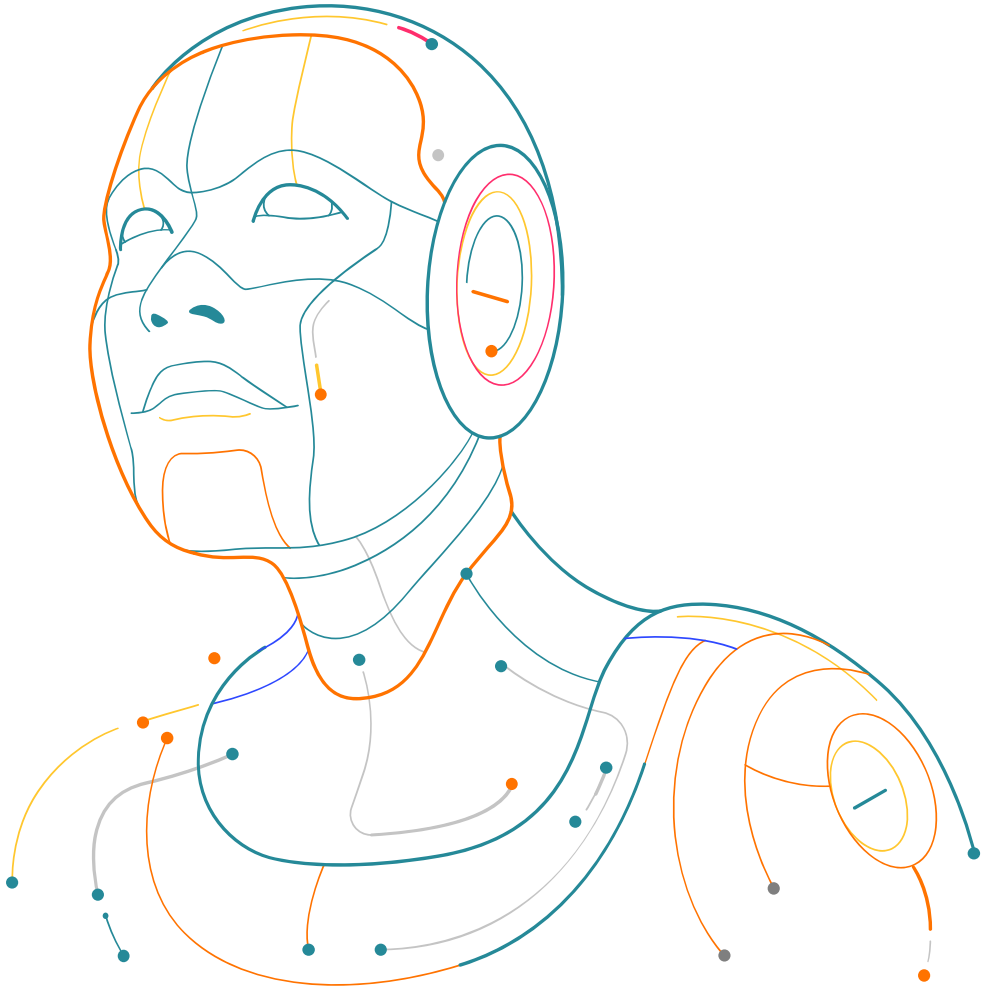
What is AI?

Narrow AI: Executes specific tasks within set parameters (e.g., a chatbot handling customer service inquiries).

We are here

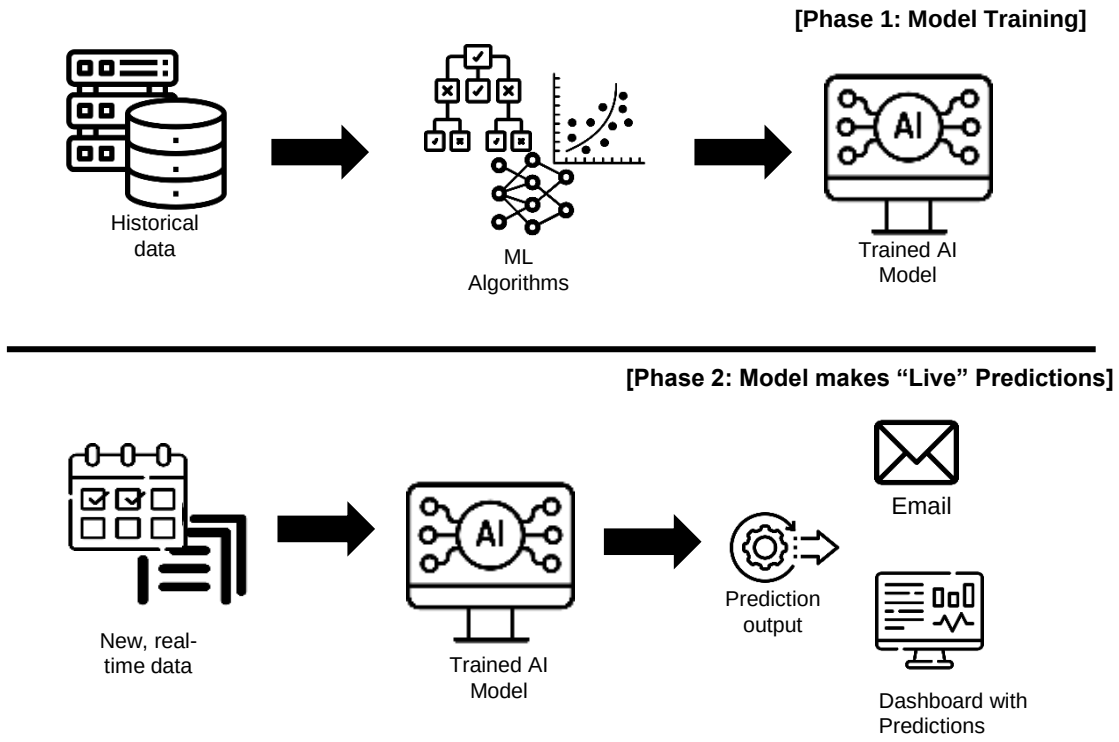
General AI (AGI): Mimics human cognitive abilities, adaptable to a wide range of activities (e.g., a robot capable of performing complex medical surgeries as well as composing music).

Super AI: Surpasses human intellect and abilities, excelling in all areas including creativity and emotional intelligence (e.g., an AI that innovates new scientific theories beyond human conception).



AI works by identifying **patterns** that exist in data

- Using **data from the past,** AI algorithms **record patterns** that exist in that past data.
- Goal is to find patterns that help **predict a certain variable,** or to find general patterns that exist but otherwise are hard to see (like in clustering)



How are patterns in data found via AI?

Ingredients needed to "record" the patterns found in data:

1. **A machine learning algorithm** | think of this as a blank equation or newborn brain, waiting to learn relationships and things about the world
2. **Training data:** data from the past that's used to fit the equation, or train the newborn baby brain
3. **Objective function:** what the model should optimize for, how it "knows" it's doing a good job

Training Data

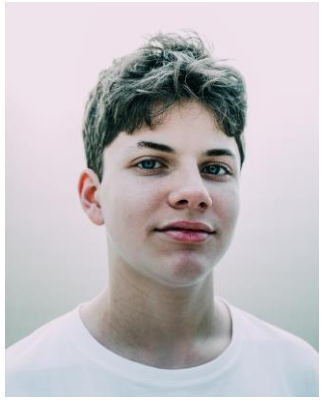
Experience	Outcome
Touched hot stove	Burned hand, pain signal
Walked into street without looking	Car honked, fear signal
Rode bike too fast down a hill	Fell off, pain signal
Touched hot stove	Burned hand, pain signal
Walked into street without looking	Car honked, fear signal
Approaches new street to cross	Looks both ways (to avoid fear signal)

+

Untrained Algorithm

=

Trained Algorithm (Model)



Photos by Jimmy Conover and Noah Blaine Clark via Unsplash

How are patterns in data found via AI?

Features | **Target**

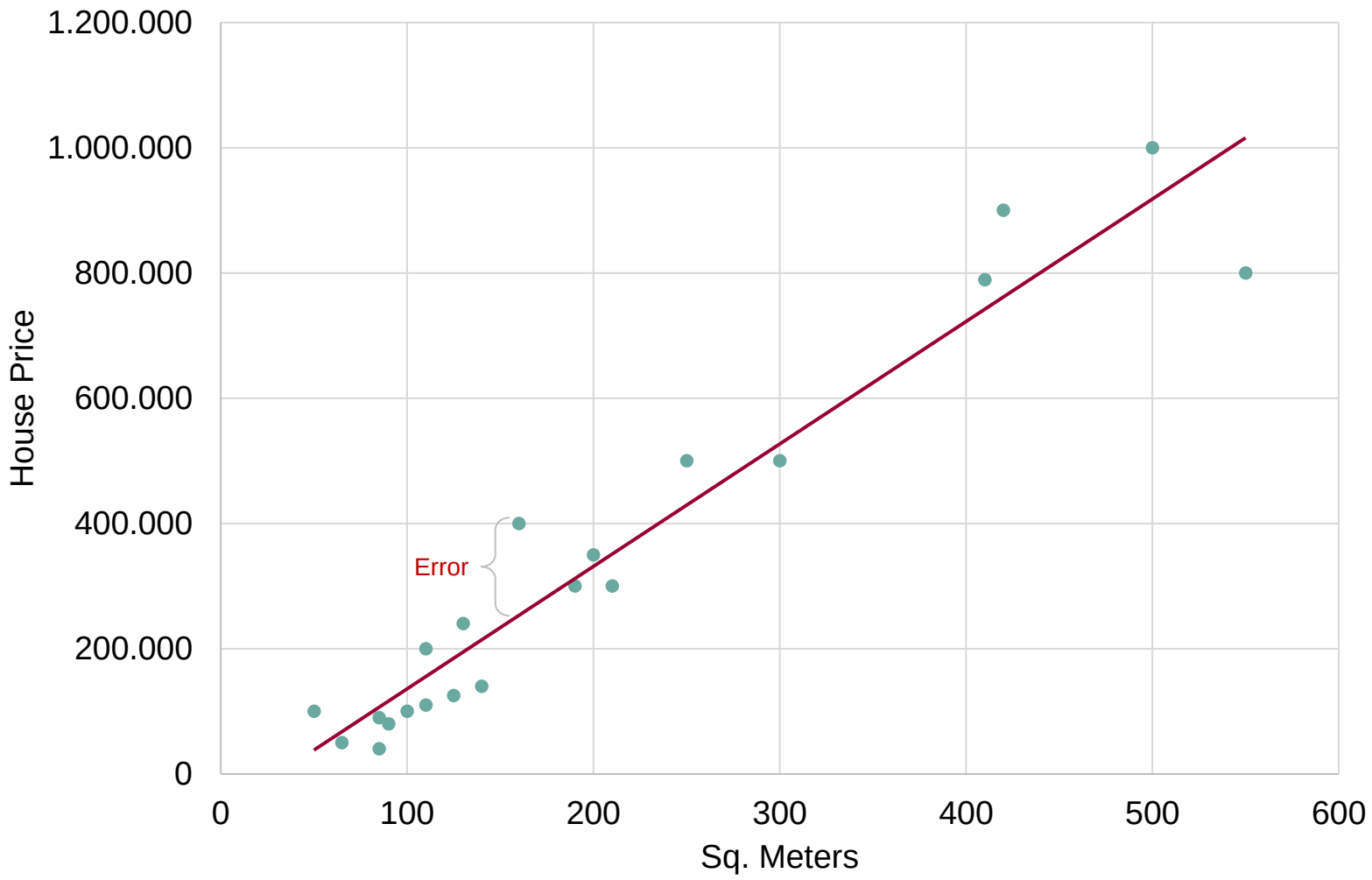
Training Data

Sq. Meters	Bedrooms	Bathrooms	Zip Code	Price (€)
350	5	4	10718	550,000
120	2	1	13567	200,000
60	1	1	14555	148,000
200	3	2	10382	310,000

Prediction Data

Sq. Meters	Bedrooms	Bathrooms	Zip Code	Price (€)
130	2	1	10382	?
40	0	1	14678	?

How Machine Learning works: training data + algorithm = trained model

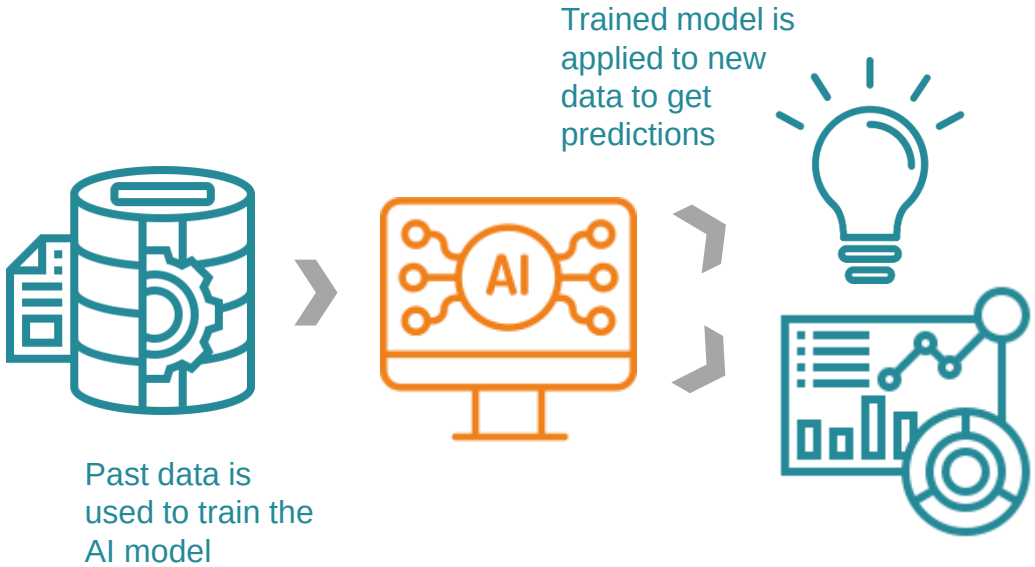


$$y = a + bx$$

price = a + b * sq. meter

price = -59,760 + 1,955 * sq. meter

What does ML do?



There is no one single AI (ML) **model.** A new AI model must be trained for each target variable, using unique past data that is relevant to that specific target value to predict.

Machine Learning (ML) uses **past data** to **find patterns** that can be used **to make decisions in the future**.

ML models are **representations of the pattern** between past data, and a target value that we want to predict.

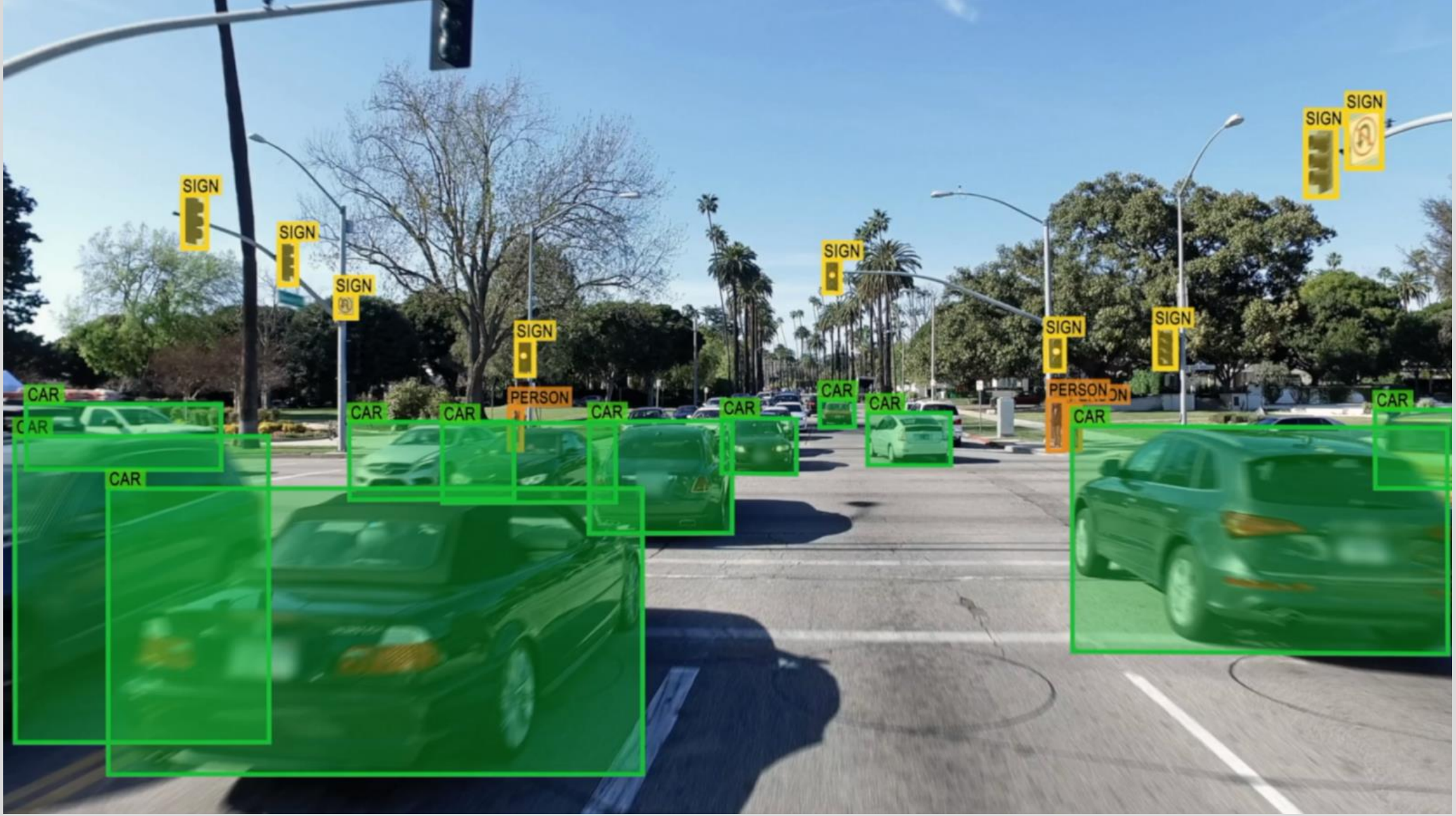
AI can predict 3 categories of target values:

1. Numbers (energy prices, load)
2. Categories (Type of road sign seen in an image)
3. Actions (What action to do next to balance the grid)

Below are some examples of target variables AI can predict, and the past data used to train the model:

Target Variable	Data (features)
Solar power infeed	Weather, time of day, past solar infeed values
The next move to make in a game of chess	Current state of the board, value of all potential moves
What a customer will purchase	Demographic data, past purchases made
If an email is spam	Examples of spam emails, features of the email

What about Autonomous Driving?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AI Project Lifecycle

Decide on the target variable to predict using AI/Machine Learning

Problem Definition

Clean and prepare the historic data for use in machine learning model. Analyze the data

Data Preparation + Analysis

Deploy the best-performing model to predict in real time. Monitor the predictions for continued quality

Model Deployment + Monitoring

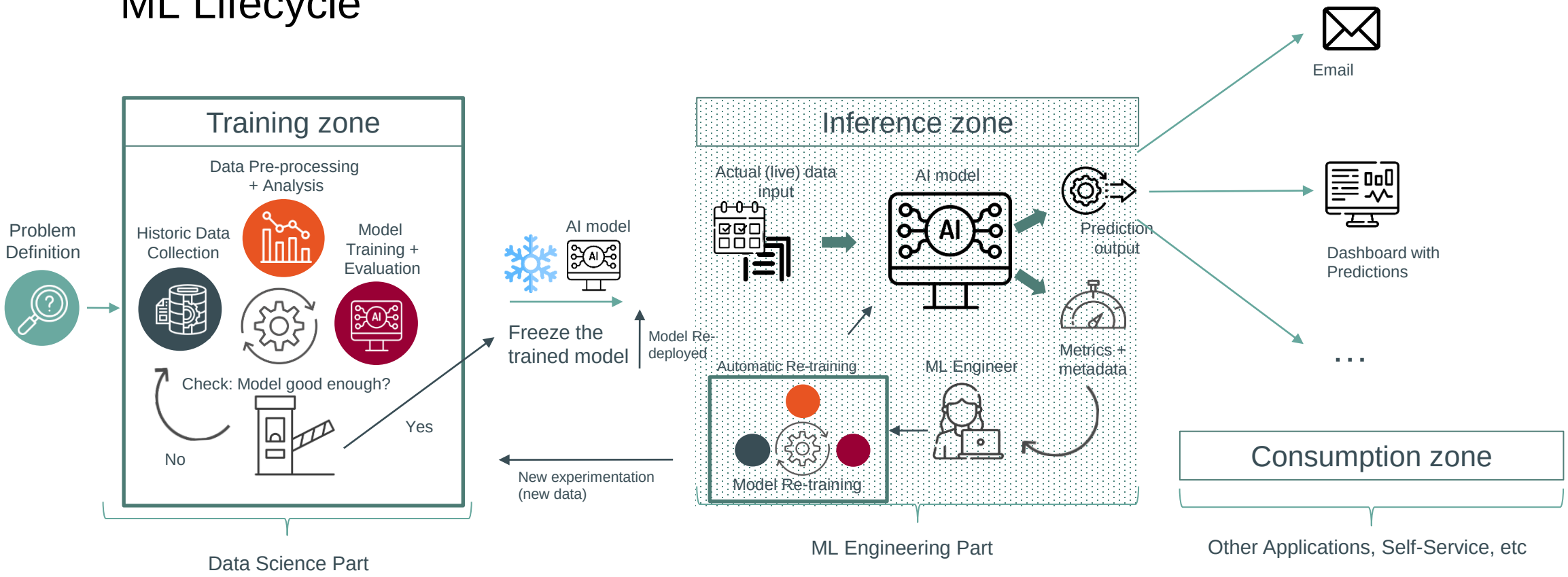
Data Collection

Collect past values of the target variable to predict, and past features that explain the target variable

Model Training + Evaluation

Train machine learning models on the past data. Compare the performance of the model against business needs

ML Lifecycle



The data format that goes into the model has to be the same as the data that what used during training

Use Case areas for AI

Predicting continuous values

- Grid loss prediction
- Budget prediction
- Predicting stock prices

Predicting categories

- Customer segmentation
- Object recognition
- Customer churn predictor

Recommendation Systems

- AI Control Systems
- AI system for grid montioring

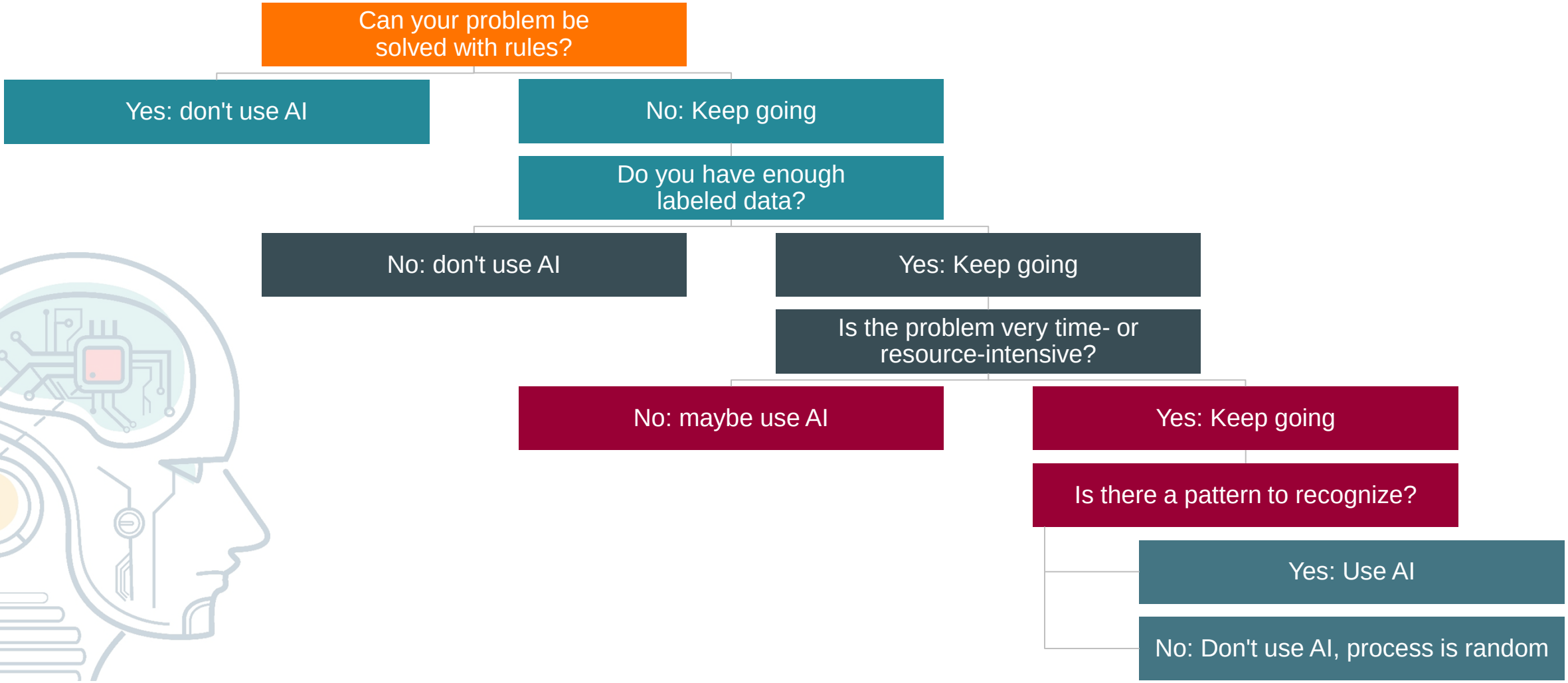
Natural Language Processing

- Chat bots
- PDF processing
- Sentiment Analysis

Outlier Detection

- Automatic reporting on outliers

When to use AI?



Question

What is Generative AI?

How is it different from "traditional" AI?

Summary: AI Fundamentals

- All AI systems are made up of:
  - Training data
  - Algorithm
- All AI systems today are narrow AI systems (complete one task using past data and examples of how that task was completed in the past
- AI models only show relationships inherent in the data they have seen in the past. If relationship is not there or badly modelled, model will not work!
- Training data can come from Elia Group (internally-trained model), or external (like ChatGPT)
- **AI is not the right tool for every use case.**

What about ChatGPT?

Difference between Generative AI and Traditional AI

	Output What is the result of the model	Training Data What data is the model output based on	ML Algorithm What algorithms are used	Objective What means the model is "good"?
Traditional AI	• Specific values (number or category) ○ ex. Wind infeed in the next 15 mins, in MW	• Elia Group-specific ○ ex. Past grid topologies, asset data, IoT sensor data	• Simple statistical methods ○ ex. linear regression • Advanced non-linear methods ○ ex. Neural Networks	• Business-related objectives ○ ex. Reduce error in forecasts (in MW), improve accuracy of drone image classification
Generative AI	• New content in the form of text, image, and video ○ ex. An image, which does not actually exist, based on prompts	• All publicly-available data, plus proprietary data and prompts and outcomes from model use ○ ex. online articles	• Advanced non-linear methods ○ ex. Neural Networks	• Believability ○ Outputs are optimized to be believably, not accurate

Question

What are some examples of use cases where AI is the right tool for the job?

Question

What are some examples of use cases where AI is *not* the best tool for the job?