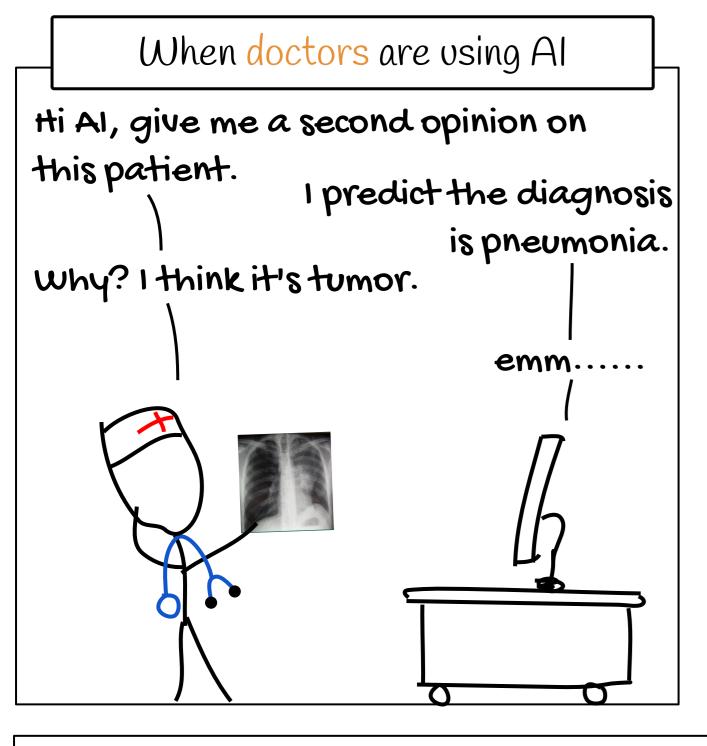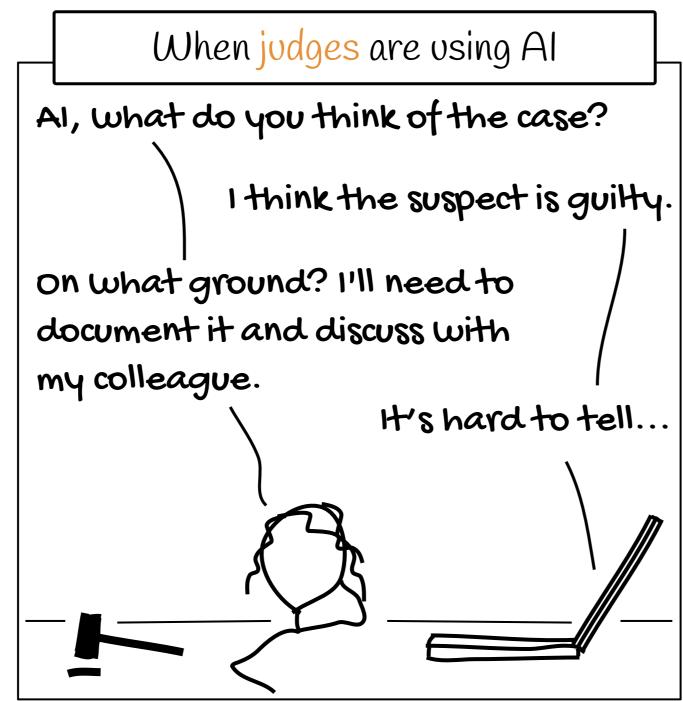# Bridging AI Developers and End Users
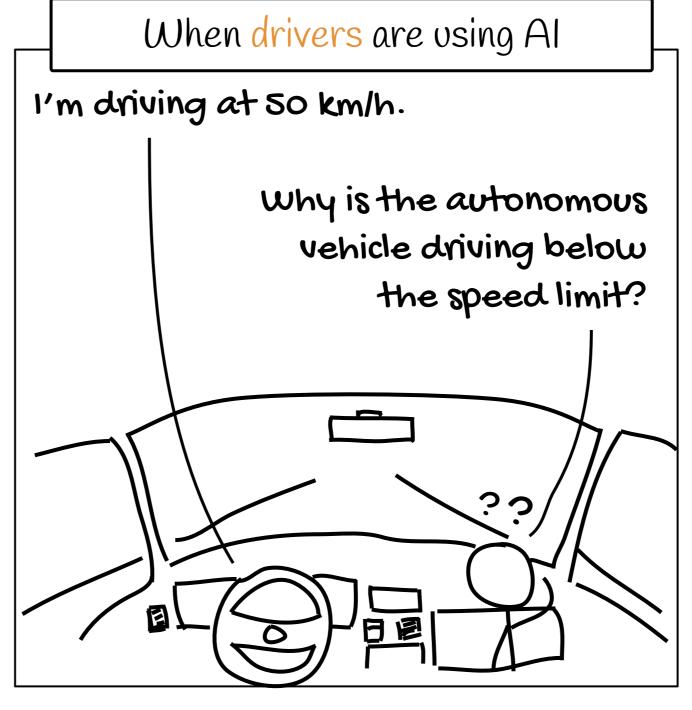## An End-User-Centred Explainable AI Taxonomy and Visual Vocabularies
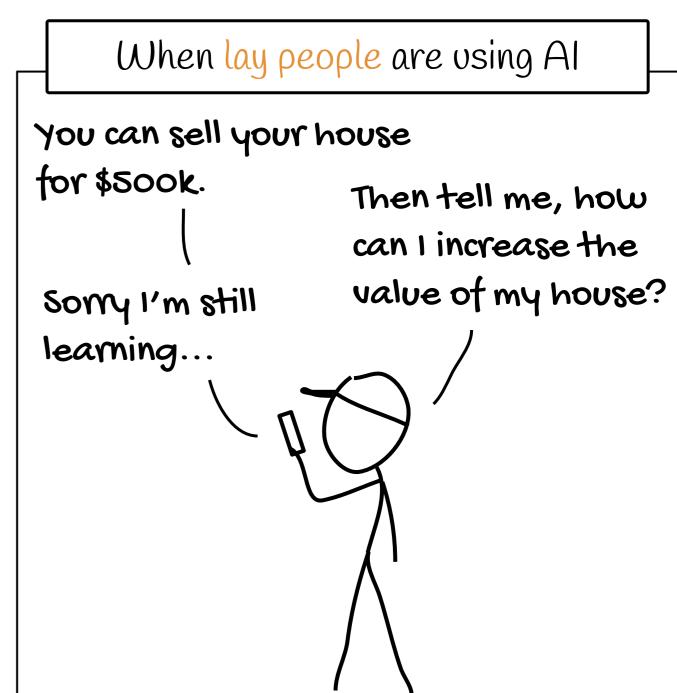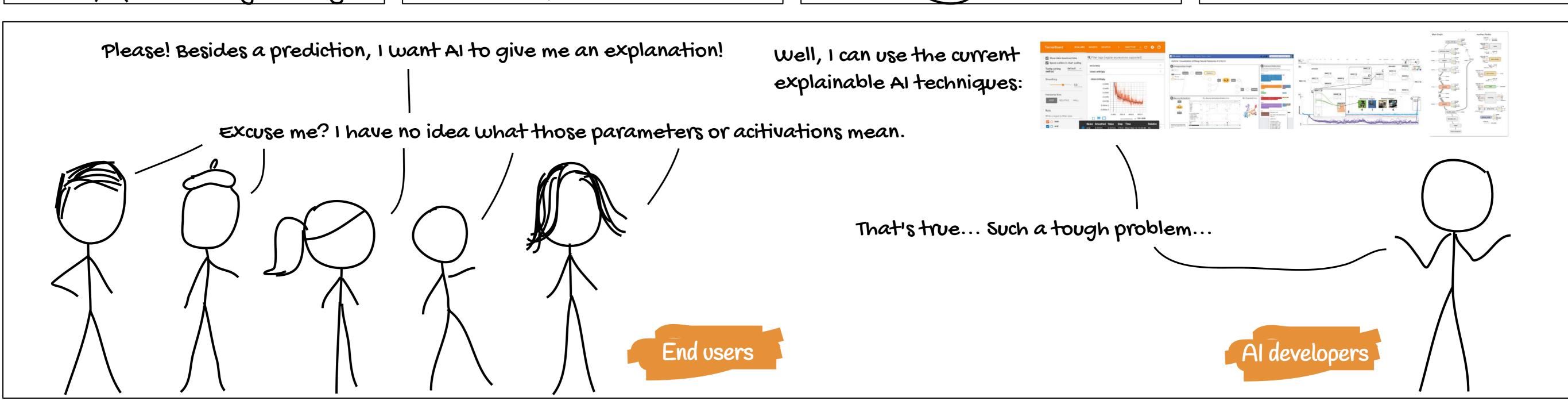
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When **doctors** are using AI

Hi AI, give me a second opinion on this patient.

I predict the diagnosis is pneumonia.

Why? I think it's tumor.

emm......

When **judges** are using AI

AI, what do you think of the case?

I think the suspect is guilty.

On what ground? I'll need to document it and discuss with my colleague.

It's hard to tell...

When **drivers** are using AI

I'm driving at 50 km/h.

Why is the autonomous vehicle driving below the speed limit?

??

When **lay people** are using AI

You can sell your house for $500k.

Then tell me, how can I increase the value of my house?

Sorry I'm still learning...

Please! Besides a prediction, I want AI to give me an explanation!

Excuse me? I have no idea what those parameters or acitivations mean.

Well, I can use the current explainable AI techniques:

That's true... Such a tough problem...

End users

AI developers

How about this: I filter the existing techniques, and summarize three main forms of explanation that are user-friendly.

User-friendly? Do you mean that I don't need to know AI or coding to understand your explanation?

Exactly!

I can't wait to see how it works!

AI developers

End users

Let's say you ask AI to predict the price of your house that you're going to sell.

I can show you:

the rank of dominant features

the effect of feature change on prediction

Yeah, I want to know the important factors to the overall price.

and even how the features interact with each other to influence the price

1. Explain using feature attribute

That's cool. What if I want to know more details about how AI uses these features to make the prediction?

I can show you the decision rules AI used, and present them in forms that you prefer:

If **house area** ≤ 800 sq, and **distance to school, parks** > 2.5 km, Then house price is no more than 600,000

If **house area** is 800 - 900 sq, and **distance to school, parks** < 2.5 km, Then house price is about 700,000-850,000

	house area	distance to school, parks	house price prediction
Rule 1	≤ 800 sq	> 2.5 km	< 600,000
Rule 2	≤ 800 sq	< 2.5 km	600,000-700,000
Rule 3	800-900 sq	< 2.5 km	700,000-850,000

2. Explain using decision rules

Great! That gives me an overall idea of how the AI is actually making the decisions. But I want a final double check.

No problem. To give you an intuitive understanding, here are:

similar examples based on your house's features

The houses of **similar features** as yours

prototypical examples

A **typical** house to sell at the estimated price as yours is like:

In your neighbourhood:
- 2 bedrooms
- 2 bathrooms
- 1000 sq
- 20 years old
- ......

similar examples based on the predicted price

The houses of **similar price** as yours

counterfactual examples

If the feature of your house had changed to the following feature, your house would have increased 10% of the estimated value
- have a back yard, or
- 3 bathrooms, or
- 1200 sq, or
- less than 10 years old, or
- has new household appliances
- ......

Good job! I can even combine the different forms of explanations to answer my questions. Thanks!

You're welcome! Glad I can speak your language :)

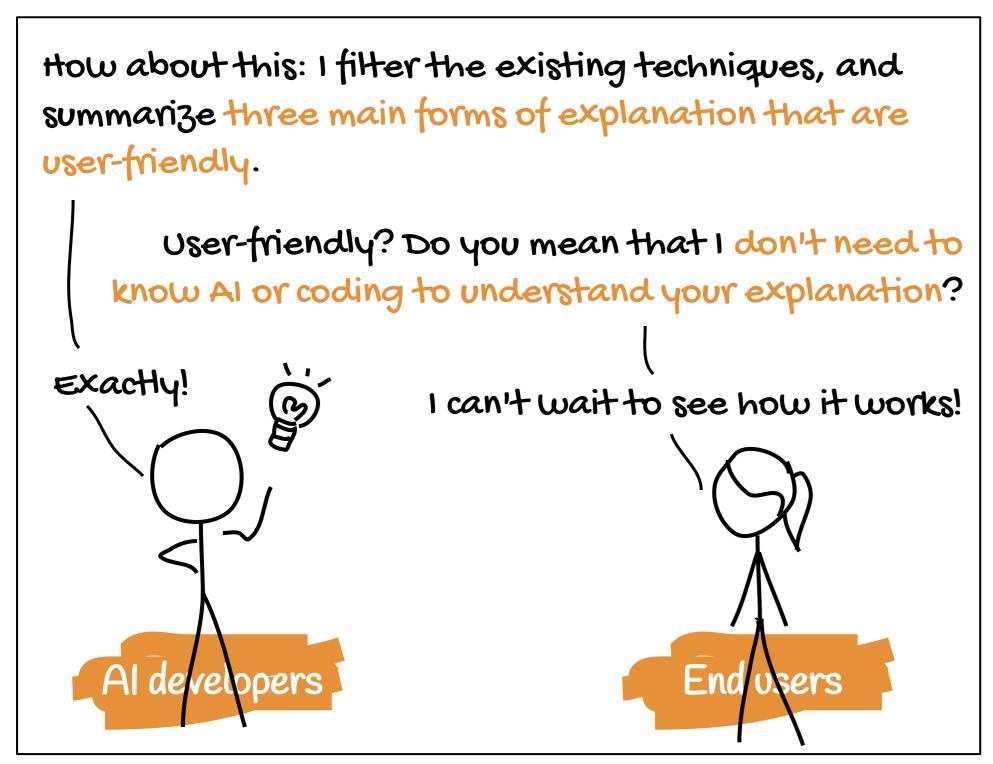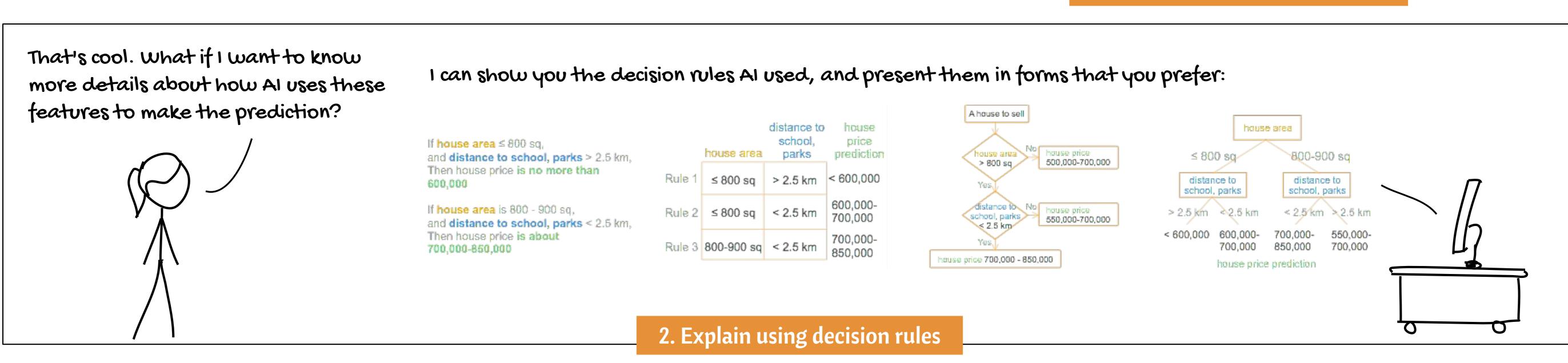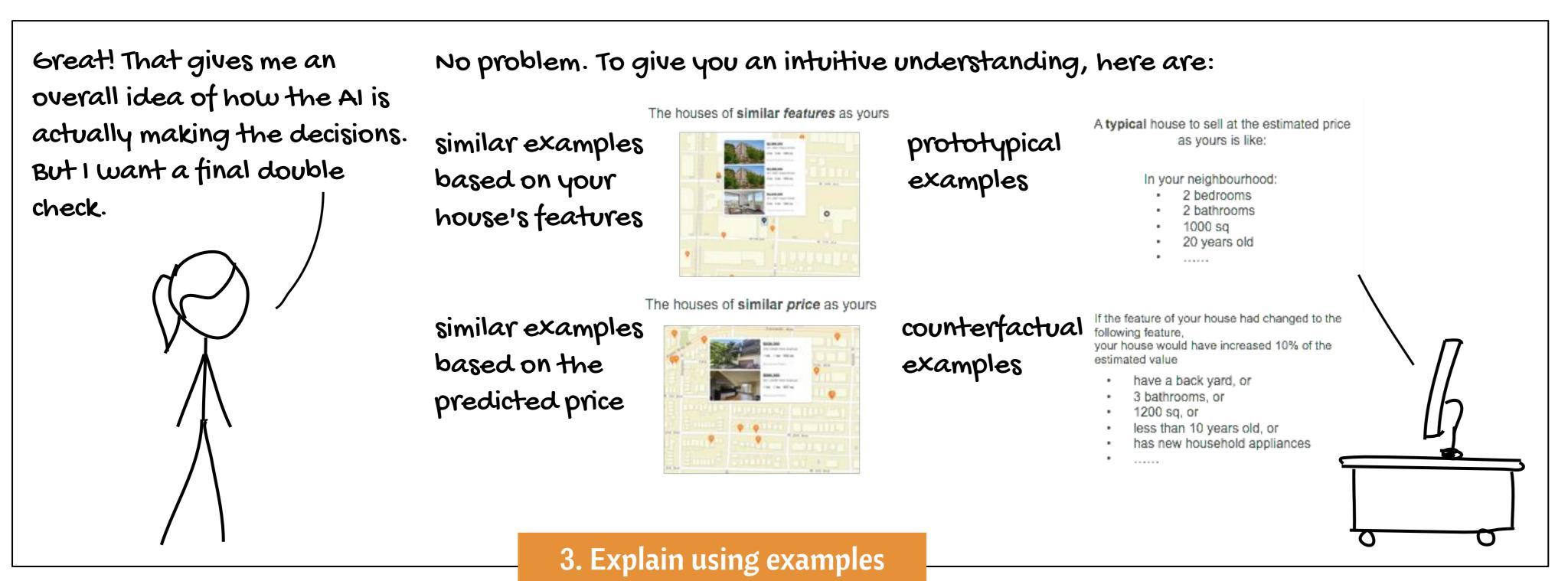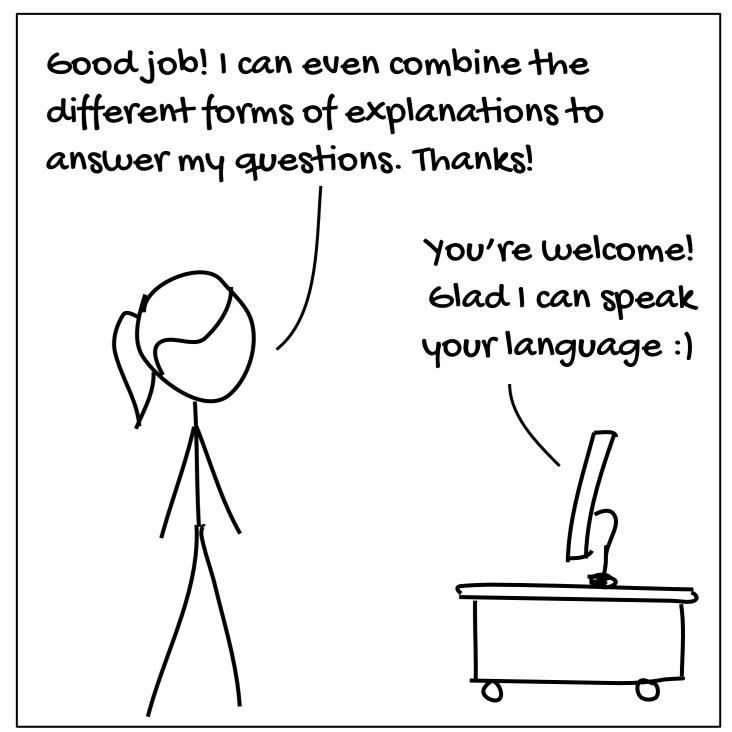**3. Explain using examples**

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Method
The end-user-centred explainable AI taxonomy is based on literature review of 59 technique papers on explainable AI by searching "explainable/interpretable/visualizing AI/ML" and identifying relevant works from these papers' reference. We excluded works that do not have an evaluation of the proposed XAI method. Visit weina.me/end-user-xai for details.