

Open World

Personalized knowledge could be incomplete or outdated.

When using personalized knowledge, it shouldn't be assumed to be complete. For example, the robot should not assume that employees unknown to it does not belong in the office.

User Acceptance

The utility of personalized knowledge learning is mainly to the robot, and might not be obvious to the user. This could make the user reluctant to participant in teaching the robot.

Multiple Parties

There might be multiple users with different intentions trying to interact with the robot at the same time. The robot needs an effective interaction strategy to manage the situation and respond to unexpected interruptions.

Question Effectiveness

Non-expert users might not be able to understand the goal of the learning robot, or realized the data it needs. If the questions are ill-posed, they may result in erroneous or useless responses.

Data Quality

The quantity of data that can be gathered through interaction is limited. It would be best to gather high quality data, such as with clear image features and proper labels.

Just Ask

When there is a lack of knowledge, can you add an interaction step to directly query the user?

EXAMPLE SOLUTION

When encountering an unidentifiable user, rather than assuming it is a first-time encounter, the robot could apologize for not recognizing the user, and then ask for their identity.



Socially-Assisted Robotics

When there is a lack of knowledge, can you design a mechanism to let other users provide that knowledge?

EXAMPLE SOLUTION

Other known users nearby could be asked for help when an object, location, or person cannot be recognized.



It's a Feature!

Can you add a functionality to the robot, and embed the learning interaction within it?

EXAMPLE SOLUTION

At environments like offices and classrooms, new users are introduced periodically. While learning faces one-by-one would be inefficient, a robot could be designed to lead an ice-breaking. During the interaction, the robot can learn correspondance between names and faces along with the users.

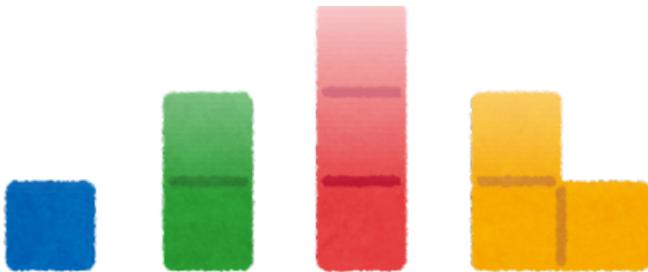


Back-up Plans

Can a question be asked differently according to context?

EXAMPLE SOLUTION

The robot can record the times it has asked a question to a user. When a question has to be asked a second time, the robot could express awareness of the situation, such as by apologizing for repeated asking.



Isolation

Can the robot somehow guide the person of interest to do something significantly different than others?

EXAMPLE SOLUTION

In activities and speeches, it is often that the speaker stands up, or holds objects that signify their position. This could be borrowed by the robot. The robot could encourage such an action, in order to separate the speaker from the rest by a distinct posture or human-object relationship.

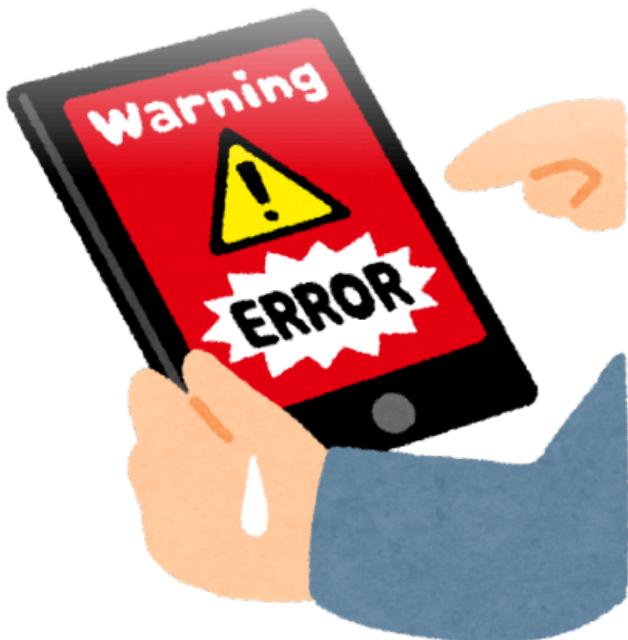


To Err is Human

If there is a preliminary recognition result, can the robot show it to the user in an easy-to-understand way?

EXAMPLE SOLUTION

When approaching a user, the robot could proactively show the name of the user that it detected, or show the absence of a name in a clear way.



Provide Context

Can the robot use multiple modalities to explain the current context to the user when asking a question?

EXAMPLE SOLUTION

When describing an object to the user, the robot can show relevant information such as its last seen location, photos of the object, or similar objects.



Describe Uncertainty

Can the robot use multiple modalities to describe its uncertainty when asking questions to a user?

EXAMPLE SOLUTION

When referring to an object, person, or location to a user, the robot can use different expressions to convey its confidence, such as “I’m sure that...”, “I guess that...”, or “it should be...” This could also color-coded to represent uncertainty.



Hands-on

Can the robot guide the user into doing something that better helps the robot learn?

EXAMPLE SOLUTION

Design interactions to guide the user into performing the appropriate actions. For example, the robot could correct the way the user is holding an object, or guide the user into a specific posture.



Waiting for Windfalls

Can the robot utilize its idle time to go and wait for encounters at the most possible location?

EXAMPLE SOLUTION

For example, for an office robot, it could ask for the charging station to be located at the break room, where many people would go and is suitable for social chit-chat.

