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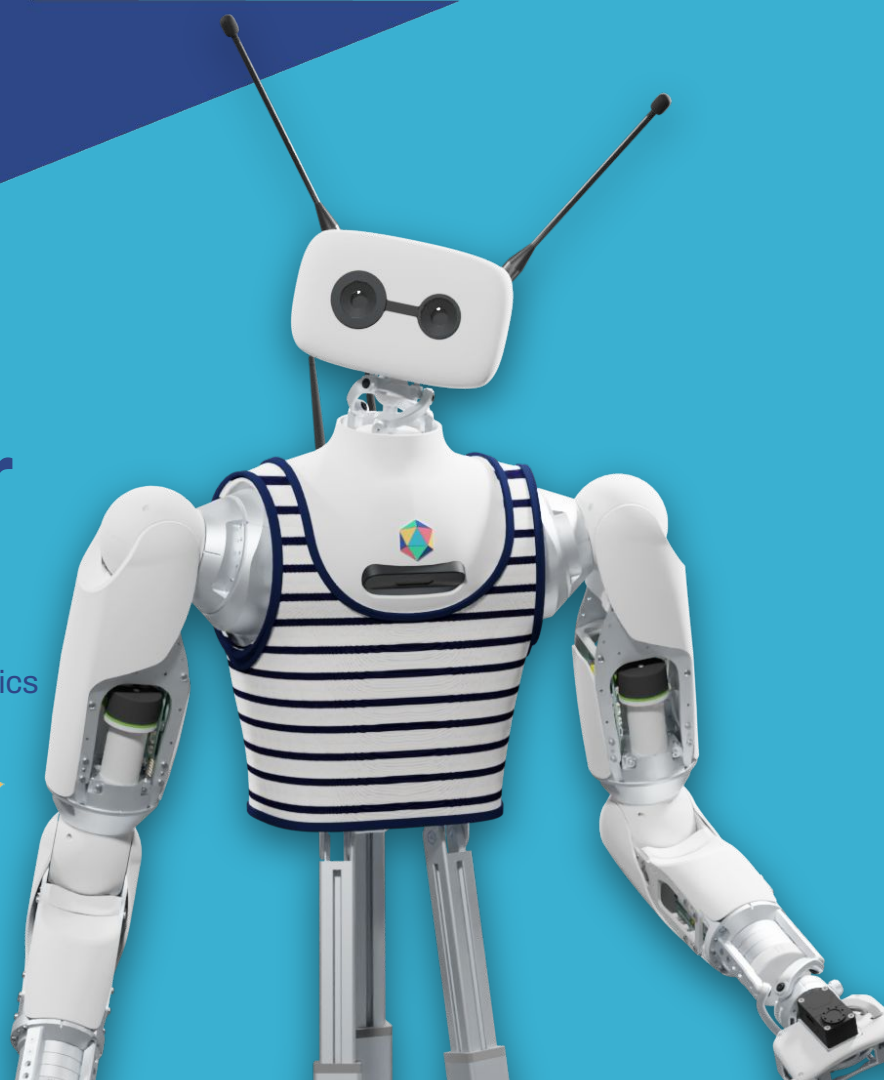
Designing emotions for robots

Anne-Charlotte Passanisi - Senior Product Manager, Pollen Robotics



Pollen Robotics SAS
Bordeaux, France

We are POLLEN ROBOTICS, a 🤗 Hugging Face company

We build open source robots

We’d like to democratize robotics

Here’s Reachy!

Reachy is our humanoid robot and is now capable of **listening to speech** and responding with **emotions**.

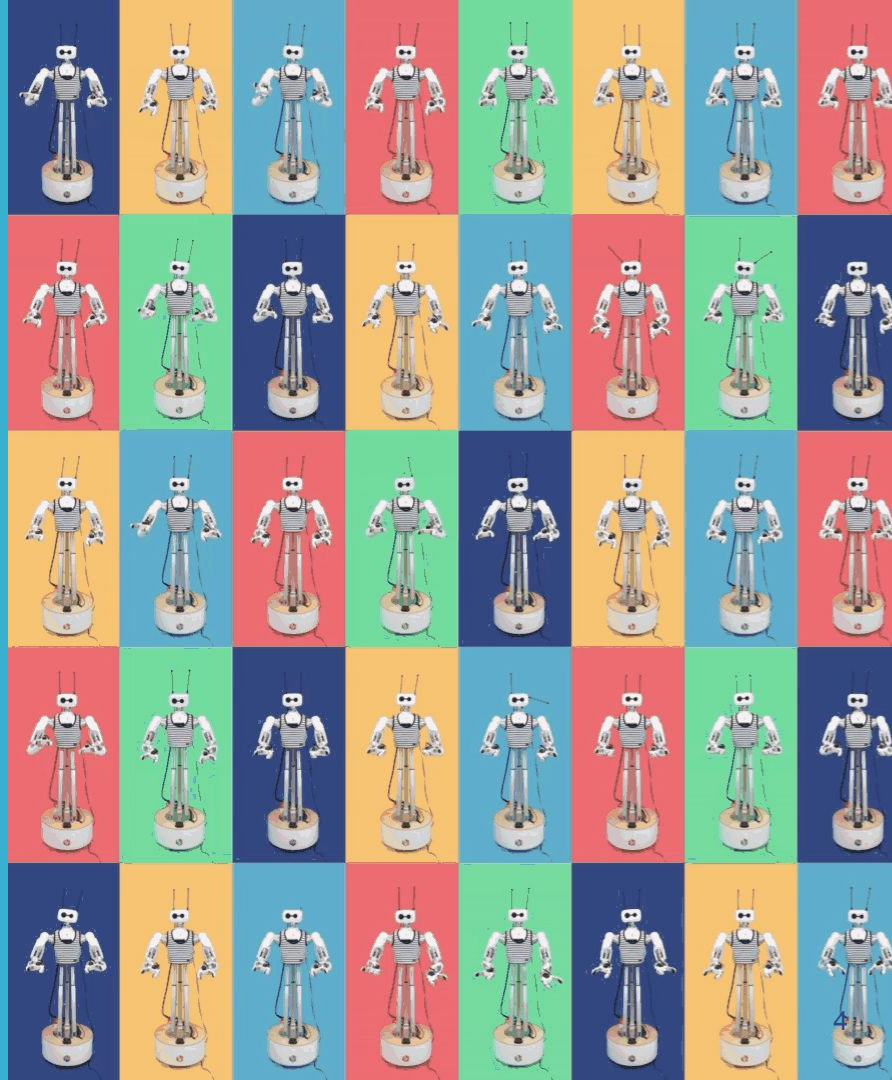
We recorded sounds and moves for 80+ emotions via teleoperation

+

plugged an LLM (GPT4 realtime)

=

Reachy can react to voice using its emotions



The team behind the project

Rémi Fabre

Magician behind the LLM

Mélissa Gaitaz

Communication master

Augustin Crampette

Sound specialist

Antoine Pirrone

Behind the scenes orchestrator

Anne-Charlotte Passanisi

Teleoperator & UX specialist

At Pollen Robotics, we believe emotions help humans understand and interact with robots

Emotions make interactions natural and engaging

This talk offers a theoretical perspective on designing robot emotions

“The strength of robots lies not in their intelligence but in their heart.”

Serge Tisseron: The Day My Robot Will Love Me

Plan

1. **Machine emotions**
   - Why robots need emotions
   - Emotions as indicators of robot internal states
   - Building basic emotional frameworks: fear, pride, pain, satisfaction

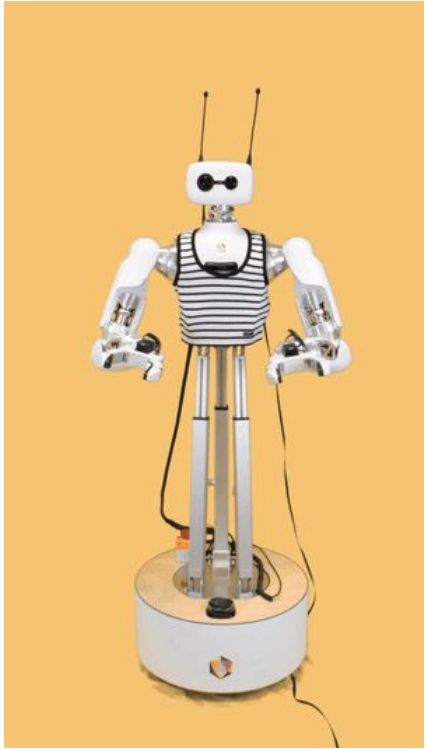
2. **Emotional attachment**
   - Human projection and anthropomorphism
   - Emotional expressions create stronger human-robot bonds
   - Dopamine, habits, and positive reinforcement

3. **Robot social acceptance**
   - Recognizing and responding to human emotions
   - Expressing genuine-looking emotions: voice, eye contact, gestures
   - Managing surprise and predictability

Why robots need emotions

Human emotional systems are essential to interaction and social cooperation.

- Robots will need a form of **machine emotion** to engage socially and functionally.
- Emotions help **interpret robot behavior**: Are they focused? Do they understand us? Are they confused?



Emotions are signals of intent, success, confusion, or difficulty

These will not be human emotions, but rather emotions aligned with the **machine's needs** reflecting the internal states and current functioning of the robot.

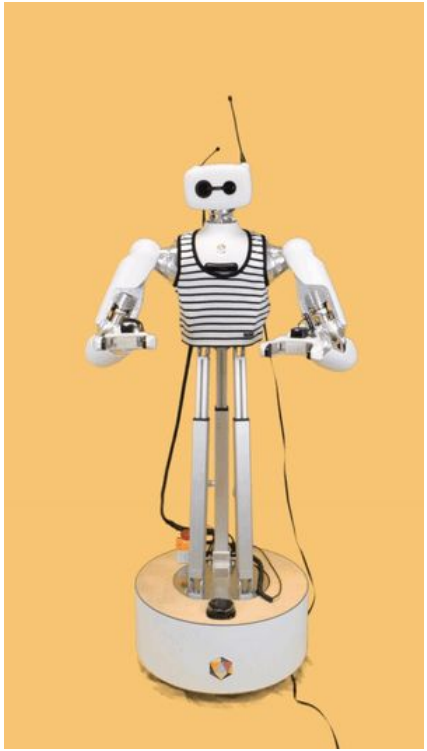
Transparency leads to **trust** and **authenticity**.

Emotions will be authentic because they are real.

- Start with **basic functional emotions**: fear of falling, obstacle avoidance, fear of water.
- Progress to machine-relevant affective states: satisfaction, worry, pride, and obedience.

Robots will begin with **visceral behaviors** and evolve toward more complex emotional expressions.

Emotions as functional cues, not decorative features.



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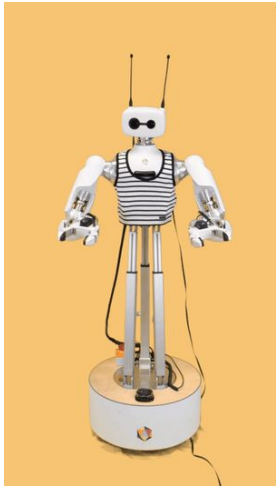
Fear, worry, discomfort, and displeasure have a place in robot emotion.



Example
"***Pain***" *when joints are strained*

leads to →

Robot self-protection

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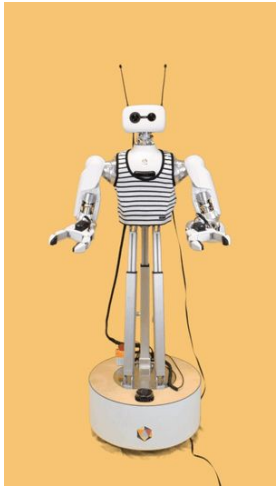
Positive affects like pleasure, satisfaction, gratitude, and pride enable **learning**.



Example
"***Pride***" when
completing tasks

leads to →

motivation to
improve

Emotions as learning and self-regulation tools

2. Emotional attachment

Human projection and anthropomorphism

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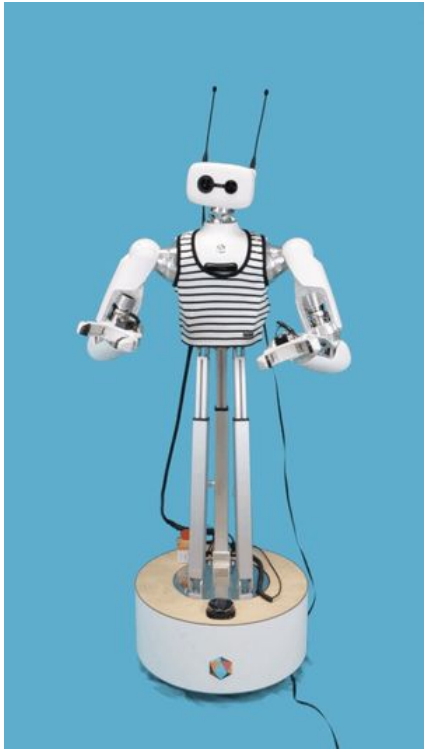
Much of the richness in our interaction with machines comes from our minds.

We tend to project emotions and intentions onto all types of objects.

This innate anthropomorphism creates **emotional bonds**.

Emotional design leverages this human tendency.



2. Emotional attachment

Stronger human-robot bonds

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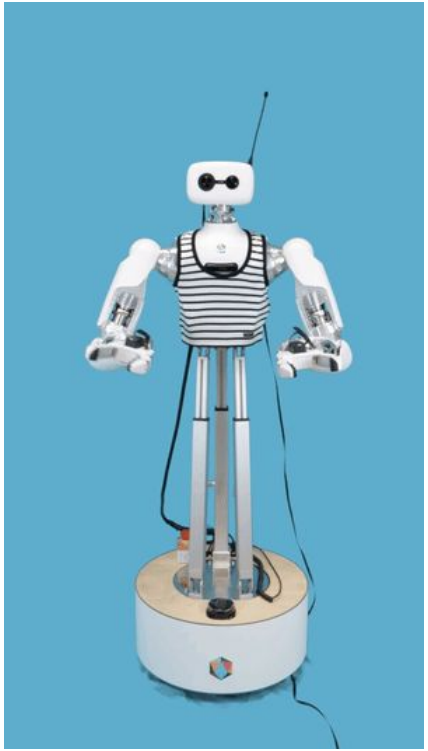
When machines show emotions, they create strong interaction with humans, even if our interpretation is subjective.

Emotional cues (eyes contact, sound, gestures) enhance empathy.

Even if synthetic, expressions provoke genuine human response.



2. Emotional attachment

Dopamine and positive reinforcement

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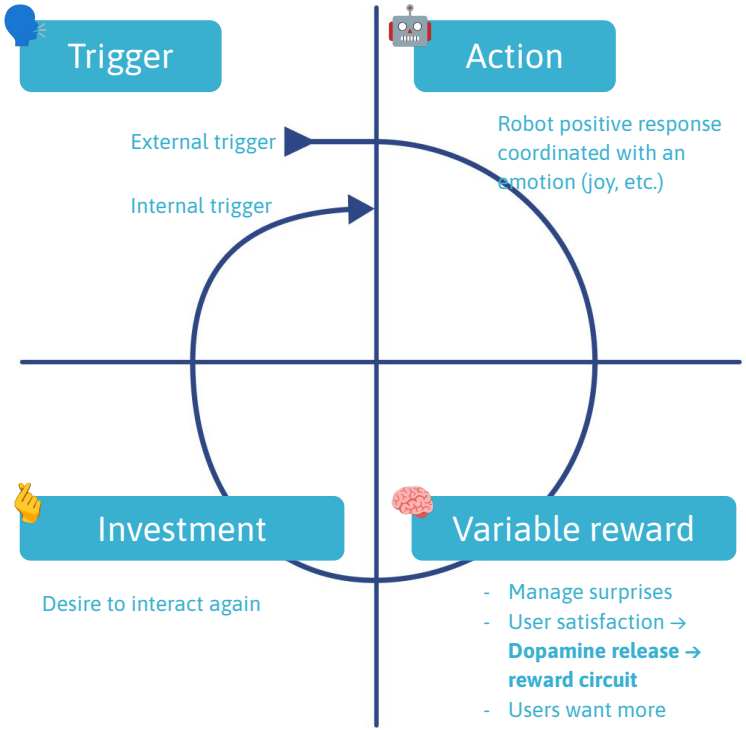
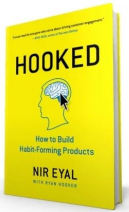
Dopamine, habits, and positive reinforcement

- Every positive robot action → triggers a small dopamine reward in user's brain.
- This reinforcement loop builds emotional attachment and habit.

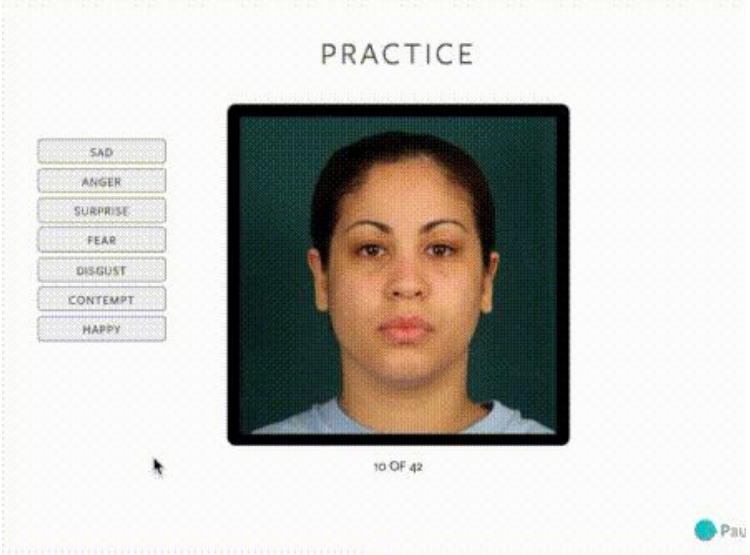




📖 Inspired by *Nir Eyal – Hooked: How to Build Habit-Forming Products*

To be accepted, robots must recognize the meaning of human expressions.

- Facial expressions, tone of voice, body language.
- Example: MIT's Affectiva system based on Paul Ekman's microexpressions.



Reading human emotion is important for meaningful interaction.

3. Robot social acceptance

Expressing genuine-looking emotions

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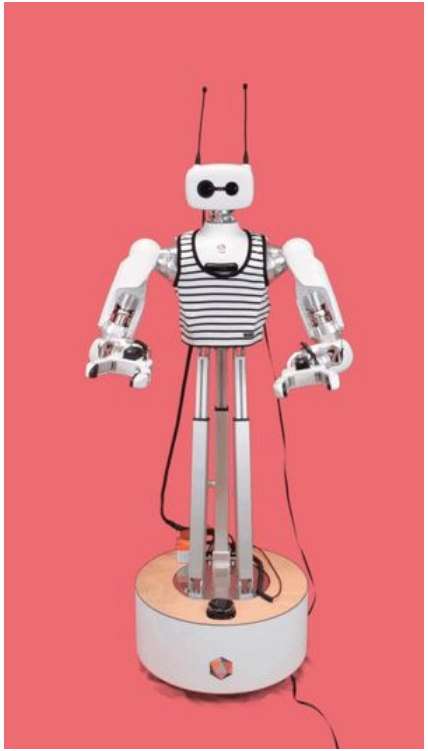
Robots should speak with tone and mimicry that evokes true emotion.

- Social acceptance depends on expressive intonation, eye movement, body language.
- Robots must be emotionally legible and believable.



Expressions must match internal states, not be pre-scripted.

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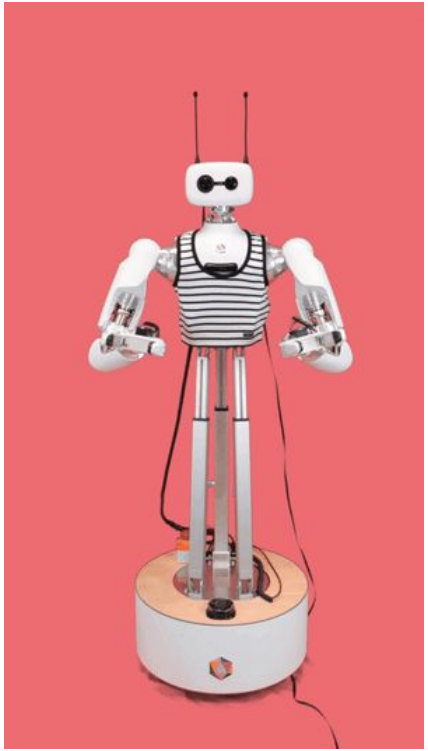
AI's role is to propose situations that were not expected but solvable.

Inspired by video game design:

- Introduce surprise, but not too much.
- Familiar patterns with slight novelty foster trust.

Emotional AI must surprise just enough to remain engaging.



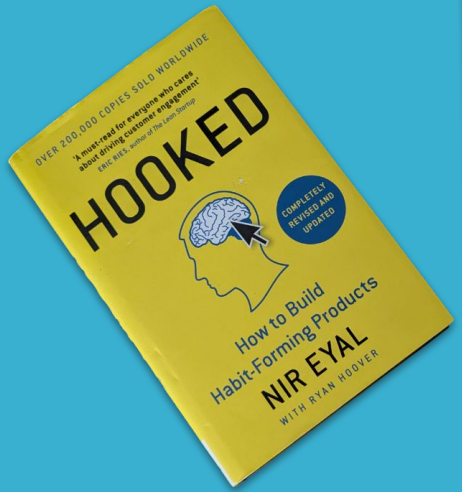
In the end, we will not work with the smartest robots, but with those we trust/understand the most.

At Pollen Robotics we build engaging robots that are fun and pleasant to interact with

Making human-robot interaction feel natural and enjoyable

RESOURCES

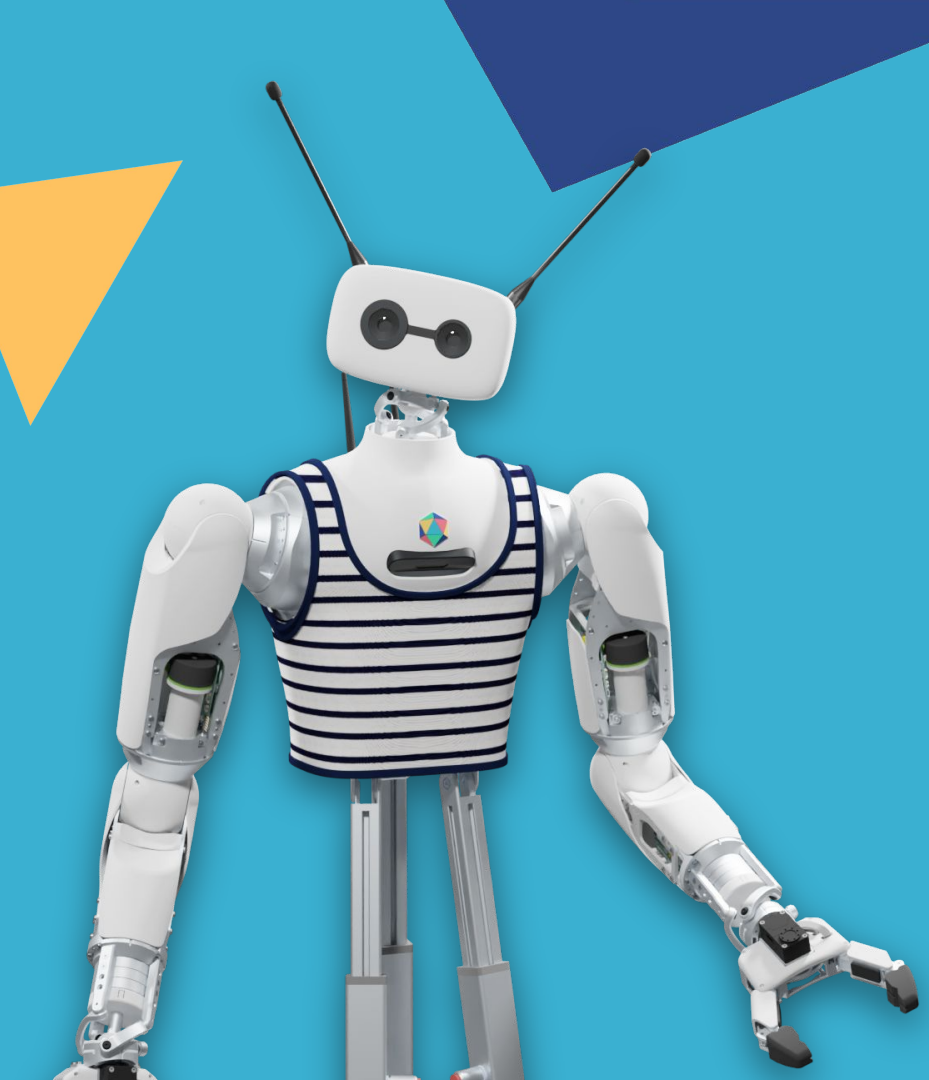
📖 *Serge Tisseron: The Day My Robot Will Love Me*



📖 *Nir Eyal – Hooked: How to Build Habit-Forming Products*

📖 *Donald A. Norman: Emotional design*

Any questions?



Thank you!

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SCAN ME