Human-Computer Interaction

Affective & Physiological Computing

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Today's Agenda

- Topic overview: *Affective & Physiological Computing*
- The frame: *enduring fundamental → how AI changes it*
- Provocation: *Recognition or construction?*
- Discussion

This term's frame

Enduring fundamental → *How AI is changing it* → *Depth (a claim to argue with)*

- **Fundamental:** inferring a person's inner state *validly* and *ethically*
- **Fault line:** emotion as a *readable inner state* (Picard) vs. signals whose meaning *depends on person and context* (Barrett)
- **AI:** extends the *reach* of inference **and** *generates* affect
- **Depth: Moderate.** Validity and consent run throughout

This week's readings

- **Required**
  - Picard, *Affective Computing* (MIT Media Lab TR 321, 1995)
  - Barrett et al., *Emotional Expressions Reconsidered* (2019)
- **Recommended**: Morris & Brubaker, *Generative Ghosts* (CHI 2025)
- **Optional**: De Freitas et al., *AI Companions Reduce Loneliness* (2026)

Topic overview: *Affective & Physiological Computing*

What is physiological computing? [1]

Systems "that employ real-time measures of psychophysiology to communicate the psychological state of the user to an adaptive system."

Communicating the user's…

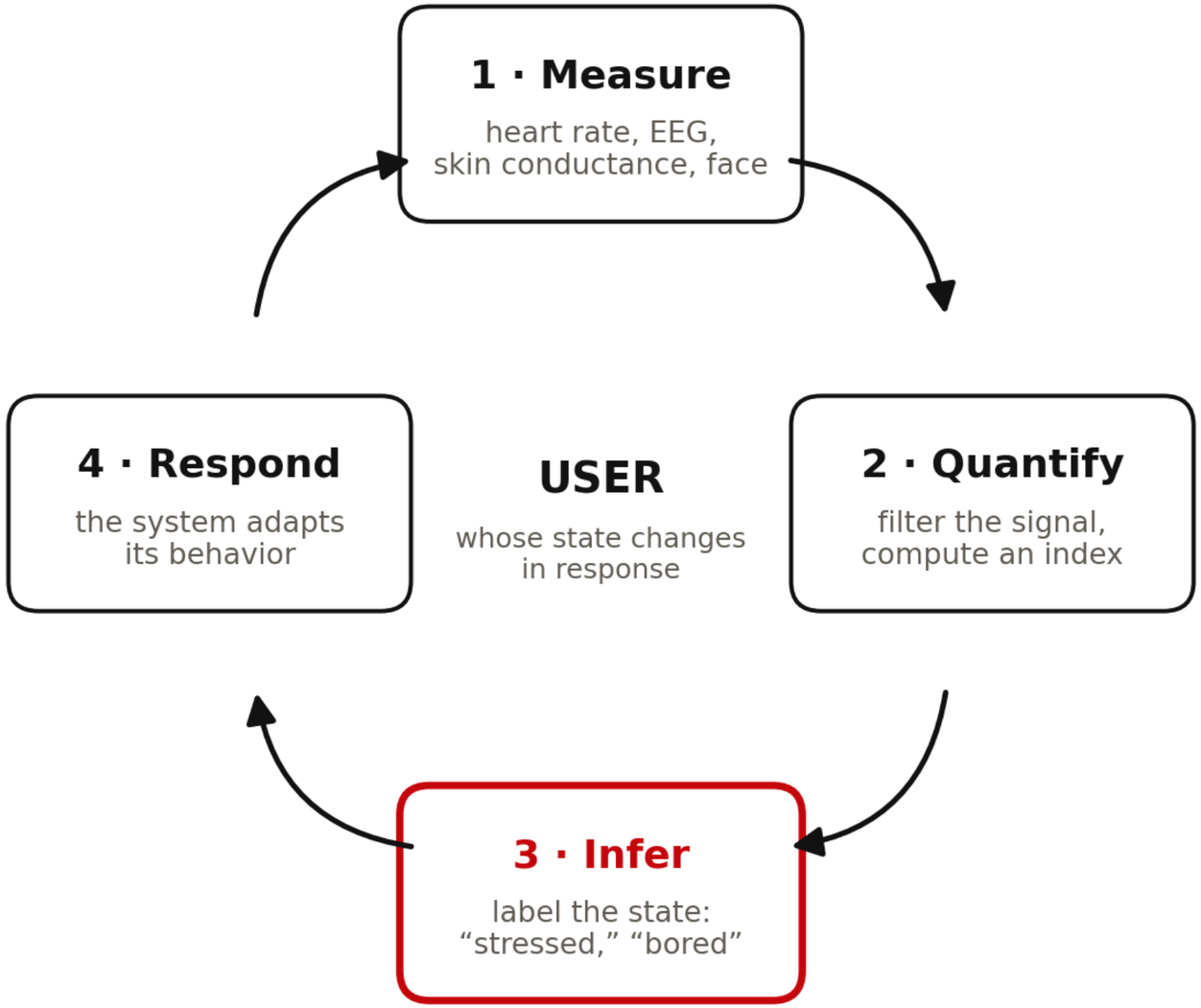
- **Affective** state: affective computing
- **Cognitive** state: brain-computer interfaces
- **Physical** state: prosthetics, driving aids

[1] Fairclough, S.H. (2009). Fundamentals of physiological computing. *Interacting with Computers*, 21(1–2), 133–145.

The biocybernetic loop [2]

Affective systems do not only *sense*: they **measure, infer, respond, and change** the person they measure.

1. Measure psychophysiology
2. Quantify: filter the signal, compute an index
3. **Infer:** label the user's state
4. Respond: the system adapts



Validity depends on step 3: does the index measure the inferred state?

[2] Pope, A.T., Bogart, E.H., & Bartolome, D.S. (1995). Biocybernetic system evaluates indices of operator engagement in automated task. *Biological Psychology*, 40(1–2), 187–195.

The founding statement: Picard [3]

"Computing that relates to, arises from, or deliberately influences emotions."

Imagine a computer piano teacher that "not only interprets your musical expression, but also your facial expression and perhaps other physical changes corresponding to your emotional feelings."

The premise: emotion is expressed through the body, so a system can **read** it. This week tests that premise.

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[3] Picard, R.W. (1995). *Affective Computing*. MIT Media Laboratory Perceptual Computing Section, Technical Report 321. Book: Picard, R.W. (1997). *Affective Computing*. MIT Press.

The counter-lens: Barrett [4]

"It is not possible to confidently infer happiness from a smile, anger from a scowl, or sadness from a frown, as much of current technology tries to do."

- **Limited reliability:** one emotion, many faces
- **Lack of specificity:** one face, many emotions
- **Limited generalizability:** context and culture ignored

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[4] Barrett, L.F., Adolphs, R., Marsella, S., Martinez, A.M., & Pollak, S.D. (2019). Emotional Expressions Reconsidered: Challenges to Inferring Emotion From Human Facial Movements. *Psychological Science in the Public Interest*, 20(1), 1–68.

The central tension

Recognition vs. construction

Recognition

Affect is a **legible inner signal** a system can detect

Construction

Affect is **built in context**, so a detector's label is an *interpretation*, not a reading

Why this is hard [1]

Four of Fairclough's six issues; AI makes them harder:

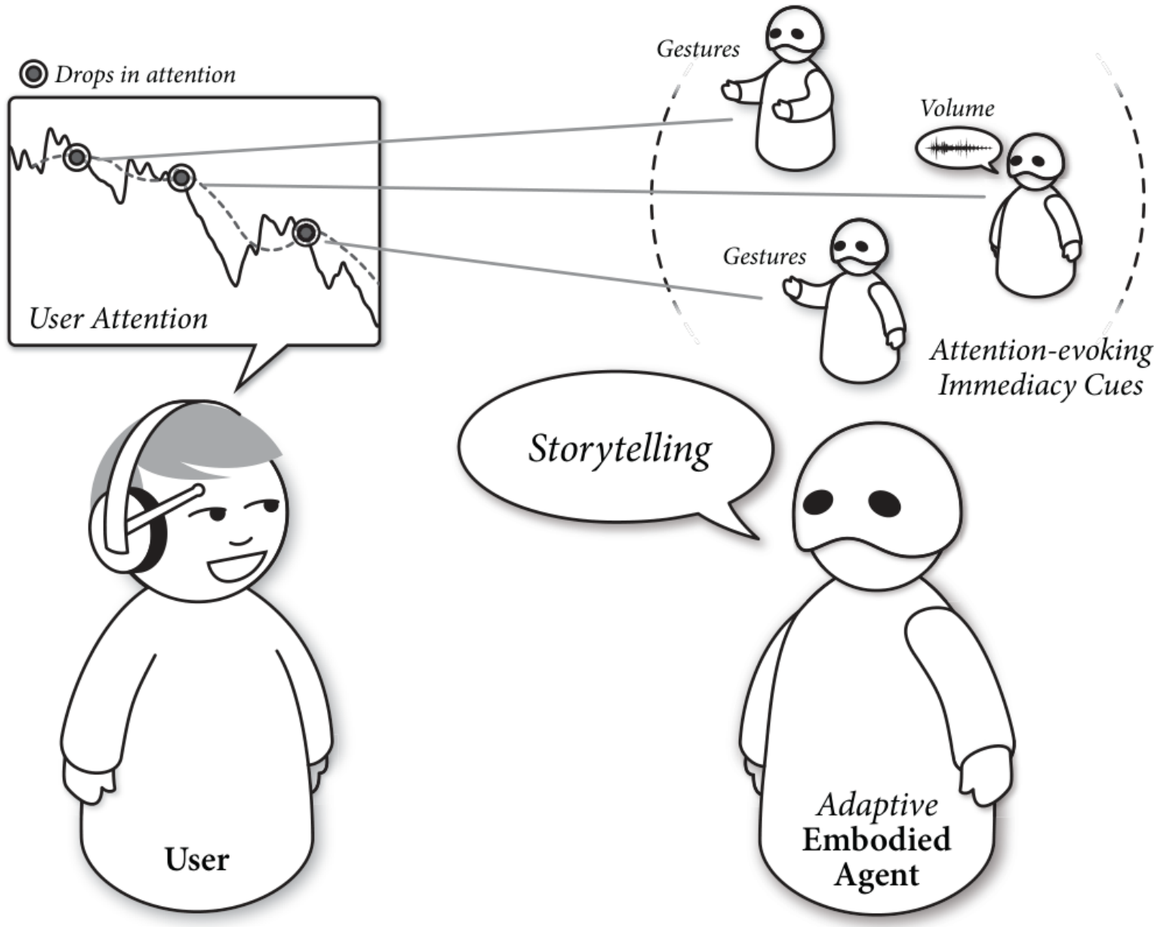
- **Inference:** one body signal, many possible causes
- **Validity:** does the index measure the state it names?
- **Modeling the user:** which states, on what scale?
- **Ethics:** privacy, consent, user control

[1] Fairclough, S.H. (2009). Fundamentals of physiological computing. *Interacting with Computers*, 21(1–2), 133–145.

Sensing attention [5]

Can an agent detect drops in *attention* and win it back?

- EEG drops trigger gestures and a louder voice
- Recall **43% higher** than baseline
- The state had a **behavioral criterion**



[5] Szafir, D., & Mutlu, B. (2012). Pay Attention! Designing Adaptive Agents that Monitor and Improve User Engagement. *CHI 2012*.

But what about *AI*?

Two moves AI makes

1 • Extends *reach*

Multimodal affect inference at scale: face, voice, text, physiology, everywhere

(re-stages the inner-state model at scale, despite Barrett)

2 • Enables *generation*

Affect **performed**, not just detected: empathy, companions, "generative ghosts"

(anthropomorphism, parasocial attachment, manipulation)

Affective generation [6] [7]

- **Generative ghosts:** "AI agents that represent a deceased person." A **reincarnation** of the person, or a **representation**?
- **AI companions** eased loneliness about as much as talking to a person

[6] Morris, M.R., & Brubaker, J.R. (2025). Generative Ghosts: Anticipating Benefits and Risks of AI Afterlives. *CHI 2025*. doi:10.1145/3706598.3713758

[7] De Freitas, J., Oğuz-Uğuralp, Z., Uğuralp, A.K., & Puntoni, S. (2026). AI Companions Reduce Loneliness. *Journal of Consumer Research*, 52(6), 1126–1148. doi:10.1093/jcr/ucaf040

Guardrails coda

- **Consent:** physiological and affective data are an intimate surface
- **Construct validity:** is the system measuring what it claims?
- **Whose ground truth:** who labels an emotion, and by what criterion?
- **Manipulation and parasocial harm:** performed empathy as a lever

Your provocation *(post one slide)*

Pick one:

1. **Provocation:** is affect a *signal to detect*, or *built in context* so that any label is an interpretation? Stake a claim.
2. **Critical artifact:** an emotion-recognition system or an AI companion; annotate where it shows the tension.
3. **Design / policy:** one principle for affect systems (consent, validity, non-manipulation) that keeps them accurate about what they can and cannot read.

Discussion

Today's roles

Reporter	Skeptic	Connector
Seat 3	**Seat 4**	**Seat 5**

Same in every pod. **Seats 1, 2 and 6** have no role today; you are still in the argument.

Discussion Format

In your pod, on your pod monitor: ~30 minutes.

- **Everyone shows their slide**, about 2 minutes each, cast from your own laptop
- **Skeptic** puts a counterargument on the table · **Connector** ties it to an earlier week
- **Reporter** writes the pod's three lines (agreed, split, unresolved) and delivers them to the room

What's Next?

Friday, Nov 13: Analysis/Results Crit

- **Due 9:30:** your *Inferential Analysis Plan* (everyone)
- **Present** your team's results so far: tests and effect sizes, codes and themes, or design findings
- **The crit question:** does your evidence support your claim?