

CSE 428

Human Computer Interaction

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State-of-the-Art in HCI

Brain-Computer Interfaces (BCIs)

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- What it is: Direct communication between the brain and a computer
- Cool Examples:
 - Neuralink (by Elon Musk) – enables control of digital devices using thoughts
 - CTRL-Labs (Meta) – wristbands that decode neural signals without implants
- HCI Impact: Enables interaction without physical movement, especially beneficial for users with disabilities



[Neuralink](#)



CONTROL MACHINES WITH YOUR THOUGHTS

[CTRL-Labs](#)

Multimodal Interaction

Multimodal Interaction

- What it is: Combining multiple input modes – speech, gesture, touch, gaze, and haptics – for seamless interaction
- Technologies:
 - Eye tracking + speech commands in Virtual Reality (VR)
 - Hand tracking with devices like Leap Motion or built-in on Meta Quest
- HCI Impact: More natural, intuitive interfaces



[Leap Motion](#)

Affective Computing (Emotion-Aware Interfaces)

Affective Computing

- What it is: Systems that detect and respond to user emotions
- Technologies:
 - Facial expression recognition (e.g., Affectiva)
 - Emotion-aware chatbots
- HCI Impact: Interfaces that adapt to user mood, improving UX and accessibility



[Affectiva](#)

Augmented Reality (AR) & Mixed Reality (MR)

Augmented Reality & Mixed Reality

- Modern Devices: Apple Vision Pro, Meta Quest 3, Microsoft HoloLens
- Features:
 - Spatial computing – interacting with virtual content in physical space
 - Context-aware interfaces that enhance real-world tasks
- HCI Impact: Immersive learning, remote collaboration, intuitive spatial UIs



Introducing
 Vision Pro

[Apple Vision Pro](#)

Conversational & Generative AI

Conversational & Generative AI

- Examples: ChatGPT, Google Gemini, Amazon Alexa, Character.AI
- Advances:
 - Natural, context-aware conversations
 - Voice + gesture interfaces powered by LLMs
- HCI Impact: Human-like assistants, personalized interaction,
language-based UIs

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**Things you
didn't know
Alexa can do**



[Amazon Alexa](#)

Wearable & Invisible Interfaces

Wearable & Invisible Interfaces

- Examples:
 - Smart textiles (e.g., Google Jacquard)
 - Skin-based interfaces (e.g., iSkin)
 - Smart rings, glasses, earbuds
- HCI Impact: Continuous, unobtrusive interaction integrated into daily life

iSkin

Flexible, Stretchable and Visually Customizable
On-Body Touch Sensors for Mobile Computing



Martin Weigel, Tong Lu, Gilles Bailly, Anni Oulasvirta, Carmel Majidi, Jürgen Stalmár

Max Planck Institute for Informatics and Saarland University, Carnegie Mellon University, CNRS LTCI, Telecom-ParisTech, Aalto University

[iSkin](#)

Introducing
Galaxy Ring



[Samsung Galaxy Ring](#)

Zero UI & Ambient Computing

Zero UI & Ambient Computing

- What it is: Interfaces without screens – interaction through environment and context
- Examples:
 - Smart homes that react to presence, voice, habits
 - IoT devices working together without explicit commands
- HCI Impact: Frictionless, intuitive interaction woven into everyday environments

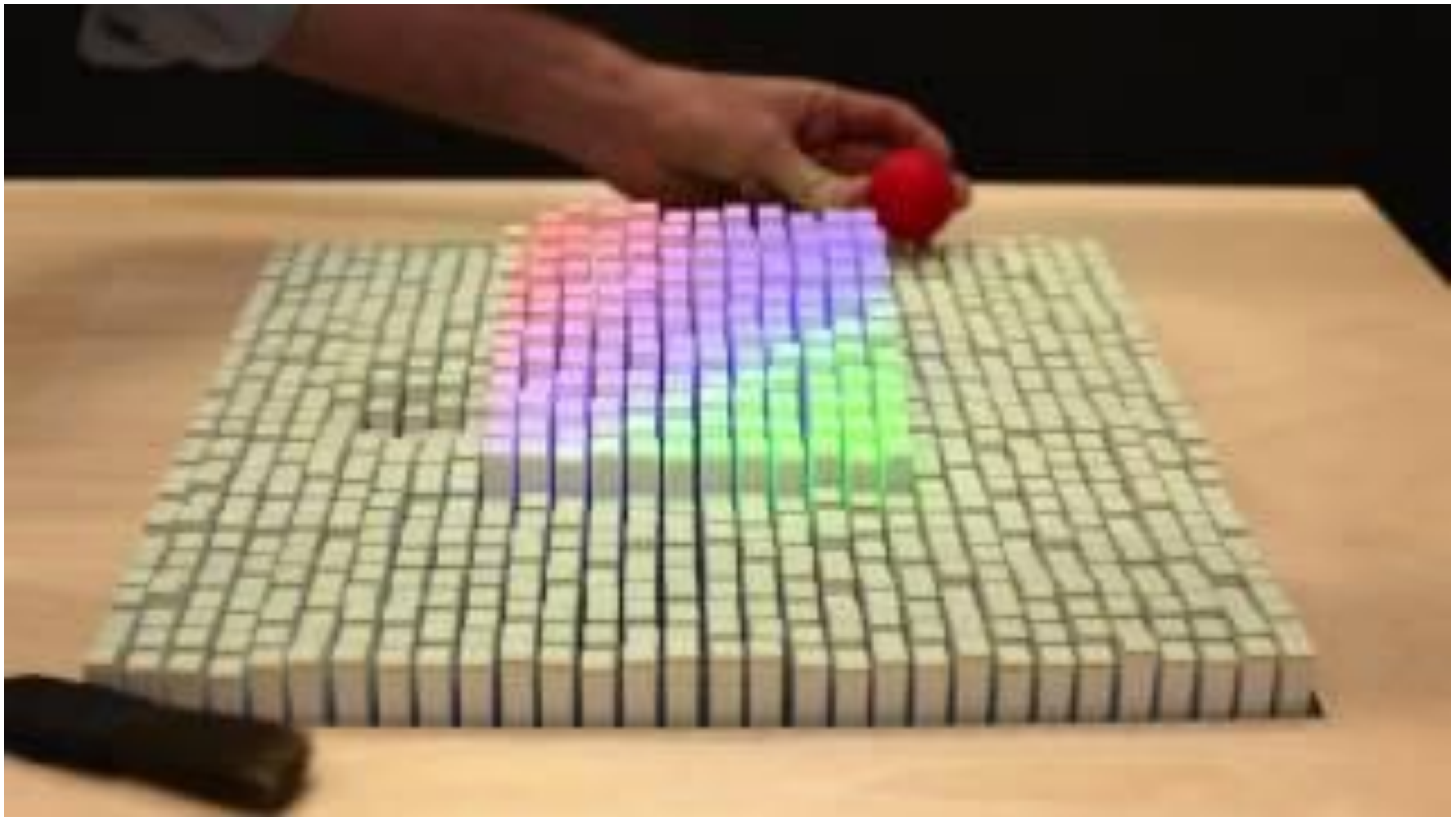


[Smart House \(Funny Ad\)](#)

Tangible User Interfaces (TUIs) & Shape-Shifting Devices

TUIs & Shape-Shifting Devices

- What it is: Physical objects that users manipulate as digital inputs
- Examples:
 - MIT's inFORM – shape displays that dynamically change form
 - Tangible blocks for programming (e.g., Tern)
- HCI Impact: Merges physical and digital for intuitive learning and design



[inFORM by MIT](#)

Inclusive & Adaptive Accessibility Technologies

Inclusive & Adaptive Accessibility

- Technologies:
 - Real-time sign language recognition
 - Voice-controlled navigation for blind users
 - Adaptive keyboards and UIs for neurodivergent users
- HCI Impact: Accessibility-first design, enabling broader participation

Top Publication Venues in HCI

Top Conferences in HCI

- [CHI – ACM Conference on Human Factors in Computing Systems](#)
- [UIST – ACM Symposium on User Interface Software and Technology](#)
- [CSCW – ACM Conference on Computer-Supported Cooperative Work and Social Computing](#)
- [DIS – ACM Conference on Designing Interactive Systems](#)
- [IUI – ACM Conference on Intelligent User Interfaces](#)
- [HRI – ACM/IEEE International Conference on Human-Robot Interaction](#)
- [MobileHCI –](#)
[International Conference on Human-Computer Interaction with Mobile Devices and Services](#)

Top Journals in HCI

- [TOCHI – ACM Transactions on Computer-Human Interaction](#)
- [Human–Computer Interaction \(HCI Journal\)](#)
- [Interacting with Computers](#)
- [IJHCS – International Journal of Human-Computer Studies](#)
- [Personal and Ubiquitous Computing](#)

**THANK
YOU**