

Lesson 14

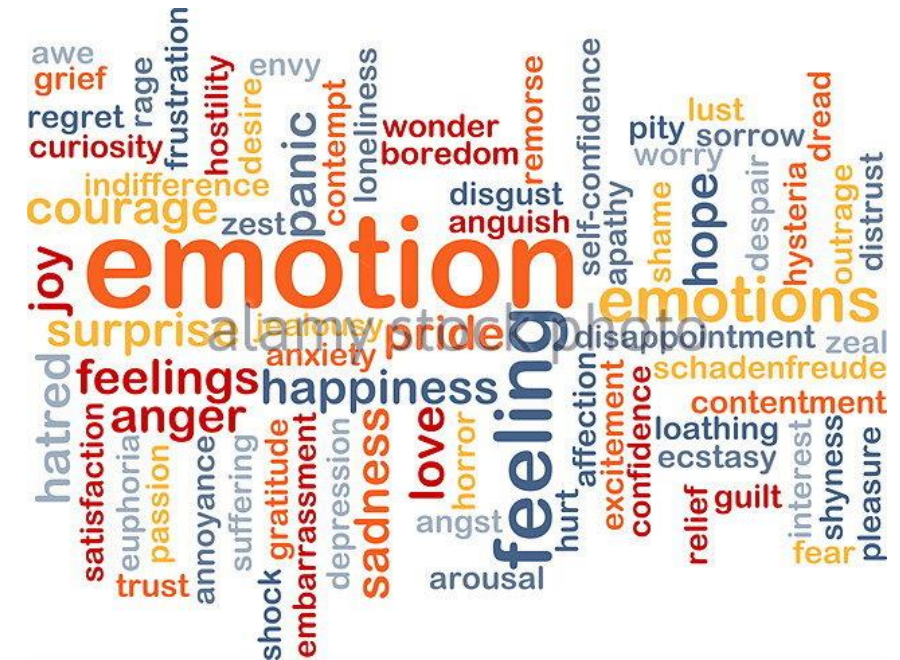
Interaction Design (CM3055)

Affective Interaction

- psychological term for ‘**emotional**’ responses or ‘**to do with the feelings and emotions**’
- make use of Affective Interaction - machines can recognise, sense, analyse and express emotions, leading to an improvement in both human–computer and human–human communications

The simplest of interaction designs may convey or elicit both positive and negative emotions. We can use icons or animation:

- to express emotion
- to provide pleasing aesthetics
- as helpful interface agents
- as basic emoticons.



Affective Interaction

3 main research areas:

- Computer recognition of human emotion
 - Computer adapts its behaviour based on what it knows about user
- Computer simulation of human emotion
 - Computer appears to display human characteristics
- Computer evocation of human emotion
 - Computer targets human emotions and encourages particular responses

Affective Interaction

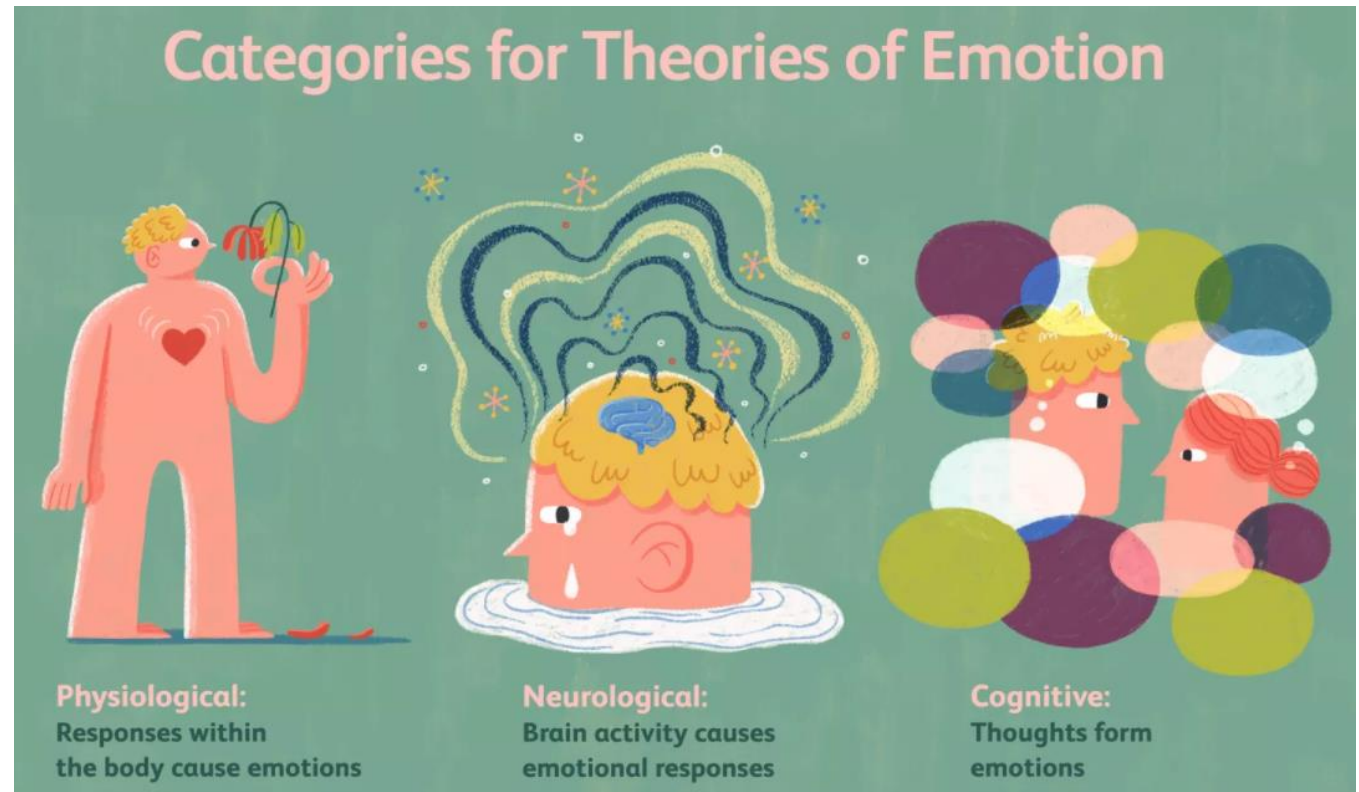
What are emotions?

- A neural impulse that moves an organism to action
 - We cannot choose our emotions
 - Emotions happen spontaneously in response to events in the environment
 - Causes physiological changes visible in behaviour
 - Facial expression, faster heartbeat, perspiration, aggression, crying etc.



6 Theories of emotion

- Evolutionary Theory
- James-Lange Theory
- Cannon-Bard Theory
- Schachter-Singer Theory
- Cognitive Appraisal Theory
- Facial-Feedback Theory



Extra Reading:

<https://www.verywellmind.com/theories-of-emotion-2795717>

Affective Interaction

Plutchik Wheel of Emotions

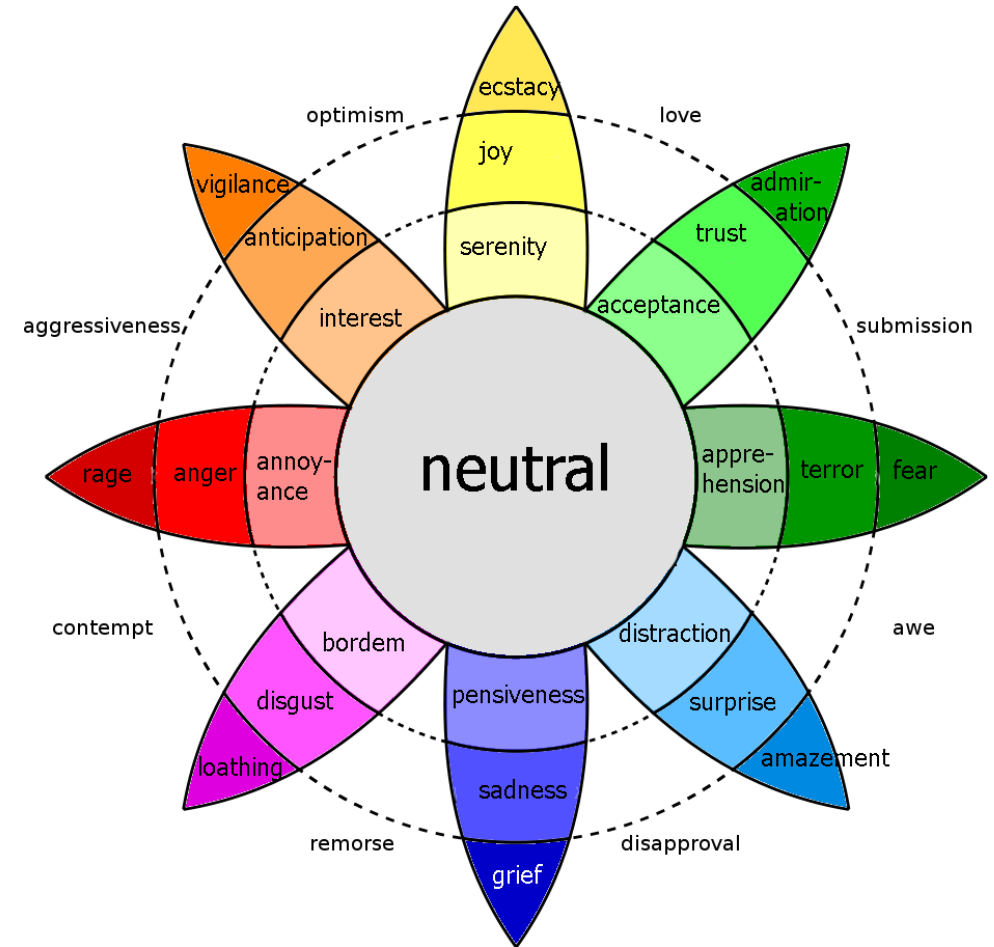
- 8 Primary
- Concept of emotion is applicable to all evolutionary levels and apply to animals and humans

Made up of pairs of opposites

- Joy & sadness
- Fear & anger
- Surprise & anticipation
- Trust & disgust

Primary emotions can be combined to form secondary emotions

Disgust + Sadness = Remorse

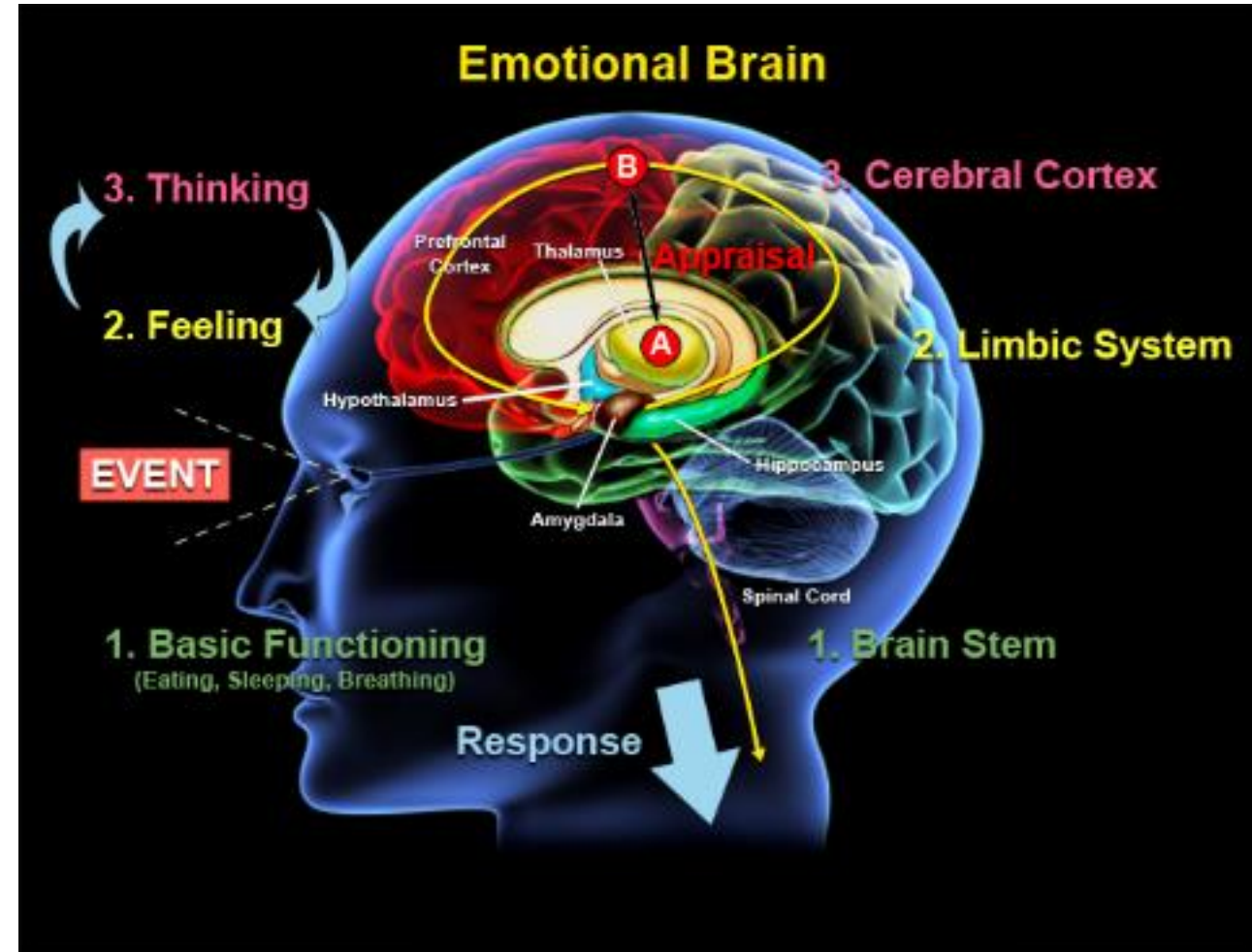


Wheel of emotions by Robert Plutchik

Affective Interaction

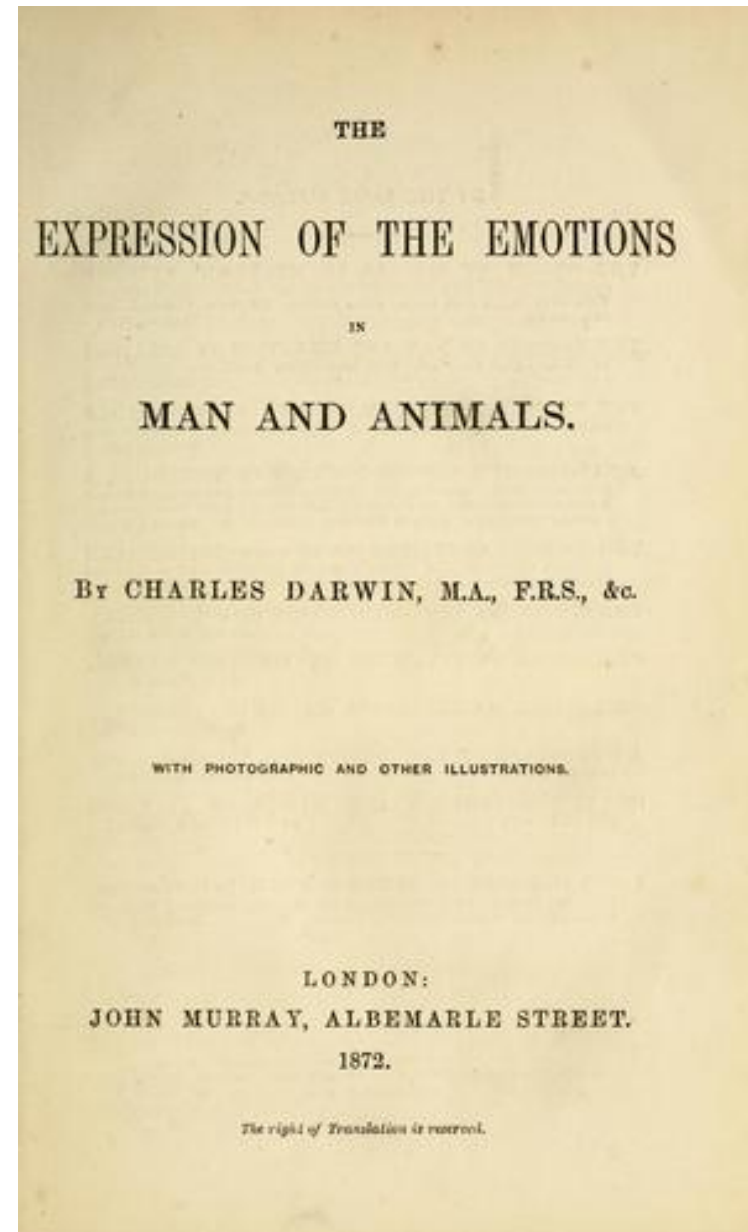
Where do emotions come from?

- Produced and experienced in the brain's limbic system
- Emotional impulses travel from limbic system to the front of the brain where rational, logical thinking can take place



Universal Emotions

- Charles Darwin
- Expression of Emotions (1872)
- Emotions universal across humans



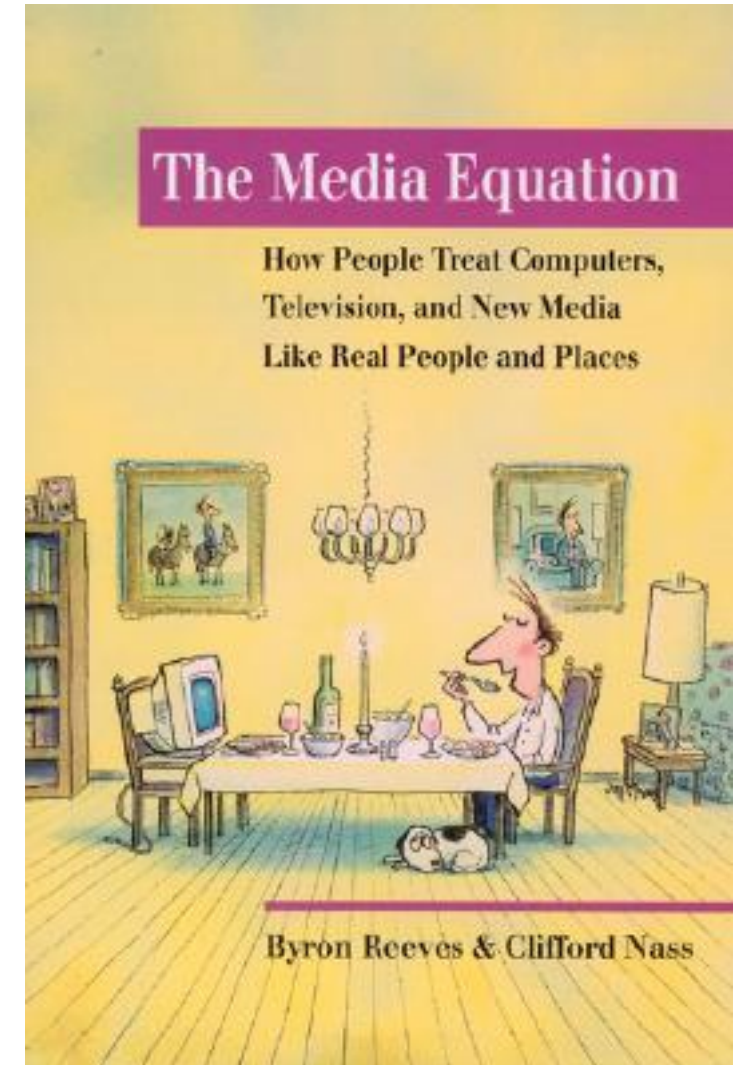
Duchenne

- The mechanism of human facial expression
- Electrical probes
- 60 discrete emotions



Affective Interaction

- Humans respond to computers like real people
 - We prefer computers that flatter us
 - We prefer computers which have a similar personality to our own
 - We are polite to computers
- Therefore, we seem to have social relationships with computers
 - Emotions are an important component of social relationships...
- **Will we “like” it more if computer has a friendly face?**



Affective Interaction

Emotional response to stimuli

- Ekman, Friesen & Ellsworth (1972)
- identified 6 basic emotions
- recognised & expressed in same way in all cultures



anger

fear

disgust



surprise

happiness
















sadness

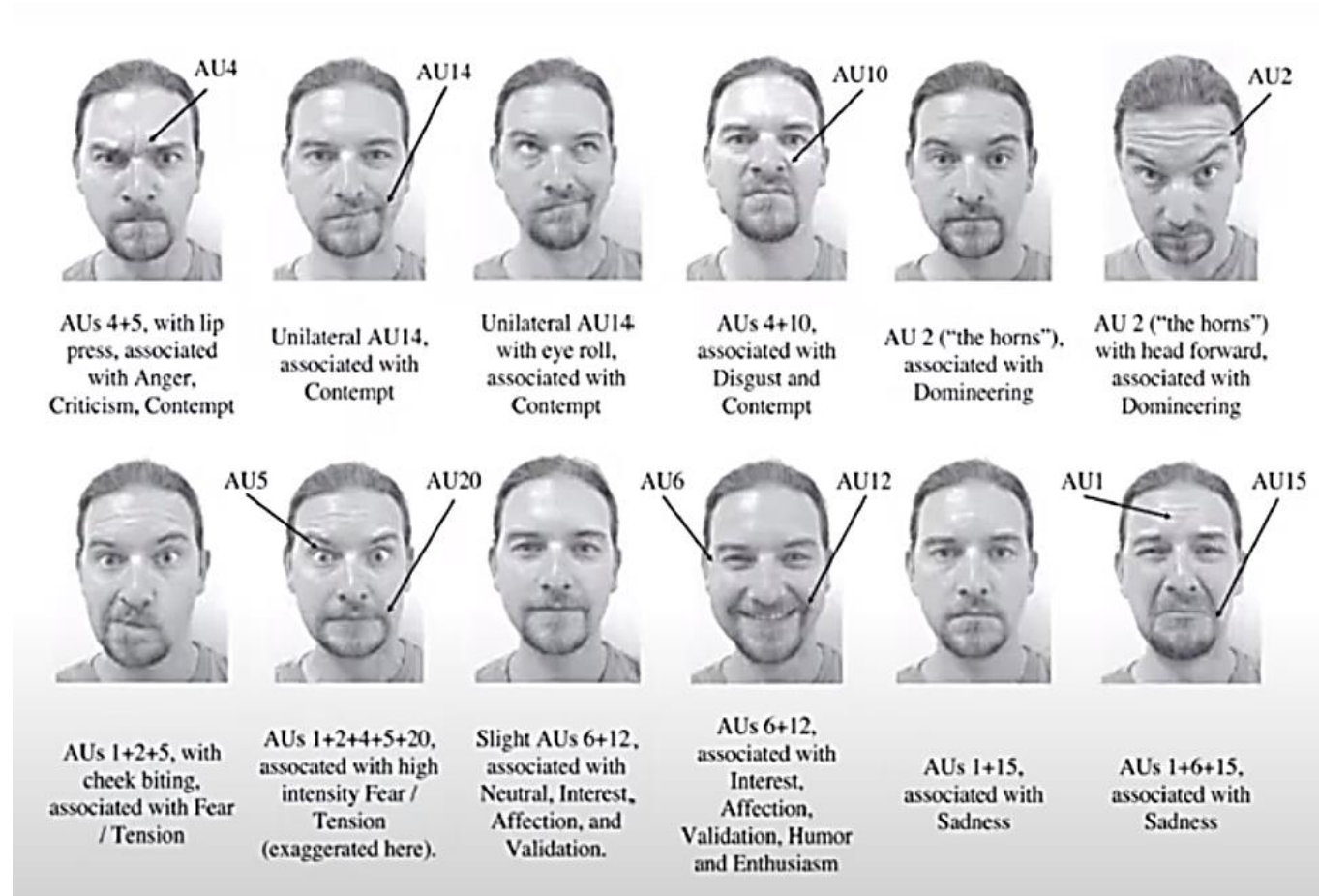
Which emotions are these people displaying?
(Ekman, Friesen & Ellsworth, 1972)

Affective Interaction

Facial Action Coding System (FACS)

- Developed by Ekman and Friesen (1978) developed FACS
 - Taxonomy of expressions
 - Defines expressions as 1 of 46 “Action Units”
 - > Contraction or relaxation of one or more muscles
 - > AU1- inner eyebrow raise, AU 9- Nose Wrinkle
- Cowe & Johnston (Psychology Dept. University College, London)
 - system automatically generates a virtual puppet, or avatar, then drives it by mimicking the facial movements of an actor.
- Applications?
 - Recognising user expression
 - Generating appropriate responses for avatars

| | | | | |
|---|---|--|---|--|
| AU1  Inner brow raiser | AU2  Outer brow raiser | AU4  Brow Lowerer | AU5  Upper lid raiser | AU6  Cheek raiser |
| AU7  Lid tighten | AU9  Nose wrinkle | AU12  Lip corner puller | AU15  Lip corner depressor | AU17  Chin raiser |
| AU23  Lip tighten | AU24  Lip presser | AU25  Lips part | AU26  Jaw drop | AU27  Mouth stretch |



Facial Expressions

- Facial Action Coding System
- Universal emotions

Affective Interaction

Recognizing emotions

- Tele-healthcare (Lisetti, et al. 2003)
- System models patient's affective state using multiple inputs from wearable sensors and other devices such as camera
- Detected emotions mapped onto intelligent agents embodied as avatars
- Avatar able to chat to patient to confirm emotion

90% success recognizing sadness

80% success for anger

70% success for frustration



**Magic Leap Introduces MICA |
Unbelievably Human like AI Avatar**

Affective Computing

- Rosalind Picard
- MIT Media Lab



Rosalind Picard: Affective Computing, Emotion, Privacy, and Health | Lex Fridman Podcast #24
<https://youtu.be/kq0VO1FqE6I>



Emotions in machines

- Sense emotion state of the user
- Sensor, cameras, microphones
- Speech recognition
- Gesture recognition
- Image recognition
- Machine learning



Attention and
emotion analytics.
Real-time shopper
experience



Video

Application scenarios

- Retail
- Education
- Medical
- Social



Image from telegraph.co.uk



Reading:

**Why affective computing
and mindless AI will
conquer the world?**

Affectiva

<https://www.affectiva.com/>

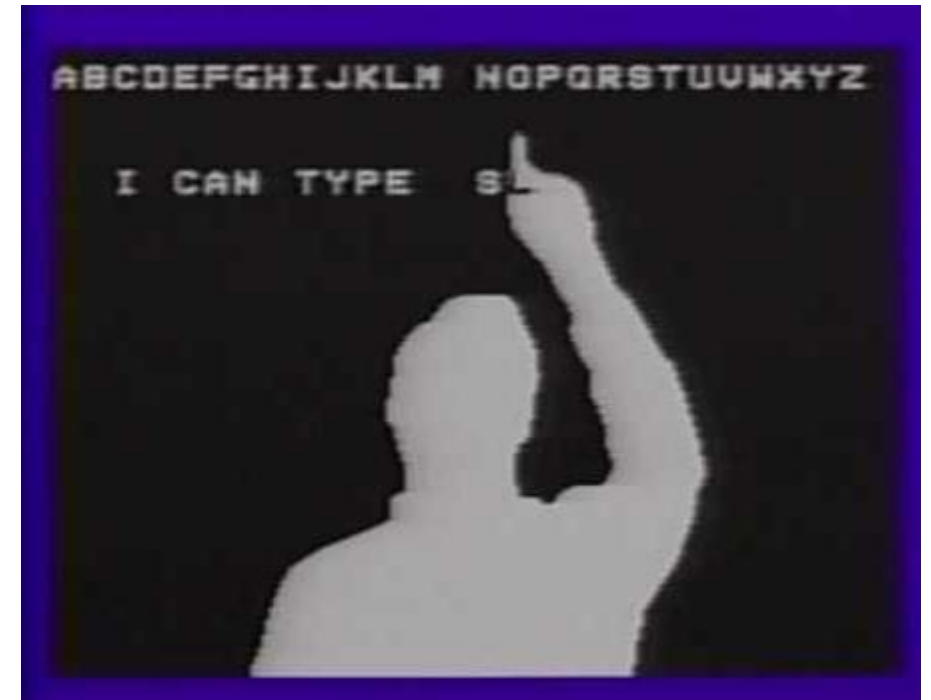




Virtual Environments

Virtual Reality

- roots in 1950s cinema technology
- Ivan Sutherland⁶ (creator of the head-mounted display) and Myron Krueger⁷ (creator of Videoplace)



Videoplace (1985)

Virtual Environments

Immersive Virtual Reality

- Present users with a projected image, often viewed through head-mounted displays which cover the eyes with shutter glasses so that the left and right eyes receive different views
- 3-D depth simulation and can be a very compelling experience
- A strong sense of 'presence' enables a suspension of belief that the real world can be overlaid with another, which seems more or less real



Immersive VR Education (Video)

Virtual Environments

Basic elements that must be incorporated are:

- 3D images appear, from the user's perspective, to be life-sized.
- Ability to track the user's movements (especially eye and head motion)
- Ability to interact with that environment in meaningful ways (becoming unaware of the real surroundings)



Virtual Environments

Telepresence - combination of a sense of immersion and interactivity

If users become aware of the surrounding real world – Immersive experiences suffer

If a user can easily direct his or her own movements, that becomes an '**interactive experience**' which can draw in the user, making the interaction interesting and absorbing and creating a sense of '**engagement**'

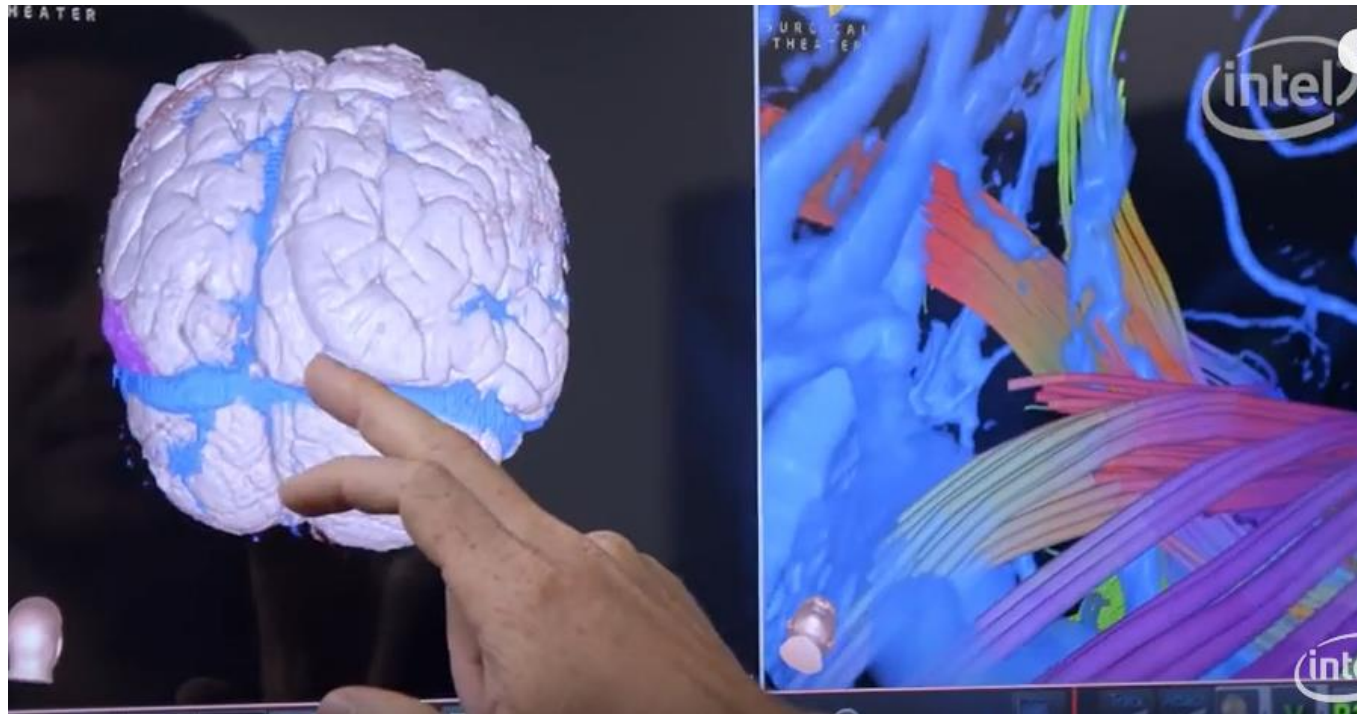
Virtual Environment can be easily modified and is responsive to the user's actions in a way that makes sense (even if only in that Virtual Environment) that will enhance a user's sense of telepresence.



Top 5 VR Technologies 2018

Virtual Environments

Virtual Reality



Reimagining Brain Surgery with VR | Intel

Virtual Environments

Augmented Humans

- Bionics and biomechanical additions (i.e. exoskeletons)
- Existing technologies (i.e. augmented and Mixed Realities; Ubiquitous Computing; smart artefacts, wearables and tangibles)

Uses

- entertainment (augmented sport, games and tourism)
health (augmented wellbeing, technology for training and rehabilitation)
- smart artefacts
- new methods of interaction (brain computer interfaces and augmented context-awareness)

TedTalk: New bionics let us run, climb and dance

by Hugh Herr- MIT Media Lab's Biomechatronics group (19 min)



Augmented Humans: Technology is Changing Lives (Video)

Virtual Environments

Augmented Humans



8 Amazing Human Augmentations (Video)

Metaverse: Augmented reality inventor warns it could be far worse than social media



<https://bigthink.com/the-future/metaverse-augmented-reality-danger/>



Research

Research areas ▾

Products & Downloads

Programs & Events ▾

People

Careers

More ▾

All Microsoft ▾



Human-computer interaction

Redefining human experiences through innovations in research, design, and technology.



<https://www.microsoft.com/en-us/research/research-area/human-computer-interaction/>

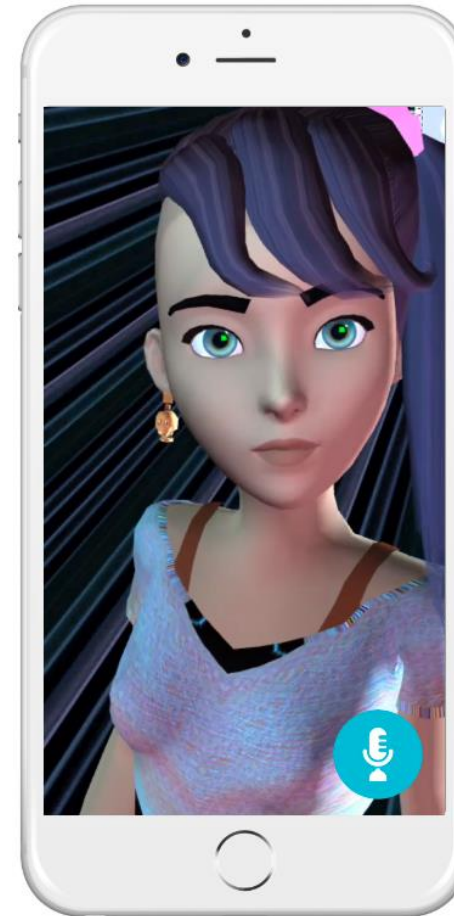
New Technologies Will Disrupt UX

1) Artificial Intelligence and the future of user experience

- AI conversational chatbots

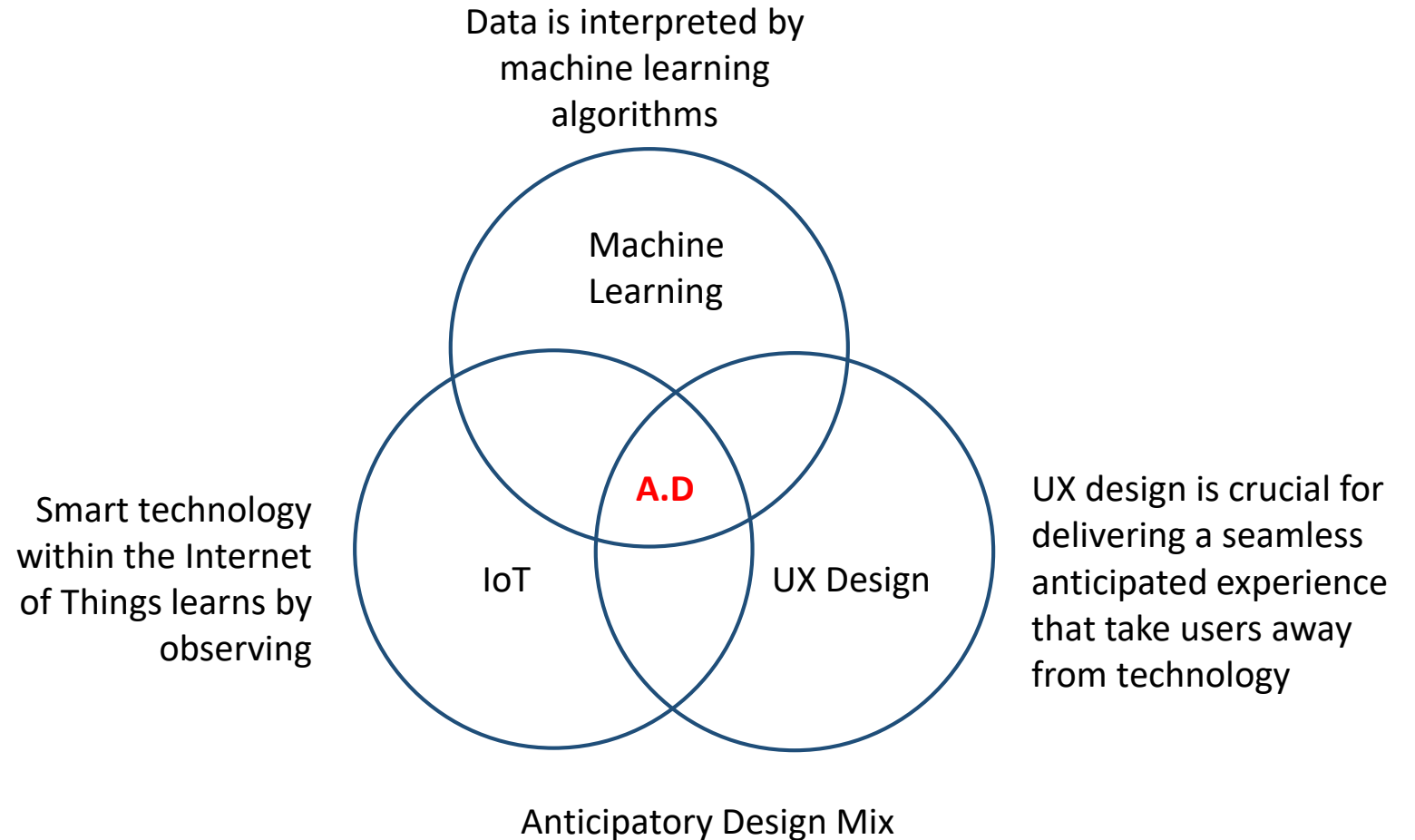
Will AI reach critical mass and outperform existing user interfaces?

AI designers should at least be aware of [anticipatory design](#)



[Mitsuku](#), an AI chatbot created by Pandorabots, a multi award-winner of the Loebner Prize Turing Test, a competition that awards artificial intelligence programs considered to be most human-like.

Anticipatory Design is a design pattern that moves around learning (Internet of Things), predicting (Machine Learning) and anticipation (UX Design).



People and AI Guidebook (PAIR)- Google's design guidelines and best practices when designing for AI products.

<https://pair.withgoogle.com/>

New Technologies Will Disrupt UX

2) Humanising Autonomy

is creating a new category of human-centred products that help people and **autonomous** systems to better understand, interact, and work with each other.



3) Voice UI (invisible interfaces)

- voice is used as the primary or only interaction between people and devices
- proliferation of voice assistants, both physical and built in virtual software: Alexa, Google Home, Siri, Google Assistant
- voice interaction is very different to Graphical UI interaction > requires an understanding of voice communication



Google Home

4) Touchless Gesture Interaction

- new sensing technology works by tracking the motion of a person's hand.
- By detecting touchless gesture interactions using radar, a person's hand becomes the interface and gestures become the input.



[Video: Project Soli](#)

[Project Soli: https://atap.google.com/soli/](https://atap.google.com/soli/)

Google Tulip, machine learning technology to improve the profitability of Dutch agriculture and the well-being of Dutch cash crops.



https://youtu.be/nsPQvZm_rgM



Erica: 'I want to be more like a human'

Erika the talking robot

Erica is a humanoid robot designed to look, sound and conduct conversations like a real person.

She was designed by Professor Hiroshi Ishiguro, director of the Intelligent Robotics Laboratory at Osaka University.

Professor Ishiguro's ambition for Erica is to make her as human-like as possible.

Erica is currently conversant in around 20 subjects, from her favourite hobby to what type of animals she likes.