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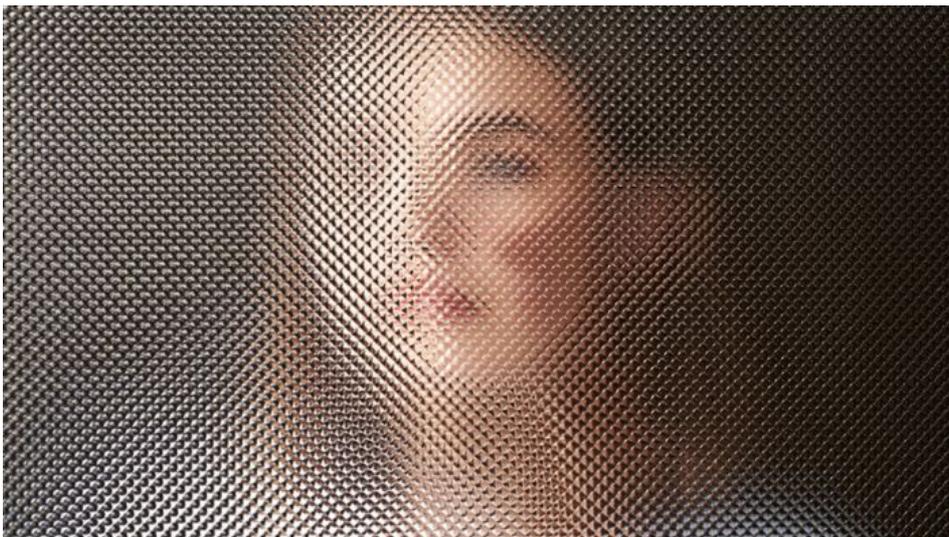
When machines learn to love

Machines do what humans want them to do. But can they also feel what humans feel? Affective computing is pushing the boundaries.



"You look tired," says the voice. "Maybe you could do with a nap. There's a service station in 25 minutes. I'll wake you then and you can buy yourself a coffee." I hadn't noticed that the light had grown warmer and softer. The music matched my heartbeat, but always a beat slower to relax me. I smiled. "You're not normally convinced so easily. Sleep well," says my car. And drives me to my conference in Hamburg.

—A vision of the future from Marco Maier.



Shrikanth Narayanan, an Indian--American Professor at the University of Southern California in Los Angeles, and his colleagues spent two years recording hundreds of conversations from couple therapy sessions. This material was supplemented with information on the marital status of the people involved. Narayanan's team added voice data to their algorithm, analysing the data according to volume,

pitch, and jitter and shimmer symptoms. That was all it took. The system was then able to predict with 80 % certainty whether a couple would still be together at the end of the observation period, outdoing the assessments of the therapists involved in the trial. Narayanan is very optimistic about the future of this technology, claiming that machines are moving very close to people when it comes to recognising emotions. He also explains how our voices transport a great deal of information about our mental state and our identity. Affective computing focuses on machines that not only function but can also adapt to people and understand their feelings. The growing popularity of voice assistants has lent huge impetus to research in this area of computer science. Voices, more than any other human expression, transport emotions. They are a key element in the interaction between humans and machines.

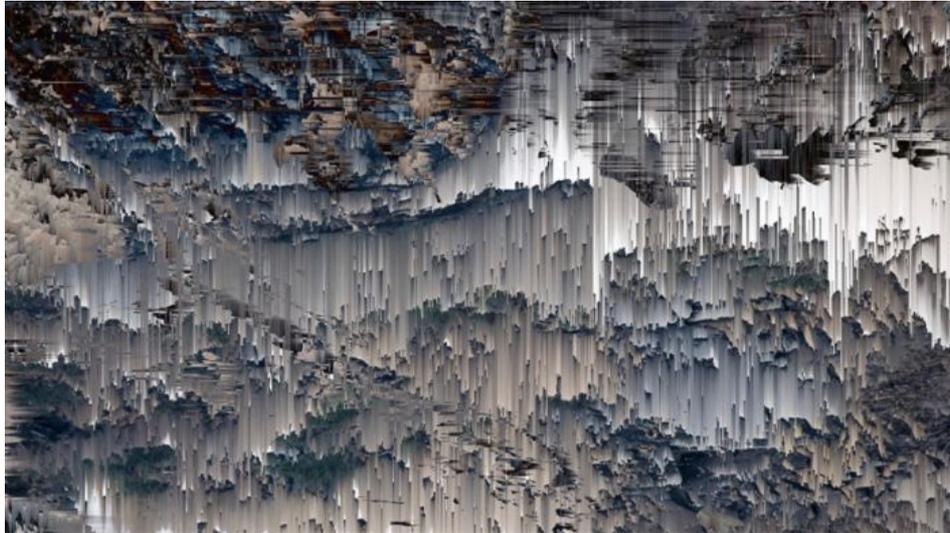
A changing human/machine interaction



Starner laid his smartphone to rest about ten years ago now, frustrated by the unwieldy design and the fact he never had his hands free. His preference remains glasses with integrated computers, which are becoming ever smaller to the point of being invisible. It is still to have a breakthrough, but he firmly believes that this type of smart system, combined with voice commands and an assessment of mood, will soon be able to recognise what the user needs: a weather report or route navigation on the way to an appointment, or even, if the user is stressed and rushing to an urgent meeting, learning only to put through important phone calls. These systems "sense" what their wearer is doing and predict what he is about to do. They can, for example, project the next stages in a work process on to smart glasses or directly on to the desk using augmented reality, or provide unobtrusive assistance by briefly illuminating the box containing the correct screws. Dieter Schmalstieg, augmented reality expert at Graz Technical University and author of the book *Augmented Reality – Principles and Practice*, refers to these wearable devices as "all-knowing organisers". "Information is becoming a component of the real world."

Modern-day cars, devices on wheels, are already busy collecting data. Sensors can monitor the driver's stress levels by recording skin conductance or pulse, recognising when he or she is excited or angry and reacting accordingly. The Fraunhofer Institute for Industrial Engineering IAO in Stuttgart is developing demonstrator models and prototypes for the short-term future of automated driving. These use the principles of persuasive computing to track the mood of drivers and passengers at any given time, by evaluating eye movements, for example. If they detect fatigue or a lack of attention, a blue light within the vehicle or a small movement of the steering wheel alerts the driver to the situation.

Emotionally adjusted machines are the future



Björn Schuller has launched a start-up called Audeering, offering voice-based emotion recognition services. "Emotions are important because people need them to survive. And that also applies to artificial intelligence." Ideally, Schuller wants to see machines adapt to people in the same way as another person would do. Alongside the US, Germany is a driving force in this type of research. Audeering's customers include market research companies interested in using analysis of customers' voices to find out what they really think about a product. According to Schuller, the analysis of voice data from the internet (such as YouTube) is another huge market, enabling "opinion-forming to be tracked on a real-time basis". Schuller is in no doubt. Before long, emotionally sensitive systems will be having conversations with humans, and not just controlling devices with language. Siri's response to a marriage proposal might be: "It's nice of you to ask." But in a real conversation the dialogue would have to continue, and "for that I need emotions," explains Schuller. "The computer can then carry out a perfect analysis of mood and knows if I am feeling strong, weak, happy or sad."

Machines have to learn to adapt to humans

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Info

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