



In *Ex Machina*, director Alex Garland explores the implications of endowing a robot with emotional intelligence.

ARTIFICIAL INTELLIGENCE

Virtual love

A young programmer falls for a humanoid robot, but is the feeling mutual?

By Rosalind W. Picard

In the opening scene of *Ex Machina*, Caleb Smith, a tall, young programmer, has just won a contest to spend a week at the home of his company's founder, Nathan Bateman. Bateman is the genius programmer behind Bluebook, a corporation handling 94% of the world's web search requests. On arriving at the isolated retreat, Caleb learns that he will be the first person to see if Nathan's newest creation, the robot Ava, passes the Turing test. The classic test, developed by Alan Turing, has the computer hidden from the human, who asks questions, receives answers via text, and in the end must judge, "Is this a human or a computer?" When Caleb points out that this will be different—that he will know that it's a computer from the start—Nathan argues that it will be all the more impressive if Caleb knows that Ava is a computer and yet becomes convinced that she is conscious.

When Caleb meets Ava, we see close ups of Ava's face and shots framing her sculpted breasts, transparent waistline, and internally illuminated organs. Caleb responds as any healthy 26-year-old heterosexual male might, with a slack jaw. When Nathan asks Caleb, "How do you feel about her?" Caleb is effusive: "She's fucking awesome." The more

interesting question, however, is what Nathan asks next, "How does she feel about you?"

As Caleb and Ava supposedly grow closer, we watch for the emotions to develop. When Caleb shares that his parents died when he was 15, Ava's face remains unmoved; her pause is only perfunctory before changing the topic. Later, we see experiences that should elicit expressions of pain and do not. Her face reminds me of the face of a dermatologist I once met who had experimented a bit too eagerly with Botox. Scientists have shown that we read a neutral facial expression as happy if we felt happy before we saw it or as slightly sad if we felt slightly sad before we saw it. We may buy that Ava has feelings because she produces words that describe feelings and because Nathan said "she can feel pleasure," but we do not see her demonstrate convincing empathy or emotional intelligence (1).

At one point, Caleb recognizes that Ava has "mind-reading" abilities. He does not mean the "I know all your thoughts" kind of mind reading that is routinely debunked but the ability to infer the likely mental state of another person—a simple task for most people. For example, if your phone is placed under a basket while you watch, and then moved while you are out of the room, when you come back to retrieve it, a "mind reader" would expect you to look for it where it had been and for you to be surprised to find that it is not where you left it. Ava speaks lines that imply that she is aware of minds and can reason about them. Some scientists argue that a lack of mind reading is the hallmark of autism, although there is also ample counter-evidence to this. As such, Nathan's remark that autistic people are not aware of their own minds, or those of others, is the first line I would have put on the cutting room floor.

When Caleb tries to engage Nathan intellectually about how Ava works, keywords like "stochastic" and "linearized" are sprinkled into the conversation in a way that is in-

Ex Machina

Alex Garland, director
DNA Films, 2015.
108 minutes.



tended to sound erudite without boring the uninitiated. To those of us who build emotional artificial intelligence (AI), however, the phrases have the sound of a toddler randomly sampling keys on a Steinway grand piano.

Nonetheless, the director, Alex Garland, has done some homework on the science of bringing emotions, emotional intelligence, and more to AI. He is wise, for example, to stretch the Turing test over multiple days (2). He is also clearly aware of how valuable it is to collect massive data to train the system. At one chilling point, Nathan tells Caleb how Ava was taught to read and synthesize facial expressions by turning on every camera and microphone in every cell phone on the planet and recording everybody without their knowledge. Still, the film leaps over the major breakthroughs that would be required before we could encounter such a future, namely, the complete lack of evidence that machines could ever have conscious feelings like ours.

A particularly glaring gap is the fact that Ava is programmed without morality. Some might consider morality an option or an upgrade; however, smart machines do not evolve unguided. A machine's choices are significantly biased by the procedures with which it has been programmed. Ava, and her actions, say more about the mind of her programmer than about the robot he created.

REFERENCES AND NOTES

1. For the first scholarly work on emotional intelligence, see P. Salovey, and J.D. Mayer. *Imagination, Cognition and Personality* 9, 3 (1990).
2. For steps on testing computers' emotional intelligence, see R. Picard, *Affective Computing* (MIT Press, Cambridge, 1997).

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Rosalind W. Picard (July 16, 2015)

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