

Through the Looking Glass: Bodies of Data in Alex Garland's Ex Machina

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Alex Garland's *Ex Machina* (2014) is a film about the creation of artificial general intelligence, and forms part of a cluster of films from the last few years that explore this topic, such as *Eva* (Spain/France, 2011), *Her* (USA, 2013), *The Machine* (UK, 2013), *Transcendence* (USA, 2014), *Automata* (Spain/Bulgaria, 2014), *Uncanny* (USA, 2015) and *Chappie* (USA, 2015). Amongst these films, *Ex Machina* takes an unusual perspective on artificial intelligence (AI), focusing on its relationship to big data. Ava, the AI robot in the film, is literally a body of data. She is the first robot with artificial general intelligence, an intelligence on a par with human consciousness, and this breakthrough has been enabled by unauthorized data mining. The film also engages with the acquisition of data, verbal and written, audio and image, to explore this issue in a broader way than the creation of Ava herself. As the film suggests through its references to Lewis Carroll, entering the world of big data is like stepping through the looking glass, to a place where the normal rules do not apply. In addition, it interrogates the relationship between big data and small data, demonstrating that recording devices used to create supposedly anonymous tranches of big data can also be used to monitor the activities of named individuals and produce small data sets specific to them. The film links human and AI by presenting both as data processors and data repositories. Both can parse data, albeit in different ways and at different speeds, but both are also constituted from data, and these data can be analysed and used for their benefit or detriment.

Three years after the release of *Ex Machina*, scandals emerged surrounding the unauthorized data use practices of Cambridge Analytica. Through the app *This Is My Digital Life*, 270,000 Facebook users agreed to third-party use of their data. Allegedly these users' friends' data were also acquired without consent, giving the company access to the data of 87 million Facebook users. Via a third party, GSR, it is alleged that these data were used to influence the results of the US Presidential Election that saw Donald Trump take the White House, and Cambridge Analytica have also been linked to the Leave. EU campaign, amongst others. Cambridge Analytica deny these accusations. The company had previously claimed to use psychographic analysis, or psychological profiling to identify users' personality types, to target advertisements to their Facebook feed likely to have the most impact (BBC 2018). Cambridge Analytica later defended themselves against the claim that they carried out this research. In April 2018, a spokesperson for Cambridge Analytica said that the number of users was lower than had been alleged – only 30,000 – that the data in question had been deleted in 2015 when it came to their attention that it was acquired in violation of Facebook's terms and conditions, and that in any case, the data were 'virtually useless' for psychological profiling, little better than 'only just above random guessing'.¹

The Cambridge Analytica scandal highlighted the serious consequences of unauthorized data mining, and the seemingly readily available opportunities to carry it out. There are signs that big data will only become more powerful into the future. Plans have been announced in China to roll out a new social credit system, which will use big data to monitor and control its citizens. China's 200 million CCTV cameras will be used along with 'facial recognition systems, and cross-checked with financial, medical records, and legal records – with the whole apparatus regulated and interpreted by advanced, big-data-crunching AI networks' (Dockrill 2018: n.pag.). The rise of big data may even have created a new paradigm in scientific inquiry. In 2008, writer and tech CEO Chris Anderson provocatively stated that big data had made the scientific method obsolete: 'No semantic or causal analysis is required'. He claimed that the old scientific advice that correlation is not causation no longer applies because of the size of the data sets available and that 'with enough data, the numbers speak for themselves' (Anderson 2008: n.pag.). Anderson's views have been criticized and caution advised about the 'blind' use of big data (e.g. Coveney et al. 2016: n.pag.; Symons and Alvarado 2016: n.pag.). Irrespective of which side of the argument you favour, the debate does seem to demonstrate at least the potential of big data to create a paradigm shift within the sciences.

Big data often consist of a high volume of data as the name suggests, data that are measured in terabytes or petabytes. Rob Kitchin brings together key characteristics of research into big data, identifying, in addition to its volume, its velocity, its scope, its detailed and relational nature, its variety and its flexibility and scalability (2013: 262). John Gantz and David Reinsel argue that '[b]ig data is not a "thing" but instead a dynamic/activity that crosses many IT borders'. They go on to describe big data as a 'horizontal cross-section of the digital universe [that] can include transactional data, warehoused data, metadata, and other data residing in ridiculously large files. Media/entertainment, healthcare, and video surveillance are obvious examples of new segments of big data growth' (2011: 6). John Symons and Ramón Alvarado emphasize that big data are not just the information itself or the commercial or state systems that enable it to be captured. It is also computational architecture designed to analyse that information, and so they include in the definition of big data '[i]ts use of statistical methods and computational tools of analysis' (2016: 4). The potential for the use and mis-use of big data in technology, commerce, politics and social engineering is vast. *Ex Machina* illuminates this future potential, but also highlights the present ubiquity of data mining in ordinary activities, implicating its audience in the foreboding picture that it presents, and pitting big data against small data in thought-provoking ways.

Nathan is a reclusive programming genius and CEO of a fictitious Internet company BlueBook. He has made the breakthrough to artificial general intelligence through the use of big data. In the history of AI, big data are linked to machine learning, which has been an aspect of AI research since its beginnings. However, progress was relatively slow because of the processing speed of the computers and the quantities of data available. The processing speeds of computers have increased exponentially in the last 25 years, and there is an ever-increasing glut of data available online, and so this strand of AI has developed rapidly. Machine learning has been used to develop better voice recognition, facial recognition and translation software. It has also been used in question answering, as evidenced by the AI Watson's win over two human contestants on the gameshow Jeopardy in 2011. Watson had access to over 200 million pages of data, including the entire Wikipedia database (Kaplan 2016: 42). So, there is realworld context for Nathan's breakthrough in the film, although the breakthrough to artificial general intelligence or human-like AI is still only an aspiration.

Nathan claims that his quest to create a 'conscious' AI was stymied by the problem of how to get the AI to 'read and duplicate facial expressions'. The solution was found in machine learning through big data. If Ava's software had access to enough examples, it would be able to interpret and replicate

human interactions. Unable to obtain these data legally, Nathan claims to have turned on all the microphones and cameras of all the mobile phone users in the world: 'Boom. Limitless resource of vocal and facial interaction'. He then redirected these data through BlueBook. He states, '[t]hey thought search engines were a map of what people were thinking but actually they were a map of how people were thinking'. The phone manufacturers knew what was happening but were powerless to intervene as they were engaged in similar practices themselves. This breakthrough to artificial general intelligence was enabled through the use of big data that were illegally obtained without the consent of users, invading the privacy of their personal lives by surreptitiously and constantly recording through their devices.

Caleb is invited to spend a week at Nathan's remote laboratory and home, supposedly to carry out a Turing test on Ava. It becomes immediately apparent that this is a ruse – Ava is not hidden behind a screen as she should be in a real Turing test; there is no 'control' in the form of another human, and in any case, it is evident from the beginning that Ava can convincingly simulate human consciousness – Nathan surely does not need a test to confirm this. But Caleb continues to participate: initially because he is curious and then because he begins to develop a relationship with Ava. The manner in which he 'won' the competition to allow him to participate in the experiment is also suspicious. The film opens with an image of Caleb sitting at his desk in work from the perspective of the camera on his computer. The computer is one of many screens that manipulate characters' experiences in the film, like Lewis Carroll's looking glass. Digital overlays on the image of his face, with shifting shapes and colours, suggest that data from his desktop camera are being recorded and processed. When he receives an alert to say that he has won a competition, he immediately texts the news to friends on his mobile phone. These data, we later discover, may also be hacked. This focus on profiling is unusual. As Michael Roess notes in his commentary on the film, '[p]rivacy advocates typically focus on factual disclosures that may be exploited [...] while overlooking what otherwise innocent interactions may disclose about our personality' (2016: n.pag.).

As soon as the film begins, the illegal harvesting and use of personal data is presented, and it continues throughout the film in relation to serious and more trivial matters. For example, when Caleb arrives at Nathan's home, the bright flash of a camera momentarily blinds him as his photograph is taken for a key card without warning and without consent. After meeting Nathan, he is presented with a complicated non-disclosure agreement concerning what he is about to witness. He is required to agree that he will not communicate through written, verbal or any other means, anything of what he sees in the house. More worryingly, he must also agree to regular 'data audits' in the future to ensure that the agreement is being complied with. Although hesitant, Caleb agrees because he does not want to miss out on the opportunity to interact with this new technology, a compromise often made by users who agree to the terms and conditions of online services and applications.

Caleb was selected to meet Ava not because he was the winner of a randomized competition, and not because he was 'chosen' for his intellect and his programming abilities as Nathan claims when he tries to quell Caleb's suspicions. He was selected as the best potential candidate by Nathan after building profiles of BlueBook employees' lifestyles and personalities, perhaps psychographic profiling. This profiling presented a lonely, isolated individual, a man with no close family and no significant other. He also matched the requirements because of his 'moral compass', perhaps allowing Nathan to anticipate his sympathy for Ava's incarceration, and test her ability to use Caleb to bring about her escape. His pornographic search history was also used in the creation of Ava, helping to ensure Caleb's attraction to her. His selection was probably carried out using a mixture of legal and illegal personal data to allow Nathan to take advantage of Caleb's vulnerabilities and

manipulate his desires. The recording of video and audio on Caleb's devices, and the records of his online activity, may have been used to create big data, but may also have been used to create small data, which are acquired from and identifiable with a specific named individual.

When Caleb meets Ava for the first time, he notices the glass that surrounds her small living quarters and through which they must interact. This glass has been damaged in one area as if from an impact and a spiderweb of cracks has appeared. His first impression of her is combined with this image of the cracked glass, suggesting perhaps her anger, or violence towards her, suggesting that she is trapped and may wish to escape. Later Caleb describes his first meeting with her by saying, 'when you talk to her, you're just through the looking glass'. In Lewis Carroll's novel, when Alice goes through the looking glass, what she sees is a reflection of her normal world, but the same rules do not apply. The same is true of Ava, who communicates like a human but is visibly partially inorganic as only her face and hands are covered with material that looks like skin. The looking glass metaphor also relates to the collection of big data: Ava's glass room is an alternative world where normal conventions of privacy are disregarded. When Caleb meets her for the first time, Nathan is shown closely monitoring their interactions on three computer screens. Cameras in Ava's room record her actions 24 hours a day, and Caleb finds a screen in his bedroom that shows him a live stream from Ava's room. Ava, the AI, is not the only one who is being monitored – Caleb is too. The most interesting thing about this monitoring is that it is foregrounded at the start of the film by the cameras that show him in the outside world, at his desk, an ordinary employee. His experiences of being intensively monitored in Nathan's house are just a magnified version of what he, and by extension we, potentially experience in our daily lives.

That Caleb is seen as a body of data just as much as Ava is, becomes clear during their conversations, when she uses her artificial intelligence to glean information from him. In their fifth session together, keeping up the pretence that this is some kind of Turing test, she tells Caleb that this time she will test him. She begins by asking a seemingly innocuous question 'what is your favorite colour?'. When he answers 'red', Ava detects he is lying by reading the micro-expressions of his face and his body language. Upon deeper reflection, Caleb admits that the truthful answer is that he does not have a favourite colour. In analysing his responses in this way, Ava represents a branch of AI called affective computing, which originated with the research of Rosalind Picard at MIT in the 1990s. In *Heart of the Machine*, Richard Yonck defines affective computing as the 'recognition, interpretation, replication and potentially the manipulation of human emotions by computers and social robots' (2017: 5). Such affective computers have existed since the 1960s with Joseph Weisenbaum's computer program Eliza. Affective computers were commercialized and popularized in the 1990s with the Tamagotchi toy. Currently, affective computers have reached new levels of sophistication with the therapeutic robot seal Paro, which is used in elder care. Even more ubiquitously, Amazon's Alexa, Google Assistant and Apple's Siri project the illusion of a human personality. But what are the dangers of these 'relational artefacts' as Sherry Turkle calls them? (2007: 515). Ava tells Caleb in their first meeting that friendship should be an exchange of information and she contextualizes their exchanges in terms of the development of their relationship. However, as Yonck warns, affective AI may manipulate human emotions, and may do so all the more easily by presenting itself as friendly, helpful and sympathetic. At the end of the film, there is doubt over Ava's motivations in fostering a relationship with Caleb when it appears that she was at least partly manipulating him to ensure her escape. Ava can be seen as an affective AI who uses her powers of manipulation to extract data for her own benefit. Caleb is seen by her at least in part as a data set that can be discovered and utilized.

Ava's powers of understanding, interpretation and deduction in conversation with Caleb can be linked to the inspiration for the name of Nathan's company BlueBook. The Blue and Brown Books

belonged to Ludwig Wittgenstein and were comprised of notes taken at lectures, which became the basis for *Philosophical Investigations* (1953). In this text, Wittgenstein was concerned with exploring thinking and language, and with language games. Ava's conversations with Caleb demonstrate her dexterity with language. For Ava, however, this knowledge has come from a BlueBook that is a search engine rather than a series of lecture notes. It comes from big data, which have been acquired without the knowledge or consent of BlueBook's online users. Wittgenstein's twentieth-century insights into language are an example of acquiring knowledge through small data – one individual observing, thinking, reasoning and writing. Nathan's twenty-first-century insights into language are an example of acquiring knowledge through big data. It is subtly suggested that in relation to language philosophy, as elsewhere, Ava prefers small data methodology. When she dresses to leave the house for what seems like it will be the final time, she covers up her robotic body with a white dress. As she leaves, she passes by a painting of another woman wearing a white dress, which is hanging on the wall in Nathan's house. It is a portrait of Wittgenstein's sister, Margaret Stonborough Wittgenstein, painted by Gustav Klimt in 1905, on the occasion of her wedding. As she passes by the portrait Ava too is about to embark on a new phase of her life, like the woman in the painting, and it seems that she does so with respect for the more old-fashioned, small data modes of language acquisition.

Caleb is monitoring Ava, Nathan is monitoring them both and it is revealed that all three are being monitored by someone else: a domestic servant also lives in Nathan's house. She cooks for the two men, and it is also implied that she has a sexual relationship with Nathan. She does not speak, and Nathan claims it is because she does not understand English and that he has chosen her specifically because of this: 'it's like a firewall against leaks'. Later it is revealed that this woman, Kyoko, is an artificially intelligent robot. She is seen in Nathan's office monitoring all the screens and she assists Ava to escape at the end of the film. The AI that is locked in the glass room, distinguished from the humans by her robotic body, distracts from the AI that roams freely around the house, and blends in with its human occupants. Caleb's failure to recognize this AI, who is in plain sight, parallels his failure to recognize the surveillance that is being carried out on his desktop, his mobile phone and potentially other devices also. Information technology that is so well-concealed in the everyday that it is almost unnoticeable is the most dangerous kind, not the AI robot who is interrogated and imprisoned.

Empowered by his plan to help Ava to escape, Caleb gets Nathan drunk and uses his key card to explore the rooms he has been denied access to in the house. He finds a room surrounded by cupboards in which the defunct bodies of previous AI robots are stored. He uncovers video footage of these earlier versions of Ava called Lily, Jasmine and Jade, footage that shows their rage at being denied liberty. These are bodies of data that have been used and then discarded, just as Ava will be, and as Caleb will be. These are not the only empty bodily shells to be found in the film – mounted along the hallway in Nathan's house are a collection of masks. Later, Caleb finds masks that Nathan has presumably designed himself as templates or as earlier versions of faces for his AIs. Human and AI are linked in relation to how they process data – Ava's demonstration of human-like consciousness is seen as testament to her artificial general intelligence. They are also linked because they are both presented as repositories of data that can be accessed, analysed and utilized. These discarded bodies may symbolize the online user. For the advertisers and the social engineers, the physical shell is almost immaterial – what matters is the information, the data, that can be used to persuade, to sell, to sway.

Back in his room, as Caleb looks in the mirror, the first real looking-glass of the film, the digital overlay on his face is repeated. It was used at the beginning of the film as a visual representation of

the camera recording him and the data collected on him being processed. It is used here again to demonstrate Caleb's well-founded fear and paranoia that he may be being monitored everywhere he goes. He is seen smashing the mirror, creating a spider-web crack that mirrors the crack in Ava's glass wall that was his first introduction to her, visually joining them and their experiences together. In fact, Caleb feels such an empathy with Ava's experience that he begins to wonder if he too is an AI, slashing his wrist open with a blade and probing his fingers into the wound to search for circuitry and electronics.

The film's exploration of big data and small data in relation to humans and AI presents two contrary perspectives on epistemology. On the one hand, there is traditional knowledge that is created by an individual and tested through experience that is based on small data. Both Caleb and Ava demonstrate this kind of knowledge in their relationship with each other, and how they get to know each other, in as much as that is possible, through their conversations. On the other hand, there is knowledge based on big data, whereby a large volume of information can be analysed by a computer program with a speed and efficiency that far outstrips human ability. This type of knowledge production requires human input to frame the perimeters of the search, and possibly to interpret the findings, but the bulk of the data collection and processing is done by computers. This is the type of knowledge that Nathan has used to create Ava. He has found the key to replicating human behaviour in the big data of the billions of mobile phone users' conversations and interactions. It is this insight that has enabled him to make the break through to artificial general intelligence. Although Nathan uses big data to create Ava, it is small data that he values in Ava: her ability to converse with Caleb by interpreting his tone, his body language, the context of his words and their implications. This 'small data' knowledge, which is associated with individual analysis, with personal creativity and insight, is also what Nathan most values in himself. For him, big data represented simply a tool that allowed his personal genius to flourish. He describes himself, misquoting Caleb, as a 'God', aspiring to the Romantic idea of the inspired artist, and he displays the faces and the bodies that he has previously made like works of art.

The subjective, 'small data' view of the creation of knowledge can also be seen in Ava's artistic works. She seems to feel compelled to create abstract drawings, and states, 'I do drawings every day, but I never know what they're of'. Later, at Caleb's request, she produces more conventional, representative drawings of a tree and Caleb's face. The first drawing that she shows him, created of her own volition, is most interesting as it seems the most authentic expression of her personal artistic creativity. Moreover, its mode of production and its enigmatic nature link it to a work of art that is hanging in Nathan's house, Jackson Pollock's No. 5 (1948). Nathan explains that Pollock's drip painting method helped him escape from automation, and allowed his creativity to be expressed. Nathan states, 'the challenge is to find an action that is not automatic, from painting to breathing to talking to fucking to falling in love'. Nathan's comment suggests that humans are programmed to respond to data sets, as AIs are. Their actions are usually a predictable response to internalized experience and externalized stimuli. Nathan mentions this view earlier in the film when he states of Ava that 'I programmed her to be heterosexual, just like you were programmed to be heterosexual'. Over these 'automatic' responses of both humans and AIs, it is implied that Nathan privileges moments of creativity and unpredictability.

The film juxtaposes big data and small data in relation to two different ways of thinking about human interaction, knowledge and creativity. It demonstrates that even in the case of an AI made through the use of big data, her ability to understand small data – what others say, and mean, and do – is more valuable. Furthermore, Ava's artworks suggest her regard for a type of knowledge that is creative, subjective and non-utilitarian. The film also highlights comparisons between Ava and Caleb

as bodies of data. Each of them has been created or chosen through big data and each of them endures rigorous monitoring, from the cameras and microphones that surround them, and from each other. Moreover, each time a comparison is made between Ava and Caleb, AI and human, the audience is implicated too. Ava is monitored and tested and codified through data processing, but so is Caleb and so are we. She is a thinking machine whose consciousness is made out of data, but so is Caleb and so are we. Ava is trapped in a glass room where she is constantly monitored and tested and analysed, but so too is Caleb. His screens are not those in a physical glass room, but those of the cameras that observe him, the screens of computerized devices that are present whether in his room in Nathan's house or outside it. Moreover if Caleb is trapped by the screens that harvest his data, then so are we. When in the end Caleb doubts whether his existence is based on carbon or silicon, it reflects the status of the online user, whose organic existence and physical reality are far less important to the commercialized interests of the online world than the disembodied information that they transmit, both with their knowledge and consent, and without.

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