Liar, Liar, Pants on Fire!
Examining the Constitutionality of Enhanced Robo-Interrogation

WORKING DRAFT

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"You may be deceived if you trust too much, but you live in torment if you don't trust enough."
(Frank Crane)

Abstract

The combination of human-computer interaction ("HCI") technology with sensors that monitor human physiological responses offers state agencies improved methods for extracting truthful information from suspects during interrogations. These technologies have recently been implemented in prototypes of automated kiosks, which allow an individual to interact with an avatar interrogator. The HCI system uses a combination of visual, auditory, near-infrared and other sensors to monitor a suspect's eye movements, voice, and various other qualities throughout an interaction. The information is then aggregated and analyzed to determine whether the suspect is being deceptive. This paper argues that this type of application poses serious risks to individual rights such as privacy and the right to silence. The paper concludes by suggesting that courts, developers, and state agencies institute limits on how and what information this emerging technology can collect from the human's who engage with it.

Introduction

Humans lie frequently,[1] but are poor lie detectors.[2] Even individuals who are specifically trained in detecting deception when compared to the average person have only slightly improved accuracy in detecting lies.[3] This means that when investigators in a law enforcement or national security environment need to know whether someone is telling them the truth, they must find other methods to accurately detect deception.

People have long turned to technology to enhance human capacities, and the field of lie-detection is no exception. Polygraphs and brain scans are useful tools in helping investigators identify deception.[4] They measure an interview subject's natural physiological reactions during an interview to determine whether that individual is trying to deceive or lie to the interrogator. The integration of human-computer interaction ("HCI") research with physiological measurement devices may provide new and unparalleled opportunities for state agents to improve their ability to extract truthful information from a suspect.

HCI is the study of how people interact with computing technology.[5] Research in this field reveals that people are willing, and in some instances may even prefer, to communicate socially with an automated computer or robot.[6] Automated interlocutors may even be able to build rapport and engage people in conversation more easily than humans can.[7] In addition to the ability to manipulate conversation in ways equal or superior to human interrogators, robot interlocutors can be equipped with deception-detection technologies that provide the robot with important information about the subject. Through the use of various sensors, the robot can also detect whether the human interlocutor is lying and can use this information to direct the course of the interaction.

By monitoring a human's reaction during a conversation, robots can respond by employing persuasive techniques like flattery, shame or intimidation to elicit more information.[8] This technology offers significant possibilities for state agencies in the context of interrogation.

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[1] For example, Kashy and DePaulo (1996) found that "deception is a standard component of everyday interactions, and that lies are told for a variety of reasons" Bella M. DePaulo and Deborah A Kashy, "Everyday Lies in Close and Casual Relationships" (1998) 74 Journal of Personality and Social Psychology 63-79.

[2] Humans are generally poor lie detectors (not usually accurate above 60%): Don Grubin and Lars Madsen, "Lie Detection and the Polygraph: A Historical Review" (2005) 16(2) The Journal of Forensic Psychiatry & Psychology 357-369 at 357-8. See also Bella M. DePaulo et al, "Cues to Deception" (2003) 129 Psychological Bulletin 74-188 at 106, "Behavioral cues that are discernible by human perceivers are associated with deceit only probabilistically. To establish definitively that someone is lying, further evidence is needed."

[3] Charles F. Bond, Jr. and Bella M. DePaulo, "Accuracy of Deception Judgments" (2006) 10 Personality & Soc. Psychol. Rev. 214–234 at 214.

[4] Aldert Vrij, *Detecting Lies and Deceit: Pitfalls and Opportunities*, 2nd ed (West Sussex, UK: John Wiley & Sons, Ltd., 2008) at 317-329.

[5] Gary M. Olson and Judith S. Olson, "Human-Computer Interaction: Psychological Aspects of the Human Use of Computing" (2003) 54 Annual Revue of Psychology 491-516 at 492.

[6] See e.g. Joseph Weizenbaum, "ELIZA—A Computer Program For the Study of Natural Language Communication Between Man And Machine" (1966) 9 *Communications of the ACM* 36; Ian Kerr, "Bots, Babes and the Californication of Commerce" (2003-2004) 1 *UOLTJ* 285.

[7] See e.g. Jonathan Gratch et al, "Can Virtual Humans be more Engaging than Real Ones?" (2007) In: Human-Computer Interaction, Part III, J. Jacko (ed) Speinger-Verlag Berlin 286-297; Jonathan Gratch et al, "Virtual Rapport" (2006) In: LNAI 4133, J Gratch et al (eds) Springer-Verlag Berlin pg 14-27.

[8] M. Ryan Calo, "Robots and Privacy" in *Robot Ethics: The Ethical and Social Implications of Robotics*, Patrick Lin, George Bekey, and Keith Abney, eds. (Cambridge: MIT Press, 2011).

Interrogation (or "questioning") is a form of interview employed by police, military and intelligence agencies with the goal of obtaining information or a confession from the interview subject.[9] The prospect of using a deception-detecting robot for interrogation offers a solution to many of the weaknesses exhibited by human interrogators, such as an inability to accurately detect deception, exhaustion or bias of the interrogator, and time efficiency.[10]

While the widespread use of robots in interrogations may not be an imminent concern, recent work on the development of an automated, deception-detecting avatar for questioning at border crossings ("border avatars") suggests that it is not out of the realm of possibility.[11] The use of such technologies by state agencies, particularly in law enforcement and security contexts, puts constitutional rights at issue.[12] This paper will explore the implications that the use of robot interrogators has on the rights commonly engaged by state investigation in the United States and Canada: the privilege against self-incrimination and right to silence and the right to be free from unreasonable searches.[13]

In order to anticipate the legal implications of robot interrogation, the first section of this paper explores the existing the deception-detection technologies and interrogation techniques and how these may be incorporated into robot interrogators. Current developments on border avatars suggest that the combination of lie detection with a robot's ability to engage a person in a persuasive conversation might allow for an enhanced and effective interrogator. A robot's deception-detection component will allow it to analyze two things: whether a person is being deceptive when answering a question (e.g. "I was born in Toronto" when she was in fact born in Chicago), and whether a person has knowledge or recognition of a piece of information put to them (e.g. "I do not recognize the weapon in that photograph" when she in fact does recognize it).

The second half of the paper builds on the discussion of the technology's potential and examines some possible constitutional challenges posed by robot interrogators. The deception-detection component of the robot will allow it to analyze two things: whether a person is being deceptive when answering a question (e.g. "I was born in Toronto" when she were in fact born in Chicago), and whether a person has knowledge or recognition of a piece of information put to them (e.g. "I do not recognize the weapon in that photograph" when she in fact does recognize it). By combining the statement-seeking nature of interrogation with the enhanced capacity of sensor technologies, the suspect's constitutional interest in privacy and self-incrimination might be engaged. Therefore this paper concludes by recommending limits on the design and use of this technology.

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[9] Saul M Kassin et al, "Police-Induced Confessions: Risk Factors and Recommendations" (2010) 34 Law and Human Behavior 3-38 at 6.

[10] Nunamaker J. et al, "Embodied Conversational Agent-Based Kiosk for Automated Interviewing" (2011) 28 Journal of Management Information Systems 17.s

[11] Nunamaker et al, *supra*.

[12] Commercial use is another area where rights might be implicated, but which is beyond the scope of this paper. See e.g. Kerr, "Bots" *supra* and Calo, *supra*.

[13] U.S. Const., amend. IV and V; Canadian Charter of Rights and Freedoms, Part I of the Constitution Act, 1982, being Schedule B to the Canada Act 1982 (UK), 1982, c. 11 ss. 7, 8, 11(c).

I – What is a Robot Interrogator?

For the purposes of this paper, a robot interrogator is any automated technology that examines an individual through questioning. Interrogation is generally conducted for the purpose of eliciting incriminating statements or confessions.[14] Other relevant forms of questioning might include an interview in which the questioner is generally seeking information. In either context, the questioner (human or robot) must accomplish two things–persuade the suspect to provide information and assess the veracity of that information. As such, psychological interrogation techniques and behavioral lie-detection methods now form the twin pillars of modern interrogation.[15] This section will examine the potential effectiveness of a robot interrogator under each pillar of interrogation.

i. The Psychology of Interrogation

In order to be useful in interrogation, a robot needs to be capable of replicating, if not improving upon, the effectiveness of a human interrogator. Modern interrogation involves numerous techniques that tap into human psychology in an effort to persuade the interview subject to provide the desired information.[16]

For instance, one of the leading techniques used in North America is known as the Reid technique.[17] This method involves both a non-accusatory interview in which questions are directed at provoking reactions from the suspect and assessing whether the suspect is being truthful or deceptive in their responses. The questioning then shifts to a nine-step approach that aims to reduce moral blameworthiness of the crime[18] and may involve deceiving the suspect about the facts of the case or investigation[19] in order to induce a confession.[20] The laws in Canada and the United States permit psychological persuasion of this kind, within certain limits.[21]

Interrogation techniques, like the Reid technique, are technical and involve complex and manipulative processes. Interrogators are usually trained in the art of questioning. And, whether using the Reid or another technique, interrogators must be able to build rapport with the subject and must be able to read the subjects body language and reactions to questions. To be useful tools, robot interrogators must have the capacity to be similarly manipulative and effective at inducing admissions or confessions.

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[14] Kassin, *supra* at 6.
[15] Kassin, *supra* at 6.
[16] See e.g. Slonick, J and Leo, R, "The Ethics of Deceptive Interrogation" (1992) 11 Criminal Justice Ethics 3.
[17] John E. Reid and Associates Inc., "Company Information" online: <http://www.reid.com/r_about.html>.
[18] Slonick and Leo, *supra* at 5.
[19] Investigators cannot however create false evidence, Slonick and Leo, *supra* at 7.
[20] Fred E. Inbau, John F. Reid, Joseph P. Buckley and Brian C. Jayne, *Criminal Interrogation and Confessions,* 5th ed. (Burlington, MA: Jones & Bartlett Learning, 2011). See also, Kassin, *supra* at 7; Slonick and Leo, *supra* at 6.
[21] Specifically, the common law confessions rule in Canada (*R v Oickle*, 2000 SCC 38, [2000] 2 SCR 3) and the restrictions on threats, abuse or oppression defined in *Bram v United States*, 168 U.S. 532 (1897) and *Brown v Mississippi*, 297 U.S. 278 (1936) in the United States.

Persuasive Robots: Findings from the Field of Human Computer Interaction

The HCI literature suggests that robots can potentially perform the role of an interrogator because of the human inclination to respond to a robot as they would to another human. The fact that people will engage in conversation with computers and robots has been a central theme of HCI research dating back to Joseph Weizenbaum's observations about his ELIZA program. ELIZA is a computer program that engages in natural language conversation with a human interlocutor. The person inputs comments into the program, which then employs basic language detection algorithms to pull out key words from the person's input and respond with simple follow up questions.[22] Weizenbaum found that people who interacted with the program were very willing to quickly enter into detailed and personal conversations with the computer.[23] As a result, he concluded that people might even be more willing to open up to automated conversational counterparts than to other humans.[24]

Subsequent research further supports the observation that artificial entities can engage humans socially.[25] Studies found that it is in fact quite easy to trigger this social interaction between human and a computer/robot.[26] However, in order to elicit this response, a robot must be properly designed. Conversation must seem natural – interruptions will destroy the illusion of a meaningful connection between human and robot.[27] With anthropomorphic robots, the use of body language, such as facial expressions, can send powerful suggestions that the robot has beliefs, thoughts and opinions.[28] This suggestion further inspires humans to engage the robot as a social being, even if the robot in fact has no ability to analyze anything the human is saying.[29] By exploiting this social response, human interlocutors can be induced to give up personal information with relative ease.[30]

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[22] Joseph Weizenbaum, "ELIZA-A Computer Program For the Study of Natural Language Communication Between Man and Machine" (1966) 9 Communications of the ACM 36 at 36: "When in conversation with ELIZA, the user types in some statement or set of statements in natural language using normal punctuation and sentence structures. […] ELIZA then analyzes the user's statement and generates some response which it types out."

[23] For example, shortly into a conversation between a person and ELIZA, with ELIZA responding to inputs in all caps: "You are like my father in some ways. WHAT RESEMBLANCE DO YOU SEE. You are not very aggressive but 1 think you don't want me to notice that. WHAT MAKES YOU THINK I AM NOT VERY AGGRESSIVE. You don't argue with me. WHY DO YOU THINK I DON'T ARGUE WITH YOU. You are afraid of me." Weizenbaum, "ELIZA" *supra* at 36-37.

[24] Joseph Weizenbaum, Computer Power and Human Reason: From Judgment to Calculation (San Francisco: W.H. Freeman & Company, 1976) at 6-7. Wizenbaum observed that, "ordinary people seemed to enjoy cultivating relationships with artificial entities." This was one of the factors contributing to Weizenbaum's ultimate decision to condemn the continued development of artificial intelligence systems. Kerr, "Bots" *supra* at 305.

[25] See e.g. Clifford Nass, Jonathan Steuer, Ellen Tauber, "Computers are Social Actors" (1994) CHI '94 Proceedings of the SIGCHI conference on Human factors in computing systems: Celebrating Interdependence 72. Nass, C and Moon, Y, "Machines and Mindlessness: Social Responses to Computers" (2000) 56 Journal of Social Issues 81–103; Robins, B, Dautenhahn, K, Boekhorst, RT, Billard, A, "Robotic Assistants in Therapy and Education of Children with Autism: Can a Small Humanoid Robot Help Encourage Social Interaction Skills?" (2005) 4 Special issue, Design for a more inclusive world of Universal Access in the Information Society, 105-120.

[26] Nass et al, supra at 72: "[a limited set of characteristics associated with humans provides sufficient cues to encourage users to exhibit behaviors and make attributions toward computers that are nonsensical when applied to computers but appropriate when directed at other humans."

[27] Weizenbaum, "ELIZA" *supra* at 42.

[28] Cynthia Breazeal and Brian Scassellati, "How to Build Robots that make Friends and Influence People" (1999) IEEE/RSJ International Conference on Intelligent Robots and Systems, 858 – 863.

[29] *Ibid*.

[30] See e.g. Kerr, "Bots" *supra* at 310 with respect to online shopping bots and consumer information.

To be effective at interrogation, however, it is not enough that a robot can simply engage a person in conversation. That robot must also be able to build rapport with the human suspect, analyze her reactions to the questions and in the context of an interrogation, take advantage of her psychological tendencies in order to induce a confession. A robot interrogator can analyze the reactions of the suspect using sensor technologies, which is the topic of the next subsection. Recent HCI research suggests that rapport building between an artificial entity and a person is not only possible, but might even be easier for a robot than for another human. [31]

Robots can be programmed to reflect certain rapport building characteristics such as positivity, mutual attention and non-verbal coordination.[32] However, even with these characteristics, rapport typically takes time to develop as inhibitions break down and individuals develop emotional bonds between one another.[33] What might set a robot apart from a human in building rapport with a suspect though is the observation that artificial entities might be "inherently less threatening than other forms of social interaction due to their game like qualities and the inherent unreality of the virtual worlds they inhabit."[34] Artificial entities might therefore be able to encourage humans to talk more freely than they would with another person, even without knowing what the speaker is talking about.[35]

The Psychology of Interrogation in Practice: Border Avatars

Researchers based primarily at the University of Arizona are currently working to develop the first application of automated interrogation technology.[36] They are designing a device that could be used at border crossings to conduct pre-screening interviews of individuals seeking to pass through the border. The device will take the form of a kiosk containing a computer screen displaying a virtual character or avatar, specifically the upper body of a virtual person.[37] The avatar is designed to exhibit human-like characteristics including rationality, intelligence, autonomy, and an ability to perceive its environment.[38] The device will also contain numerous sensors that will monitor the reactions of interlocutors throughout the course of the pre-screening interview.[39] The virtual agent will pose a series of questions and may display images of contraband goods. The agent will collect, amalgamate and analyze the human's physiological and verbal responses to these questions, and will then make an autonomous decision as to whether or not that person requires additional screening (their answers were deceptive or raised suspicion) or not.

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[31] Gratch, "Virtual Humans" *supra* at 287.
[32] Gratch et al, "Virtual Humans" *supra* at 287; Gratch et al, "Virtual Rapport" *supra* at 14.
[33] Gratch et al, "Virtual Humans" *supra* at 287.
[34] Gratch et al, "Virtual Humans" *supra* at 288, citations excluded.
[35] Gratch et al, "Virtual Rapport" *supra* at 26. The experiments conducted by Gratch et al did not control for social anxiety, which will need to be considered in greater depth in the future: Gratch et al, "Virtual Rapport" *supra* at 24.
[36] Nunamaker et al, *supra* at 18. Other researchers are based at the University of Nebraska at Omaha. The Department of Homeland Security provides funding.
[37] Nunamaker et al, *supra* at 21-22.
[38] *Ibid*.
[39] For example, a high-definition video camera, a near-infrared camera, a microphone, two computer monitors, a proximity card reader, a fingerprint reader, and a magnetic strip reader. Nunamaker et al, *supra* at 19.

Preliminary studies using this border avatar have shown that the agent can communicate nonverbally to the human interlocutor using facial expressions to facilitate communication.[40] This engagement has the effect of increasing the vocal fluency of the human, in other words, increasing the amount of verbal dialogue from the person to the avatar.[41] In these studies, the border avatar used its sensors to identify and respond to the human interlocutor's gestures and statements, improving the person's engagement in the interview.[42] These preliminary results align with HCI research about human responsiveness to artificial entities. However, these border agents can also venture into the realm of psychological manipulation.

The human-like avatar is this robot interviewer's main interface, and it is its primary means for influencing its human interlocutor. Designers can take advantage of subtle persuasive techniques by manipulating the appearance, voice and size of the avatar.[43] In particular, the demeanor, gender, ethnicity, hair color, clothing, hairstyle, facial structure, voice pitch, tempo, volume, accent, and physical dimensions of the avatar can all be manipulated to serve the purpose of eliciting information from the interview subject.[44] Early studies by these researchers suggested that large male avatars were perceived as more dominant than small female avatars.[45] Additionally serious male avatars were perceived as powerful, while smiling female avatars were more inviting.[46] The design of the avatar could theoretically be altered depending on the personality of the interview subject, and the goal of that interview.

These are preliminary studies, but they already suggest that robots may have the capacity to use gentleness, flattery, intimidation and other personality traits in order to target the psychological tendencies of an interlocutor. Further studies will be needed to determine how successful these techniques are in a law enforcement or in a security context to induce a confession or incriminating statement. For now, such an outcome seems feasible enough that it is therefore worth considering the implications of such a possibility. Furthermore, the potential success of a robot interrogator might be further enhanced by its ability to use technology to monitor for deception, something a human interrogator largely lacks the capacity to do.

ii. The Technology of Interrogation

For over a century, people have turned to technology to assist in deception detection,[47] starting with the polygraph in the late nineteenth and early twentieth century.[48] This section

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[40] Nunamaker et al, *supra* at 22.

[41] Users who talk to an agent that is responsive (e.g. by nods its head, *etc*.) tend to speak for longer and say more, while humans engaging with unresponsive agents (e.g. that simply staring at them with no body language reaction) talk less and have greater rates and frequencies of disruption. Nunamaker et al, *supra* at 22. See also, Douglas C Derrick, Jeffrey L Jenkins, Jay F Nunamaker Jr., "Design Principles for Special Purpose, Embodied, Conversational Intelligence with Environmental Sensors (SPECIES) Agents" (2011) 3 Transactions on Human-Computer Interaction 62-81.

[42] Nunamaker et al, *supra* at 21.

[43] Nunamaker et al, *supra* at 35.

[44] Nunamaker et al, *supra* at 23.

[45] *Ibid*.

[46] Nunamaker et al, *supra* at 35.

[47] "For centuries, humans have tried to improve their ability to detect deception by harnessing the latest technological advances." Francis X Shen and Owen D Jones, "Brain Scans as Evidence: Truths, Proofs, Lies and Lessons" (2011) 62 Mercer Law Review 861 at 863; See also, Daniel D Langleben, "Detection of Deception with

examines the role of deception-detection technology in interrogation. The paper will draw analogies and distinctions between the legal and academic status of these existing technologies and robot interrogators in an effort to illuminate some of the constitutional implications of robot interrogation.

Polygraph: Limited Use but Helpful Insight

The polygraph is one of the original deception-detection technologies. It is a diagnostic instrument that monitors a subject's respiration, vasoconstriction, cardiovascular and electrodermal activity while that person is asked to answer "yes" or "no" to a series of questions.[49] Questions are designed to elicit certain physiological responses from the suspect and do not constitute an interrogation in themselves. When the subject lies, her internal fight or flight instincts will typically generate measurable, predictable physiological responses.[50] A polygraph expert can interpret these reactions to determine whether the subject was being deceptive while providing specific answers.

Polygraph results have been deemed both scientifically unreliable and unhelpful in court, and have therefore been ruled inadmissible in both the United States and Canada.[51] Despite being inadmissible in court, polygraph examinations serve an important function in police investigations. While suspects cannot be forced to undergo a polygraph examination, should they volunteer to do so, the results can be useful. A non-deceptive polygraph result can rule a suspect out of an investigation or support the suspect's earlier statement to the police, allowing investigators to focus their efforts elsewhere. A failed polygraph examination can also serve as a catalyst for a voluntary confession from the test subject.[52]

Brain Scans: Powerful Insight about Deception and Concealment

The human brain reacts in specific and discernable ways depending on whether a person is lying or telling the truth. When someone lies or conceals information, specific areas of her brain will be activated.[53] Scanning technologies have made it possible to measure this reaction in order to assess the veracity of an individual's claims. In particular, electroencephalography ("EEG") monitors the electrical activity within the brain[54] and functional magnetic resonance imaging ("fMRI") measures blood flow within the brain.[55] These technologies cannot be cheated

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fMRI: Are We There Yet?" (2008) 13 Legal and Criminological Psychology 1 at 1-2; Grubin and Madsen, *supra* at 357-8.

[48] Grubin and Madsen, *supra* at 359.

[49] Langleben, *supra* at 2.

[50] See e.g. National Research Council, The Polygraph and Lie Detection (Washington D.C.: The National Academies Press, 2003).

[51] See e.g. *Frye v United States,* 293 F. 1013 (D.C. Cir. 1923) and *R v Béland*, [1987] 2 S.C.R. 398 respectively. See also Aldert Vrij, *Detecting Lies and Deceit: Pitfalls and Opportunities*, 2nd ed (West Sussex, UK: John Wiley & Sons, Ltd., 2008) at 317-329.

[52] See e.g. *R v Oickle*, *supra*.

[53] Owen D Jones, Joshua W Buckholtz, Jeffrey D Schall, Rene Marois, "Brain Imaging for Legal Thinkers: A Guide for the Perplexed" 2009 Stanford Technology Law Review 5 at paras 15-17.

[54] Jones et al, *supra* at para 15.

[55] Langleben, *supra* at 2; Shen and Jones, *supra* at 865.

like the polygraph and therefore are thought to provide highly reliable evidence of deception or truthfulness.[56]

One of the major improvements in the fMRI scan over the polygraph is that it allows for what is known as a Concealed Information Test or Guilty Knowledge Test.[57] The test is designed to determine whether the subject recognizes secret information, such as details about a crime scene that only the culprit could know. Information or images are put to the suspect, and without her having to give a verbal answer the scanner will detect changes in her brain function. When she recognizes information, her brain will react in a distinct way that can provide circumstantial evidence of guilt.[58] The production of this type of information has enormous potential for aiding law enforcement and national security investigations. In order to undergo an fMRI exam, an individual must lay in a CAT scanner. The infrastructural requirements of the fMRI currently prohibit its wide spread use. [59] However, the prospect of portable fMRI scanners means that the evidence that can be obtained by these devices might someday take on greater prominence in the criminal justice system.[60]

The admissibility of brain scan evidence in court is still unclear. In *Iowa v Harrington*, the Iowa District Court held that EEG results are sufficiently reliable to be used as evidence in court.[61] However, in *United States v Semrau,* the court refused to accept exculpatory fMRI results because the results were deemed too unreliable. However, the unreliability in that case was in part due to the circumstances of that particular fMRI examination.[62] When more reliable procedures are in place perhaps this result will be different.

The Technological Side of Robot Interrogators

As discussed above, research suggests that robots will have the capacity to build rapport with, and potentially to manipulate individuals in an interview or interrogation context. In addition to this capacity to replicate a human in the first branch of interrogation, they also have the ability to go well beyond human capability with respect to the second branch of interrogation – lie detection. A robot can be equipped with sensor technology through which it can monitor the physiological responses of the human, much like the polygraph or brain scan discussed above. Unlike these other technologies though, the robot interrogator can analyze the results of those scans in real time and use those to steer the interrogation.

The border avatar research capitalizes extensively on this capacity. The kiosk will contains a high-definition video camera, a near-infrared camera, a microphone, two computer

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[56] See e.g. Bruno Verschuere, Gershon Ben-Shakhar, Ewout Meijer, *Memory Detection: Theory and Application of the Concealed Information Test* (New York: Cambridge University Press, 2011). Critics point to an absence of extensive data to confirm brain scan reliability however. See e.g. Shen and Jones, supra at 866.

[57] Verschuere, et al, *supra*.

[58] *Ibid*.

[59] Ian Kerr, Max Binnie and Cynthia Aoki, "Tessling on My Brain: The Future of Lie Detection and Brain Privacy in the Criminal Justice System" (2008) 50 CJCCJ 367 at 375.

[60] *Ibid*.

[61] *Iowa v Harrington*, 659 NW2d 509 (Iowa, 2003). See also, Dov Fox, "The Right to Silence Protects Mental Control" in Law and Neuroscience: Current Legal Issues, M. Freeman, ed. (Oxford: Oxford University Press, 2010), in From The Selected Works of Dov Fox at 9, online: <http://works.bepress.com/dov_fox/21>.

[62] *United States v Semrau*, No. 07-10074 M1/P (W.D. Tenn. May 31, 2010). Semrau sought to disprove his intention to defraud Medicare through an fMRI exam. The first test results were inculpatory so the test was re-done. The second set of results were exculpatory.

monitors, a proximity card reader, a fingerprint reader, and a magnetic strip reader.[63] These sensors can be used to detect uncontrollable physiological reactions such as eye movement toward a familiar image,[64] pupil dilation/movement when viewing a familiar and incriminating image, [65] voice fluctuations[66] and physical rigidity indicating deceptiveness.[67] Other technological developments may further enhance these avatar kiosks. For example, sensors to measure the body temperature, pulse, blood flow to the eye region will all contribute to deception-detection.[68] If someday fMRI scanners do become portable, these could also feasibly be integrated into a device like the border avatar.[69]

These sensors monitor and analyze the subject's physiological reactions[70] to identify deception[71] or concealed/guilty knowledge. [72] This latter information can be collected without the subject even answering the question.[73] Therefore, if the human interlocutor approaches the kiosk with knowledge about something, which happens to be something that the border avatar has been programmed to inquire about, that person through their uncontrollable physiological reactions will essentially admit their knowledge regarding that thing. The robot can detect this knowledge and either use it to continue the interrogation to the point of obtaining a confession, or use it to flag that individual for further investigation by human agents. It is through this combined interrogation and collection of information that constitutional rights might be engaged.

II – Potential Legal Implications

When a state agent interacts with an individual or conducts an interrogation, certain constitutional protections can be triggered. In particular, individuals have a right to silence and privilege against self-incrimination, as well as a right to be free from certain searches, when interacting with the state. This section argues that robot interrogation will be sufficiently analogous to human interrogation to trigger these same rights and protections. It further argues that the combination of scanning technology and questioning poses potentially irresolvable threats to the privilege against self-incrimination. It also undermines the suspect's interest in privacy where there is no lawful justification for the use of such scanning technology.

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[63] Nunamker et al, *supra* at 19.
[64] Derrick, *supra*.
[65] Nunamaker et al, *supra*.
[66] Ibid.
[67] Nathan W. Twyman, Aaron Elkins, Judee K. Burgoon, "A Rigidity Detection System for the Guilty Knowledge Test" Proceedings of the Credibility Assessment and Information Quality in Government and Business Symposium (January 4-7, 2011) Kauai, Hawaii 48.
[68] See e.g. Pavlidis L and Levine J, "Thermal Image Analysis for Polygraph Testing" (2002) 21 IEEE Engineering in Medicine and Biology Magazine 56-64: The US Department of Defence is presently developing a device that uses high-resolution infrared camera to detect surge of blood flow to eye.
[69] Kerr, "Tessling", *supra*.
[70] "Physiological cues that may be diagnostic of emotional state, arousal, and cognitive effort include heart rate, blood pressure, respiration, pupil dilation, facial temperature, and blink patterns. Behavioural indicators include kinesics, proxemics, chronemics, vocalics, linguistics, eye movements, and message content." Nunamaker et al, *supra* at 20, citations removed.
[71] Twyman, et al, *supra,* found that rigidity of the body can reveal deception.
[72] For instance, Derrick et al, *supra* found that eye gaze can be suggestive of guilty knowledge.
[73] Derrick, *supra*.

As discussed above, robots have the potential to improve upon human interrogation capacity in two ways. Robots might be able to capitalize on greater human comfort and willingness to talk with artificial entities, and robots can capitalize on their superior ability to collect, amalgamate, analyze and implement deception-based physiological data into the interrogation. In order to assess the legal implications of robot interrogation technology, the following sub-section will consider each of these improvements in turn. While the improved dynamic between human and robot interrogator might persuade people to reveal more information verbally, this will not automatically violate constitutional self-incrimination protections if the robots are properly designed. The ability to combine this dynamic with a search of someone's physiological reaction however will likely undermine both the self-incrimination protections and the individual's privacy interest.

i. Robots, Psychology and Self-Incrimination

The right to silence is constitutionally guaranteed in both the United States and Canada.[74] It operates to ensure that an individual can never be "compelled to testify … or otherwise provide the State with evidence of a testimonial or communicative nature."[75] The onus therefore rests with the state to prove all aspects of a crime, without the forced assistance of the accused. Part of the purpose of this protection is to ensure that an accused never has to share her thoughts or beliefs with the Government.[76] It guarantees, "a 'private inner sanctum of individual feeling and thought and [proscribes] state intrusion to extract self-condemnation."[77] State agents must warn a suspect of this right upon her arrest or detention.[78] A failure to warn could lead to the exclusion of any incriminating evidence provided by the suspect while in custody or detention.[79] Though the state is not obliged to warn a suspect of her rights prior to the point of arrest or detention, she still cannot be forced against her will to give self-incriminating evidence.

There are of course limits on these constitutional protections. Suspects can voluntarily choose to waive their rights to silence.[80] Additionally, police can ask questions of the suspect in spite of her insistence on exercising the right to silence. [81] As discussed above, interrogators are permitted to use psychological techniques, so long as these do not violate the limits imposed on

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[74] The Fifth Amendment of the US Constitution, *supra*, holds that "No person shall be held to answer for a capital, or otherwise infamous crime […]" and section 11(c) of the Canadian *Charter*, *supra*, holds that "Any person charged with an offence has the right ...(c) not to be compelled to be a witness in proceedings against that person in respect of the offence." Sections 7 and 13 of the Canadian *Charter* also protect an individual against self-incrimination.

[75] *Doe v United States*, 487 US 201 (1988); see also *Miranda v Arizona,* 384 U.S. 436 (1966) at 457-458 reinforced that state cannot compel self-incrimination: "[…] one of our Nation's most cherished principles – that the individual may not be compelled to incriminate himself."

[76] *Doe v United States*, 487 US 201(1988).

[77] *Couch v United States*, 409 US 322, 327 (1973), cited in *United States v Nobel*, 422 US 225, 233. See Sean Kevin Thompson, "A Brave New World of Interrogation Jurisprudence?" (2007) 33 American Journal of Law & Medicine 341-357 at 346.

[78] See e.g. *Miranda v Arizona*, *supra* and *R v Manninen*, [1987] 1 S.C.R. 1233 in Canada.

[79] *Ibid*.

[80] See e.g. *Raffel v United States* 271 U.S. 494 (1926); *R v Wills* (1992), 12 CR (4th) 58 (Ont CA).

[81] See e.g. *R v Singh*, 2007 SCC 4; [2007] 3 S.C.R. 405, in which the accused asserted his desire to remain silent eighteen times, but the Supreme Court of Canada held that continued questioning did not violate his constitutional rights. See also, *Miranda v Arizona*, *supra*.

investigators to prevent coerced confessions.[82] Specifically, interrogators cannot rely on oppression, duress, trickery, or promises to induce the confession.[83] In both the United States and Canada, the only true way for a suspect to fully maintain their right to silence is to refuse to answer questions. But, importantly, the constitution ensures that any suspect who refuses to speak is entitled to do so and cannot be forced to do otherwise.

Application to Robot Questioning

As long as the questioning component of robot interrogation can be programmed to fall within the scope of the above rules, human verbal confessions to robots might be admissible as evidence in court. As discussed above, people may be more willing to make statements to a robot, but it is unlikely that this alone would amount to a violation of the confessions rule. If the interrogation takes place in detention or custody, the suspect must be warned of their right to silence and their right to counsel. This warning could either be given by the detaining officers or could feasibly be programmed into the robot itself. Given that the law does permit a certain amount of psychological manipulation and persuasion in interrogation, the simple fact that a person might be more willing to open up to the robot interrogator than she would to a human would probably not be enough to limit the admissibility of any incriminating statements. Robot interrogators would of course be prohibited from making any threats or promises, or inducing oppression or physical abuse. However, a robot could feasibly be programmed in such a way that making inappropriate statements, such as inducements or threats, is simply impossible.

Therefore as far as the ability of the robot to ask questions is concerned, any confessions or statements voluntarily made by a suspect who, if necessary, has been given her right to silence and counsel, would likely be admissible. However, as the above section makes clear, robot interrogators are not simply replacements of human interrogators. They have remarkable sensory enhancements, giving them far greater interrogation capacity than a human interrogator possesses. The next sub-section considers the legal implications of these enhancements.

ii. Robot Interrogators as Enhancements on Human Interrogation

The capacity of a robot interrogator to simultaneously question a suspect while scanning and analyzing her physiological reactions may undermine two fundamental constitutional rights. Specifically, using sensors to monitor physiological reactions might constitute a search, which implicates constitutional privacy rights. However, such a search also evokes the right to silence and privilege against self-incrimination because of the information that it collects. The subject matter of the search – physiological reactions triggered by deception or knowledge – are arguably the same in meaning and content as a verbal admission. Therefore, unless a suspect has waived her right to silence, the interrogator might be compelling the functional equivalent of an admission. A compelled admission violates the right to silence. Therefore, the search itself might also constitute a violation of the suspect's right to silence. These constitutional challenges are explored below.

[82] See e.g. *R v Oickle*, *supra*; *Bram v United States*, *supra*; *Brown v Mississippi*, *supra*. See also Kassin, *supra* at 6.
[83] *Ibid*.

Robot Interrogator Searches

Both the Unites States and Canada have constitutional provisions that protect individuals from unreasonable state search and seizure.[84] While each country has a slightly different test for determining what the state can and cannot search, both protect a similar concept of privacy – "the right to be let alone" by the state.[85] A state agent violates that right if she engages in a search that is not lawfully justified. A "search" for constitutional purposes occurs when a state agent invades something over which an accused has a reasonable expectation of privacy. In order to determine whether using sensors to collect physiological data constitutes a search, a court would first have to decide whether the robot could be considered a state agent for the purpose of triggering constitutional protection. A court would then have to determine whether the individual has a reasonable expectation of privacy in the impugned physiological data.[86]

Is the Robot Interrogator a State Agent?

For the purposes of this paper robot interrogators will be assumed to be acting as state agents, and will therefore implicate constitutional rights. Court treatment of existing state investigation tools supports the above assumption. For example, law enforcement agencies deploy sniffer dogs to smell or "scan" certain objects or areas like bags, cars or lockers for targeted odors such as drugs or explosives. The dog collects and processes information (scents) in order to make an autonomous decision as to whether the bag contains the targeted materials.

Courts in both Canada and the United States have treated a dog's sniff as a state act.[87] In the context of a border crossing or police interrogation, the state's role will often be to confirm or deny the presence of contraband materials. Therefore, it is probable that for the purposes of a constitutional challenge, a robot interrogator would be considered to be a state agent.

Does an Interrogation Subject Have a Reasonable Expectation of Privacy?

The Subject Matter of the Search:

In order to determine whether someone has a REP, the court needs to identify the subject matter of the impugned state action. The subject matter of an alleged search can be anything from an accused's garbage left at the curb,[88] the contents of a letter,[89] the odorous contents of a duffle bag,[90] or the heat emanating from a home.[91] Generally, it is the information that the state is interested in.

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[84] The Fourth Amendment protects "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures […]" and section 8 of the Canadian *Charter*, *supra*, holds that " Everyone has the right to be secure against unreasonable search or seizure."

[85] See e.g. *Katz v United States*, 389 US 347 (1967); *Hunter v Southam Inc*, [1984] 2 SCR 145.

[86] See e.g. *Kyllo v United States*, 533 U.S. 27 (2001); *R v Tessling*, 2004 SCC 67; [2004] 3 S.C.R. 432.

[87] *R v AM*, 2008 SCC 19, [2008] 1 S.C.R. 569; *R v Kang Brown*, 2008 SCC 18, [2008] 1 S.C.R. 456; *United States v Place*, 462 U.S. 696 (1983).

[88] California v Greenwood, 486 U.S. 35 (1988); R v Patrick, 2009 SCC 17, [2009] 1 S.C.R. 579: the contents of one's garbage are not protected once placed on the street for pick up.

[89] United States v Van Leeuwen, 397 U.S. 249 (1970): the inside of a letter is protected, while the outside is not.

[90] *R v AM, supra*; *R v Kang Brown, supra*; *United States v Place, supra*.

In a robot interrogation, the subject matter of the search can be characterized as the autonomic, physiological reactions "emanating" from the interview subject, which are imperceptible to the human eye. These reactions directly reflect the emotions and knowledge of the suspect.[92] The data collected by a robot interrogator reveals more than just the movement of the eye or dilation of the pupil. When combined with questioning, it could reveal information about the subject's statements, which may be more or less invasive depending how the interrogator asks a question. For example, where the robot interrogator asks someone to respond to an open-ended question, its sensors can determine whether or not a response is deceptive, but it cannot identify the true answer.[93] Alternatively, if the robot puts a series of possible answers to the subject in what is known as a Guilty Knowledge or Concealed Information test, the subject's physiological responses will identify which is the correct answer.[94]

While the presence of deception reveals information about the veracity of the statement, it does not necessarily tell the state what the suspect knows. By contrast, determining the actual answer to a question reveals a piece of the suspect's knowledge, and might implicate that person in a crime or security threat. This latter outcome is problematic because, "[t]here is nothing more interior, and nothing more important and central to individual autonomy than one's consciousness."[95] The physical reaction being monitored is actually reflective of mental thought, and therefore, the subject matter of the search would seem to be extremely personal.[96] This observation, should it be accepted by courts, would factor significantly into the determination that someone's expectation of privacy in this information is objectively reasonable.

Reasonableness of a Subjective Expectation of Privacy in Physiological Responses:

The revealing nature of an interrogation robot scan will be an important factor in determining whether an individual has a REP in that information. Through the physiological data collected by a robot interrogator, the robot is accessing what may be highly reliable evidence of an individual's knowledge, memory or recognition. One's thoughts and knowledge are jealously guarded from being involuntarily compelled by the state through the self-incrimination protections. As such, a court should be inclined to find a reasonable expectation of privacy in this information. Analogies in the jurisprudence also suggest that one might reasonably expect privacy in these physiological reactions.

Sniffer dogs can again provide insight on how the courts would treat robot interrogators. Similarly, law enforcement agencies have in recent years used scanning technology to measure

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[91] *R v Tessling, supra*; *United States v Kyllo, supra*.

[92] Paul Ekman, "An Argument for Basic Emotions" (1992) 6 Cognition and Emotion 169-200; Verschuere et al, *supra*.

[93] For example, if the question is: "where are you coming from" and the suspect answers "Toronto", even though they are coming from elsewhere. The interrogator can rule out "Toronto" based on the deception indicated, but cannot identify the subject's true origin.

[94] For example, if the interrogator asks "the murder weapon was: a) a knife b) a gun c) a brick", a distinct physiological reaction will be generated in response to the correct answer. If this is information that only the guilty person could have, then this provides circumstantial evidence that the subject is the murderer (concealed memory book). Alternately the subject can be shown an image of the thing in question and her physiological reactions will reveal whether she recognizes it. See e.g. *Derrick, supra*.

[95] Richard G Boire, "On Cognitive Liberty" (2000) 1 Journal of Cognitive Liberties 13 at 15.

[96] Kerr, "Tessling" *supra* at 377.

the amount of heat emanating from a home.[97] The use of technology to measure emanations exiting from an enclosed space might similarly provide insight for the application of the constitutional protections in the context of robot interrogation.[98]

Both the US and Canadian Supreme Courts have ruled on whether the use of sniffer dogs or heat-scanning technologies constitutes a search. In Canada, the sniff of a sniffer dog constitutes a search. Significant to the Supreme Court's determination of this issue is the fact that the drug odors are imperceptible to humans.[99] Because an officer can only detect the odors through the use of the dog, the owner of the bag can expect the odors emanating from it to remain private. This is relevant to robot interrogation, as the physiological emanations from a person can likewise only be detected through additional technology.

However, the Supreme Court of the United States ("SCOTUS") has ruled differently than Canadian courts on the issue of sniffer dogs. In the United States, an individual does not have a REP in the odors emanating from a bag into a public place.[100] Because the search is so specific in terms of what it reveals – the presence or absence of contraband – it is essentially non-invasive.[101] Importantly though, the court appeared to limit this observation to sniffer dogs (which it considers a *sui generis* investigation tool) due to the very limited amount of information they can actually reveal.[102] Robot interrogators, by contrast, can reveal a wide range of information by asking a range of questions on any number of topics. The reasoning in this case, finding that there is no REP protecting against a dog's sniff, may therefore not apply to robot interrogators.

Heat scanning cases provide additional insight for how courts might treat robot interrogations. In the United States, while it is lawful to observe the home with the naked eye,[103] this lawfulness does not extent to a technologically enhanced form of observation.[104] As stated by Scalia J in *Kyllo v United States*,

> We think that obtaining by sense-enhancing technology any information regarding the interior of the home that could not otherwise have been obtained without physical "intrusion into a constitutionally protected area," Silverman, 365 U. S., at 512, constitutes a search […][105]

Notably though, Scalia J qualified this by stating that this observation applies "at least" where the technology in question is not in general public use.[106]

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[97] See e.g. *Kyllo v United States, supra*; *R v Tessling, supra*.
[98] See Kerr, "Tessling", *supra*.
[99] The police officer had to use the dog to "obtain information about the possible presence of a controlled substance inside the appellant's bag […]." *R v Kang Brown, supra* at para 174.
[100] *United States v Place, supra*.
[101] *Ibid*, at para 12.
[102] *Ibid*, at para 13.
[103] "The Fourth Amendment protection of the home has never been extended to require law enforcement officers to shield their eyes when passing by a home on public thoroughfares." *Kyllo v United States, supra* at 4 citing *California v. Ciraolo*, 476 U. S. 207, 213 (1986).
[104] *Kyllo v United States, supra* at 5.
[105] *Kyllo v United States, supra* at 6.
[106] *Kyllo v United States, supra* at 6-7. The law on this point is slightly different in Canada. Canadian courts take a normative approach to the reasonable expectation of privacy vis a vis surveillance technologies. Specifically the court will consider what types of privacy should a free and democratic society protect, regardless of how common that search technology might be. See *R v Tessling, supra* at para 42. The public use exception in *Kyllo* could have a chilling effect with regard to robot interrogators because should there be mass deployment of the devices the reasonableness on an expectation of privacy from these devices might be lost. See e.g. Richard G Boire, "Searching

By contrast, the use of technology to measure heat emanations from a home is not considered a search in Canada because it does not reveal *meaningful* information about the activities taking place inside of the home.[107] Where the technology is limited to revealing an overall image of heat without being able to identify the source of any of that heat, it is not considered to be looking into the home, but merely looking at the outside of the home.[108] A search of one's emotional responses, however, reveals information that may be reliably indicative of knowledge or recognition.[109] It would therefore reveal the equivalent of the activities taking place inside the home.[110]

The courts have made other pronouncements that would support the objective reasonableness of an expectation of privacy in physiological information used to assess deception. For example, the Supreme Court of Canada has pronounced that, "the use of a person's body without his consent to obtain information about him, invades an area of personal privacy essential to the maintenance of his human dignity."[111] It has further held that, "privacy is grounded in physical and moral autonomy – the freedom to engage in one's own thoughts, actions, decisions."[112] Each of those statements emphasizes the sanctity of one's body and thoughts, both of which are implicated by the robot interrogator. Where a technology can decipher one's thoughts through recognition or guilty knowledge, it would appear that the subject matter of that search is entitled to a high degree of protection. The search, if conducted without the subject first waiving her constitutional rights, also raises questions about compelled self-incrimination, which will be discussed in greater depth below.

Is Robot Interrogation A Search that Compels Self-Incrimination?

As discussed above, the concept of a robot interrogator raises new considerations for the courts' traditional privacy framework. In the past, courts have treated search and seizure challenges separately from challenges to the admissibility of confessions and statements.[113] However, robot interrogation merges these two concerns. Without the questioning from the robot interrogator, there would be no physiological data for it to collect and analyze. Without the physiological data, the robot would not be able to identify an individual's incriminating knowledge. Physiological evidence demonstrating that the suspect recognizes the murder weapon when only the murderer would recognize that weapon is functionally as incriminating as the suspect declaring, "I recognize the weapon." However, it can be collected whether or not the

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the Brain: The Fourth Amendment Implications of Brain-Based Deception Detection Devices" (2005) 5 The American Journal of Bioethics 62

[107] Heat emanations offer "no insight into his private life, and reveals nothing of his "biographical core of personal information."" *R v Tessling, supra* at para 63 citing *R v Plant*, [1993] 3 S.C.R. 281 at p. 293.

[108] *R v Tessling, supra*.

[109] See e.g. *Thompson, supra* at 344.

[110] See Kerr "Tessling", *supra* at 379-380 making the same analogy with regard to the fMRI: "Whereas thermal imaging can only detect the presence of heat (coinciding with heat-generating activities going on in the house), neuroimaging has the potential to gather information about the brain (coinciding with the thoughts and memories of an individual)."

[111] *R v Dyment*, [1988] 2 S.C.R. 417 at para 27.

[112] *Dagg v Canada (Minister of Finance)*, [1997] 2 S.C.R. 403 at para 65.

[113] See e.g. *R v Pickton*, 2006 BCSC 383 and *R v Pickton*, 2006 BCSC 995 in which a cell block interrogation that was surreptitiously filmed was treated as two separate constitutional challenges for the same incident. See also *R v Stillman*, 1997 SCC 32, [1997] 1 S.C.R. 607.

suspect chooses to make that admission. Therefore, the physiological search generates self-incriminatory evidence.

The privilege against self-incrimination and the right to silence protect suspects from being forced to make inculpatory statements. The courts in both the United States and Canada have held that this protection applies only to statements or testimony, and not to physical evidence.[114] Statements can include non-verbal conduct such as a head-nod or the pointing of a finger, if that conduct implies an admission.[115] On the contrary, when the police collect DNA, perform a Breathalyzer test, or take other physical evidence without the suspect's consent, these acts do not implicate the right to silence or compel self-incrimination, though they may infringe the suspect's privacy interests.[116]

Neuroscientific research demonstrates that our conscience is directly connected to perceivable physiological actions.[117] When we think in certain ways or feel certain emotions, those thoughts trigger uncontrollable and often imperceptible physical responses. Because we cannot separate mind from body, a scan of these reactions reveals our mental activities.[118] No other form of physical evidence, such as pictures, handwriting samples, or DNA, compromises an individual's ability to control the disclosure of her thoughts.[119]

For evidence to be considered testimonial, as opposed to physical, it must "explicitly or implicitly, relate a factual assertion or disclose information."[120] The ultimate question here will therefore be whether or not monitoring physiological reactions during questioning relates a factual assertion. In the context of the fMRI, Professor Dov Fox argues that a technology that reveals knowledge is communicative. The results of a scan by such a technology are functionally equivalent to a statement.[121] This kind of statement would certainly be protected if expressed verbally. If not for the scanning technology, the suspect would have the ability and right to choose whether or not to speak to the police about what she did or saw. Brain scans and other similarly revealing physiological scans expose the suspect's thoughts with or without her decision to reveal them.[122] In this way, the physiological search conducted by a robot interrogator arguably threatens the right to silence.

The courts have previously commented on the self-incriminatory nature of deception-detection technology when it is used without the consent of the suspect. In *Schmerber v California*, the majority of the SCOTUS commented on a compelled polygraph, noting that although it measures physical processes similar to a blood test, the polygraph is actually directed at eliciting responses that are essentially testimonial.[123] The court concluded that compelling someone to submit to a test that could "determine his guilt or innocence on the basis of

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[114] *R v Stillman, supra*; *Schmerber v California*, 384 US 757, 764 (1966). In both cases the extraction of blood and other physical evidence did not invoke the suspect's protection against self-incrimination.
[115] *Pennsylvania v Muniz*, 496 US 582, 587 (1990).
[116] See e.g. *R v Stasiuk* (1982), 16 MVR 202 (Ont Prov Ct); *United States v Wade,* 388 U.S. 218 (1967): standing in a line-up and sound of voice do not constitute testimonial evidence.
[117] See Eckman, *supra*; Fox, *supra* at 21: "neuroscientists agree that the complex phenomena of thought and behaviour can be explained in terms of the neural activity of the brain."
[118] Fox, *supra* at 22.
[119] Fox, *supra* at 23.
[120] *Doe v United States,* 487 US 201, 210 (1988).
[121] See Fox, *supra* at 20.
[122] Thompson, *supra* at 346; see also Kerr, "Tessling", *supra* at 381: "Neuroimaging techniques have the potential to remove the individual from their role as the gatekeeper of their own personal information, bypassing the person by simply seizing the information from snapshots of their brain activity."
[123] *Schmerber v California*, 384 US 757, 764 (1966) at para 764.

physiological responses," whether or not it is done with consent, undermines the spirit and history of the right to silence.[124] While informative, it is unclear how persuasive *Schemerber* continues to be in the United States today, almost fifty years after the decision was rendered.[125]

Nevertheless, in the specific case of the border avatars, a requirement that every traveler engage with a robot interrogator threatens to undermine the constitutional rights of the individuals who pass through the border. Presently, border agents can ask questions of travelers, and if someone chooses not to answer she might not be allowed to continue to her destination. She may even become the subject of suspicion and further investigation. However, the decision to decline to answer a question and suffer the consequences is distinct from being compelled to provide an answer. The use of robot interrogators on all passengers at a border threatens to substantially increase the requirements that travelers must meet in order to cross a border. In light of these constitutional challenges, the next section of this paper makes preliminary recommendations for how these issues might be addressed

III. Recommendations

Robot interrogation raises a number of new and challenging legal issues. These interrogation devices might have numerous advantages over human interrogators. For example, through the use of robot interrogation, innocent suspects could be more readily exonerated from suspicion in a law enforcement setting, national security threats could be identified faster and the transport of illegal cargo or people across borders could be curbed. However, the negative consequences that might also arise through the deployment and use of these devices demand caution. Legislators, courts, law enforcement agencies and designers of the technology should carefully consider when, how, or if robot interrogators should be put into use.

i. Using Robot Interrogation with Consent and Waiver of Rights

A suspect can waive her constitutional protections should she wish to do so.[126] The waiver of the right to silence and privacy should be applied no differently in the context of robot interrogation than in any other.[127] In fact, these technologies might provide powerful exonerating evidence that could exclude a suspect from suspicion and help investigators focus on identifying the correct suspect of an offence. Such evidence could also be useful in post-conviction settings, like a parole hearing to show that an offender does not intend to commit an unlawful act again, or at a sentencing hearing to show that she is remorseful.[128] While the polygraph has been ruled inadmissible in court, the status of brain scans suggests that reliable physiological evidence might some day be admissible in court for exoneration.[129] This is one way in which this technology might be put into lawful use.

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[124] *Schmerber v California*, supra at para 765. See also Thompson, *supra* at 348.
[125] The purposive approach to rights taken in that case is less common in the US now; see Thompson, *supra* at 348-9.
[126] See e.g. *Raffel v United States* 271 U.S. 494 (1926); *R v Wills* (1992), 12 CR (4th) 58 (Ont CA).
[127] This proposal is supported by numerous authors. See e.g. Boire, "Searching the Brain," *supra* at 63; Thompson, *supra* at 344 and 357; Kerr, "Tessling", *supra* at 380.
[128] Shen and Jones, *supra* at 867.
[129] See e.g. *Iowa v Harrington, supra*.

ii. Designing Less Invasive Interrogators

State agents generally have more flexibility to interview and search people at the border because to the national security implications of border crossings.[130] This includes asking people questions and assessing based on their external reactions whether there is a need to ask them further questions or search their belongings. One of the reasons for designing border avatars is to increase efficiency at the border.[131] Robots do not require breaks, do not get tired and should not exhibit bias.[132] The challenge posed by a robot interrogator stems from its combined interrogation and search capacity. If certain search technologies and lines of questioning were removed from the design, such that the robot was not capable of assessing guilty knowledge, the robot may function without infringing constitutional rights. Whether this would be a worthwhile endeavor and how changes could be made to eliminate the potential for infringement are beyond the scope of this paper. However, certain design limitations on robot interrogators might effectively balance the goals of the state agencies that wish to use these devices and the rights of the individuals who will encounter them.

iii. Balancing Competing Interests through Legislation

Legislators in the United States and Canada should begin to consider the regulation of this emerging technology. In light of the many conceptual and constitutional issues associated with robot interrogation, legislators are perhaps best suited to clarify how and if these devices can be used before they are implemented.

For example, elected officials have greater flexibility than courts to consider and balance the competing policy issues associated with robot interrogation. On the one hand, a device that can quickly determine someone's guilty knowledge could be enormously beneficial to law enforcement and national security agents. On the other hand, the use of such technology raises complex philosophical and ethical issues. Legislatures can consider whether we as a society want to eliminate the capacity to deceive or whether such a requirement might be too onerous. For example, a refugee's escape from a repressive country might be impossible if her ability to deceive the guards at the border is eliminated.

Additionally, moral autonomy and the choice whether to tell the truth or deceive would be virtually non-existent in a situation where one's answer to a question is already available through a scan. Professor Ian Kerr raised this issue with respect to the fMRI arguing that, "[m]orality entails the ability to choose. When one is *compelled* to tell the truth […] that person is precluded from the possibility of full moral agency."[133] The Oregon Supreme Court in a concurring opinion in *State v Lyon* has likewise noted this concern. The court was uncomfortable with admitting polygraph evidence, even if it were reliable, because it would, among other things, reduce the accused to an "electrochemical system[] to be certified as truthful or mendacious by a machine."[134] How can someone be a moral actor when technology reduces or

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[130] See e.g. *United States v Ramsay,* 431 U.S. 606 (1977); *R v Simmons,* [1988] 2 S.C.R. 495, *R v Jacques*, [1996] 3 S.C.R. 312. See also Anna Pratt, "Between a Hunch and a Hard Place: Making Suspicion Reasonable at the Canadian Border" (2010) 19 Social & Legal Studies 461.
[131] Nunamaker et al, *supra*.
[132] *Ibid*.
[133] Kerr, "Tessling" *supra* at 380.
[134] *State v Lyon*, 744 P.2d at 240 (Linde J concurring), discussed in Fox, *supra* at 19.

removes the potential for deceit? There are likely countless other issues that might be raised through public discussion and debate of this issue. For this reason, the legislature might be the ideal ground for addressing the concerns associated with this interrogation technology.

Conclusion

This paper explored some of the potential constitutional issues associated with robot interrogation. Robots are not currently interrogating people, but this possibility seems to be approaching with the development of the border avatar concept. While these devices offer a number of extremely valuable benefits, they also risk undermining rights in a fundamental way. It is imperative that courts, state agencies, legislators and designers consider and address the potential implications of this technology before it is widely deployed for use.