The Perfect Lie Detector: A Moral Hazard?

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Abstract

People lie all the time. It is frequently hard to determine whether a person is telling the truth or making something up without the assistance of other sources, such as lie detectors. Nonetheless, even this technology has severe flaws, as it is regulated by physical measures that may be manipulated to a certain extent by skilled individuals. In recent years, attempts have been made to evaluate a person's emotions by analyzing physical variables that might increase the likelihood of detecting deception. These technical advancements include facial recognition, thermal facial imaging technologies, and mapping of the brain's signals and inputs. These three technologies are considerably harder to deceive than a conventional polygraph. If a system that incorporates all three of these measurement tools could be developed, it would be feasible to catch liars with more precision than ever before. In various instances, such as criminal investigations and interrogations, this system would be invaluable. However, the introduction of any new system is inevitably accompanied by complications that may result in a false positive and, eventually, a wrongful conviction. In several U.S. states, the polygraph is not admissible in court proceedings due to its unreliability and the fact that its findings can be construed in a variety of ways; hence, it cannot be used as evidence. Consequently, this study will investigate the minimum level of accuracy such a system must possess to be accepted in court. In the case of flawed DNA evidence, for instance, it is a customary procedure to present the court with a random match chance of one in a billion between DNA loci. This level reduces the number of errors made while submitting DNA evidence to the court. However, a super-accurate lie detection system would cause innumerable moral quandaries and constitute a major invasion of privacy for both criminals and innocent people. For instance, the French data privacy company CNIL ordered Clearview A.I., a U.S.-based face recognition business that has gathered 10 billion photographs globally, to cease collecting and utilizing data from French citizens. The French argued that this was a violation of the European Union's standards on data protection, emphasizing the morality of implementing face recognition technology. This research will look into the development of such a system and if its use is ethically acceptable.

The History and Implementation of the Polygraph

To understand the implementation of this new system and why it is necessary, it is crucial to be familiar with polygraphs and their operation. John A. Larson, a police officer and scientist, created the first polygraph in 1921. The gadget evaluated changes in blood pressure, respiration rate, and heart rate to detect physiological changes associated with dishonesty. Based on the views of Italian psychologist Vittorio Benussi, who published research on the respiratory symptoms of lying in 1914, and American psychologist William M. Marston, who developed the discontinuous systolic blood pressure test for lie detection in 1915, this device was developed.[i] The validity of its use in court as evidence subsequently provoked a heated discussion between advocates for the polygraph and ardent opponents of the device. However, a substantial body of research demonstrates that polygraphs are not as accurate as many would like to believe. The primary tool used in polygraph examinations is a device that monitors physiological changes in the body, including heart rate, breathing rate, blood pressure, and skin conductivity. However, this equipment is not the only component of a polygraph examination. Methods of questioning are also a vital aspect of these tests. The Control Question Test(CQT) is the most often employed interrogation technique in criminal investigations. In this style, the responses of respondents to "relevant" questions are compared to their responses to "control" questions. In the instance of a polygraph examination using this format in connection with a shooting investigation, a pertinent question may be "Did you shoot this person?" In contrast, control questions resemble relevant questions in nature, but are more directly related to an individual's background and have a broader scope. In this circumstance, one example of a control question may be, "Have you ever considered injuring or even murdering someone?" This type of interrogation is based on the assumption that an innocent person would dread control questions more than relevant questions. These control questions are intended to induce anxiety in an innocent subject. Consequently, an innocent individual would exhibit a stronger physiological reaction to the control questions. A pattern of heightened physiological reaction to relevant questions would result in a verdict of "deception." A verdict of "non-deception" would result from a greater response to control questions. The test result is deemed "inconclusive" if there is no substantial difference in physiological response between the two types of questions.[ii]

The Guilty Knowledge Test (GKT) is another type of polygraph test questioning. This method employs multiple-choice questions pertaining to information that only the guilty individual would know. During a theft inquiry, for instance, a potential question may be, "Was $200, $400, or $600 stolen?" If a guilty subject is being tested, a stronger physiological response to the right answer would indicate dishonesty. With a sufficient

number of these questions, a thorough evaluation of the examinee may be obtained. Among the apparent disadvantages of this testing approach is the requirement to retain knowledge that only a guilty individual would have. In addition, a lack of a larger physiological response to the correct answer might just reflect an absence of knowledge of the specific details, not innocence.[iii]

The accuracy of these polygraph testing and physiological response measuring techniques has been contentious. There is no proof of physiological reactions that are specific to deceit, which is one of the major drawbacks of this approach for detecting lies. A dishonest individual, for instance, may appear calm when lying during polygraph testing, but an honest person may be anxious when answering questions truly. Few studies demonstrate the accuracy of polygraph exams in identifying lies. Another issue is that polygraph research has not distinguished between placebo effects and physiological responses caused by lying. A polygraph exam may appear to be accurate since respondents who believe these polygraphs function will be more anxious when questioned. Following this line of reasoning, it would be more correct to characterize polygraph exams as a means for detecting fear and nervousness than deceit. Several examiners, examinees, and situational factors can affect the test's validity and the technique used to create polygraph charts, according to research on CQT polygraph exams. In addition, little study has been conducted on the impact of subject variations in parameters such as level of education, intellect, and autonomic arousal on test accuracy comparisons. In addition, evidence suggests that countermeasures employed to deceive polygraph testing may be successful. These could include simple physical movements, psychological manipulation, and the use of psychotropic drugs. These are only some of the limitations of existing lie detection systems.[iv]

Brain Scans for Lie Detection?

Currently, polygraphs are commonly regarded as unreliable and incorrect. Functional magnetic resonance imaging has proven to be a more trustworthy tool for detecting deception (fMRI). Functional MRI operates by detecting the magnetic signals emitted by oxygen atoms in the bloodstream. Depending on the kind of brain activity, blood flow rises to more active areas of the brain.[v] In this manner, fMRIs are used to scan the brain for medical purposes, as the capacity to map brain activity down to the smallest details is crucial in this field. Nonetheless, this technique has begun to be utilized in lie detection. An fMRI was used in the study that was done by Scott Faro, a radiologist at the brain-imaging center at Temple University in Philadelphia, Pennsylvania. The study focused on lie detection. In the study, Faro and his colleagues had six participants fire a toy gun. The participants then took turns being scanned using an fMRI while lying about having shot it. Five more volunteers who did not fire the toy gun were asked the same question while

undergoing an fMRI scan. Specific regions of the brain, including portions of the frontal, limbic, and temporal lobes, were engaged when the participants were lying, as revealed by fMRI. In actuality, more areas of the brain were active while lying.

Despite the fact that these findings may appear highly promising, this approach to lie detection is invasive and obtrusive. It is implausible to utilize an fMRI. Possibilities exist that the suspect's mentality will be affected by the unusual circumstance of being confined within an fMRI machine. A recent study demonstrates that mental strategies may be used to prevent brain imaging lie detection. The University of Plymouth's Drs. Chun-Wei Hsu and Giorgio Ganis, in partnership with the University of Padova, Italy, undertook another study concentrating on developing countermeasures for brain mapping lie detection systems. In this study, the concealed information test was utilized to identify deception through questioning. This test is based on the assumption that a person who is concealing anything will automatically respond when presented with the object they are attempting to conceal in a list. For instance, a person who stole a necklace will exhibit greater brain activity while attempting to conceal signals of identification than when confronted with other objects such as rings or earrings. Brain scans can directly detect the blood flow within the brain and, as a result, can interpret when increased brain activity is occurring in certain regions of the brain associated with decision-making and focusing attention. This study's researchers instructed participants to hide information regarding a "secret digit" they were given in an envelope. The researchers next taught two countermeasures to twenty subjects. The first technique consisted of associating the control items (the digits that were not the secret ones they saw inside the envelope) with meaningful memories to boost their significance. Instead of emphasizing the familiarity with the thing they were concealing, the second strategy emphasized the superficial characteristics of the hidden number. As a result of the fMRI's inability to identify significant changes in brain activity, the accuracy of the research decreased by up to 20%.[vi] It is hardly surprising that fMRI examinations are not being employed by law enforcement as lie detectors, given the technology's multitude of shortcomings and liabilities. And even when such brain scanning technology is allowed in court, as in a 2008 murder trial in which an Indian criminal court accepted the brain scan of a woman who murdered her former fiancé as evidence of her guilt, many experts remained skeptical that the technique had been thoroughly vetted.[vii] Focusing on other, more straightforward modern technologies may be the key to developing a more accurate lie detection system.

Facial Mapping Technologies

As a pioneering method of identification, facial recognition is fast emerging. This technique is a biometric identification approach that collects

face biometric data and patterns that are unique to each individual in order to recognize or verify an individual's identity. It collects and analyzes human face characteristics and expression patterns, then compares them to historical data. This is achieved by following three steps: 1. the face detection algorithm locates and recognizes human faces in images and recordings. 2. the face capture method converts analog information (the face) into digital information (in the form of data), taking into account all elements of the individual's facial characteristics. 3. the face match technique examines and analyzes the characteristics of two facial photographs to determine whether or not these two photos share a substantial likeness. Facial recognition, unlike most other kinds of identity authentication such as passwords, employs unique dynamic and mathematical patterns to scan individuals' faces.[viii] This makes it one of the most secure identifying systems. However, how precisely might this technology be utilized to detect deception?

While facial behavior that directly reveals whether an individual is going through a certain emotion is difficult to read, facial cues that attempt to conceal other expressions are not as easily concealed. At the University of Bradford's School of Computing, Information, and Media, research was undertaken using face-reading technologies for lie detection. The researchers assumed that people are incapable of controlling their physiological reactions to emotions. Additionally, stressful events and stress, in general, can result in rapid variations in skin temperature and distinct facial expressions/signatures. When a frightening signal is detected, the periorbital area situated all around the eye is linked to particular emotions. Concerning face traits, University of Bradford researchers defined what they termed Facial Action Units (FACS). Their study was based on the fact that humans have a solid, well-defined skull and a fixed face muscle anatomy. Therefore, the researchers concluded that there must be a limited amount of facial expressions that people are capable of producing. 46 of these so-called Action Units were defined. During the experiment, FACS were extracted from videos, classified, and categorized; patterns between the facial expressions were then identified and compared to the participants' facial activity at rest. These Action Units included Inner Brow Raise, Cheek Raise, Tongue Bulge, Nostril Dilate, Lip Wipe, Speech, Head Up, Down, Turn Left, and Right. All of these were extracted from the facial characteristics of people who were instructed to display various emotions, such as happiness or anger. These facial captures were used to collect the facial signatures.[ix]

Thermal Mapping Technologies

Recently, thermal imaging technology has become more relevant to facial recognition applications. Thermal infrared technology enables facial detection in a variety of situations where conventional facial recognition technology fails. In low-light situations, thermal imaging is the ideal

substitute for conventional optical A.I. facial recognition technologies. In addition, thermal infrared imaging technology may distinguish between individuals under a wider range of situations by identifying facial blood vessel structures.[x] Due to the COVID outbreak, this type of technology is already in use on a global scale. Thermal facial mapping is one of the most efficient strategies for controlling the pandemic and detecting individuals with a higher body temperature who might have been infected. The COVID crisis inspired the creation of a multitude of useful thermal imaging devices. For instance, the Ramco Innovation Lab in Singapore has recently developed an integrated system combining facial recognition technology with thermal imaging to track the attendance of office workers and individuals with extraordinarily high body temperatures. Australia has also just inked a contract with the drone manufacturer Draganfly for the production of so-called "pandemic drones" equipped with thermal recognition technology and other types of sensors.[xi]

To make such a system suitable for lie detection, researchers from the University of Bradford examined variations in the pattern of blood flow on a person's face in the aforementioned study. This is achievable because thermal imaging technology can monitor and identify individual blood vessels and assess the blood flow pattern resulting from their movement. The research group at the University of Bradford lists as an advantage the inability of visual-based techniques to discern the actual emotion of humans. Therefore, connecting a specific activity with emotion requires taking extremely precise measurements of the facial muscles, which is difficult with a standard camera. In addition, microcirculation of the blood vessels influences our skin temperature, which may imply a correlation with our behavior.[xii] [xiii] Therefore, thermal imaging methods may have the potential to be more accurate than current polygraph technologies. In addition, large physiological responses would not be the only way to determine if a person is lying in a system that utilizes several other modes of assessment in addition to thermal facial imaging. Contrary to the polygraph, it would be impractical to deceive an interrogation system that measures a subject's involuntary physiological reactions as the primary approach for judging honesty.

Speech Analysis Methods

While polygraph equipment may not be able to entirely discern a respondent's degree of honesty, the scientific world has made significant progress in understanding how the inflection, tone, and choice of words of the human voice signal truthfulness. The first step in detecting lies through speech analysis is establishing a baseline. That would be the typical tone of voice we use when conversing with others. Other aspects of this baseline include a person's posture, how much space they are occupying, whether they are retreating into themselves or sitting proudly, facial

movements, whether they are touching their face, eye movement/contact, and the intensity of their fidgeting, i.e. whether they are constantly moving versus sitting perfectly still. According to research, over 95% of all false utterances differ from the previously established voice baseline. Additionally, tone is a key predictor of mood. When we are excited or furious, for instance, our voice tone automatically jumps. Conversely, it decreases when we are feeling sad or embarrassed. Untrained individuals find it extremely difficult to conceal their emotions while speaking.[xiv]

Another advantage of employing speech analysis is that lying in and of itself is disadvantageous. Being dishonest requires continually fact-checking what you know to be true and the lies you are telling, as well as remembering what you have said earlier to avoid contradicting yourself. The reaction of the person listening to the lie, along with their dread of what they do not know and their interrogator, makes the liar feel anything but at ease. Commonly, experts in this subject refer to certain sorts of liars as "Equivocators." Equivocators straddle the line between honesty and deception and usually fumble their words. Mixed tenses, opaque phrasing such as "one thing led to another," and frequent stopping are all likely markers of dishonesty that observant listeners should be on the lookout for. Other types of liars include "The Maximizer," who uses illogical information and a flurry of words to push their way through an interrogation.

On the other hand, "The Minimizer" will talk less and less and metaphorically hide in order to escape the truth and participation in the dialogue. The Maximizer represents the fight response, while the Minimizer represents the flight response.[xv] A person who understands the complexities of speech can use this strategy in conjunction with the others outlined above to more precisely and efficiently identify a liar.

There have also been various attempts to determine the vocal patterns of a liar by analyzing the inflections and variations in the voices and tones of individuals who are speaking. Recent research has led to the development of support vector machines (SVM) for recording and differentiating distinct tones and enunciations of test subjects. An SVM is a supervised technique of learning used in machine learning to classify, regress, and identify outliers in a data set.[xvi] After extracting important and distinct voice features, the SVM classifies the voice patterns to distinguish between truth and lies. The SVM is trained using real-world data from public court proceedings, where the audio of speakers is distinct and audible. This technique has an 81% success rate in identifying falsehoods and a 78% success rate in spotting truths.[xvii] This form of technology is in its infancy, relatively speaking. If these levels of accuracy could be increased to near 100% for both lie and truth detection, there would be enormous social, political, and moral ramifications.

Proposal of an Integrated Lie Detection System, and its Morality

The proposed amalgamated lie detection system would incorporate elements of the system developed by the University of Bradford's researchers with the experience of both experts in lie detection and computer voice recognition systems. The proposed system would use a video camera to scan a person's face while speaking and responding to inquiries. It would examine facial emotions, minute movements around the eyes, and pupil dilation to detect indicators of dishonesty. A thermal camera would also be used to examine the subject's facial blood flow, assessing blood flow patterns and changes within the patterns, which might be an indication of deception. Military personnel, such as customs officials and border patrol agents, would also be trained to discern the subtle variations in a subject's baseline, whether through posture, tone, or choice of words. Computer systems would also examine the subject's speech patterns and identify the tiniest indications of dishonesty. By integrating all of these features of lie detection into a single system, it is feasible to build a system with remarkable accuracy, especially when compared to polygraphs or fMRI brain scans, which only employ a single facet of lie detection. With a system that combines computer analysis, visual analysis, thermal analysis, and human experience, a more precise and efficient system than polygraphs and fMRIs could come to the realization. However, is it genuinely in the best interests of society to develop a foolproof lie detector?

The Right to Lie?

When polygraphs and fMRI brain scans are used as lie detectors, people understand they are being investigated and tested. Even while these kinds of interrogation may be intrusive and create an atmosphere in which a person may not feel comfortable enough to function normally, lie detection is only achievable when individuals are aware they are being tested and have consented to the administration of the tests. What authority do we have to interrogate those who are uninformed of the ramifications of their responses? With a video camera, thermal camera, trained staff, and computer software capable of evaluating a person's behavior at the scene, a person might be questioned in situations such as Customs or Border Patrol without being informed they are being tested for honesty. This lie detection technique may be more morally questionable than prior methods. Humans are innately capable and permitted to lie for a multitude of reasons. Imagine that this technology becomes increasingly prevalent owing to the simplicity of testing in comparison to fMRIs and polygraphs. In such a scenario, it may become commonplace for individuals to be unable to deceive one another without being caught. This might prove fatal in a society that places the highest emphasis on privacy. For instance, the author and neuroscientist Sam Harris says that we may improve society by being

pragmatically truthful and realistic, as opposed to depending on any form of deception. He focuses on so-called "white" lies, which are typically employed to save people the discomfort of discovering the truth. Critics of his position, however, contend that it is difficult for people to be truthful with one another since our perceptions of a given situation may vary.[xviii] In a world where everyone thinks and acts differently, the freedom to lie may be the lubricant that keeps society functioning smoothly. The Kantian view of ethics holds that we should conduct in such a way that if our acts were to become the universal standard, we would be pleased with the result (the notion of a "categorical imperative").[xix] The implementation of a flawless lie-detection technology in our culture would have disastrous and unforeseen effects on human interaction and communication if it became the norm. People would have to choose between always telling the truth or avoiding answering questions that, if answered honestly, would cause harm. Aristotle also thinks that falsehood is justified if it results in a more moral world.[xx] Consider the realm of international politics, which is replete with falsehoods, half-truths, deceptions, doublethink, and false compliments, all of which are required to avert global conflicts and maintain a functional international system. Introducing a perfect, non-intrusive lie-detection technology will do irreversible damage to all human relationships, from the national level to the most intimate of relationships. Parents could no longer lie to their children, and presidents could no longer hide the truth from their citizens, although, in certain instances, these falsehoods might result in safer and more advantageous situations for more people.

The Perfect Lie Detection System?

This paper discussed the implications of contemporary technologies of lie detection (polygraphs and fMRI scans) as well as their actual effectiveness. I proposed a system that incorporates numerous additional techniques of lie detection that, when combined, might prove to be a more successful approach for determining whether a person is telling the truth. It would be possible to create such a system by using video cameras to examine face features (muscles, expressions, pupil movements, etc.), thermal cameras to check blood flow patterns and variations, and computer analysis and skilled specialists to analyze speech. However, implementing this method may be morally unjustifiable. If the technology of lie detection is so inconspicuous that people are unaware they are being tested, would it be lawful to use such a system? Would such a system be damaging to a modern society that places the highest emphasis on privacy? Ultimately, dishonesty is a subject about which we have little knowledge. Identifying deception and understanding the human urge to lie is a gradual but constant endeavor, and our proposed approach might be essential for this understanding. At this time, however, we are

aware of the threats posed by the commercial availability of this proposed system, should it ever become a reality. It is essential to recognize that the suggested technique is only a way for evaluating the credibility of a person's statements during a proper investigation. The seeming efficacy of this lie-detecting system might either benefit or overwhelm a world with it.

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