AN ABSTRACT OF THE THESIS OF

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Michael J. Quinn

"'Biometrics is at the forefront in our agenda for homeland security,' declared Asa Hutchinson, the Department of Homeland Security's undersecretary for border and transportation security, at the 2004 Biometric Consortium Conference" [11].

Flashy retinal scanning and voice activated computers were once considered technologies for science fiction movies and novels. Nowadays, such technologies are widely used across the nation—in airports, trucking companies, and casinos—by both private and government organizations. These technologies are termed as biometrics. They use a certain physiological characteristic that is unique to a person as a means of identification. As Hutchinson said, it is an important agenda item for homeland security. By using paradigm case analyses, the morality of using biometrics will be discussed.

Morality of Biometrics

by

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I understand that my project will become part of the permanent collection of Oregon State University, University Honors College. My signature below authorizes the release of my project to any reader upon request.

Dany R. Tao, Author

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TABLE OF CONTENTS

I. INTRODUCTION

The September 11 terrorist attacks on the World Trade Center and the Pentagon have changed the way the United States views security. Domestic and international travel are being watched very closely. No longer can the United States afford to permit individuals of unverified identity to enter and roam freely; the need for higher accuracy in identifying individuals is now apparent. Biometrics is a possible way to satisfy this need. Biometrics is the use of physical, biological or behavioral characteristics to authenticate a person's identity.

Some examples of biometrics are fingerprint scans, hand geometry scans, iris scans, retinal scans, voice recognition, facial recognition, and signature and hand writing authentications. A fingerprint scan offers a high level of detail. It is a tremendous improvement over the visual identification of a fingerprint. Fingerprinting is seen in the Department of Homeland Security as a way to block entry of criminals and terrorists [9]. How fingerprinting is used will be illustrated in the Intelligent Firearms case that will be presented later. A hand geometry scan reads the three-dimensional picture of a hand, measuring hand thickness, surface area, and length. An iris scan reads the unique and complex patterns of the iris. Iris scans are being used in six American airports as part of Registered Traveler, a Homeland Security Department program that aims to speed up the process of checking in trusted travelers who have already undergone background checks [9]. With a retinal scan, an infrared light source illuminates unique blood vessel patterns in the retina, by far the most complex form of biometrics identification. Voice recognition uses a person's unique speech patterns. Facial recognition uses a photograph to identify an individual [3]. This technology was used at the 2001 Super Bowl Game in Tampa Bay, Florida. We will examine the morality of this usage later. Signature or handwriting

authenticates by measuring the speed, pressure, and angle of each character being written. It is considered the least intrusive form of biometrics compared to the scanning techniques. Scanning of our physical characteristics is being used in making perfect-fit jeans and performing background checks for transportation workers; we will analyze the morality of these two cases later.

Biometric identification systems are used in government buildings, airports, casinos, trucking companies, hospitals, the military, banks, retail stores, and some consumer products. The United States is issuing passports that have a small computer chip with the holder's fingerprints, among other private information.

There are several reasons for biometrics to become popular. Some credit certain biometrics with having a high accuracy of identifying individuals, by making sure that authorized people have access to facilities and sensitive information. Others also claim that biometrics improves convenience for accessing account information over the phone, using voice recognition, and for self-checkout at grocery stores [7].

Some large corporations require employees to have a half dozen passwords or more—to log into computer systems or restricted laboratories—and to also periodically change their passwords to ensure that they are highly secured. From a user's point of view, this is a growing frustration. The companies suffer a loss of productivity, and it costs them money to pay administrators to reset forgotten passwords. With biometrics identification, the password is always with the individual and is unique to him or her. There is no way of forgetting your hands, fingers, or face. Using biometrics recognition, employees would not have to remember their passwords, and it would ensure the corporation that employees are who they claim to be.

As reliable and cost effective as it may be, using biometrics is not as simple as it sounds. Privacy concerns have been raised. Debates over privacy versus security are an ongoing battle. In this thesis, I will use case-based analysis to evaluate whether using biometrics morally justifies giving up privacy to gain security. In order to ground the evaluation of the base cases, two ethical theories will be used: Kantianism and utilitarianism.

II. BACKGROUND

II.1 Kantianism

Immanuel Kant (1724-1804) advocated morality based on acting with a good will and following moral laws. Even if one's well-intended action causes harm, the good will behind the action is still good. Acting from a good will is good in and of itself; it is good without qualification [10]. Moral laws determine what one ought to do in various circumstances. In determining moral laws, Kant proposed three formulations of what he called the Categorical Imperative. This thesis will only make use of the second formulation of the Categorical Imperative.

The second formulation of the Categorical Imperative states: "Never act in such a way that we treat humanity, whether in ourselves or in others, as a means only but always as an end in itself" [8]. To Kant, every person deserves respect. It is wrong to use anybody, at any time, as only an instrument to achieving an end. This does not mean it is wrong to eat food, wear clothes, and sit on chairs that are produced by the talent and sweat of others willfully, as long as we pay for their hard work. It would be wrong, however, to enslave people to produce goods for one's consumption.

Kantianism is considered a non-consequentialist ethical theory because it does not take into consideration the end results of an action. Instead, it puts great emphasis on the value of respect for people as rational agents who can make their own rational decisions.

II.2 Utilitarianism

Jeremy Bentham (1748-1832) and John Stuart Mill (1806-1873) are among the most well known figures in utilitarianism. They believed that an action is moral if it benefits someone, immoral if it harms someone [10]. Basing itself solely on considering the consequences of an action to determine the morality of an action, utilitarianism is considered a consequentialist theory. It has the following characteristics:

- It accepts the happiness or welfare of individuals that results from an action as a means to evaluate the extent of the rightness or wrongness of that action.
- Right or moral actions are those that compared to other alternatives available in a situation would produce the greatest net increase in value, known as utility. Actions that maximize the net increase in utility are the best (i.e., the most right); those that causes the greatest net decrease in utility are the worst (i.e., the most wrong).
- It is both universalist and impartialist. The values of the consequences must be equally taken into consideration, among all individuals who will be affected by the action in question, not just the individual acting. As Bentham put it, "[e]veryone to count for one, no one to count for more than one" [12].

To a utilitarian, an action is right or wrong depending on how much net utility it produces for everyone, compared to other alternate actions one could carry out. The utility is measured in terms of welfare of the individuals, and the effect on each individual is equally weighted and taken into consideration.

An action often has both positive and negative effects on the welfare of individuals. Suppose I choose to use drugs. My choice to use drugs with my peers will have bad consequences. Not only am I hurting my health, but I am hurting my family and friends, and it is illegal. These are bad consequences. However, while I'm high, it gives me pleasure, and I fit in with my peers. Pleasure and fitting in a social group are good consequences. We may say, then, that my action produces both good and bad consequences. Bentham introduced the word "utility" as a technical term for the value we place on the consequences of an action. If we were to compare the bad and good consequences, the overall net value of my action determines whether it is good or bad. In this scenario, the utility comes out to be negative. My action would agonize the people who love me (bad), while far outweighing the pleasure I experience while I'm high and the acceptance by my peers (good). Therefore, it would be wrong to use drugs.

It is important to note that, in some cases, all of the alternative actions produce negative utilities. When this happens, the utilitarian theory directs us to choose the least amount of negative utility. In other words, choose the best of a bad situation.

In order to add up the overall net change in utility that results from an action, each utility must be assigned a number. Bentham proposed a checklist of seven points to help quantify utilities [6]. This is based on his idea that all utility can be reduced to pleasure or pain.

1. More intense pleasures are worth more than less intense pleasures.
2. Pleasures that last longer are worth more than pleasures that last a shorter period of time.
3. Pleasures that are more likely to occur are worth more than pleasures that are less likely to occur.

4. Pleasures that happen sooner are worth more than those that are to happen later.
5. Pleasures that are more likely to lead to more pleasures are worth more than pleasures that aren't.
6. Pleasures that are not mixed with pain are worth more than pleasures that are.
7. Pleasures that affect more people are worth more than pleasures that affect fewer people.

As you may have noticed, calculating the utilities of an action to reach to a moral conclusion is not a task for a child. This is one of the standard areas in which utilitarianism is criticized. Some say it is not practical for everyone to stop and apply this ethical theory to everyday moral decisions.

III. PARADIGM CASE ANALYSIS

A paradigm case analysis looks at two extreme stories: an extremely positive (moral) case and an extremely negative (immoral) case. By using these two cases as extreme ends of a continuous line, this thesis will analyze the morality of actual cases where biometrics are appearing in our lives, and place them on the lines between the two paradigm cases. The following two stories illustrate obvious moral and immoral uses of biometrics. Then, by identifying some attributes that these two paradigm cases possess, we can use Kantianism or utilitarianism to justify our decision on whether an attribute is moral or immoral.

III.1 Positive Paradigm Case

A police department announced that it would launch face-scanning technology to monitor individuals with criminal histories to ensure the safety of others at a sporting event. This announcement was also printed on the tickets. Over 100,000 people attended the game. Out of those 100,000, nineteen individuals were identified to have criminal histories ranging from shoplifting to felonies. Throughout the game, seventeen of those nineteen individuals who had committed more serious crimes were under close surveillance from the police department. Of those seventeen individuals, one was promptly removed without much of an incident during half-time after he started a fight, and two were arrested for the attempted kidnapping of a 6-year-old girl.

III.2 Negative Paradigm Case

A week after a sporting event, the stadium owner was forced to admit that it had employed face scanning technology during the game. Every person who had entered the stadium had been scanned. The software digitized their faces and stored them in a database that was later sold to companies interested in marketing sports merchandise. On several occasions the software had difficulty digitizing faces due to the lack of data (people walked by the camera too quickly). Instead of discarding the incomplete data, the software made predictions and filled in the missing parts. In effect, it made up faces to store in the database.

III.3 Analysis

The following five dimensions illustrate why the two paradigm cases are labeled as positive and negative. These are the underlying ideas that we will use to determine the morality of each biometrics usage that will be presented later.

Positive Paradigm Case		**Negative Paradigm case**
1. Pre-notification	_____	Perform secretly
2. Public benefits	_____	Private benefit s
3. Data kept temporarily	_____	Data kept permanently
4. Substantial benefits	_____	No benefits
5. Increase convenience/ save money	_____	Decrease convenience/ cost money

By using Kantianism and/or utilitarianism, we can justify why an attribute is negative or positive. Let's examine each attribute in turn:

1. *Pre-notification*: If all parties—the public who attended the game, the organization that organized the game, and the police department that launched the facial recognition at the game—know that the software will scan the entire crowd's faces, Kant would ask, can we, as rational agents, want all police departments to do this for all large public events? Yes, if the public is warned of such action at every event that they attend. In the positive paradigm case, the public was warned in advance of the capability of the software—that showed respect that Kant looks for in a moral action. If they attended the game, they implicitly gave consent for the software to scan their faces. In the negative paradigm case, the public was not informed. As a result, the negative paradigm case is immoral according to this point. A utilitarian would also agree that by being aware of the face scanning technology, the majority would know what to expect and therefore behave properly. If they do otherwise, as the two kidnappers tried, they will end up getting caught. Society as a whole benefits from having these two individuals locked up in jail because children are safer.

2. *Goal of the data collection*: In the positive paradigm case, the police were collecting data to ensure public safety, while in the negative paradigm case, data were collected and sold to marketers for their own profit. In essence, the stadium owner used the people who attended the game solely as a means to an end (to benefit the few). Kant would strongly object to that. Trading privacy for public safety is one thing; trading privacy for private gain is another thing that most people will object to. A utilitarian would agree with Kant, but the underlying reasons are different. In the positive paradigm case, the purpose for collecting the data was to ensure public safety. There is a collective benefit in the case. However, in the negative paradigm case, only a few people benefit from the data and many are harmed by them because they lost their privacy.

3. *Period for which the data are kept*: In the positive paradigm case, data are discarded after one use, eliminating any concern about leakage of private information. The negative paradigm case, on the other hand, kept the data and sold them to anybody who was willing to pay for them. Once again, Kant would see this as using people as a means to an end. A utilitarian would see that there are more potential troubles waiting to be exposed in the negative paradigm case when data are kept indefinitely. The longer the records are kept the greater the threat of a security problem with the database.

4. *Benefits*: The face scanning technology in the negative paradigm case exhibits a flaw that shows it is unreliable: it made up nonexistent people who entered the stadium. Kantians would object to deceiving marketers by selling fabricated data. Utilitarians would see that having sold unreliable data to marketers would increase the amount of undesired mail people receive. In the positive paradigm case, the software had substantial benefits. Utilitarians would endorse this use of biometrics because the police officers were able to pinpoint high risk individuals and monitor them. Ultimately, they were able to act quickly to prevent one of the offenders from kidnapping a girl.

5. *Increase convenience/ save money*: This means stopping crimes before they start (before we have to spend thousands of dollars searching for a missing girl) and keeping the public safe. In the positive paradigm case, it shows that face-scanning technology saved a child from being kidnapped. The child's parents will forever be grateful for this technology. Utilitarians would favor this usage. The negative paradigm case, on the other hand, increases costs to marketers who are mailing catalogs to people who do not want them. The problem is not so much that people are getting junk mail; the problem is that the wrong people are getting junk mail because bad records were put into the database.

Now that we have established two paradigm cases; we will use them to evaluate some actual uses of biometrics from an ethical point of view. We will now analyze the morality of actual cases of where biometrics has been and is being used. Let's first look at the 2001 Super Bowl, where face-scanning technology was secretly deployed without fans' knowledge.

IV. 2001 SUPER BOWL GAME

IV.1 Case

The 2001 Super Bowl has come to be known as the Snooper Bowl by many who attended the game. A facial-scan system was put in place at the Raymond James Stadium in Tampa Bay, Florida to scan the fans' faces for known felons, terrorists and con-artists [1]. In milliseconds, each fan's face was digitized and compared against criminal photos in the FBI files without their knowledge. The surveillance system quietly matched a few fan faces with database mug shots, but no arrests took place [10].

IV.2 Analysis

It is not surprising that Privacy International gave the 2001 Big Brother Award for the "Worst Public Official" to Tampa, Florida for spying on over 100,000 fans [4]. Let's use the five dimensions established earlier to analyze the morality of this biometrics case.

1. *Pre-notification*: People were not informed that they were being scanned. This case evaluates to the right end of the "pre-notification/ perform secretly" scale.

2. *Goal of the data collection*: Fans were being scanned in order for the police to seek out and monitor people with criminal histories. It is a means to increase public safety. We rate this case to be on the left end of the "public safety/ private gain" scale.

3. *Period for which the data are kept*: There are no indications that the data records were kept after they were compared against the FBI database. We evaluate this case to be on the temporary end of the "data kept temporarily/ permanently" scale.

4. *Benefits*: The police did not make any arrests. The software had no benefit to the people who attended the game. They would have been just as safe without the software. This case evaluates to no benefits on the "substantial benefits/ no benefits" scale.

5. *Increase convenience/ save money*: Having to purchase and install the camera and the facial recognition program was an inconvenience, especially when nothing big came out from it. It cost more money than it saved. We evaluate this case to be an inconvenience and expensive on the "increase convenience, save money/ decrease convenience, cost money" scale.

The following chart graphically depicts our analysis of the use of face scanning technology at the 2001 Super Bowl Game.

Positive Paradigm Case		**Negative Paradigm case**
1. Pre-notification	_____**x**	Perform secretly
2. Public benefits	**x**_____	Private benefit s
3. Data kept temporarily	**x**_____	Data kept permanently
4. Substantial benefits	_____**x**	No benefits
5. Increase convenience/ save money	_____**x**	Decrease convenience/ cost money

IV.3 Conclusion

There are two positive aspects and three negative aspects for using facial recognition at the Super Bowl game. Aspect number one and four are very important to a Kantian and a utilitarian, respectively. Kantians believe that respect is monumental to people. Without it, as the police department had demonstrated to the public, it caused distrust and hostility for law enforcement. Utilitarians believe that an action is wrong if it

does not produce benefits. In this case, it did not produce a benefit and it cost money. This does not mean that we are discrediting the other dimensions. To Kant, a well-intended action is still moral even though it caused harm. Surely, the police department had a good reason to use this technology during the game, however, it infringed upon people's privacy. We conclude that using face-scanning technology at the 2001 Super Bowl was immoral.

V. INTELLIGENT FIREARMS

V.1 Case

In Pretoria, South Africa, Nic van Zyl started working on "an Intelligent Firearm" that would only work if it could verify the fingerprint on the trigger with the registered fingerprint. Van Zyl was fed up with stories of police being robbed of their firearms and of accidental deaths when guns had fallen into the hands of children. He grew up in a high crime-rate country, so he decided to do something about it. Van Zyl has been working on the project for more than fifteen years, working with companies and government to develop the idea. His aim is to reduce the shortcomings of the ordinary firearm. "The problem with the firearm is that it is a dumb killing machine. It has no recognition of the identification of its owner and no accountability" [2]. He plans on incorporating technology similar to that used in camera phones to monitor the time and location of the gun. This data could then be used in court as evidence. Van Zyl went a step further to make the license to own his intelligent firearm renewable. Authorities can keep up-to-date records of gun users because the renewable license works the same way as other subscription services, such as cell phones and cable TV.

V.2 Analysis

The Second Amendment of the United States' Bill of Rights guarantees the right to bear arms. It is legal to own a gun, given that the gun is properly registered. Let's apply the five attributes that we have looked at in the two paradigm cases and see where this intelligent firearm fits in.

1. *Pre-notification*: With such innovation, the company will pay the media to publicize the intelligent firearms. Therefore, most gun seekers and gun owners will be most likely to be aware of it. Certainly, anyone who purchases one for himself/herself will be aware of this feature. This case evaluates to the left end of the "pre-notification/ perform secretly" scale.

2. *Goal of the data collection*: Fingerprints of the gun owner must be registered and saved into the gun for this intelligent firearm to work. It is being used as a safety mechanism against unauthorized users. It has the potential to save children's lives. Also, data on the whereabouts of the gun at any given time can be collected as evidence, and be used in the courtroom. We evaluate this to be on the left of the "benefits" scale.

3. *Period for which the data are kept*: Fingerprints of the gun owner must be kept permanently in the gun or until the owner decides to sell the gun. Van Zyl plans on incorporating a technology similar to that used in camera phones to monitor the time and location of the gun. The whereabouts of the gun may be kept permanently by law enforcement. This raises questions on privacy concerns. This evaluates to the right side of the "data kept temporarily/ permanently" scale.

4. *Benefits*: This technology is still in the development stage. However, we can infer that in order to receive a patent, this technology must meet a certain percent reliability rate and it must benefit society in some ways. Since patent laws vary from one country to another, it is safer to stay neutral in regard to judging whether this dimension is moral or immoral. We put 'x' in the middle of the "benefits" scale.

5. *Increase convenience/ save money*: Having biometric locks on guns would save lives. Human life is invaluable; this technology in guns would be a plus to our

society. Therefore, this case is placed to the left of the "increase convenience, save money/ decrease convenience, cost money" scale.

Positive Paradigm Case		**Negative Paradigm case**
1. Pre-notification	**x**_____	Perform secretly
2. Public benefits	**x**_____	Private benefits
3. Data kept temporarily	_____**x**	Data kept permanently
4. Substantial benefits	____**x**____	No benefits
5. Increase convenience/ save money	**x**_____	Decrease convenience/ cost money

V.3 Conclusion

Of these five dimensions, Kant values dimension one and two. Both evaluated to be moral. A utilitarian put great emphasis on dimension four and five. Dimension four is neither moral nor immoral, and five is moral. A utilitarian would say that this action is right. There are good consequences that would come out from using biometrics locks on guns. For this technology to work, fingerprint data must be registered and saved permanently in the gun, or until the owner decides to sell it. We conclude that his use of biometrics is more ethical than the use of biometrics at the 2001 Super Bowl game. Although the data are being kept indefinitely, it is for good reasons—to prosecute criminals and guard against unauthorized use of the gun. This factor is not strong enough to make this case immoral.

VI. TRANSPORTATION WORKER IDENTIFICATION CREDENTIAL

VI.1 Case

Up to 12 million workers from port, air, truck and train industries could be affected by Transportation Worker Identification Credential (TWIC) checks. Workers needing unescorted access to secure areas are required to carry the TWIC. The current proposal is to use fingerprints and digital photographs, and ultimately hand geometry and iris scans to identify and verify the background of these workers. The implementation of the project is over a year behind schedule. Existing workers will need to undergo background checks, which may end up costing them their jobs [9].

VI.2 Analysis

The fact that this plan is running behind schedule, and some workers may end up losing their jobs, makes this case sound depressing. Yet, it is crucial that we make sure that these transportation workers have no bad intentions, as many lives rest in their hands. Let's analyze using the five dimensions to see if we are going too far with this background check.

1. *Pre-notification*: The workers are aware that they are subject to background checks. However, their privacy is not being respected because they do not have a choice as to whether their employers can do a background check on them or not. It is either giving up their jobs now, or losing their privacy by having their identification credential checked. At the same time, the public needs to be informed and ensured that they can rest their lives in the hands of these workers. We are torn in two directions. It is only fair that 'x' is placed on the middle of the "notification" scale.

2. *Goal of the data collection*: Biometrics data collected are used to verify the credential of transportation workers, to make sure that they are not terrorists or criminals who pose a danger to the public. A good motivation for using this technology must go on the left of the "public benefit/ private benefit" scale.

3. *Period for which the data are kept*: The data would be kept temporarily if these workers do not already have criminal records. If they have a history, their records are already kept under existing laws. It will be kept temporarily for most people who have not have offenses. This case evaluates to the left of the "data kept temporarily/ permanently" scale.

4. *Benefits*: The project is already behind schedule. It has not been implemented. We cannot say whether it is reliable and would have substantial benefits or not. Although with biometrics, it is more reliable than any other form of identification and verification because we have to use a part of the person's body, which is not easy to forge, to identify him/her. Nevertheless, it is safer to stay neutral with this dimension by placing it on middle of the "substantial benefits/ no benefits" scale.

5. *Increase convenience/ save money*: For those who know they will lose their jobs, it is more than an inconvenience that their privacy will be exposed. However the public need to know that their pilots, train conductors, bus drivers, and ship captains are law abiding citizens. Once again, we are torn in two directions.

Positive Paradigm Case		**Negative Paradigm case**
1. Pre-notification	____**x**____	Perform secretly
2. Public benefits	**x**_____	Private benefits
3. Data kept temporarily	**x**_____	Data kept permanently
4. Substantial benefits	____**x**____	No benefits
5. Increase convenience/ save money	____**x**____	Decrease convenience/ cost money

VI.3 Conclusion

Dimension four and five that utilitarians would value most are neither positive nor negative. They are indifference at those points. Since data are kept temporarily, there are bad consequences that a utilitarian could foresee. They would say then, that this is a moral action. Dimension one and two that Kant values are neutral and on the positive paradigm case, respectively. He would be inclined to say that it is a moral action to make sure that transportation workers have their background credentials checked. This proposal for biometrics usage is not as moral when compared to other cases we have seen. However, it does not sound as outrageous as using facial recognition software at the Super Bowl game because, at least in this case, the workers are informed. Other dimensions are not as clearly marked on the positive side of the paradigm case like the Super Bowl case, making it difficult to assess where it would fit with the rest of the cases. For sure, it is sitting on the positive paradigm case side. Although it is still moral, we need to recognize that some people may lose their jobs for petty crimes in the past.

So far, we have looked at biometrics technologies being used to increase public safety. There are other practical applications for using biometrics. Let's now look at a soon to be everyday use of biometrics that everyone can easily relate to.

VII. PERFECT-FIT JEANS

VII.1 Case

In London, designers can create perfect-looking clothes by using Bodymetrics. This machine scans the body and calculates precise measurements for designers to make perfect fitting jeans for specific shapes and sizes of customers. A customer gets his/her measurements by stepping into a scanning machine that shines lights on his/her body, creating numerous data points that the machine uses to calculate the exact measurements of the customer's hips, waist, and the inside seams of the legs. The first UK National Sizing Survey to use this technology found that "the average measurement around women's midriffs had increased by 16.5 cm (6.5 inches) in just over 50 years" [5]. Retailers and jeans designers failed to see the changes in modern women's bodies, which makes buying a pair of fitting jeans a chore for most of us. British super model Jodie Kidd is not afraid to endorse Bodymetrics. Similar technology is being used in lingerie companies in hopes of remedying the overwhelming number of women who wear incorrectly sized bras.

VII.2 Analysis

Let's look at the five dimensions and analyze how they apply to this biometrics use as we did with the other cases.

1. *Pre-notification*: Customers must give consent to retailers before they get into the Bodymetrics machine to have their measurements taken. If customers choose to do so, then their privacy is not infringed upon. The retailer would have to respect the

privacy of the customer if he/she chooses not to be scanned by Bodymetrics. Therefore, we place this case on the left of the "pre-notification/ performed secretly" scale.

2. *Goal of the data collection*: Bodymetrics is used to help customers find better-fitting jeans, and save them time in shopping. It is meant to increase customer satisfaction. We evaluate this to the left of the "public benefits/ private benefits" scale.

3. *Period for which the data is kept*: It is unclear as to whether the measurements gathered by Bodymetrics are being kept by the retailers or immediately discarded after one use. It is safer to stay neutral with this dimension by putting it in the middle of the "data kept temporarily/ permanently" scale.

4. *Benefits*: There are benefits in using this technology. Similar technology is being used in lingerie companies; it must be reliable, because making comfortable perfectly fitting bras is not an easy task. This case evaluates to the left of the "substantial benefits/ no benefits" scale.

5. *Increase convenience/ save money*: It saves customers time not having to try on every brand of jeans to find one that fits. If customers buy things they are satisfied with, they would be less likely to return them, and they would come back for more. Retailers would not have to deal with returns as much. This evaluates to the left of the "increase convenience, save money/ decrease convenience, cost money" scale.

Positive Paradigm Case		**Negative Paradigm case**
1. Pre-notification	**x**_____	Perform secretly
2. Public benefit	**x**_____	Private benefit
3. Data kept temporarily	____**x**____	Data kept permanently
4. Substantial benefits	**x**_____	No benefits
5. Increase convenience/ save money	**x**_____	Decrease convenience/ cost money

VII.3 Conclusion

Kant is critical on dimension one and two. These two dimensions are both positive. He would be moved to use this technology. Dimension four and five that utilitarians value are both positive. Having dimension number three at a neutral zone would not influence a utilitarian to say that this case is immoral. This analysis indicates that using Bodymetrics is moral. It is more moral than any other cases that we have looked at.

VIII. CONCLUSION

In analyzing the four cases of how biometric technologies are being used, I have noticed that the Bodymetrics and the intelligent firearms stand on a firmer ground than the Super Bowl game and the transportation worker credential checks, in terms of being moral. There are two features that explain why the Bodymetrics and the intelligent firearms cases are more morally acceptable than the other two cases.

One is that people are allowed to choose whether they want anything to do with this technology or not. If they do not want to be scanned by Bodymetrics, that is not a problem. People can still buy jeans in the traditional way by trying them on until they find ones they're satisfied with. Of course, people are allowed to choose whether they want to own a gun or not. With the Super Bowl game and the transportation worker credential checks, on the other hand, people do not have choices. In the Super Bowl game, people did not know that they were being scanned by face-scanning technology. As we have concluded, that was immoral. In the transportation worker credential checks case, people know they are subjected to such checks. However, the only choice they have is to lose their job if they do not want to submit to a hand geometry scan or iris scan to verify their credentials, and we were torn in two directions.

The other feature that clearly separates the Bodymetrics and the intelligent firearms from the other two cases is that in increasing convenience and saving money for people, it is more acceptable to use biometrics. In the transportation worker credential checks case, biometrics background checks do not increase convenience for those workers when some knew that it might cost them their jobs. In the Super Bowl game case, there were no arrests—nothing came from employing the face-scanning technology.

Meanwhile, it was an inconvenience for the police department to have to deal with public protests.

It all comes down to choices. If people are allowed to choose and they have reasonable alternatives to using biometrics, then using biometrics is moral.

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