

Navigating the Associated Risks of Emotion AI Across Different Industries

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Background

The recent onslaught of articles being pumped out about the potential of artificial intelligence to solve all your problems truly showcases the current excitement surrounding these new developments. One particular sub-field of AI is Affective Computing, which is more commonly referred to as Emotion AI. This relatively newer technology uses the inputs of facial expressions, eye movements, body language, vocal patterns, heart rate, and more to identify what emotion a person is feeling (Monteith, 2022) (Somers, 2019). Since Emotion AI systems use fundamental machine learning techniques as a base, the relevant emotional states and attributes are labeled before training the AI model (Monteith, 2022). A common component of Emotion AI is the usage of Natural Language Processing (NLP) to obtain more context and analyze the mental states expressed in a textual format from places like social media and chatbots (Teufl et al., 2010).

In recent years, Emotion AI has become an essential feature of many technological advances, and companies from different industries have incorporated it into their products and services. Big companies such as Google, Microsoft, and Amazon have integrated emotion recognition into things like virtual assistants and voice-controlled devices (Monteith, 2022). Many Emotion AI-focused companies specialize in integrating emotion recognition features in user technology such as Affectiva and Emotient (Kokalitcheva, 2021) (Somers, 2019). For example, in the marketing sector, the primary objective of Emotion AI is to enhance customer experiences, improve marketing tactics, and increase sales (Monteith, 2022). These businesses can tailor their products and services to meet customers' preferences and emotional states by analyzing customer feedback, measuring engagement levels, and curating personalized

recommendations (Somers, 2019). Another example of implementation is in the mental health field, where Emotion AI plays a crucial role in understanding and addressing mental health issues. By analyzing facial expressions and vocal patterns, Emotion AI can help in detecting conditions such as depression and anxiety (Oh, 2017). Other similar objectives in this domain include improving the accuracy of mental health assessments, developing virtual therapy tools, and providing early intervention options to individuals who may be experiencing emotional distress (Oh, 2017). These different implementations of Emotion AI showcase its versatility and potential to have a widespread positive impact.

Limitations

The ability to identify human emotions and comprehend language offers a wide range of possible applications. However, numerous imperfections exist that can impact the effectiveness and accuracy of this technology. One significant limitation surrounding Emotion AI is the current lack of regulation monitoring its development and deployment. As this technology continues to evolve and find its way into various industries and applications, there is a growing concern about the ethical implications and potential misuse of Emotion AI. The absence of clear guidelines and standards raises questions about privacy, data protection, and the responsible use of this technology (Peter, 2022). Without proper regulations in place, there is a risk of unintended consequences, such as biased algorithms, unauthorized data collection, or the manipulation of emotions for commercial or manipulative purposes. Establishing proper regulations and ethical guidelines is crucial to ensure that Emotion AI is utilized in a manner that respects individuals' rights, safeguards their privacy, and promotes transparency and accountability in its implementation. But despite the growing concern about all the potential consequences, actually regulating AI poses a harder problem. For all the companies developing

Emotion AI-integrated products, maintaining algorithmic secrecy is imperative in sustaining a competitive advantage (Peter, 2022). Therefore, it will be harder to create guidelines when there is a lack of transparency with these developments (Peter, 2022).

Another significant problem is that the limited availability of training data further impacts the effectiveness and accuracy of Emotion AI. Those models heavily rely on large datasets for training, but these datasets may not be a comprehensive representation of the entire population, and they may exclude certain cultures and social groups (Monteith, 2022). The personal privacy of individuals' data is one reason for the lack of data for certain groups of people. The types of data that the technology uses to analyze emotions are typically protected because of privacy concerns. However, following the ethical practice of respecting people's data privacy means that it's harder to collect a diverse enough dataset. Since the models might overlook underrepresented groups of people, biases can be embedded into the emotion recognition algorithm as a result (Monteith, 2022).

Another substantial problem is the inaccuracies caused by the variability of emotions amongst different cultures. Emotions can be expressed and interpreted differently depending on factors like culture, region, and context, making it challenging to develop a universal model for Emotion AI that accurately captures and understands emotions across diverse populations (Somers 2019). Algorithms are typically trained and tested using smaller sets of static and posed expressions that enhance this problem (Monteith, 2022). In addition, vocal inflections are also very distinct for different cultures and languages, and the lack of data on lesser-known languages, such as one of the 2,000 languages in Africa, means that the chances of accurately recognizing the correct emotion are even lower (Sciforce, 2022).

Additionally, even if Emotion AI was able to correctly analyze the data, there is still a risk of ambiguity in terms of interpreting what that specific emotion means. The complexity of human emotions allows a person to feel multiple emotions at the same time, and there are some that we don't even consciously recognize (Wallace, 2023). The notion that even humans struggle with interpreting emotions accurately makes it more difficult to train an AI to do so. Even with NLP which can analyze language pretty easily based on sets of grammar rules, what a human considers to be contextually ambiguous is different from what a machine considers to be ambiguous. For example, the term “I saw a person on the beach with my binoculars” could be interpreted as seeing someone through the binoculars or as seeing someone that is holding the binoculars (Roldós, 2020).

The lack of regulation and the potential for inaccuracies in Emotion AI could lead to unintended consequences when integrated into products that people regularly use. Minimizing errors that occur is also crucial in products that deal with health and safety because of how drastically they can affect a person’s life (Naik et al., 2022). Because Emotion AI has been incorporated into vastly different technologies with different types of people using it, it is important to consider the potential negative impact of it in each situation. To address these circumstances, I investigated how different implementations of Emotion AI introduce risk into users’ lives. Researching this topic is important because there is little research about the impact of Emotion AI on consumers compared to the research that exists about experimental usage.

Methodology

To assess how different implementations of Emotion AI address the associated risk that consumers face, I needed a way to interpret the vastly different perspectives of people using the

technology. To accomplish this, I first conducted a literature review to find the different ways that people are currently utilizing Emotion AI. I gathered some information from scientific journals about existing technologies, and I filled in the remaining gaps with articles about newer technologies from tech news sites. I also made sure that the main focus of the journals was Emotion AI rather than AI, in general, to ensure that the conclusions drawn from this research were directed toward emotion recognition technology in particular. Although there's a lot of research on the effectiveness of Emotion AI within the past decade about its experimental usage, it's only recently been implemented into consumer products, which resulted in the necessity of using more informal sources. I also only kept the scope of the research to focus on existing technologies that are sold and used in daily practice rather than those that talk about the potential uses of Emotion AI. Even though there are many sources about the potential for it to solve many problems, using them would require speculation about its impact. Through the literature review, I was able to identify communities from different social settings like the corporate and medical world.

After that, I was able to analyze how those social groups interact with Emotion AI using the Social Construction of Technology framework (SCOT). The objective of the SCOT approach is to uncover the diverse perspectives of stakeholders towards a particular artifact and examine how each group shapes the technology to serve their own interests (Pinch 1984). By adopting a multidirectional viewpoint, the SCOT framework explores the evolution of an artifact and analyzes its strengths and weaknesses towards the relevant social groups (Pinch 1984). This approach facilitates a comprehensive analysis of how different actors influence and adapt Emotion AI for their own benefit (Pinch 1984). In the following section, I describe the different social groups at work as my literature review and then evaluate with SCOT how much risk they

face when interacting with Emotion AI. Afterward, I analyze the various groups to discern which faces the most risk.

Results

Workplace Hiring

The job hiring process has become more streamlined with the help of Emotion AI by automating the different stages of the entire process. Companies use predictive tools that use Emotion AI to screen and interview job candidates that apply online to gain insight into their personalities and how suitable they are for particular roles (Monteith, 2022). Many of these products help companies analyze things like facial expressions, vocal patterns, and language to select candidates faster and with fewer resources. Some also include chatbots that ask questions to candidates and respond according to their answers (Monteith, 2022).

Emotion AI technologies have become a more common practice in the hiring process. A survey in 2020 from 34 countries showed that 39% of hiring managers used Emotion AI or predictive tools (Monteith, 2022). Compared to the 10% that were using it in 2016, this shows a steadily increasing trend of organizations of all sizes adopting the use of Emotion AI tools in their hiring practice (Monteith, 2022). The heightened accessibility of these technologies and different product availabilities have contributed to this widespread acceptance of them across many industries. Morphecast is one such company that has adopted the use of Emotion AI claims to “analyse the emotional response of your candidate... from assessment tests to the job interview, live or through video call. This way, recruiters can collect scientific and objective data on each candidate to enrich each one’s profile and optimize the process and final decision” (2023).

One of the main stakeholders in this job hiring landscape is the hiring managers since they are the ones actively utilizing those products to make the hiring decision easier for them. However, recruiters that use these tools with Emotion AI have the risk of missing out on good candidates. The cause behind this is the potential biases that the Emotion AI systems may inherently have, which could overlook candidates that lie outside of the coded patterns that detail the ideal candidate for a specific role. This is especially an unintended risk because recruiters are likely to not understand how the algorithmic processes arrived at their decisions. Having set attributes that the system looks for can also limit diversity in the organization's future and could prevent unexpectedly good candidates or unique individuals from having equal opportunities in the company.

The other main stakeholder in this process is the job candidates themselves, who aren't the direct users of Emotion AI technology in this case, but they are still affected by it. Candidates face the risk of being unfairly eliminated from the company's consideration because of coded bias in the algorithm. As explained earlier, this can happen when the candidate's performance is outside of the ideal attributes for the role, but this can hinder capable candidates from getting hired because of subjective interpretations. For example, a candidate with a speech impediment might unfairly be negatively scored if the AI doesn't match their vocal inputs with the coded ideal. Although this risk already existed with the bias of the hiring managers causing unfair judgment, the introduction of Emotion AI amplifies this issue because a human isn't checking every decision the system makes to ensure it isn't being unreasonable. In addition, there are many times when the reasoning behind AI's decision may be obscure, and using technology that works as a form of a "black box" only makes the whole process less transparent and more likely to be unfair.

Although the two main stakeholders in this industry both face a certain degree of risk, the risk that job candidates face is far more consequential. If something goes wrong or if something unintended happens with the use of Emotion AI, the unfair elimination of candidates from consideration has a huge impact on their future career prospects. Even though hiring managers face the risk of over-reliance and ethical challenges, their position of power and control in the hiring process lessens the impact of those risks whereas job candidates lack that ability. Because of this, job candidates are the most vulnerable group in this implementation of Emotion AI.

Employee Surveillance

Another similar field where Emotion AI has become prevalent is workplace monitoring. This consists of analyzing workers' emotions, moods, and personality traits from the visual data collected in online meetings (Roemmich et al., 2023). Corporate leaders have always needed for monitoring their employees to ensure proper performance, but now Emotion AI has allowed them to ease back on their more traditional methods of doing so. Traditional monitoring methods include tracking internet usage, email communication, and attendance (Monteith, 2022). The addition of the data that is collected through Emotion AI helps to measure productivity, create custom training programs, identify internal fraud, and increase safety in workplaces (Monteith, 2022). This type of workplace monitoring has become increasingly prevalent, especially after remote work has become more common after the pandemic when companies became more willing to invest in products to monitor productivity and engagement levels. By 2024, the usage of Emotion AI to monitor employees is projected to rise to 50% (Roemmich et al., 2023). Companies like MorphCast have incorporated the use of Emotion AI into a tool used during

Zoom meetings that provide insights into employees' emotional reactions to observe the engagement and responses (2023).

Even though Emotion AI contributes towards a process that already existed, there are still inherent risks for the corporate leaders. The main risk is that they can end up collecting unwanted information that can affect their analysis of employee performance (Monteith, 2022). Emotion AI collects a vast amount of data which is only made sense of afterward, so the risk lies in collecting irrelevant and excessive information that isn't needed for assessing employee job performance. Collecting too much irrelevant data can lead to the emotion recognition algorithm making flawed conclusions and misinterpreting the existing data.

On the opposite end, employees face multiple risks when Emotion AI is used for workplace monitoring. One of the biggest risks is that their information can be collected without their knowledge and consent, especially data that isn't relevant to employers (Roemmich et al., 2023). This raises concerns about privacy and data protection, especially since there currently isn't regulation about how much data Emotion AI is allowed to collect. Even when the use of Emotion AI is properly communicated, employees tend to feel uncomfortable having that much data collected from them (Roemmich et al., 2023). Another risk is that the incorporation of Emotion AI in the workplace could end up creating an environment where employees' emotions carry more weight than they should compared to their actual work productivity (Roemmich et al., 2023). This can cause pressure on the employees to feel and appear in a forced professional manner to be recognized for their work. This also raises ethical questions about the boundaries of employee surveillance and the potential for bias or discrimination based on emotional responses (Monteith, 2022).

Of the groups that are most affected in this scenario, the corporate leaders deal with less risk by being the ones intentionally deploying this technology. Since employees are subject to the impact of this technology without having much control over it, the imbalance of power and the potential for negative consequences on employees' personal and professional lives highlight how they are more vulnerable to the risks associated with workplace monitoring involving Emotion AI. In addition, the power dynamics between the employer and employee in this case may cause emotional distress and distrust depending on the way corporate leaders decide to use the collected data. Even though corporate leaders may also have their data collected in meetings with Emotion AI, they don't face the same risk of having their career on the line because of how seriously their emotions are taken, which is why employees face a significantly higher degree of risk.

Patient Care

The adoption of AI in healthcare has already been very impactful in improving patient care, and the emergence of Emotion AI is starting to show similar effects. Emotion AI tools in healthcare assist workers in monitoring patients' emotional states and responses to treatment as a way to help them make more informed decisions. Although AI lacks proper regulation, there are existing medical device regulations that provide a foundation for addressing the use of Emotion AI in healthcare settings. Guidelines like these are why the use of Emotion AI in healthcare is still in its early stages in countries like the United States, but some countries have made more progress in implementing those technologies, like Japan (Ho et al., 2022).

To help mitigate the problem of aging healthcare infrastructure, Japan has invested heavily in the integration of AI technologies, and many start-ups have developed products to

improve communication between patients and physicians (Ho et al., 2022). Companies like Ubie offer tools to analyze online medical records, conduct preliminary examinations on patients, and assist personnel with chatbots (Ho et al., 2022). Similar start-ups provide functionalities like cancer diagnosis, image-based cell sorting, clinical decision management, and patient monitoring (Ho et al., 2022). These products are available for public use but are mainly adopted by rehabilitation centers, local hospitals, and senior citizen residences (Ho et al., 2022).

One of the main social groups in healthcare is the healthcare workers. A particular risk they can face is the overreliance on it for decision making which can have severe consequences if the AI were to produce an incorrect result. However, this seems unlikely because it's currently only being used as a way to assist healthcare workers, and providing for people's well-being won't be easily taken over because of all the restrictions that medical practices already have. Healthcare workers may just need to interpret the emotional data provided by Emotion AI tools combined with their clinical judgment, striking a balance between AI-generated insights and their expertise (Ho et al., 2022).

On the other hand, patients face risks concerning data privacy because Emotion AI collects personal information and hasn't had an established way of handling this information responsibly. And although AI might not be able to handle patients on their own and make judgments without the assistance of a healthcare worker, there is also the risk of Emotion AI misinterpreting the patient's emotions which could potentially lead to incorrect diagnoses and treatment plans that can produce a lot of harm. In addition, patients aren't the ones using Emotion AI, so they have limited control over their circumstances. Many times, patients who are in rehabilitation centers or under nursing care have more specific needs and circumstances that can cause them to be even more vulnerable with this technology. Invisible illnesses and mental

disorders are also something that patients struggle to get adequate treatment for that may not be recognized by the technology. A patient's unique circumstances may not be anticipated, and therefore it won't be sufficiently supported by the AI.

When analyzing both social groups, it's clear that the involved healthcare workers face challenges such as overreliance and improper interpretation when using Emotion AI, but they possess the ability to control how much of an effect the AI has when caring for a patient. In contrast, patients directly experience the consequences of delicate data security, mistreatment, and limited authority. Those potential negative effects that make them more vulnerable outweigh the challenges that healthcare workers face because of the inability to make decisions based on Emotion AI technology. Therefore, with their personal health and well-being on the line, patients are the ones that deal with the greater amount of risk.

Automotive Safety

Another application of Emotion AI exists in the automotive industry. It is slowly becoming a valuable tool for enhancing safety by monitoring the driver's emotions. The incorporation of Emotion AI has allowed automotive equipment manufacturers and suppliers to design features by measuring driver impairment (Chen et al., 2022). In particular, driver monitoring systems are trained to track debilitations like driver fatigue, road rage, and mental distractions and provide corresponding countermeasures such as audio alerts and seat belt vibrations, to name a few (Chen et al., 2022). The goal of these technologies is to prevent reckless driving by seamlessly making drivers more alert and attentive. When it is used with semi-autonomous driving vehicles, Emotion AI assists with deciding when to switch between

manual and autonomous driving modes depending on the driver's current mental state and the likelihood of dangerous activity (Chen et al., 2022).

Even though these features are still very limited in automotive businesses compared to other industries, prominent vehicle brands like Audi, BMW, and Mercedes-Benz are slowly releasing cars with emotion recognition capabilities. For example, BMW offers the Caring Car feature, which refreshes fatigued drivers to create a relaxing environment for stressed drivers by using interior lighting, fragrances, music adjustments, and seat ventilation (Braun et al., 2021). Mercedes-Benz also has implemented a coaching session feature in certain vehicles to keep the driver attentive during extended trips through the integration of climate control, ambient lighting, and music (Braun et al., 2021). Affectiva is also an automotive-integrated software that detects user drowsiness and warns the driver in real-time to reduce the potential for collisions (Affectiva, 2023). From here, car manufacturers are currently producing more tailored systems that respond to head postures and eye movements (Braun et al., 2021).

With this technology in its early stages, it's important to assess the level of risk for different populations, such as automotive manufacturers, drivers and passengers, and pedestrians. Automotive manufacturers face the risk of releasing faulty products as a result of false positives or negatives. By releasing products that haven't had a lot of proven reliability amongst customers, they are a greater potential for unwarranted outcomes. Another major social group consists of the people inside the vehicle: the driver and the passengers. One risk that they face is the privacy violation of their personal information because of the constant stream of data that is monitored and analyzed by the system. Another risk is the potential for drivers to become too reliant on the technology, which may lead to safety hazards in the case of delayed alerts or false positive interventions. In addition, as we've seen in previous examples of Emotion AI in other

industries, people who don't choose to use this technology are also greatly affected by it. In this way, pedestrians also face the risk of being involved in vehicle accidents in the case of automotive malfunction.

Comparing the various stakeholders, it is more ambiguous as to who faces the most risk. In other industries, the ones with the least control over the usage of emotion recognition tools were the ones that faced the most risk. However, this circumstance has different groups in a position of power. In one frame of reference, the automotive manufacturers have control over how the technology works, but another perspective shows that the driver has control over how the technology is used. This would mean that pedestrians that have no control over the usage of Emotion AI have the most risk. However, the risk they face of actually getting injured in an accident is very dependent on the location (Chang, 2022). Because of this, drivers face the most potential risk of the three social groups, because, in addition to the chance of injury, they face privacy risks and potential over-reliance as well.

Conclusion

The integration of Emotion AI into the different fields of society offers both promising opportunities as well as significant risks. There are also noticeable patterns in the risks that different social groups face across various industries. One such pattern is the potential over-reliance on emotion recognition systems. Especially when considering the worst-case scenario of potential injury, there is a clear hazard when basing major decisions on newer technology. This shows how important it is for balance to be maintained between the AI's choices and our human judgment. Another discernable pattern amongst the different industries is the power dynamics that surround the use of Emotion AI. While the general purpose of emotion recognition is to

improve decision-making and user experiences, this seems to happen in favor of the one employing this technology for their benefit. In the social groups I analyzed, this archetype provided the least risk for the ones with more authority, such as corporate leaders and healthcare workers.

In addition to the conclusions that can be drawn from this analysis, it's important to consider the limitations of this research. One limitation is the availability of sources. Since Emotion AI has only recently been implemented, there is a great saturation of sources containing proposals rather than reports of actual released products. The availability of more formal sources analyzing these products rather than company websites and news articles may have also provided more reliable information. Another limitation surrounding my analysis of the involved risk is the potential bias when determining which social group faces the most risk. I measured the risks using a more holistic approach of comparing the instances of risk for each social group, however, particular individuals may find that they are more concerned with privacy issues and it would therefore contain more weight in the level of individual risk.

These patterns and limitations highlight the complexities of the implementation of Emotion AI, and as these technologies become more integrated into everyday life, it is important to consider how people are negatively affected by it. These risks also emphasize the importance of effective regulation and sufficient training to ensure proper usage, as well as updated privacy policies to protect personal data. Subsequent steps can progress this research by reaching out to individuals who have firsthand experience with the changes that Emotion AI has provided in their lives to get a better understanding of the risks and the best way to proceed with the development of these technologies. Ultimately, the ongoing research in the field of Emotion AI

has the potential to responsibly shape the future of decision-making and efficiency in our everyday lives while minimizing the potential risks.

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