



Exploring the human bias against songs partially generated by AI

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Abstract

Artificial intelligence has been expanding its presence across numerous industries, revolutionizing operations and transforming the user experience. The entrance of AI into artistic fields has sparked scepticism and fear, as creativity is traditionally seen as uniquely human. In music, this has led to a human bias against AI that can be observed when listeners rate a song higher when they believe, or are told, it was created by human artists rather than by AI. This dissertation focuses specifically on AI covers which are songs where AI replaces the vocals of the original piece by the voice and style of another artist. It aims to understand what are the factors contributing to the bias against AI covers and how strongly they influence listeners perceptions. Furthermore, the study examines how the perception of these factors differs between generations.

A review of the existing literature identified factors that possibly contribute to this bias, such as believing AI covers lack emotional depth, believing they have an unnatural sound, perceiving AI as unable to be creative, fearing AI will surpass human intelligence and considering AI covers are unethical. To test these hypothesis, in-depth interviews and an online survey were performed, revealing that the perception that AI covers have an unnatural sound is the strongest factor contributing to the bias. Additionally, beliefs regarding emotional depth, creativity and ethics also play significant roles. Finally, the analysis showed that younger generations perceive these factors more negatively than the older generations, revealing stronger biases against AI covers.

Keywords: Artificial Intelligence; AI-generated music; AI covers; AI Listener Bias; Emotional depth; Creativity; Unnatural sound; Ethics; Fear of AI surpassing human intelligence; Generational differences

Título: Análise do preconceito humano contra música parcialmente criada por IA

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Sumário

A inteligência artificial tem expandido a sua presença em múltiplas indústrias, revolucionando operações e transformando a experiência do consumidor. A entrada da IA em campos artísticos despertou ceticismo e medo, pois criatividade é tradicionalmente associada a humanos. Na música, isto levou à formação de um preconceito contra IA, observado quando um ouvinte classifica uma música melhor ao acreditar, ou ser informado, que esta foi criada por um artista humano, em oposição a gerada por IA. Esta tese concentra-se em *covers* de IA, músicas onde IA substitui a voz da canção original pela voz e estilo de outro artista. O objetivo é compreender os fatores que contribuem para o preconceito contra *covers* de IA e como estes influenciam as percepções dos ouvintes. Adicionalmente, o estudo analisa diferenças de percepções entre gerações.

Uma revisão da literatura existente identificou fatores que possivelmente contribuem para este preconceito, como acreditar que as *covers* de IA não têm profundidade emocional, o som é artificial e são pouco éticas, e considerar que a IA é incapaz de ser criativa e vai ultrapassar a inteligência humana. Para testar estas hipóteses, foram realizadas entrevistas e um questionário online, que revelaram que a percepção de que as *covers* de IA têm um som artificial é o fator mais significativo. Percepções relativas à profundidade emocional, criatividade e ética também contribuem significativamente. Finalmente, a análise mostrou que as gerações mais jovens têm uma percepção mais negativa dos fatores e um preconceito maior contra *covers* de IA do que as gerações mais velhas.

Palavras-chave: Inteligência Artificial; Música criada por IA; *Covers* de IA; Preconceito do ouvinte contra IA; Profundidade emocional; Criatividade; Som artificial; Medo que a IA ultrapasse a inteligência humana; Diferenças geracionais

Table of Contents

Abstract.....	II
Sumário.....	III
Table of Contents.....	IV
Acknowledgments	VI
List of Abbreviations	VII
List of Tables	VII
List of Figures.....	VII
1. Introduction	1
1.1. Industry Analysis and Contextualization.....	1
1.2. Problem Statement.....	2
2. Literature Review and Hypothesis	4
2.1. Artificial Intelligence and Its Evolution in Music Creation	4
2.1.1. Artificial Intelligence.....	4
2.1.2. Artificial Intelligence in Music Creation.....	4
2.2. Listeners' Perceptions and Bias Toward AI-Generated Artworks and Music ..	5
2.3. Factors Influencing the Listener Bias Toward AI-Generated Music	6
2.3.1. Emotional Depth.....	6
2.3.2. Creativity Perceptions.....	7
2.3.3. Sound Quality	8
2.3.4. Concerns on AI Surpassing Human Intelligence.....	10
2.3.5. Ethical Concerns.....	11
2.4. Age Differences in Perceptions Toward Music Partially Generated by AI ...	13
3. Research Methodology	14
3.1. Qualitative Data	14
3.1.1. Research Design	14
3.1.2. Data Collection Process.....	14
3.2. Quantitative Data	15
3.2.1. Research Design	15
3.2.2. Data Collection Process.....	15
4. Research Results.....	17
4.1. In-depth Interviews.....	17
4.2. Survey Analysis.....	19
4.2.1. Sample Demographics and Characteristics	19
4.2.2. Statistical Analysis and Hypothesis Validation.....	22
5. Discussion.....	30
5.1. Results	30

5.2.	Managerial Implications	31
5.3.	Limitations and Future Research	33
6.	Appendix	35
6.1.	Interview	35
6.1.1.	Interview Script	35
6.1.2.	Summary Interviews	36
6.2.	Survey	41
6.2.1.	Survey Questionnaire	41
6.2.2.	SPSS Survey Analysis	42
7.	References	48

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List of Abbreviations

AI – Artificial Intelligence
IA – Inteligência Artificial
IFPI – International Federation of the Phonographic Industry

List of Tables

Table 1: Age Groups Frequencies.....19
Table 2: Descriptive Statistic Frequencies divided in Younger and Older Generations.28

List of Figures

Figure 1: Generation Frequencies.....19
Figure 2: Gender Distribution.....20
Figure 3: Occupation Frequencies.....20
Figure 4: Monthly Income Frequencies.....20
Figure 5: Frequency of Music listening Distribution.....21

1. Introduction

1.1. Industry Analysis and Contextualization

In recent years, the global music industry has been changing alongside technological advancements. 2023 marks the ninth consecutive year of growth for this industry, rising by 10.2% and reaching \$28.6 billions in revenue (IFPI, 2024). The main trend shaping this industry in the last years has been the digitalization of music, moving from vinyls and CDs to digital formats, which changed the value chain completely. Building on this trend, it is predicted that emerging technologies, such as AI, will further reshape the music industry, by changing the way content is produced and displayed (Darvish & Bick, 2022). AI is already being used in the music industry in various fronts, such as assisting music producers with tasks like mixing and mastering, in a much faster and cost-effective way. And also, enhancing the listeners experience in streaming platforms, offering tailored recommendations (Chow, 2023). More recently, the relationship between AI and the music industry evolved even further with the appearance of AI-generated music mimicking the voices of well-known artists. On April 4th, 2023, the song “Heart on My Sleeve” written and produced by the TikTok user *Ghostwriter977*, with vocals mimicking the musicians Drake and The Weeknd, was the first AI composition that used the voice of known artists to become viral online. The song had millions of views and comments as listeners were astounded at how closely the AI-generated vocals resembled the real artists (Veltman, 2023). This creation demonstrated how AI could mimic the voice of artists so seamlessly, paving the way for a new trend: AI covers.

AI covers are compositions partially generated by artificial intelligence as they combine a human creation with vocals generated by AI. Essentially, AI takes a human-created song and not only replaces the original vocals for AI generated ones of another artist, but also rearranges the song to fit the mimicked artist’s style and tone. This is done using an extensive database that captures artists voice across different contexts (Baris, 2024). Nowadays, there are already various platforms available online, accessible to everyone, that allow the creation of AI covers. While producing a high-quality AI cover still requires technical expertise in music production, users don’t need to be professional to create an acceptable version. For this reason, the number of AI covers available online is rapidly increasing. Reactions to this innovation have sparked debate and polarized opinions. Some individuals view this tool as having immense potential to create a personalized

experience for listeners, allowing them to experience all sorts of combinations of their favourite artists voice in different songs and styles, and even creating the possibility of reviving the voice of a deceased or retired artist (Adejola, 2024; Galuszka 2024). Others express a more concern and sceptical view of AI covers, raising questions over the fact that many artists don't have prior knowledge or give consent to someone using their voice (Feffer et al. 2023). These listeners fear the possibilities that this technology may bring, for instance with the loss of authenticity. In the latest IFPI's global report, attitudes toward AI-generated music were collect from more than 43,000 individuals across 26 countries. The findings concluded that 76% of respondents feel that "an artist's music or vocals should not be used or ingested by AI without permission", and 74% "agree that AI should not be used to clone or impersonate artists without authorisation" (IFPI, 2024). While AI covers offer exciting new possibilities for the music industry, they also raise complex questions regarding AI creativity, emotional expression, authenticity and ethics. AI music-generating tools have reached Portugal, as it is possible to listen to AI-generated covers of Portuguese songs or tracks using the voice of Portuguese artists on platforms such as YouTube and across social media. However, upon an extensive search, as it is a new technology, there appears to be very limited academic literature directly addressing this topic in the Portuguese market. This is an opportunity for this study to further delve into Portuguese consumers' perceptions of AI covers.

1.2.Problem Statement

As artificial intelligence continues to integrate into creative industries, skepticism and fear emerge in individuals over its ability to replicate human creativity. Art forms such as painting, poetry or music are often viewed as areas that require a human touch that AI is unable to achieve. This skepticism opens up the possibility for humans to exhibit a bias against AI art creations by preferring and raking higher creations they believe are made by humans versus creations they believe are generated by AI.

Regarding music generated by AI, this human bias can also be observed, as music is an art form deeply tied to human expression and emotion. Despite the ongoing advancements that already enable music partially generated by AI, or AI covers, to achieve a human-like quality, individuals often rate AI-generated songs lower than those fully created by human artists. Sometimes, even the same composition is rated differently simply if individuals are told, or they believe it is AI versus human-generated.

This bias is possibly holding back this technology from growing and further developing as individuals perceive it negatively from the beginning. To address this, it is important to understand the underlying factors fuelling this bias and how strongly each factor contributes to the bias. Additionally, it is important to explore if different age groups perceive these factors in the same way. By focusing on the Portuguese market, this research aims to uncover valuable insights into the human bias against music partially generated by AI and provide a foundation for future research that can explore strategies to reduce this bias, enabling AI covers to achieve their full potential.

Research Questions:

RQ1: What are the main factors that contribute to the human bias against music partially generated by AI?

RQ2: What are the factors that contribute more strongly to the human bias against music partially generated by AI?

RQ3: How do perceptions of music partially generated by AI differ among generations?

2. Literature Review and Hypothesis

2.1. Artificial Intelligence and Its Evolution in Music Creation

2.1.1. Artificial Intelligence

In recent years, artificial intelligence has become an integral part of our everyday lives, it is present all around, many times operating in ways that go unnoticed. But what exactly is AI? Artificial intelligence has multiple definitions as it can be challenging to define something that is an attempt to replicate human intelligence - a concept that has been extensively studied but remains far from being fully understood. One possible definition of AI describes it as “systems that display intelligent behavior by analyzing their environment and taking actions – with some degree of autonomy – to achieve specific goals”. Bearing in mind that this definition has limitations, as AI continues to evolve this definition is likely to change (Sheikh et al., 2023).

2.1.2. Artificial Intelligence in Music Creation

As of today, multiple powerful generative AI models have been developed, especially in the areas of text and image creation. However, in the domain of music creation, music-focused generative models have not yet reached the same level of development and sophistication. Music presents unique challenges due to its diverse structures and forms, combining intricate arrangements with elements of emotion and passion. This complexity makes it significantly more challenging for artificial intelligence to generate music in a way that replicates human creativity and expression (Zhang et al., 2023).

The first connection of AI and music is dated back to mid-1960s, with research focusing on music as a cognitive process modelled by computer programs. The first paper on algorithmic music composition was published in 1960 by R. Kh. Zaripov. In terms of practical evidence, Ray Kurzweil, a pioneering inventor in multiple areas, one of those being artificial intelligence, made a significant development in the field by programming a computer to recognize musical patterns and compose melodies. Later, Kurzweil collaborated with Stevie Wonder to create the Kurzweil 250 (K250), an electronic instrument that replicated the sound of a grand piano and other orchestral instruments (Zulic, 2019). Over the following years, AI continued to advance in the music industry through the creation of systems capable of intelligent musical performance, offering not only entirely new compositions but also supporting artists in more technical and

algorithmic tasks. A notable example is the song “Daddy’s Car” made by artificial intelligence at Sony’s computer science laboratory in Tokyo, Japan in 2016. This project aimed to replicate the sound and feel of a Beatles song, and its impressive results demonstrated the capabilities of AI in imitating human artistic styles (SeventhQueen, 2023).

2.2. Listeners’ Perceptions and Bias Toward AI-Generated Artworks and Music

Like with every new technological advancement that surfaces and shows a rapid grow, humans take time to adapt and accept it. Despite its growing presence in various fields, many consumers still have skepticism and hold different perceptions of AI-generated content compared to humanmade. This negative perception toward AI-generated content is accentuated when it concerns outputs that require creativity and are usually associated with human talent, such as paintings, poems or music (Magni et al., 2023). Several studies have already explored this negative perception toward AI artworks, finding negative biases toward AI creations. For instance, Bellaiche et al. (2024) investigated whether individuals prefer human-created artwork compared to AI-created. In the study, participants were shown several AI-generated paintings that were labeled randomly as AI-created or human-created. Participants had to rank the artworks based on various criteria, including Liking, Beauty, Profundity, Worth, Emotion, Story (narrativity), Meaningfulness, Effort, and Time to Create. Although on different levels, on almost all criteria, respondents rated artworks labeled as human-created higher than those labeled as AI creations. This is a clear demonstration of the bias against AI artworks since all creations were AI-generated, only some were labelled differently to prove the bias.

Focusing more specifically on AI-generated music, Shank et al. (2023) predicted that “given an identical piece of (human-composed) music, a listener will like it less if they are simply told it was composed by AI” (Shank et al., 2023, p.678). The study tested both classical and electronic music by showing participants clips of human created songs from both genres and asking if respondents believe it is AI- or human-generated, and to rate how much they liked the excerpt. The study confirmed the hypothesis by concluding participants liked music less when they thought it was composed by AI, demonstrating the presence of a bias against AI-generated music as well.

Regarding AI covers, as it such a novel innovation, the literature that exists focuses on songs entirely generated by AI, with no literature yet proving the existence of a human

bias against songs partially generated by AI. However, for the purpose of this dissertation, and as proven that this prejudice exists in different artistic creations and particularly in music generated by AI, the assumption that the bias exists in songs partially generated by AI - AI covers – was made in order to continue the research.

Moving further this bias will be denominated as AI Listener Bias and it refers to the human prejudice against songs partially generated by AI.

2.3. Factors Influencing the Listener Bias Toward AI-Generated Music

The following section will explore the underlying reasons why individuals tend to exhibit this prejudice. Insights from an extensive literature review will allow to hypothesize which factors possibly contribute to the AI Listener Bias and to what extent they affect listeners judgements.

2.3.1. Emotional Depth

Music has long been recognized as a powerful evoker of emotions. Most people exhibit a strong connection to music as they find it central to their identities and self-expression (Shank, et al). When concerning AI-generated music, many listeners find it unsettling to believe that artificial intelligence may be able to evoke emotions in the same way as human-created music does. Some music experts even argued that “AI-composed music lacks the emotional depth and complexity inherent in human-created music” (Fernando et al., 2024, p.1). But is this view actually accurate or does it reflect a broader bias against AI-generated creative content? A study conducted by Agudo et al. (2022) explored the emotions a piece generated by AI aroused in listeners, both music and visuals, hypothesizing that listeners preference did not rest on the quality of the artwork itself but on the bias people exhibit toward AI creations. This hypothesis was confirmed as participants “reported stronger emotional arousal when they thought the artist was a human as compared to when they thought it was an AI” (Agudo et al., 2022, p.4).

Understanding emotional responses to music is complex, as the emotions triggered vary widely across individuals and contexts. Factors such as genre preference, age, musical background, and contextual factors like time of day, environment or occasion, all affect the emotional reactions individuals experience when listening to a song. Nonetheless, the overall common factor is the ability that music has to arouse emotions and create strong connections with listeners (Fernando et al., 2024). Only 3% to 10% of people report they

don't experience pleasure from music (Belfi & Loui, 2019). Taking all this into consideration, the power that music has in evoking emotions and the tendency to create strong relationships with its listeners may help explain individuals' skepticism and bias toward AI-generated music (Shank, et al). It is also important to note that a song's emotional impact isn't just in its lyrics or melody. An artist's interpretation is often the lead factor that brings emotional depth to a song, making it also important to examine emotion in AI-generated covers, as the AI vocals may alter the songs' perceived emotional resonance. To study how the perceived lack of emotion that listeners tend to associate with AI covers affects the AI Listeners Bias, the following hypothesis was proposed:

H1: The belief that AI-generated music lacks emotional depth contributes to the manifestation of the AI Listener Bias

2.3.2. Creativity Perceptions

The recent rise of AI-generated art has sparked anxiety among individuals, raising questions about whether AI-made art should even be considered "art" and whether AI can truly be creative or not (Horton et al. 2023). The term *artificial creativity* is usually used by authors that don't consider AI's creative process the same as from human creativity. Artificial creativity is not considered authentic since the outputs are based on data that already exists, either existing information or a combination of existing data. Additionally, it lacks intentionality, an important motivator that is present in human creativity. Therefore, creative outputs by AI can be considered novel, original, useful, valuable but should not be described as "creative" in the same sense as human work (Runco, 2023; Lac & Moura, 2024).

To better understand the public perception of creativity in art generated by AI, several studies have been conducted. Magni et al. (2023) concluded that sometimes consumers rate AI-generated content as less creative and attribute it less value, as they perceive that AI places less effort than humans in the creative process. Another experiment conducted by Horton et al. (2023) concerning the perception toward AI- versus human-production of art and creativity, also concluded that there is a negative perception towards AI-generated art comparing to human made. The experiment, centered on visual art pieces, showed that participants considered the same exact piece of art less valuable and less

creative if it was labeled as AI-made comparing to labeled as human-made. These findings confirm the presence of a human bias against recognizing creativity in AI-generated art.

Focusing more specifically on music, Hong et al. (2020) hypothesized in his study that “people who believe that AI can be creative will appreciate its music composed more than those who do not” (Hong et al., 2020, p.4) as he believed the bias against creativity in AI is centered in the perception that individuals have of AI, rather than the quality of the art itself. The study concluded that the acceptance that AI can be creative is a necessary requirement for a positive evaluation of its artistic performance.

When it comes to AI covers, the focus of this paper, one may argue that there are no creative outputs compared to a fully AI-generated song. However, Boden (2024) introduced the concept of “combinational creativity”, commonly associated with AI, as the merging of existing elements into novel ideas. AI covers apply this by taking the familiar elements of a song such as the melody, rhythm and lyrics, and combine them with the distinct vocals and style of another artist. Thus, even though it is not a completely new song created by AI, there is still creativity involved in the process by recontextualizing the known materials and creating a new interpretation through different voices and styles.

In light of these points, it is possible to hypothesize that the skepticism among listeners regarding whether artificial intelligence can truly be creative may contribute to the AI Listener Bias:

H2 - The belief that AI-generated content cannot be creative contributes to the manifestation of the AI Listener Bias

2.3.3. Sound Quality

Despite the ongoing advancements, AI-generated music still has some difficulty in capturing the “natural” sound of a human-composed song or accurately mimic human vocals. Many AI covers circulating on social media are produced by amateurs that use simple platforms, contributing to the perception that AI-generated music sounds unnatural or artificial. However, with ongoing technological improvements, there are already AI-generated songs nearly indistinguishable from human-composed ones. One technique adopted by creators of AI covers is the re-recording of the instrumental track

in order to achieve a seamless AI cover song. Instead of separating and replacing the vocals from the original track, these composers re-record the instrumental track in the style of the artist being mimicked and only then add the artificial vocals. This allows for a better placement of the new voice adapted to the style of the impersonated artist. However, this technique requires a high level of music expertise and production skills, making it typically only achievable by professional musicians and producers (Galuszka, 2024).

Recent research on AI music generation platforms highlights the increasing quality and technique these systems bring to AI-created songs. Chu et al. (2020) studied different platforms that create AI-generated music with "unconditional" (no prompt needed) and "conditional" (requires a prompt) methods. For the purpose of this study, the focus will be on conditional methods since AI covers rely on pre introducing a condition, in this case: a song. The study collected insights from individuals regarding different metrics, such as "naturalness" (sounding expressive and human-like) and "melodiousness" (musical harmony and cohesion). The findings show existing platforms that already score high in those metrics, with participants stating: "I wouldn't be able to find a difference between music played by an AI and music played by a real human." and "the songs can break into the commercial music industry" (Chu et al., 2020, p.311). This study shows models that are increasingly perfecting their characteristic to further enhance the AI music experience and offer a more natural and cohesive sound. However, despite this undeniable progression, the human bias against AI music still remains a reality, as listeners tend to immediately associate AI-generated songs to a computerized and unnatural sound. A study on listeners perspectives of AI- and human-composed progressive metal music, provided insights on why listeners believe a song is AI-generated or human-generated when they don't know the identity beforehand. The majority of participants deemed a song as AI when they believed there was something "off" about the composition. In those songs, some participants felt a sense of unease, others noticed lack of cohesiveness, and some even detected note choices that felt odd. Additionally, the perceived excessive repetition and inconclusiveness of melodies also contributed to the belief a song was AI. When participants were asked what made them identify the excerpts as human-made the responses centered on the sense of cohesion and consistency, musical choices that felt intentional and deliberate, and compositions that felt natural. It was also mentioned that certain characteristics in those songs felt more human, such as "soul", creativity and playability. Keeping in mind that many participants

were not able to fully distinguish between AI- and human-composed music, showing that listeners tend to have preconceived notions about AI-generated music, associating it with certain negative characteristics (Sarmiento et al., 2024).

Additionally, as seen before, Shank et al. (2023) confirmed the AI Listener Bias in classical and electronic music, but in the study it was also possible to conclude that electronic music excerpts were more often mistaken as AI-generated due to the more computerized-sound present in electronic music. Furthermore, participants rated music with a more "human" or "natural" sound significantly higher in quality compared to music they considered to have an "AI sound".

These studies demonstrate that while AI-generated music is increasing in quality, listeners still have a bias towards it, associating AI-generated songs to lower quality and artificial sound. Thus, the following hypothesis is proposed:

H3 – The perception that music partially generated by AI lacks a natural sound contributes to the manifestation of the AI Listener Bias

2.3.4. Concerns on AI Surpassing Human Intelligence

Artificial intelligence has been one of the most discussed topics of the last decade due to its immense potential. It is undeniable that AI will have a huge impact on the future of humanity, whether it is for better or for worse. While AI's benefits in many industries are undeniable, its rapid advancements spark significant debate, dividing public opinion. Many individuals have concerns regarding job loss for AI replacement and also fear the lack of transparency in AI processes (Bentley et al., 2018). These concerns are legitimate, as historically in other industries, automation decreased the value of human labor and goods (Horton et al., 2023). A poll carried out in September 2023 showed over a fifth of workers in the US are concerned about tech replacement, meaning they fear technology might make their jobs obsolete (Whiting, 2023).

Concerns about artificial intelligence surpassing human capabilities have existed since this technology's early days. In 1997, Garry Kasparov's defeat by IBM's chess computer Deep Blue marked a groundbreaking moment that raised many concerns about the limits of artificial intelligence, as chess was considered the "pinnacle of human intelligence". This achievement sparked fear and questioning that if AI could excel at chess, it could also perform all the tasks humans considered easier at the time. From then until now,

research on AI has proven that this line of thought is not exactly linear. For instance, chess is a relatively easy task for AI, as it has a set of clear rules and finite alternatives. But, recognizing a cat in a photograph, something that is very easy for humans, remains very challenging for AI (Sheikh et al., 2023).

Another milestone for this technology occurred in 2016 when Google DeepMind's AI program, AlphaGo, defeated the South Korean *Go* champion, Lee Sedol. This victory made headlines worldwide as *Go* is an ancient Chinese game known for its complexity and deep strategic demand. Unlike chess, this game needs intuition, therefore representing an enormous breakthrough that raised new concerns about AI potentially surpassing human intelligence (Curran et al., 2020).

In creative fields, AI has also ignited significant debate, particularly in music. Even though AI has simplified processes and helped musicians of all skill levels in tasks such as music composition or production, its capabilities in music generation have sparked controversy among artists, listeners, and producers. Music critics have already expressed their fear that AI-generated music might cheapen this art form and make human-generated music obsolete (Chu et al., 2022; Daily, 2023). Musical artists, like Stevie Wonder, Billie Eilish, Katy Perry, have expressed their discontent regarding AI covers, featuring on an open letter calling on artificial intelligence tech companies and digital platforms to stop using AI "to infringe upon and devalue the rights of human artists." (Mouriquand, 2024). Others, like John Legend and Grimes, have expressed they embrace AI but with the rightful copyright laws in place and fairness (Daily, 2023).

Building on these insights, it is possible to hypothesize that this fearful view of AI's advancements may be clouding listeners' judgements on music partially generated by AI. For this reason, the following hypothesis is proposed:

H4 – The fear of AI surpassing human intelligence contributes to the manifestation of the AI Listener Bias

2.3.5. Ethical Concerns

As previously mentioned, AI's capabilities in producing creative outputs that are undistinguishable from human-made ones are increasingly improving. While this can be a very positive development for AI-generated music, leading to a more natural and cohesive sound, it also raises some important ethical concerns regarding the creation of

deepfakes. Deepfakes are generations of images, illustrations, text, audio and music, typically used maliciously or to spread false information. As AI technology continues to evolve, the creation of false statements, fake images and videos, and other deceiving content, are getting better in quality and more convincing. This practice is extremely unethical and dangerous, and creates fear among artists and also listeners, who may not be able to realize they are experiencing fake content (Jaiman, 2020).

Ethical concerns regarding AI covers also center in the usual lack of consent from the artists involved. Many times, artist don't have prior knowledge that their voice and style are being used in other songs, or that their own songs are being reinterpreted by different voices. This creates issues around the fact that artists may not want to be associated with a certain song, with a specific genre, or they may simply be against the artificial use of their voice. Moreover, current laws regarding the ownership of creative outputs are outdated in light of this new technology and do not provide exact guidelines for copyrights and royalty distribution when AI is involved. AI covers still have some difficulty getting around copyright laws as they use human compositions and mimic artists voices, many times resulting in these creations being removed from the internet if they don't comply with the law. However, compositions fully generated by AI fall into a grey area. Although the final composition is completely generated by AI, the model had to be trained using a database of human-created songs, making it difficult to assign clear ownership and often resulting in unfair distribution of credit and royalties (Pigna, 2024; Drott, 2020).

To address these concerns, it is essential to update and clarify copyright laws to ensure artists receive the rightful credit and royalties and ensuring the unique contributions of human intellect, skill, labor, and judgment are valued. Additionally, there needs to be transparency in the creation process by always identifying the part AI took in a specific creation.

All of these issues lead to skepticism and hesitation among listeners, who may question every time they hear an AI cover if its respecting copyright laws and intellectual property rights. This uncertainty might influence their perception on AI-generated covers and can possibly contribute to the AI Listener Bias. Therefore, the following hypothesis is proposed:

H5: The perception that AI covers are unethical contributes to the manifestation of the AI Listener Bias

2.4. Age Differences in Perceptions Toward Music Partially Generated by AI

Examining public perceptions of AI reveals significant generational differences in openness and acceptance toward this technology. Generation Z, born between 1997 to 2012, grew alongside technology in a digital age, having witnessed rapid advancements in this area from early ages. This exposure inevitably shaped their learning preferences, communication styles and expectations regarding technology use (Chan & Lee, 2023). Concerning specially AI, this generation has shown to be more receptive compared to the older generations. Young adults from the age of 18 to 25 exhibited a weekly adoption rate of about 75% in 2023 (Statista, 2024). Additionally, around half of Gen Z and Millennials (born from 1981 to 1996) believe that AI creations based on prompts provided by humans (e.g. text-to-image creations) can be considered art. Whereas only 17% of “Boomers” (born from 1946 to 1964) share this view. Moreover, more than two-thirds of Gen Z and Millennials predict that AI-generated art will continue to gain importance, surpassing human-made creations. These findings indicate that younger generations – Gen Z and Millennials, having grown up with this technology, are generally more open and receptive to AI comparing to older generations such as Gen X and Boomers (Pastis, 2023).

However, despite this openness, younger generations still have concerns regarding AI. While 34% of Gen Z and Millennials describe themselves as “excited” and “hopeful” about the future of AI, 31% described themselves as “worried”. In the older generations, this concern is more accentuated, with 53% of Gen X and Boomers describing themselves as “worried” and only 17% as “excited”. The main concerns stated by the respondents focused on the spread of misinformation, the erosion of trust in digital content and mass unemployment. Therefore, it is possible to conclude that younger generations are generally less fearful of AI and more enthusiastic about its potential, whereas older generations are generally more skeptical and concerned (Pastis, 2023). Based on this information, the following hypothesis was formulated aiming to understand if the level of openness to AI in differences generations impacts the AI Listener Bias and strengthens the factors that contribute to it:

H6: Older generations perceive the factors contributing toward the AI Listener Bias more intensely

3. Research Methodology

3.1. Qualitative Data

3.1.1. Research Design

Collecting qualitative data is essential to gather experiences, attitudes and behaviors that can be difficult to quantify (Tenny et al., 2022). In this study, in-depth interviews were selected as the qualitative method to collect deeper insights into the AI Listener Bias and listeners' perceptions toward AI covers. The interviews were designed to explore interviewees' observations about the factors that possibly contribute to the AI Listener Bias and investigate generational differences in these perceptions. Additionally, a listening test was incorporated into the interview to examine participants' ability to detect AI covers and how the evaluations of these songs changed if participants believed they were AI covers or human-created songs. The aim of the data collection was to explore the research questions in detail and potentially refine the study's hypothesis.

3.1.2. Data Collection Process

The interview process started by selecting participants from various age groups to examine generational differences in perceptions, in line with the study of hypothesis six. A total of eight interviews were conducted, seven of which were conducted face-to-face to ensure maximum accuracy. One interview could not be performed in person, and as a result, the listening test was not executed, due to the inability to control the sound quality. However, the insights gathered from the other sections of this interview were valuable for the study, therefore the decision was made to include it. Each interview lasted approximately 20 minutes and started by collecting demographic information and respondents' music listening frequency. The first section explored listeners' acquaintance with AI covers, their views on AI creativity, concerns regarding the future of AI, and any ethical considerations, thus further studying hypothesis two, four and five respectively.

The second section of the interview, the listening test, used audio stimuli designed to analyze the specific characteristics of AI covers. Participants were presented with nine 30-second excerpts from Pop songs. These contained a mix of human-created songs (five excerpts) including original covers, and high-quality AI covers (four excerpts) selected from YouTube. The human-created excerpts were selected to represent diverse sounds and styles, ones more acoustic while others with a bigger production. After each listen,

respondents were asked if they believed the excerpt was partially generated by AI or human-created, as well as their thoughts on the emotional resonance of the song and the quality of the sound – gathering insights to further explore hypothesis one and three. The purpose of this test was not to confirm the AI Listener Bias, as the sample is too limited to collect accurate conclusions. The aim was rather to explore how participants' perceptions changed whether they believed the excerpt were performed by human artists or were artificial creations. The test also allowed to understand if exposure to high-quality AI covers affects participants' perceptions and if their pre-expectations about songs partially generated by AI matched the excerpts they listened to. The last section focused on respondents' reflections after listening to all excerpts, understanding if they were surprised by their ability or inability to distinguish AI from human vocals and explore if their overall perception of AI covers changed. Participants were also given the chance to share additional comments at the end.

3.2. Quantitative Data

3.2.1. Research Design

Building on the insights gained from the qualitative research, a quantitative study was conducted through an online survey to further deepen the analysis. This phase of the research focuses on collecting numerical data, applying statistical methods to test hypotheses and identify statistical trends or relationships among variables (Henline-Hall, 2024). This approach allows for the validation or rejection of the hypothesis proposed and aims to find answers for the research questions.

3.2.2. Data Collection Process

The online survey was carefully designed using Qualtrics and open to collect responses from November 25th to November 30th. It was distributed through friends, family and social media, taking approximately three minutes to complete. To ensure insights were gathered only from the Portuguese population, the survey included an initial screening question excluding participants whose nationality was not Portuguese. The survey was initially written and designed in English, then carefully translated to Portuguese, allowing participants to respond in the language they preferred. This approach aimed at gathering

the most accurate and inclusive results by accommodating participants that may struggle to respond in English.

The questionnaire began by explaining the concept of AI covers, providing an example, to ensure all participants had a clear understanding of this technology. Next, it explored participants familiarity with AI covers and the frequency with which they encounter this music online. Following that, opinion-based questions using a Likert scale ranging from Strongly disagree (1) to Strongly agree (7) were used to explore openness to listen to AI covers, indications of AI Listener Bias, and the potential factors that contribute to the manifestation of this bias. The survey concluded with a demographic section that collected information on age, gender, occupation, monthly income, and music listening frequency.

4. Research Results

4.1. In-depth Interviews

Starting by focusing on perceptions regarding artificial intelligence, the interviews allowed to confirm the dichotomy that forms around this technology, as mentioned before in the literature review. While some respondents are open and excited to embrace AI in their lives, others report fear and concern. The belief that AI can be creative goes alongside this openness, with most respondents that reported positive sentiments toward artificial intelligence also responding they believe AI can generate creative outputs. However, three Gen Z participants that considered AI as an interesting and promising technology, stated they don't consider AI creative, or they don't think AI can generate outputs as creative as human ones, as it is a blend and reconstruct of ideas that humans already had. Moving further in the interview, as to be expected, the participants that showed less openness to AI and considered it as unable to be creative were the ones who reported more fear towards the future of AI. Both participants from generation X reported a strong fear against AI with concerns that the technology might "get out of control", steal jobs from humans and even "take control of everything and rule us". In contrast, interviewees from younger generations reported minimal concerns, but some emphasized the importance of regulations and boundaries previously defined by humans to ensure AI advancements are controlled.

Regarding AI covers, most participants were familiar with the technology and reported they occasionally encounter these songs on social media platforms such as TikTok, Facebook and Instagram. Most participants consider this technology interesting and full of potential, with only one Gen X respondent considering this technology unsettling.

Additionally, almost all respondents reported they would be open to listen to an AI cover in their day-to-day if they considered the song high quality and enjoyed the song or artist, including the respondent that considered it unsettling. Only one Gen X participant stated they would never listen to an AI cover, aligning with its strong belief against AI creations throughout the interview. Ethical concerns were surprisingly minimal among interviewees, with only two participants acknowledging potential ethical issues regarding copyright laws and lack of consent from artists, but confessing these concerns would not stop them from listening to music partially generated by AI. Another participant expressed ethical concerns around individuals that take advantage of deceased artists work for profit.

In this first section there is a clear distinction between the younger and older generation, with exception to the respondent from the Boomer generation (R5), which answers mostly aligned with an openness and interest towards AI, as contrary to be expected. Nevertheless, it is clear that the younger generations showed more openness and excitement toward AI creations comparing to the older generation, thus helping support hypothesis 6.

Transitioning to the listening section, it allowed to gather valuable insight for this study. First, all participants struggled in distinguishing the human created excerpts and the excerpts partially generated by AI, with most of them considering it more difficult than they anticipated. Regarding emotional depth across different excerpts, participants usually considered the music and voice able to connect emotionally with listeners. The pieces considered less capable of evoking emotions were almost every time the ones interviewees believed were AI, even when this belief was incorrect. For example, participant R8 considered the two tracks he believed were AI as unable to connect emotionally with listeners, however from those two tracks only one was actually generated by artificial intelligence. The belief that the excerpt was partially generated by AI caused the respondent to perceive it as lacking emotional depth, supporting hypothesis 1. One participant even admitted that, unconsciously, when they start to think it is an excerpt created by AI they immediately disconnect emotionally. In terms of the quality of the sound, the same thing happens. The excerpts listeners believe as AI-generated are sometimes associated with a computerized, fake or unnatural sound, even though some of them are human-created. Participant R6, in the four excerpts he believed were AI, he considered the sound very artificial and the music unable to create emotional resonance, even though two excerpts were from human artists. The other 5 he believed to be from human artists, were evaluated with good sound, emotional resonance and authenticity in the voice, even though two out of the five were AI-generated. This evaluation indicates the possibility of the AI Listener Bias, as the songs R6 believed as partially created by AI were immediately ranked worse in all parameters than the songs he believed were human created.

Overall, after performing the listening test, participants reported a change in perception of AI covers as they predicted they would be worse quality and easier to detect as AI-made. One participant additionally stated the test provoked fear in him of being deceived in the future by AI covers that are not identified as AI-generated, as he didn't think he would have this much difficulty in distinguishing them.

4.2. Survey Analysis

4.2.1. Sample Demographics and Characteristics

Sample Demographics

The survey collected 203 responses from which 174 were taken into account in the study. The data cleaning and validation process involved eliminating 29 unfinished answers and 2 responses from individuals that weren't Portuguese. It is important to note that the distribution of the survey was achieved by a non-probability convenience sampling, possibly inducing in a sampling bias. Additionally, the survey is susceptible to response bias, which could further influence the accuracy of the results (Qualtrics, 2022).

Age Groups	Frequency	Percentage
12 - 20	19	11%
21 - 27	69	40.1%
28 - 35	3	1.7%
36 - 43	7	4.1%
44 - 51	19	11%
52 - 59	38	22.1%
60 - 68	11	6.4%
69 - 78	4	2.3%
More than 79	2	1.2%

Table 1 – Age Groups Frequencies

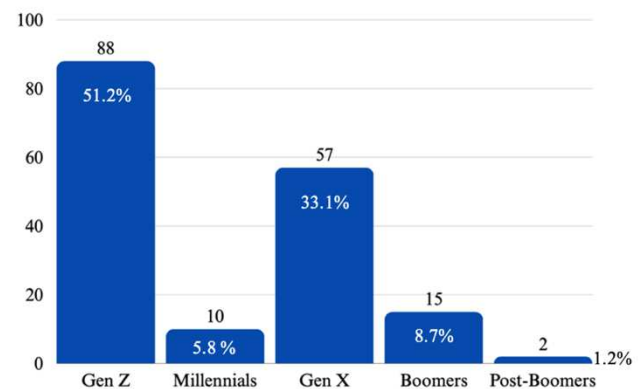


Figure 1 – Generation Frequencies

Table 1 above shows the age groups from the participants of the questionnaire. The most common age group was 21- to 27-year-olds representing 40.1% of the sample, followed by 52- to 59-year-olds accounting for 22.1% of the sample. The age groups were categorized into generations in order to simplify the analysis conducted later on (Figure 1). The largest represented generation is Gen Z making up 51.2% of the sample, followed by Gen X at 33.1%. By observing the distribution amongst age groups, it is evident that this distribution is not accurately representative of the population, as Millennials and Boomers are underrepresented. This disparity may have happened due to the difficulty of reaching Millennials and the survey being conducted online, which likely limited accessibility for Boomers due to the lower access and adoption to technology compared

to the other generations. As a result, it is important to acknowledge that the results may incur in some inaccuracies due to this limitation.

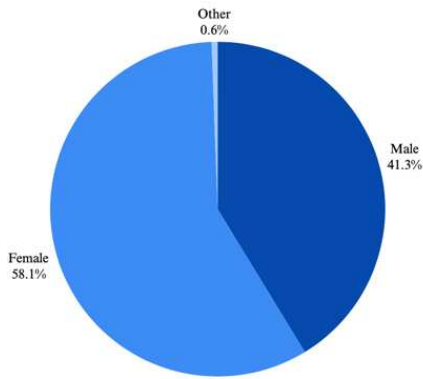


Figure 2 – Gender Distribution

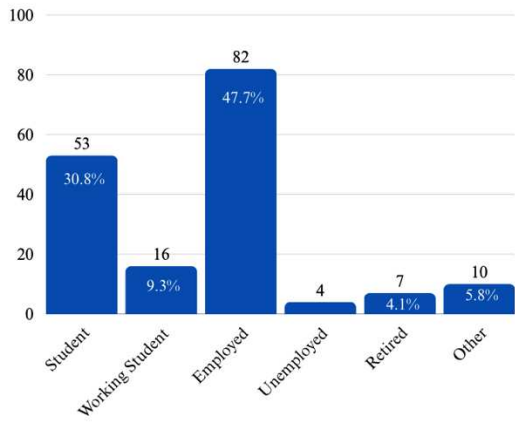


Figure 3 – Occupation Frequencies

Concerning gender distribution (Figure 2), 58.1% of respondents identified as female, 41.3% as male and 1% as non-binary.

Regarding participants occupation (Figure 3), the most predominant is “Employed”, accounting for 47.7% of the sample and “Student”, representing 30.8% of the sample. The remaining participants indicated their occupation as “Working student”, “Unemployed” or “Retired” with 16, 4 and 7 answers respectively. The 10 respondents that selected the option “Other” reported jobs such as housewife, entrepreneur and plastic artist.

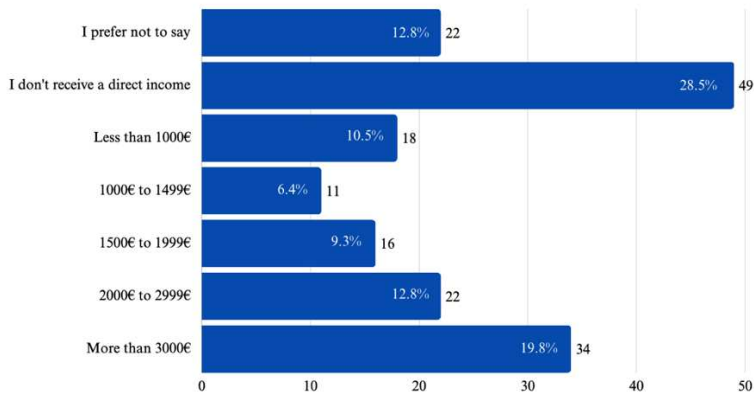


Figure 4 – Monthly Income Frequencies

Figure 4 demonstrates the monthly income of participants before taxes. The majority of respondents don’t receive a direct income, accounting for 28.5% of the sample. This

information aligns with the fact that 30.8% of the respondents are students. The next most common category was “More than 3000€” accounting for 19.8% of the sample. After collecting this information, it is necessary to acknowledge that the survey could have included more detailed income categories, above 3000€, to provide a better understanding of the income distribution. The categories that followed were “I prefer not to say” and “2000€ to 2999€” both accounting for 12.8% of the sample. The remaining categories, “Less than 1000€”, “1500€ to 1999€” and “1000€ to 1499€” represented 10.5%, 9.3% and 6.4% of the answers respectively.

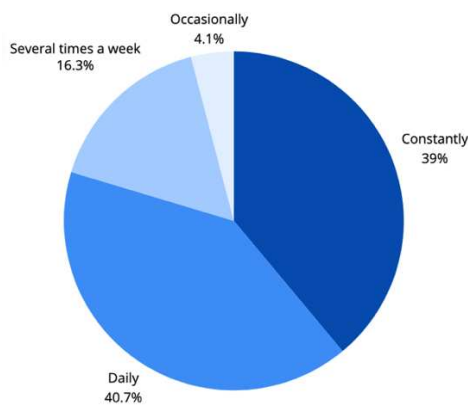


Figure 5 – Frequency of Music Listening Distribution

In the demographics section, an additional question was included to assess how frequently participants listen to music for pleasure (Figure 5). The majority of participants, 40.7%, reported they listen to music daily, followed closely by 39% who report they listen to music constantly. Furthermore, 16.3% of participants stated they listen to music several times a week and 4.1% listen occasionally. The question also had the options “Rarely” and “Never”, however there were no participants selecting those options. This data supports the information gathered in the literature review, as many participants consider music a central part of their lives and identities, being present constantly or daily in their lives.

Sample characteristics

In the following section, the survey explored the familiarity of participants with the concept of AI covers, allowing to understand if this new technology is already recognized by listeners (Appendix 6.2.2. – Figure 6). The responses revealed 46 participants, representing 26.7% of the sample, weren’t at all familiar with this technology. Moreover,

32% and 27.3% of the respondents stated they were “Slightly familiar” and “Familiar” with this concept, respectively. Lastly, 24 participants, accounting for 14% of the sample, answered they were very familiar with AI covers. When asked about the frequency of encountering AI covers online / social media (Appendix 6.2.2. – Figure 7), 20.9% of participants stated they never encounter them and 30.8% rarely. Additionally, 30.2% of participants indicated they encounter AI covers occasionally and 14.5% noted they encounter them frequently. Notably, 6 respondents, accounting for 3.5% of the sample, answered with “Very frequently”.

In order to understand the relation between familiarity with AI covers and the frequency with which participants encounter them online, a crosstabulation was performed in SPSS, providing insights into the patterns observed (Appendix 6.2.2. – Figure 8).

For instance, among participants who reported being not at all familiar with AI covers, 54.3% never see them online and 39.1% rarely. Similarly, the majority of the participants that reported being slightly familiar with AI covers (45.5%) rarely encounter them online. In contrast, participants who described themselves as familiar with AI covers tend to spot them online more frequently, with 46.8% of them stating they occasionally encounter them online and 31.9% frequently. The participants who indicated they are very familiar with AI covers, 37.5% encounter them occasionally, 37.5% frequently and 20.8% very frequently. Notably, from the 6 respondents that selected they see AI covers very frequently, 5 state they are very familiar with the concept. This analysis suggests a strong relationship between familiarity with AI covers and the frequency of exposure to these songs online, as to be expected. It indicates that participants consider themselves more familiar with the concept when they have more contact with AI covers online.

4.2.2. Statistical Analysis and Hypothesis Validation

As explained before, this research is based on the assumption that the human bias against AI covers –AI Listener bias – exists. This assumption is grounded in prior research that has demonstrated the presence of this human bias when AI engages in creative fields and specifically in music creation. In this thesis, the focus is to understand what are the factors that contribute to the AI Listener Bias and which of these factors influence it more strongly. In order to study these factors, it is necessary to measure the bias. Ideally an experiment with the use of audio stimuli would be the most accurate data collection method. However, it is not feasible to conduct such a complex analysis within the

available timeframe and resources. For this reason, two questions were carefully designed to measure the AI Listener bias, using a Likert scale approach. The first question focuses on measuring the openness to listen to AI covers that participants express. This variable is based on recent research on openness to AI-generated art that concluded that individuals high in openness exhibit a reduced negative bias toward AI in creative fields. The findings suggest that individuals who exhibit more openness are more receptive to novel forms of creativity using AI (Grassini & Koivisto, 2024). This way, the variable “openness to listen” was measured with a Likert-scale from Strongly disagree (1) to Strongly agree (7) where lower scores indicated less openness to listen and consequently indicated a stronger bias against AI covers. The second question asked participants to rate the statement: “I would enjoy more a song if I believed it was created only by human artists rather than partially generated by AI” using the same Likert-scale described above. This question intended to ask participants about the AI Listener Bias more directly, however, it has some limitations as most times humans aren’t aware of their biases or are reluctant to admit them, which means that asking it directly may lead to some inaccuracies. A higher score from this variable indicates a stronger preference for a song believed to be human created rather than partially generated by AI, and consequently a higher bias score.

The first step in the analysis was to compute these two variables into a single one titled “AI_Listener_Bias” to have a variable that measures the AI Listener Bias. In order to converge these variables, “Openness to listen” had to be reversed so that the direction of scores was the same of the variable “Preference for human created songs”. Currently, lower score in “Openness to listen” indicated stronger bias, but with the reversed variable, higher score indicates stronger bias, the same way higher score in “Preference for human created songs” indicates stronger bias. Next, the variable “AI_Listener_Bias” was computed through the average of both variables.

The descriptive statistics of “AI_Listener_Bias” indicated participants are strongly biased against AI. The mean revealed to be 5.1 which indicates respondents score relatively high in this bias. The frequencies allow to visualize 73.3% of the participants are biased as they score 4.5 and above (Appendix 6.2.2. – Figure 9).

Continuing with the analysis, the descriptive statistics of the potential factors that contribute to the AI Listener Bias were examined:

“Emotional Depth”

The variable “Emotional depth” measured the participants belief that AI covers lack emotional depth. The mean was 4.75, suggesting a tendency among participants to agree that AI covers lack emotional depth. Notably, this variable had the highest mean comparing with the remaining variables, with 55.2% of the sample selecting agreement options (5, 6, 7), while only 21.5% selecting disagreements options (1, 2, 3). However, 40 participants representing 23.3% of the sample selected the option “Neither agree nor disagree”, indicating that a significant proportion of respondents don’t have a formulated opinion. This could happen either by lack of familiarity with the concept of AI covers or simply because participants haven’t reflected on this topic yet (Appendix 6.2.2. – Figure 10).

“Ability to be creative”

The variable “Ability to be creative” measured the belief that AI-generated content is incapable of being creative. The mean was 3.26 which is surprising, as it signifies participants tend to disagree that AI cannot be creative. A significant 60% of participants responded with disagreements options, indicating they believe AI can be creative, while only 19.7% selected agreement options (Appendix 6.2.2. – Figure 11).

“Unnatural sound”

The variable “Unnatural sound” measured the belief that AI covers sound unnatural or computerized. The mean was 4.46 showing participants tend to agree with this perception. Almost half of participants (49,9%) selected agreement options, primarily “Somewhat agree” and “Agree”, both representing 20.3% of the sample. Additionally, 21.5% of participants selected “Neither agree nor disagree”, while 28,5% selected disagreement options, mainly “Somewhat disagree” (Appendix 6.2.2. – Figure 12).

“Fear”

The variable “Fear” measured the fear participants have of artificial intelligence surpassing human intelligence. The mean was 4.19, reflecting a dispersed and possibly polarized sample. Notably, “Fear” was the variable with fewest participants selecting the option “Neither agree nor disagree”, representing only 7.6% of the sample. This low percentage shows most participants have a well formulated opinion on the topic, but the opinions are divided amongst respondents. Nevertheless, a bigger percentage of

participants falls in the agreement options, amounting to 52,3% of the sample, as opposed to 40.1% of participants that selected disagreement options. This information further illustrated the polarization in perceptions of AI mentioned through the thesis (Appendix 6.2.2. – Figure 13).

“Ethics”

Finally, the variable “Ethics” measured the belief that AI covers are unethical. The mean was 4.37, reflecting a general tendency to agree with this statement. Among the participants, 52.9% selected agreement options, while 16.9% chose "Neither agree nor disagree," and 30.2% chose disagreement options (Appendix 6.2.2. – Figure 14).

After examining the variables studied in the survey, a detailed analysis was performed aiming to validate the hypothesis and consequently answer the research questions.

Correlation Analysis

The first analysis conducted was a correlation analysis in order to determine if there is a relationship between the variable “AI_Listener_Bias” and the variables that represent the factors that possibility contribute to the AI Listener Bias. And additionally measure the strength of the relationship (Appendix 6.2.2. – Figure 15).

Starting with “Emotional depth” this variable revealed a moderate positive correlation of 0.270 with “AI_Listener_Bias”, indicating that as the belief that AI lacks emotional depth increases, so does the human bias against AI covers. This variable is significantly statistic as its p-value is below 0.05. This correlation supports H1, as the perceived lack of emotional depth in music partially generated by AI contributes to bias against such music. Moving on to the variable “Ability to be creative”, the correlation is weaker but still positive and statistically significant with a p-value below 0.05. The correlation is 0.219 and indicates that respondents who agree that AI is unable to be creative demonstrate a higher bias against AI covers. As this relationship is relatively weak, a linear regression was conducted in order to understand if “Ability to be creative” can help predict the bias against AI covers (Appendix 6.2.2. – Figure 16). The linear regression revealed an R squared of 0.048, meaning this variable only explains 4.8% of the variance of the “AI_Listener_Bias”. The model is significant presenting a p-value below 0.05 and a standardized beta of 0.219 meaning that for one unit increase of this variable, “AI_Listener_Bias” increases by 0.219 units. This model is also somewhat weak,

however it is significant, as the correlations also were. This way, it can be concluded that H2 is validated as creativity perceptions play a role in shaping the bias against AI covers, even though not as strongly as “Emotional depth”.

“Unnatural sound” reveals the highest correlation among all variables, with a positive correlation of 0.281. This correlation is statistically significant as its p-value is below 0.05. This signifies that as listeners perceive music partially generated by AI as sounding unnatural or computerized, their bias against AI covers increases. These findings support H3. “Fear” was the only variable that revealed a p-value above the significance level, 0.05, meaning the correlation with the bias against AI covers is not significant. This suggests there is no meaningful relationship between the fear of AI surpassing humans and the negative listener bias. Therefore, H4 is rejected. The variable “Ethics” revealed a positive significant correlation of 0.218, which is somewhat low and indicates the relationship is weak. However, this relationship is statistically significant, as its p-value is below 0.05 concluding that as individuals perceive AI covers as unethical, their bias against AI music slightly increases. Similarly to the variable “Ability to be creative” that also had a low correlation, a linear regression was conducted in order to validate the hypothesis more accurately (Appendix 6.2.2. – Figure 17). The regression revealed “Ethics” explains 4.7% of the variance in “AI_Listener_Bias”, which is a small but statistically significant effect, as the p-value is below 0.05. This confirms that “Ethics” is a meaningful predictor of AI_Listener_Bias. The standardized beta is 0.218, meaning that for every one unit increase in “Ethics”, the listener bias increases by 0.218. This way, it is possible to conclude that H5 is supported, as “Ethics” has a small but significant effect on the bias against AI covers, contributing to the AI Listener Bias.

The correlation analysis allowed to validate Hypotheses H1, H2, H3, and H5, confirming what are the main factors that contribute to the AI Listener Bias. Building on this, it is now important to understand which of these factors contribute more strongly to the bias. The analysis above studied the individual relationships between each factor and the bias, not allowing to assess the relative strength of each predictor within the context of the others. For this reason, a multiple regression analysis was conducted to examine the relationships between the independent variables – “Emotional depth”, “Ability to be creative”, “Unnatural sound”, “Fear” and “Ethics” and the dependent variable “AI_Listener_Bias” simultaneously. This allows to understand which factors have the strongest influence on the AI Listener Bias when considered together.

Regression Analysis

The multiple regression analysis revealed an R square of 0.130, which means that the independent variables of the model explain 13% of the variance of the dependent variable “AI_Listener_Bias”. The model is statistically significant as a whole, with a p-value below 0.05, meaning that at least one of the predictors contributes to explaining the variance in “AI_Listener_Bias”. The coefficients table reveal that the only statistically significant predictor is “Emotional depth” at the significance level of 0.05. “Emotional depth” has a standardized coefficient of 0.163 which indicates that as participants perceive AI covers as lacking emotional depth, their bias against AI music increases. “Ability to be creative”, even though it is not statistically significant at the level analyzed, its p-value is very close at 0.074, which might indicate this variable could be a predictor as well. The standardized coefficient of 0.151 indicates that as perceptions of AI covers sounding unnatural or computerized increase, the bias against AI increases (Appendix 6.2.2. – Figure 18).

After looking at these results it was decided to conduct the analysis again but this time using the stepwise method (Appendix 6.2.2. – Figure 19). The stepwise method is a more robust method as it adds and removes predictors as it is building the model, in order to avoid the interference of predictors that aren’t significant (Wormuth, 2024).

The stepwise analysis starts with Model 1 using “Unnatural sound” as the only predictor. This model is statistically significant and reveals an R square of 0.079, meaning “Unnatural sound” alone explains 7.9% of the variance in “AI_Listener_Bias”. The second and final model, adds the variable “Emotional depth” which improves the R square to 0.109, meaning that this model explains 10.9% of the variance of “AI_Listener_Bias”. This model is statistically significant with a p-value below 0.05. Observing the standardized coefficients in the model, “Unnatural sound” shows a coefficient of 0.205 and “Emotional depth” 0.189. This indicates that believing AI covers have an unnatural sound and lack emotional depth, increases the human bias against these covers. “Unnatural sound”, even though its strength decreases slightly after adding “Emotional depth”, is the strongest predictor.

A collinearity diagnosis was also performed in order to ensure these results can be analyzed confidently. The tolerance values are above 0.4 and well as the VIF values are below 2.5. Additionally, the Condition Index values are below 15, which indicates there are no concerns regarding multicollinearity in this analysis.

Age Group Analysis

Proceeding, an age group analysis was performed in order to understand how perceptions of the factors that possibly contribute to the AI Listener Bias change from the younger to older generations, therefore studying hypothesis 6.

Factor	Generation	Mean	Std. Deviation	N
Emotional depth	Younger	5.19	1.558	98
	Older	4.16	1.424	74
Ability to be creative	Younger	3.34	1.579	98
	Older	3.16	1.434	74
Unnatural sound	Younger	4.86	1.533	98
	Older	3.93	1.437	74
Fear	Younger	4.36	1.933	98
	Older	3.96	1.905	74
Ethics	Younger	4.50	1.542	98
	Older	4.20	1.452	74
AI_Listener_Bias	Younger	5.32	1.257	98
	Older	4.82	1.458	74

Table 2 – Descriptive Statistic Frequencies divided in Younger and Older Generations

To study the hypothesis, an additional variable titled “generation2” was computed to separate participants into younger generation and older generation. The younger generation englobed Gen Z and Millennials and represented 57% of the sample, while the older generation comprised Gen x, Boomers and Post-boomers, representing 43% of the sample. The analysis began with observing the descriptive statistics of the variables in both groups (Table 2). The information observed was surprising as the older generation demonstrated in every variable a lower mean score than younger generation. This indicates that, overall, the younger generation tend to agree more with the negative perceptions concerning AI covers and artificial intelligence in general. Also, the variable “AI_Listener_Bias”, that intends to measure the bias against AI covers, has a significantly higher mean score for younger generations (5.32) than older generations (4.82).

To further investigate these findings and determine if the observed differences between younger and older generations are meaningful, an independent samples t-test was conducted. This test will assess whether the differences in mean scores for

AI_Listener_Bias and its contributing factors are statistically significant between the two groups (Appendix 6.2.2. – Figure 20).

After conducting the analysis, Levene's test for equality of variances confirmed homogeneity of variances for all variables, showing p-values above 0.05, and allowing to further interpret the t-values and p-values confidently. "Emotional depth" showed a p-value of < 0.001 , meaning it is statistically significant and indicating a significant difference between younger and older generations. However, contrary to expectations, younger generations (mean = 5.19) believe AI covers lack emotional depth more strongly than older generations (mean = 4.16). Similarly, "Unnatural sound" showed a p-value of < 0.001 , meaning that there is a significant difference between generations. But again, younger generations (mean = 4.86) perceive AI music as more unnatural than older generations (mean = 3.93). "AI_Listener_Bias", the variable created especially to measure the bias against AI covers, also revealed a p-value of 0,01, meaning it is statistically significant. This indicates that there is a significant difference between the younger and older generations, as the younger generation has a mean score of 5.32 and the older generations a mean of 4.82. The remaining variables "Ability to be creative", "Fear" and "Ethics" aren't statistically significant as their p-value are above 0.05. This indicates that both groups express similar beliefs about AI's creative abilities, levels of fear against artificial intelligence and ethical concerns about AI covers.

Based on these findings, H6 is rejected. Older generations do not perceive the factors "Emotional depth" and "Unnatural sound" and also the variable "AI_Listener_Bias" more strongly than the younger generations, as a matter of fact the younger generations are the one perceiving the studied factors more intensely. For the remaining factors, the mean differences are not significant, showing there are no generational differences in these factors, and further supporting the rejection of H6.

5. Discussion

5.1. Results

After conducting in-depth interviews and an online survey, which were then carefully analyzed, it is now possible to answer to the Research Questions:

RQ1: What are the main factors that contribute to the human bias against music partially generated by AI?

The qualitative findings mostly aligned with the literature review and the proposed hypothesis. The only contradiction revealed in the interviews centered around ethical concerns. When participants were asked about their views on ethical issues surrounding AI covers, such as copyright violations or lack of consent from human artists, only three participants expressed concerns. These findings do not strongly support hypothesis 5 as participants didn't express strong ethical concerns regarding AI covers. Nevertheless, in order to validate or reject this hypothesis quantitative data is required, as ethical concerns could still play a role in the human bias against AI covers even if the interviewees didn't explicitly mention them.

The quantitative data allowed to validate hypothesis H1, H2, H3 and H5 through a correlation and linear regression analysis. The findings revealed that believing an AI cover lacks emotional depth; believing AI is unable to be creative; believing AI covers have an unnatural sound; believing AI covers are unethical, all contribute to the human bias against music partially generated by AI, the AI Listener Bias.

RQ2: What are the factors that contribute more strongly to the human bias against music partially generated by AI?

To address RQ2, a multiple regression analysis was conducted, allowing to determine which factors have the strongest contribution to the AI Listener Bias when considered together. The results revealed that the belief that AI covers sound unnatural is the most significant factor contributing to AI Listener Bias, followed by the belief that AI covers lacks emotional depth. These two perceptions were identified as the strongest contributors to the manifestation of the bias.

RQ3: How do perceptions of music partially generated by AI differ among generations?

In the qualitative data analysis, there was a clear distinction in perceptions from the younger generation and the older generation participants, apart from one Boomer participant which perceptions aligned with the younger generation views. Younger participants showed to be more open to artificial intelligence, expressing less fear and more excitement toward AI covers, while the older generation participants expressed more cautious and skeptical views. Taking this into consideration, alongside with the literature review, it was surprising that the quantitative analysis revealed the opposite trend: older generations expressed less bias toward AI covers, compared to the younger generation. As a matter of fact, the younger generation perceived every factor that possibility contributes to the bias more strongly than the older generation. These findings rejected hypothesis H6 that proposed “Older generations perceive the factors contributing towards the AI Listener Bias more intensely”. Focusing on the research question, the perceptions of music partially generated by AI do differ among age groups, as the younger generation revealed they perceive factors such as believing AI covers lack emotional depth and believing AI covers have an unnatural sound more strongly than the older generation. And regarding the AI Listener Bias, younger generations expressed a higher overall bias than older generations.

5.2. Managerial Implications

The unpredictability of this technology’s future makes it difficult to offer managerial implications with certainty. Taking this into consideration, the recommendations offered will be based on the current landscape of AI covers aiming to address the key beliefs that contribute to the AI Listener Bias.

The belief that AI covers have an unnatural or computerized sound is the strongest factor contributing to the AI Listener Bias. This may stem from the fact that most individuals contact with AI covers is online, where most of these songs are low-quality covers created by amateurs using free platforms that offer rapid conversions, possibly distorting their perception. In order to address this issue, it is important that listeners have more contact and frequent encounter with high quality AI covers that involve skill and time. For this reason, the creators of such AI covers should focus on uploading their work to streaming platforms while always ensuring compliance with copyright rules, so that the songs aren’t

taken down. By increasing the visibility of these high-quality AI covers, listeners may start to change perceptions regarding their beliefs on music partially generated by AI sounding unnatural.

To reduce the perception that AI covers are unethical, it is important to address issues surrounding copyright laws and lack of consent by artists. A way of tackling these issues could be achieved by creating partnerships between AI music creation platforms and artists or rightsholders to ensure a fair royalty distribution and eliminate the concerns expressed above. Outside the music industry, it is already possible to see strategic partnerships between technology companies and rightsholders. For example, OpenAI is currently engaging in licensing agreements with media publishers, such as *The Financial Times* to use their content for AI training. In the music industry, similar collaborations that are already starting to emerge could be further developed (A&L Goodbody, 2024). For instance, the artist Grimes recently partnered with a digital musical distributor to allow the use of her voice in AI-generated music, agreeing to a 50% royalty split from any resulting songs. If AI music platforms and creators start to form these partnerships with artists, it will eliminate copyright problems and also reassure listeners that the process is transparent and fair (Pequeño, 2023).

Addressing the belief that AI covers lack emotional depth is more challenging, as many individuals struggle to accept that artificial intelligence may be able to evoke emotions in them. This belief alongside with the strong emotional connection many listeners have with music, results in a strong perception that AI covers lack emotional depth. One way to challenge this perception could be by creating an online platform that offers listening tests for individuals to detect whether a song is human created or AI-generated. In the interviews performed for this study, most participants stated their perceptions changed after they performed the listening test, as they believed they would be able to easily detect AI covers. With the listening test, most listeners realized they couldn't distinguish AI covers from originals by the feelings they evoked or by the quality of the sound. Creating an interactive platform, available to everyone, that would work almost as a game, could help listeners understand how their biases influence their perceptions in an engaging way. This strategy addresses not only the belief that AI covers lack emotional depth, but also the belief that AI covers have an unnatural sound.

The belief that AI is incapable of being creative can be tackled by showcasing how artists use AI as a tool to enhance and assist their work, rather than substituting human creativity. These days, several artists already use AI as a tool to help in the creative process, even if

listeners may not know. AI music creation platforms could show this process to listeners by partnering with different artists and create a behind-the-scenes documentary, a short-video, a livestream, or other creative content. Opening up about the use of AI in the music creative process could help individuals see the capabilities of AI in this industry and also see that many artists use AI as a creative tool and are transparent about it.

To conclude, a best practice example achieved by The Beatles, will be explored as it addresses the different factors at multiple levels. Decades after this well-known and loved band split, and two of its members passed away, a new song was released using the voice of the late John Lennon. The advancements in technology enabled the extraction and restoration of Lennon's voice from an old demo dated back to the 1980s. The song features the voices of Paul McCartney, Ringo Starr and vocals cleaned and finished by AI from George Harrison (taken from a 1995 recording) and John Lennon (taken from the original demo). The release included a music video that also used AI to combine old and new footage of the band, showing all four members singing next to each other. Initiatives like this one demonstrate how AI can achieve a natural and authentic sound, with Lennon's voice being indistinguishable from his bandmates. It evokes strong emotions as it reunites the iconic band "one last time", thus addressing perceptions that music partially generated by AI lack emotional depth. It also showcases how a project that uses the work of deceased artists can be ethical and transparent, as Lennon's son and George's widow granted permission and even contributed by sending old home videos to assist with the project (Cooper, 2023).

Even if this example doesn't center on AI covers, it is a song partially generated by AI, and it provides valuable insights for AI covers creators. Replicating such practices could help reduce listener biases and increase listeners acceptance.

5.3. Limitations and Future Research

Despite the valuable insights gathered, this study has several limitations that need to be considered when interpreting the findings. The main limitation lies in the lack of literature review on AI covers and the need to rely on an assumption as a foundation for the present study. AI covers are a technology that only surfaced recently, thus the existing research that gives evidence on the human bias against AI music is primarily focused on songs entirely generated by AI, and not partially generated, like AI covers. The novelty of this technology also introduces limitations concerning its unpredictable future. This study is

a snapshot of this point in time, however the rapid advancements in AI technology and potential updates in copyright laws that go alongside these advancements, may reduce the study's relevance in the long-term. Future research could address these gaps by studying AI covers more deeply and, with the right tools and a larger sample size, study the human bias in songs partially generated by AI. Additionally, future research could take on a longitudinal approach, being developed as laws are updated and new royalty systems are put in place.

In the quantitative research, the data collection method has limitations regarding the possibility of incurring in the sampling bias, as participants were gathered through a convenience method. Additionally, as mentioned before, the participants age group distribution is not representative of the Portuguese population, with Millennials and Boomers underrepresented in the sample compared to Gen Z and Gen X. This could lead to inaccurate results, specifically in the age group analysis. This way, it is important for future research to investigate generational differences with a more representative sample, in order to understand if the findings that indication younger generations are more biases, contradicting initial expectations, are accurate. Furthermore, this study also shows a significant limitation when measuring the human bias against AI. As explained in the methodology, audio stimuli would have been a more accurate method to measure the AI Listener Bias. However, practical constraints related to complexity, time, and resources, made it unfeasible. Additionally, under such circumstances, it would have been difficult to ensure all participants listened to the stimuli in consistent conditions, with the same sound clarity and attentiveness. This way, two questions were combined to measure the human bias against AI as accurately as possible. Nevertheless, bias is almost impossible to measure through direct questions, as individuals may be unaware they incur in this bias or don't like to admit it. For this reason, the variable "AI_Listener_Bias" may not fully capture the extent of this bias.

Lastly, the study intended to explore the perceptions of regular music listeners that consume music in their daily life for pleasure. Nonetheless, the study might have benefited from also collecting artists or industry stakeholders' perspectives to enrichen the findings providing a view from professionals in the area.

6. Appendix

6.1. Interview

6.1.1. Interview Script

Section 1

AI perceptions

- 1.1. What do you think about the recent rise of AI created art, for example paintings, poems or music?
- 1.2. Do you believe AI has the ability to be creative and generate outputs considered creative?
- 1.3. Do you have any fear regarding the future of AI?

AI cover perceptions

- 1.4. Have you ever heard about AI covers? If yes, could you elaborate on what you think of this technology?
- 1.5. Do you usually come across AI covers? If yes, where?
- 1.6. Do you feel like you would be open to listen to AI covers? Why?
- 1.7. Do you believe AI covers have any ethical problem, for example with copyright laws?

Section 2

Excerpt	Song	Type	Original Singer	Singer
Clip 1	Stardust	Original song	ZAYN	ZAYN
Clip 2	Video Games	Original cover	Lana del Rey	Conan Grey
Clip 3	Best of Joy	Original song	Michael Jackson	Michael Jackson
Clip 4	Worst of You	AI cover	Maisie Peters	Melanie Martinez
Clip 5	Cornflake Girl	Original cover	Tori Amos	Florence and the Machine
Clip 6	Goodbye	AI cover	Porches	Lorde
Clip 7	Guilty As Sin	AI cover	Taylor Swift	Lana del Rey
Clip 8	1980s Horror Film	Original song	Wallows	Wallows
Clip 9	Fake Plastic Trees	AI cover	Radiohead	Coldplay

Table 3 – Clips used on the “Listening test”

After listening to Clip X:

- 2.1. How do you feel after listening to this song? Do you believe it is AI? Why?

- 2.2. Do you think this excerpt is capable of evoking emotions in listeners? Can it create an emotional connection? Why?
- 2.3. What did you feel about the quality of the sound?

Section 3

- 3.1. After listening to the different clips do you feel certain of your choices or were there clips that made you ponder?
- 3.2. Did your perception of AI covers change in any way after listening to the excerpts?

→ Reveal of the excerpts that were human creations and AI creations

- 3.3. After knowing which excerpts were AI covers do you have any comment? Do you feel like they are better or worse than what you initially imagined?

6.1.2. Summary Interviews

Respondent	Age	Generation	Gender	Residency	Occupation	Music Listening Frequency
R1	22	Gen Z	Male	Cascais	Student - Economics	Daily
R2	54	Gen X	Female	Lisboa	Property Manager	Daily
R3	19	Gen Z	Male	Lisboa	Student - Arts	Constantly
R4	25	Gen Z	Female	Lisboa	Student - Medicine	Daily
R5	79	Boomer	Male	Oeiras	Retired - Engineer	Occasionally
R6	57	Gen X	Male	Lisboa	Architect	Constantly
R7	21	Gen Z	Female	Leiria	Student - Economics and Law	Daily
R8	25	Gen Z	Male	Loures	Consultant	Several times a week

Table 4 – Interview respondents demographics

Interview 1

R1 believes that AI creations are in line with the natural progression of artificial intelligence and will only continue to advance. In his view, AI is capable of being creative and generate creative outputs – however they may not be as creative as human works

since AI bases its creations in content that already exists. He is not afraid of AI's future if properly regulated. R1 sometimes encounters AI covers on platforms such as TikTok and Twitter. He believes it is a technology that was going to be created sooner or later and offers fans new ways to enjoy their favourite songs with endless variations. If he found an AI cover that he liked, he would consider listening to it on his daily basis.

In the listening test section, R1 only correctly identified one AI cover. In all excerpts he deemed the quality of the sound very good or even perfect and considered all of them had emotional depth. After listening to the excerpts, he expected it to be much easier to distinguish AI covers from original songs. He stated that if all the excerpts were playing in the radio, we would listen to them believing they were human. His perception changed as he believed that the covers would be worse quality, making him understand that this technology is more develop that he originally thought.

Interview 2

R2 does not keep up with the advancements of AI in artistic creations. She believes AI cannot be creative and has concerns regarding the future of this technology, believing that it can get out of control and take jobs from humans. She only heard an AI cover once on social media and finds this technology somewhat unsettling. Nevertheless, she would be open to listen to AI covers on a daily basis if she liked the songs and stated it could be fun to do so. In the listening section, R2 only correctly identified 1 excerpt as AI, saying the sound seems "to perfect". She considered all songs had exceptional sound and ability to connect emotionally with listeners. Even saying that one human created excerpt, and two AI cover excerpts aroused an emotional reaction on her. After listening, she considered the AI covers had a greater quality that she imaged previously.

Interview 3

R3 believes AI has the ability to create interesting works and projects in the artistic sector but he states that AI creations should be regulated, and the risks should be taken into account before further developments. He believes AI cannot be creative because it is "just a blend of ideas that humans already had". He has concerns regarding AI taking jobs from humans in creative areas, as he studies and plans to work in the artistic world. Nevertheless, he recognizes that the world is evolving towards the continuous advancements of AI. He occasionally comes across AI covers on social media (TikTok) and has even heard some that he enjoyed, but he acknowledges that it can be frustrating

for artists to have their voice mimicked without consent. He would consider listening to AI covers if the songs were to his liking and finds the idea interesting. He also stated that sometimes he feels “bad” listening to AI covers online due to ethical issues, but it doesn’t stop him from listening. R3 identified all AI excerpts, except 1 that he thought was from a human artist due to the emotion present in the voice. For the excerpts he correctly identified as AI, he considered the voice seemed unnatural and the transition of words was strange. The excerpts he correctly identified as human, he said that he could hear breathing, and stated he doesn’t think AI is capable of recreating breathing sounds yet. Overall, he was surprised with the quality of the sound, since he believed it would be worse in the AI covers, and it was very good in all excerpts. His perception changed as he was surprised with how indistinguishable the AI-generated and human-generated excerpts were.

Interview 4

R4 believes that the rise of AI-generated art is inevitable given the advancements in technology - it was only a matter of time. Nevertheless, she believes that there should be transparency, and human artists should have proper recognition for their contributions. She acknowledges that AI can be creative and understands why some people fear the unknown aspect of artificial intelligence, however she doesn’t personally fear the future of AI. R4 has previously heard of AI covers, but they don’t appear on her social media often. She states it is a technology that has potential and would consider listening to an AI cover if she liked the song. She doesn’t think of ethical problems when listening to AI covers. Regarding the listening section, she correctly identified two AI covers noting that the voice placement was strange and, in one of the excerpts, the sound of the voice was somewhat computerized. In every excerpt the quality of the sound was good and only in one of the AI covers she considered that the unnatural voice wasn’t able to connect emotionally with listeners. In all other excerpts, she perceived emotional depth. After listening, R4 admitted she wasn’t sure of her answers, saying it was much more difficult to distinguish between AI and human vocals than she anticipated. R4 mentioned that when she hears an AI cover, she previously knows is AI, it is easy to identify the characteristics of an AI voice, however blindly identifying is very difficult in high quality AI covers.

Interview 5

The interview with R5 was partially conducted, not including the listening section, due to the impossibility of a face-to-face interaction. However, the interview has been maintained as it offers valuable insights on the first section. R5 views AI advancements as something positive that allows for new creations and innovation. He believes AI can be creative, but there needs to be boundaries previously defined in order for humans to remain in control. He doesn't have fears concerning AI technologies, however he states that in AI covers there is some concern for individuals that take advantage of deceased artists work and use it for profit. Nevertheless, he believes AI covers are an interesting technology and will only continue to improve in quality. He occasionally comes across AI covers on Facebook, usually from deceased artists singing current songs, such as Elvis Presley. He is open to listen to AI covers if he finds them good.

Interview 6

R6 has a strong belief against AI creations. He states that AI isn't supposed to be used to generate art, it should only serve as a functional tool. He considers that AI doesn't have the capability of being creative yet and hopes it never will have that capability. He has deep concerns of the future of AI, mainly "that they take control of everything and rule us". Concerning AI covers, he thinks they are acceptable as an experiment and as a curiosity, not as a way of making profit. On social media, he rarely encounters AI covers and he would never consider listening to one for pleasure. In terms of ethical implications, he states that if no one is making profit out of the song, there are no ethical concerns. In the listening section, he believed four songs were AI covers, but only two of them actually were. In all excerpts he believe were AI-generated, he considered the sound very bad and artificial, and considered the excerpts unable to spark emotional connections, even though two of them were from human artist. The ones he believed were from human artist, were evaluated with good sound, emotional resonance and authenticity in the voice, even though two of these excerpts were AI. In the last section R6 stated he was certain of his choices, however after the reveal of which songs were composed by humans or partially by AI, he was very surprised and revealed that it created a fear in him of being deceived by future AI covers that are not identified as AI generated.

Interview 7

R7 finds the advancements in AI-generated art interesting, however she believes AI cannot be creative on his own, it has to have pointers from humans to guide the creation. She doesn't have concerns on the future of AI, but acknowledges that it might turn some jobs obsolete. Regarding AI covers, she hears them sometimes on TikTok and believes this technology has a lot of potential. She would consider listening to an AI cover if it is to her liking. Concerning the ethics implied, she acknowledges this problem but it isn't a concern for her while listening. In the listening test, R7 correctly identified two of the four AI covers, however she believed three of the human-created songs were also AI. In the correctly identified AI covers she stated the sound of the track was more computerized and robotic, but the voice sounded natural. Additionally, she associated the layers in clip 7 to AI. In the three excerpts she believed were AI it was always due to the sound of the track. Regarding the emotion in the vocals, she admitted that, unconsciously, when she starts to think the track is AI she immediately disconnects emotionally. In the last section, she stated that the test was more difficult than she anticipated, and she was uncertain of all her answers. In the end, R7 admitted she has bias against AI covers because if she knows it is AI she will always have a different perception, feeling the song is "fake".

Interview 8

R8 showed a general openness to AI, commenting he finds AI art creations very interesting and show great potential. He believes AI can be creative and doesn't have any fears regarding the future of this technology. Concerning AI covers, he isn't very familiarized with the topic, although he has seen some on social media (Instagram). He considers it an interesting technology but doesn't show much interest in listening to AI covers on his daily basis. Regarding ethics, he states that he doesn't have ethical concerns. In the listening section, he considered five excerpts as AI creations, with three being actually AI and two human creations. The main argument for believing it is AI in most excerpts centered around the fact that the instrumentals and voice sounded too perfect and didn't have natural human flaws. In terms of emotional connection, he considered that two tracks he deemed as AI weren't able to connect emotionally with listeners, however from those two tracks one was human. After listening to the excerpts, he stated that he wasn't certain of his choices and the AI covers were better than he anticipated.

6.2. Survey

6.2.1. Survey Questionnaire

Q1. Is your nationality Portuguese?

- Yes
- No (End)

AI covers

Q2. How familiar are you with the concept of AI covers?

- Not at all familiar
- Slightly familiar
- Familiar
- Very familiar

Q3. How frequently do you encounter AI covers online/on social media?

- Never
- Rarely
- Occasionally
- Frequently
- Very Frequently

Q4. Rate how much do you agree with these statements from strongly disagree (1) to strongly agree (7)

Q4_1. I am open to listen to music that was partially generated by AI (AI covers)

Q4_2. I would enjoy more a song if I believed it was created only by human artists rather than partially generated by AI

Factors

Q5. Rate these statements from strongly disagree (1) to strongly agree (7)

Q5_1. I believe that AI generated covers lack emotional depth

Q5_2. I believe AI generated content cannot be creative

Q5_3. I believe AI generated covers sound unnatural/computerized

Q5_4. I fear AI will surpass human intelligence

Q5_5- I believe AI covers are unethical

Demographics

Q6. What is your age group?

- 12 to 20
- 21 to 27
- 28 to 35
- 36 to 43
- 44 to 51
- 52 to 59

- 60 to 68
- 69 to 78
- More than 79

Q7. What gender do you identify with?

- Male
- Female
- Non-binary
- Other

Q8. What is your current occupation?

- Student
- Working student
- Employed
- Unemployed
- Retired
- Other

Q9. What is your monthly income? (Before taxes)

- I prefer not to say
- I don't receive a direct income
- Less than 1000€
- 1000 to 1499€
- 1500€ to 1999€
- 2000€ to 2999€
- More than 3000€

Q10. How do often do you listen to music for pleasure?

- Constantly
- Daily
- Several times a week
- Occasionally
- Rarely
- Never

6.2.2. SPSS Survey Analysis

Frequency of encounter					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	36	20.9	20.9	20.9
	Rarely	53	30.8	30.8	51.7
	Occasionally	52	30.2	30.2	82.0
	Frequently	25	14.5	14.5	96.5
	Very frequently	6	3.5	3.5	100.0
Total		172	100.0	100.0	

Figure 6 – “Frequency of encounter” descriptive statistics

Familiarity					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all familiar	46	26.7	26.7	26.7
	Slightly familiar	55	32.0	32.0	58.7
	Familiar	47	27.3	27.3	86.0
	Very familiar	24	14.0	14.0	100.0
	Total	172	100.0	100.0	

Figure 7 – “Familiarity” descriptive statistics

Familiarity * Frequency of encounter Crosstabulation								
			Frequency of encounter					
			Never	Rarely	Ocasionaly	Frequently	Very frequently	Total
Familiarity	Not at all familiar	Count	25	18	3	0	0	46
		% within Familiarity	54.3%	39.1%	6.5%	0.0%	0.0%	100.0%
	Slightly familiar	Count	11	25	18	1	0	55
		% within Familiarity	20.0%	45.5%	32.7%	1.8%	0.0%	100.0%
	Familiar	Count	0	9	22	15	1	47
		% within Familiarity	0.0%	19.1%	46.8%	31.9%	2.1%	100.0%
	Very familiar	Count	0	1	9	9	5	24
		% within Familiarity	0.0%	4.2%	37.5%	37.5%	20.8%	100.0%
Total	Count	36	53	52	25	6	172	
	% within Familiarity	20.9%	30.8%	30.2%	14.5%	3.5%	100.0%	

Figure 8 – “Familiarity*Frequency of encounter” Crosstabulation

AI_listener_bias					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	2	1.2	1.2	1.2
	2.00	4	2.3	2.3	3.5
	2.50	3	1.7	1.7	5.2
	3.00	10	5.8	5.8	11.0
	3.50	9	5.2	5.2	16.3
	4.00	18	10.5	10.5	26.7
	4.50	17	9.9	9.9	36.6
	5.00	20	11.6	11.6	48.3
	5.50	26	15.1	15.1	63.4
	6.00	23	13.4	13.4	76.7
	6.50	22	12.8	12.8	89.5
	7.00	18	10.5	10.5	100.0
	Total	172	100.0	100.0	

Figure 9 – “AI_Listener_Bias” descriptive statistics

Emotional depth					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	5	2.9	2.9	2.9
	Disagree	10	5.8	5.8	8.7
	Somewhat disagree	22	12.8	12.8	21.5
	Neither agree nor disagree	40	23.3	23.3	44.8
	Somewhat agree	29	16.9	16.9	61.6
	Agree	41	23.8	23.8	85.5
	Strongly agree	25	14.5	14.5	100.0
	Total	172	100.0	100.0	

Figure 10 – “Emotional Depth” descriptive statistics

Ability to be creativity					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	14	8.1	8.1	8.1
	Disagree	52	30.2	30.2	38.4
	Somewhat disagree	39	22.7	22.7	61.0
	Neither agree nor disagree	33	19.2	19.2	80.2
	Somewhat agree	14	8.1	8.1	88.4
	Agree	16	9.3	9.3	97.7
	Strongly agree	4	2.3	2.3	100.0
	Total	172	100.0	100.0	

Figure 11 – “Ability to be creative” descriptive statistics

Unnatural sound					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	2.3	2.3	2.3
	Disagree	17	9.9	9.9	12.2
	Somewhat disagree	28	16.3	16.3	28.5
	Neither agree nor disagree	37	21.5	21.5	50.0
	Somewhat agree	35	20.3	20.3	70.3
	Agree	35	20.3	20.3	90.7
	Strongly agree	16	9.3	9.3	100.0
	Total	172	100.0	100.0	

Figure 12 – “Unnatural sound” descriptive statistics

Fear					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	13	7.6	7.6	7.6
	Disagree	38	22.1	22.1	29.7
	Somewhat disagree	18	10.5	10.5	40.1
	Neither agree nor disagree	13	7.6	7.6	47.7
	Somewhat agree	34	19.8	19.8	67.4
	Agree	37	21.5	21.5	89.0
	Strongly agree	19	11.0	11.0	100.0
	Total	172	100.0	100.0	

Figure 13 – “Fear” descriptive statistics

Ethics					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	1.7	1.7	1.7
	Disagree	22	12.8	12.8	14.5
	Somewhat disagree	27	15.7	15.7	30.2
	Neither agree nor disagree	29	16.9	16.9	47.1
	Somewhat agree	48	27.9	27.9	75.0
	Agree	33	19.2	19.2	94.2
	Strongly agree	10	5.8	5.8	100.0
	Total	172	100.0	100.0	

Figure 14 – “Ethics” descriptive statistics

Correlations							
		AI_listener_bia s	Emotional depth	Ability to be creativity	Unnatural sound	Fear	Ethics
AI_listener_bias	Pearson Correlation	1	.270**	.219**	.281**	.078	.218**
	Sig. (2-tailed)		<.001	.004	<.001	.306	.004
	N	172	172	172	172	172	172
Emotional depth	Pearson Correlation	.270**	1	.237**	.398**	-.048	.324**
	Sig. (2-tailed)	<.001		.002	<.001	.532	<.001
	N	172	172	172	172	172	172
Ability to be creativity	Pearson Correlation	.219**	.237**	1	.343**	.019	.267**
	Sig. (2-tailed)	.004	.002		<.001	.802	<.001
	N	172	172	172	172	172	172
Unnatural sound	Pearson Correlation	.281**	.398**	.343**	1	.102	.316**
	Sig. (2-tailed)	<.001	<.001	<.001		.183	<.001
	N	172	172	172	172	172	172
Fear	Pearson Correlation	.078	-.048	.019	.102	1	.305**
	Sig. (2-tailed)	.306	.532	.802	.183		<.001
	N	172	172	172	172	172	172
Ethics	Pearson Correlation	.218**	.324**	.267**	.316**	.305**	1
	Sig. (2-tailed)	.004	<.001	<.001	<.001	<.001	
	N	172	172	172	172	172	172

** . Correlation is significant at the 0.01 level (2-tailed).

Figure 15 – Correlations table

Model Summary ^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.219 ^a	.048	.042	1.33555	1.789

a. Predictors: (Constant), Ability to be creativity
b. Dependent Variable: AI_listener_bias

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.243	1	15.243	8.546	.004 ^b
	Residual	303.226	170	1.784		
	Total	318.469	171			

a. Dependent Variable: AI_listener_bias
b. Predictors: (Constant), Ability to be creativity

Coefficients ^a							
Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance VIF
1	(Constant)	4.460	.242		18.418	<.001	
	Ability to be creativity	.197	.067	.219	2.923	.004	1.000 1.000

a. Dependent Variable: AI_listener_bias

Collinearity Diagnostics ^a					
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Ability to be creativity
1	1	1.907	1.000	.05	.05
	2	.093	4.535	.95	.95

a. Dependent Variable: AI_listener_bias

Residuals Statistics ^a					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	4.6565	5.8378	5.1017	.29857	172
Residual	-4.24712	2.34354	.00000	1.33164	172
Std. Predicted Value	-1.491	2.465	.000	1.000	172
Std. Residual	-3.180	1.755	.000	.997	172

a. Dependent Variable: AI_listener_bias

Figure 16 – “Ability to be creative” Linear Regression

Model Summary ^b						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson	
1	.218 ^a	.047	.042	1.33592	1.785	
a. Predictors: (Constant), Ethics						
b. Dependent Variable: AI_listener_bias						

ANOVA ^a					
Model	Sum of Squares	df	Mean Square	F	Sig.
1					
Regression	15.071	1	15.071	8.445	.004 ^b
Residual	303.398	170	1.785		
Total	318.469	171			
a. Dependent Variable: AI_listener_bias					
b. Predictors: (Constant), Ethics					

Coefficients ^a							
Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Collinearity Statistics		
	B	Std. Error	Beta		Tolerance	VIF	
1							
(Constant)	4.240	.313		13.527	<.001		
Ethics	.197	.068	.218	2.906	.004	1.000	1.000
a. Dependent Variable: AI_listener_bias							

Collinearity Diagnostics ^a					
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Ethics
1	1	1.946	1.000	.03	.03
	2	.054	5.988	.97	.97
a. Dependent Variable: AI_listener_bias					

Figure 17 – “Ethics” Linear Regression

Model Summary ^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.360 ^a	.130	.104	1.29213	1.889
a. Predictors: (Constant), Fear, Ability to be creativity, Emotional depth, Unnatural sound, Ethics					
b. Dependent Variable: AI_listener_bias					

ANOVA ^a					
Model	Sum of Squares	df	Mean Square	F	Sig.
1					
Regression	41.317	5	8.263	4.949	<.001 ^b
Residual	277.152	166	1.670		
Total	318.469	171			
a. Dependent Variable: AI_listener_bias					
b. Predictors: (Constant), Fear, Ability to be creativity, Emotional depth, Unnatural sound, Ethics					

Coefficients ^a							
Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Collinearity Statistics		
	B	Std. Error	Beta		Tolerance	VIF	
1							
(Constant)	3.097	.438		7.080	<.001		
Emotional depth	.141	.071	.163	1.977	.050	.770	1.299
Ability to be creativity	.097	.071	.108	1.370	.173	.846	1.182
Unnatural sound	.132	.073	.151	1.800	.074	.750	1.333
Ethics	.067	.076	.074	.887	.376	.745	1.343
Fear	.033	.055	.046	.597	.551	.876	1.141
a. Dependent Variable: AI_listener_bias							

Collinearity Diagnostics ^a									
Model	Dimension	Eigenvalue	Condition Index	(Constant)	Emotional depth	Ability to be creativity	Unnatural sound	Ethics	Fear
1	1	5.535	1.000	.00	.00	.00	.00	.00	.00
	2	.183	5.501	.00	.02	.22	.01	.00	.53
	3	.115	6.930	.01	.18	.72	.04	.01	.12
	4	.069	8.970	.00	.01	.00	.53	.58	.07
	5	.058	9.750	.07	.39	.03	.40	.40	.07
	6	.040	11.773	.92	.40	.02	.01	.00	.21
a. Dependent Variable: AI_listener_bias									

Figure 18 – Multiple Regression Analysis Enter Method

Model Summary ^c					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.281 ^a	.079	.073	1.31373	
2	.330 ^b	.109	.098	1.29602	1.890

a. Predictors: (Constant), Unnatural sound

b. Predictors: (Constant), Unnatural sound , Emotional depth

c. Dependent Variable: AI_listener_bias

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.069	1	25.069	14.525	<.001 ^b
	Residual	293.401	170	1.726		
	Total	318.469	171			
2	Regression	34.607	2	17.304	10.302	<.001 ^c
	Residual	283.862	169	1.680		
	Total	318.469	171			

a. Dependent Variable: AI_listener_bias

b. Predictors: (Constant), Unnatural sound

c. Predictors: (Constant), Unnatural sound , Emotional depth

Coefficients ^a							
Model		Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance VIF
1	(Constant)	4.005	.305		13.149	<.001	
	Unnatural sound	.246	.065	.281	3.811	<.001	1.000 1.000
2	(Constant)	3.526	.362		9.751	<.001	
	Unnatural sound	.180	.069	.205	2.595	.010	.842 1.188
	Emotional depth	.163	.068	.189	2.383	.018	.842 1.188

a. Dependent Variable: AI_listener_bias

Collinearity Diagnostics ^a						
Model	Dimension	Eigenvalue	Condition Index	(Constant)	Unnatural sound	Emotional depth
1	1	1.944	1.000	.03	.03	
	2	.056	5.913	.97	.97	
2	1	2.887	1.000	.01	.01	.01
	2	.063	6.767	.03	.87	.49
	3	.050	7.624	.96	.12	.50

a. Dependent Variable: AI_listener_bias

Figure 19 – Multiple Regression Analysis Stepwise Method

Group Statistics					
	Generation2	N	Mean	Std. Deviation	Std. Error Mean
AI_listener_bias	Younger generations	98	5.3112	1.25697	.12697
	Older generations	74	4.8243	1.45817	.16951
Emotional depth	Younger generations	98	5.19	1.558	.157
	Older generations	74	4.16	1.424	.166
Ability to be creativity	Younger generations	98	3.34	1.579	.160
	Older generations	74	3.16	1.434	.167
Unnatural sound	Younger generations	98	4.86	1.533	.155
	Older generations	74	3.93	1.437	.167
Fear	Younger generations	98	4.36	1.933	.195
	Older generations	74	3.96	1.905	.221
Ethics	Younger generations	98	4.50	1.542	.156
	Older generations	74	4.20	1.452	.169

Independent Samples Test										
Levene's Test for Equality of Variances					t-test for Equality of Means					
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
AI_listener_bias	Equal variances assumed	3.413	.066	2.347	170	.010	.020	.48690	.20745	.07738 .89642
	Equal variances not assumed			2.299	143.826	.011	.023	.48690	.21179	.06828 .90552
Emotional depth	Equal variances assumed	1.326	.251	4.461	170	<.001	<.001	1.032	.231	.575 1.488
	Equal variances not assumed			4.517	163.835	<.001	<.001	1.032	.228	.581 1.483
Ability to be creativity	Equal variances assumed	1.353	.246	.747	170	.228	.456	.175	.234	-.287 .636
	Equal variances not assumed			.757	164.265	.225	.450	.175	.231	-.281 .630
Unnatural sound	Equal variances assumed	1.170	.281	4.023	170	<.001	<.001	.925	.230	.471 1.378
	Equal variances not assumed			4.060	162.244	<.001	<.001	.925	.228	.475 1.374
Fear	Equal variances assumed	.231	.631	1.344	170	.090	.181	.398	.296	-.186 .982
	Equal variances not assumed			1.347	158.536	.090	.180	.398	.295	-.185 .981
Ethics	Equal variances assumed	.566	.453	1.284	170	.101	.201	.297	.232	-.160 .754
	Equal variances not assumed			1.294	161.875	.099	.197	.297	.230	-.156 .751

Figure 20 – Independent Samples t-test

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