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ARTIFICIAL INTELLIGENCE AND MEDIA: MANIPULATION THROUGH PHOTOGRAPHY AND DEEPPAKE TECHNOLOGY

Abstract

The modern way of life, which includes the use of information and communication technologies in all segments and aspects of human activity, has influenced shaping of today's media space and the way in which recipients receive information from different sources. Life in a modern mediatized society that is (over) saturated with media messages and information is almost unimaginable without having basic knowledge and skills about media and media technologies. Due to a lack of concentration, a short attention span, and the amount of information the recipient is exposed to, preference is given today to quick and concise information and visual content, which is why photography and video have become a powerful and widely used tools in conveying media messages. The development of digital technologies, easily accessible tools for content editing, but also of various producers of public information, has greatly influenced the authenticity, originality and truthfulness of photographs and videos. It is increasingly difficult for the end user to recognize the difference between a credible message and manipulation in the internet and media space. This paper deals with the ways in which certain media, media platforms and websites use artificial intelligence and modern deepfake technology to convey (symbolic) meanings and messages, and analyzes the competences of users in recognizing manipulative content with the help of artificial intelligence.

In order to better interpret the above, a survey was conducted, and the goals of the survey were to show the respondents' perception of the use of artificial intelligence to create manipulative photos and videos, and to analyze the ways in which the respondents verify the credibility of the photos. The research also showed how respondents perceive their own abilities and competences in recognizing content created by artificial intelligence. The research was conducted using an online questionnaire on a total sample of 100 respondents in Herzegovina-Neretva

Canton (N= 100, 55% female, 45% male). The results of the analysis showed that the initial research assumption was confirmed. Namely, the results of the research showed that the majority of respondents believe that artificial intelligence is often used for manipulative purposes and that they sometimes manage to recognize photos generated by artificial intelligence, but also that they do not have the habit of verifying the credibility of a photo using the tools intended for that. Most often, they verify the credibility of the photo by looking for other sources, looking for visible errors, or do not verify its credibility at all. The research was conducted on a convenient sample of respondents, and an anonymous survey questionnaire was designed and structured.

Keywords: manipulation; media; artificial intelligence; photography; video recording; deepfake technology.

UMJETNA INTELIGENCIJA I MEDIJI: MANIPULACIJA FOTOGRAFIJOM I DEEFAKE TEHNOLOGIJOM

Sažetak

Suvremeni način života, koji uključuje uporabu informacijsko-komunikacijskih tehnologija u svim segmentima i aspektima ljudskoga djelovanja, utjecao je i na oblikovanje današnjega medijskog prostora i načina na koji recipijenti primaju informacije iz različitih izvora. Život u suvremenome medijatiziranom društvu koje je (pre)zasićeno medijskim porukama i informacijama gotovo je nezamisliv bez posjedovanja osnovnih znanja i vještina o medijima i medijskim tehnologijama. Zbog manjka koncentracije, kratkoga raspona pažnje, količine informacija kojima je recipijent izložen, prednost se danas daje brzim i sažetim informacijama i vizualnim sadržajima zbog čega su fotografija i videozapis postali moćan i široko korišten alat u prenošenju medijskih poruka. Razvoj digitalnih tehnologija, lako dostupnih alata za uređivanje sadržaja, ali i različitih proizvođača javnih informacija, uvelike je utjecao na autentičnost, izvornost i istinitost fotografije i videozapisa. Krajnjemu je korisniku sve teže prepoznati razliku između vjerodostojne poruke i manipulacije u internetskoj i medijskoj prostoru. Ovaj se rad bavi upravo načinima na koje se pojedini mediji, medijske platforme i internetske stranice koriste umjetnom inteligencijom i suvremenom *deepfake* tehnologijom za prenošenje (simboličkih) značenja i poruka te analizira kompetencije korisnika u prepoznavanju manipulativnoga sadržaja uz pomoć umjetne inteligencije.

Kako bi se što bolje protumačilo navedeno, provedeno je istraživanje, a ciljevi istraživanja bili su prikazati kakva je percepcija ispitanika o uporabi umjetne inteligencije za kreiranje manipulativnih fotografija i videozapisa te analizirati načine na koje ispitanici provjeravaju vjerodostojnost fotografija. Istraživanje je pokazalo i kako ispitanici percipiraju vlastite sposobnosti i kompetencije u prepoznavanju sadržaja kreiranih umjetnom inteligencijom. Istraživanje je provedeno s pomoću anketnoga *online* upitnika na ukupnome uzorku od 100 ispitanika u Hercegovačko-neretvanskoj županiji (N= 100, 55 % osoba ženskoga spola, 45 % osoba muškoga spola). Rezultati analize pokazali su da je početna istraživačka pretpostavka potvrđena. Naime, rezultati istraživanja pokazali su da većina ispitanika smatra kako se umjetna inteligencija često koristi u manipulativne svrhe te kako ponekad uspijevaju prepoznati fotografije generirane umjetnom inteligencijom, ali i da nemaju naviku provjeravati vjerodostojnost fotografije koristeći

se za to namijenjenim alatima. Najčešće provjeravaju vjerodostojnost fotografije traženjem drugih izvora, traženjem oku vidljivih pogrešaka ili uopće ne provjeravaju njezinu autentičnost. Istraživanje je provedeno jednostavnom metodom slučajna uzorka za prikupljanje podataka te je osmišljen i strukturiran anonimni anketni upitnik.

Ključne riječi: manipulacija; mediji; umjetna inteligencija; fotografija; videozapis; *deepfake* tehnologija.

INTRODUCTION

New information and communication technologies, especially digital media and tools for media and other contents, have changed the way we approach media and technology and the way we use them. They also question the credibility of media and the ability to shape public perception of the social changes and phenomena. From the very beginning media have served as mediators between the authorities and the public, thus creating perception and shaping public opinion. The expansion of new media and Internet opened access to virtual networking, easier access to information. It also, almost completely, changed the role of the recipient who is now not only a media messages and contents receiver but also a creator of media messages and contents. Contemporary mediatized¹ society demands from the user to acquire new knowledge and skills continuously about media and media technology usage. Having acquired new knowledge and skills the final user, i.e., the media recipient, should be enabled to understand new potentials of media technology. This means that, in addition to the technical and practical skills for the usage of technology and media, the recipient should have critical competence needed for the development of critical thinking as a central link to the analysis of different media and media content functions as well as to the recognition of all forms of manipulation in media. Therefore, understanding media should *a priori* aspire to the development of critical thinking with the media recipient so

1 The term *mediatization* (Peruško, Zrinjka) refers to the social changes connected with media functioning and important changes in media and communication surrounding, that are to be noticed through the appearance of new media formats and manners of media usage in general. The basic claim is that in the world, in which media are ubiquitous, all aspects of culture and social life are mediated through the media. As a result, social institutions and processes exposed to the new communication forms and practices inevitably will be changed as a result of this mediation and everything that comes with it. Furthermore Peruško connects the transformative character of the communication, where there are no social fields nor practice that are not connected with the media in some way, with the term *mediatization*, whereas the term *mediation* represents every process of media communication, i.e. classic communication through media. Zrinjka Peruško, „Medijalizacija i društvena promjena: prilog istraživanju medijalizacije politike“, *Politička misao: časopis za politologiju*, Sveučilište u Zagrebu Fakultet političkih znanosti, 56(1), 2019., p. 164.

that they could, in a quality manner, analyze and perceive logical content of the symbolic meaning in a media expression. Additionally, we should pay attention to the fact that a huge quantity of information and an easy access to information do not necessarily mean that we possess knowledge. In order to possess knowledge one needs a structure which offers context through which one might reach new knowledge. And vice versa, the media user, who is exposed to fast changes in media surrounding, should possess knowledge about media function, understanding media messages, and creating media contents, but also they should be equipped for the interaction through various tools, media, platforms that will enable transcommunication, i.e., the communication through different formats. In that way the user will be included in all, or at least the majority of the social processes important for the community.

Development of digital technologies, of easily accessible tools for content editing, of media, but also the increasing number of creators and users of media messages and content, have largely influenced the authenticity, originality, and credibility of the media contents. It is becoming harder for a media recipient to see the difference between a credible message, true information, and manipulation in the media space. This manipulation is to be seen in fake news, disinformation through the usage of *deepfake* technologies. Hereby the manipulation in the media and the disinformation do not represent only an act of purposeful spread of fake content, but are a weapon used to discredit a competitive media or a competitive source of information with the aim of defamation of a media². A Eurobarometer research from the year 2022 on the credibility of media and trust of EU citizens in the media showed that the majority of respondents believes that they can easily recognize disinformation and fake news in the media³. Although media users believe that they can easily recognize disinformation, fake video or photography, we should take into consideration the fact that it is rather their intuitive perception than objective competence. In order to recognize false and manipulative contents, videos and photos with the deepfake content, one needs an additional set of skills and tools to be sure about the credibility, relevance and truthfulness of a source. Fake news are media reports that contain false claims, or information that does not match the facts.

2 Cf. Marta Takahashi – Josip Poljak, „Naziv fake news u svrhu diskreditiranja izvora Informacija“, *KOMENTARI, GOVOR MRŽNJE, DEZINFORMACIJE I REGULACIJA JAVNE KOMUNIKACIJE: Zbornik radova s međunarodne znanstvene konferencije održane u Zagrebu 16. i 17. rujna 2021.*, Josip Popovac – Vanja Gavran (ed.), Hrvatska akademija znanosti i umjetnosti – Agencija za elektroničke medije, 2023, p. 179.

3 „Novi Eurobarometer: građani EU-a najviše vjeruju tradicionalnim medijima“, *Europski parlament*, 12. 7. 2022., <https://www.europarl.europa.eu/news/hr/press-room/20220704IPR34401/novi-eurobarometer-gradani-eu-a-najvise-vjeruju-tradicionalnim-medijima>, (28/5/2024).

They include disinforming the public on purpose and they are not a result of a random mistake in media content. In other words, those are pieces of information that somebody has invented or published while knowing that they are not true. As opposed to fake news, disinformation does not mean that something is completely invented, but it means that it did not happen as the media report. Disinformation in media content is often associated with unverified information, facts manipulation, biased coverage and other similar forms of media manipulation.

As the information spread globally and as they are available to (almost) everybody, the users make use of web sources for information access. In spite of the fact that it is easy to access information, the users are exposed to numerous information of poor quality, incorrect and unconfirmed information. A research done at the University of Mostar in 2023 among students on their behaviour in searching for the information while retrieving information witnesses about that. The research results showed that the students do not possess competences nor do they know the basic steps in searching and verifying information in online space. While searching for relevant information, they are more prone to use the secondary and tertiary and not the primary sources of information⁴. All of this speaks of the fact that there is a lack of digital competences and a lack of analysis of information verification. They do prompt the user to the development of critical thinking about the information they are searching for or they are exposed to. Taking into consideration these relevant facts and the above mentioned research, we can conclude that media users scarcely use the tools and mechanisms to confirm the information. The most frequent verification is searching information from a different source, whereas scarcely do the users make use of the present digital and technological tools.

MANIPULATION IN MEDIA

The search of serious media for the principles and manners of integrity preservation in the times of crisis and fight for the truth have become an imperative. A look into the past testifies that the need for the search of

4 The research was done with the help of a questionnaire on a sample of 150 students of the Faculty of Humanities and Social Sciences, University of Mostar, in 2023. Cf. Andrea Miljko – Lucija Mandić – Marko Odak, „Ponašanje u traženju informacija prilikom pretraživanja informacija kod studenata“, *Aktualizacija i popularizacija znanosti kroz medije: Zbornik radova s međunarodne znanstvene konferencije u organizaciji Filozofskog fakulteta Sveučilišta u Mostaru, Federalnog ministarstva obrazovanja i znanosti i Instituta društvenih znanosti Ivo Pilar- područni centar Osijek, održane na Filozofskom fakultetu Sveučilišta u Mostaru 11. studenoga 2022.*, Ivana Sivrić (ed.), Federalno ministarstvo obrazovanja i znanosti – Sveučilište u Mostaru, 2023, p. 165-166.

truthful information has a long history, and that manipulation and disinformation have existed since the dawn of time⁵. In order to ensure domination of certain information whose quality and usefulness is often questionable (information that do not fit to the mechanisms of public knowledge control), some media, communication networks and platforms do not strive primarily to the spread of objective and truthful information, that are the founding stone of the pluralistic, free society and a reflection of the public and responsible acts. Instead, they often serve the interests of economy, which is oriented to the market value of the information according to the business world rules, and not according to the rules of the journalist profession.

The issue of the journalists' ethics and the trust of the public into media and journalists is not something new. However, Neill Fitzpatrick writes that these questions in recent years have been „under renewed and intense scrutiny, as more and more people reject traditional media in favor of social media for their news consumption“⁶. Namely, media consumption, according to Fitzpatrick, has a double meaning. It can be a biased intentional or unintentional media information manipulation or a manipulation by an individual or organisations that can manipulate even media. This can be seen in the ubiquitous examples of false information, retouched photos or videos that are spreading all over the social networks, and then enter easily media space. Stjepan Malović divided the techniques of manipulation in print media into two categories: direct and indirect. We find the direct techniques of manipulation to be highly interesting: he emphasizes agenda setting topics, which go in favour of the content creator and whose aim is redirecting attention from some other possibly important topics, the pseudo-events, usage of the functions as a news value element and hidden adds⁷. Also, it is significant to note that the strategies of manipulation through media were detected and described by Noam Chomsky a long time ago, but in contrast with the times when they were born, they are becoming more up-to-date nowadays, especially those forms of manipulation referring to the attention redirection, production of problems, arousing emotions, glorification of stupidity, creating the feeling of guilt, and misuse of knowledge.

5 Louis Alvin Day, *Ethics in Media Comumunications: Cases and a Controversies*, Klub Plus, 2006, p. 101-103.

6 Neill Fitzpatrick, „Media Manipulation 2.0: The Impact of Social Media on News, Competition, and Accuracy“, *Athens Journal of Mass Media and Communications*, Atena, Mass Media & Communication Unit of ATINER, 4(1), 2018, p. 45.

7 Cf. Stjepan Malović, „Mediji i izbori: manipulacije jače od regulative“, *Politička misao: časopis za politologiju*, Sveučilište u Zagrebu Fakultet političkih znanosti, 40(4), 2003, p. 48.

Manipulation through the lens

Even if we forget the current developed technology and widespread possibilities of photography manipulation, the claim that „Camera does not lie.“ can be disputed with the historical sources indicating that there has always been some kind of manipulation through the frame, shooting angle, perspective, context. Ever since the beginnings of the photography there has been an attempt to retouch the photographs, to show persons and things in a better light or to show them in a manner that the photographer sees them or wants to see them. An elementary retouching and unnoticeable technical interventions such as correction of exposition, sharpening or correction of the colour, are not so „dangerous“ and in the today's world of social networks, influencers and other content creators they are almost taken for granted. However, digital technologies have enabled a wide spread of photography use for the manipulative purposes: for example beautifying and retouching human body and face, political propaganda during the preelection campaigns, etc. However manipulation through photography existed much earlier before the appearance of the digital media and it was in the very same amount used for spreading the misinformation and propaganda during some historical events. Owens described (in Hal Foster, *The Anti-Aesthetic: essays on postmodern culture*) and defined the social and critical double effect of the photography as a *discourse of the other*, i.e., as a medium through which we represent ourselves to the others, but also we control the seeing of the others⁸. With the advent of the photography, various creative techniques for its retouching started developing, be it for the purpose of artistic expression, technical corrections or manipulation. One of them is photomontage. Photomontage is a process which includes a combination of several shots connected for the artistic effect or for showing more objects than it could be in one piece. It encompasses combinations through cutting, pasting, overlapping of two or more photographs or reproductions of the photographs, sometimes in the combination with other non-photographic material such as text or some abstract forms⁹. Nowadays, thanks to the digital revolution and the development of the software for the photomontage, this technique is not restricted to the print material only.

8 Cf. Ana Peraica, *Fotografija kao dokaz: Primjena tehnologijske definicije fotografije na raspravu u estetici i teoriji fotografije*, Multimedijalni institut Zagreb, 2018, p. 143.

9 Cf. Andrés Mario Zervigón, *John Heartfield and the Agitated Image Photography, Persuasion, and the Rise of Avant-Garde Photomontage*, University of Chicago Press, 2012.

The digital revolution influenced the advent of manipulative digitally retouched photos in mass media. Shooting and postproduction offer wide possibilities of creating wanted media messages, narratives and manners in which viewers perceive and experience media messages. We can start from manipulation through the frame, shot, angle and composition during shooting, and come to a number of possibilities of retouching the material in postproduction. From the film perspective, we can see that some shooting ways and techniques, that can also be used by the media, do contribute to the narrative and message construction. To exemplify, carefully selected *detail plan* diverts attention and emphasises what we want, *total plan*, in which human figures appear tiny in relation to the space, describes the psychological state of the characters who look small in relation to the world, while *lower and upper angle* determine the viewer's perception of the characters. The shot frames can later, through photomontage, be merged, according to the wishes, as well as shown in slow motion, or speeded up. Exposition can be retouched, contrast, special effects can be added, and by adding a special music and changing the colours the atmosphere of the frame can be totally changed. The symbolic colour of the scene can arouse different emotions with the viewer: warm colours such as red, orange and yellow can, in connection with the context, arouse feelings of happiness, excitement, or warmth, whereas cold colours such as blue, green and purple will create a feeling of serenity, sadness or maybe fear. Furthermore, the way of shooting, the angle, can also change the meaning of the (media) message and what we want to suggest to the viewers, be it a photograph or a video.

Manipulation through Artificial Intelligence, deepfake technology (and photography)

If we search the term *Artificial Intelligence* we will first encounter pictures of a robot with human characteristics or pictures of human brain with electric circuits. With a bit more curiosity and deeper investigation, we will find out that artificial intelligence is much more, i.e., it already plays a significant role in our everyday lives, maybe even without us being aware of it. Every person using online media, Internet or social networks is exposed to the suggested information, including news, music, products, free time activities and contents according to their interests.

Each user gets a different collection of suggested contents depending on their search history and personal preferences. In the last few years we have noted a larger amount of media reports about a face recognizing software, about medical robots, about robot applied in the military service and about

similar topics¹⁰. Furthermore the classical journalism has created a new field of the discipline as a reaction to the fast growth of the pseudo-journalism. One of the most significant ones is *fact-checking*. As the name suggests, checking facts is a process of assessing the accuracy of a text in journalism with the aim to prevent or reduce the misleading and manipulating information in the media. Therefore it is reasonable to ask ourselves what the term *Artificial Intelligence* stands for, what it means, what its scope is, and if there is a general definition of it as the content of it constantly changes.

Despite numerous definitions, there is a consensus with respect to the basic characteristics of Artificial Intelligence, and they are as follows: ability or independence of the digital computer or computer controlled robot to preform tasks that are usually connected to intelligent creatures as well as „the adoptability which encompasses the ability to preform better based on personal experience“¹¹. Collins Dictionary¹² pronounced the term *Artificial Intelligence* to be the word of the year 2023. The term is often used for a project of system development with the possibility to preform intellectual processes characteristic for humans, such as the ability to reason, discover meaning, generalization or learning from the past experience. AI research is trying to reach one of the three aims: general AI, applied AI and cognitive simulation. General AI aims at constructing machines that can think and whose general intellectual abilities are the same as human. Applied AI, also known as the advanced data processing, aims at producing commercially sustainable „smart“ systems such as medical diagnostic systems or stock exchange systems. In cognitive simulation computers are used for testing theories about functioning of human brain, such as the theory about how humans can recognize faces or remember some things. It has become a powerful tool in neuroscience and cognitive psychology¹³. Since the development of the digital computer in 1940s it has been seen that computers can be programmed to preform highly complex tasks such as proving a mathematical theorem. Some programs have reached the level of performances of the human professionals in some tasks. Therefore AI is being used in different applications like medical diagnostics, search engines, voice or handwriting recognition or *chatbots*. However, despite constant advancements in the speed of computer processing and the memory capacity, still there are no

10 Cf. Ana Pošćić, „Postoji li potreba pravnog uređenja umjetne inteligencije u Europskoj Uniji – razlozi za i protiv“, *Zbornik Pravnog fakulteta Sveučilišta u Rijeci*, Sveučilište u Rijeci, Pravni fakultet, 42(2), 2021, p. 386.

11 *Ibid.*

12 „The Collins Word of the Year 2023 is...“, *Collins Dictionary*, <collinsdictionary.com/woty> (13/1/ 2024).

13 Cf. Brain Jack Copeland, „History of artificial intelligence (AI)“, *Encyclopedia Britannica*, 12/1/2024 <britannica.com/technology/artificial-intelligence> (13/1/2024).

programs that could compete the full human flexibility in wider domains or in tasks demanding a lot of everyday knowledge. The fact is that we have a weak development of the general AI and many investigators are of the opinion that the attempts to develop general intelligence are in vain.¹⁴

In the context of AI we need to define also terms *machine learning* and *deep learning*. *Machine learning* is a branch of AI that constructs and creates algorithms and systems that can easily adopt to new situations and learn based on experience, based on empirical data. „The task of the algorithm of machine learning is to find natural samples and links in the data and based on that gain insight and then decide and predict“¹⁵. Therefore, „machine learning is a process that applies AI in a way that it automatically preforms a task, but without programming explicitly“¹⁶. *Deep learning* is a subtype of machine learning whose algorithms and systems have neural networks in four or more layers and make possible working on more complex problems and discovering characteristics in data without initial input.“¹⁷. In other words, AI in this manner independently reaches new knowledge. According to Goodfellow et al. modern term *deep learning* goes beyond the neuroscientific perspective „on the current breed of machine learning models. It appeals to a more general principle of learning multiple levels of composition, which can be applied in machine learning frameworks that are not necessarily neurally inspired.“¹⁸ However, although AI is widely spread and used in certain social segments and does represent tools and aids many professions, the omnipresence of AI, which has been in increase lately, does induce justified fears with the humans, because of the possibility that the creator applies AI for manipulation. AI in modern context can be easily used as a form of manipulation induced by the system designer. Carrloll et al. go beyond manipulation that has come into being as an intention of a designer or people who manage the AI systems. Namely, Carrloll et al. analyze what happens with the manipulation that could be induced by the AI system, in other words, what happens when the AI systems learn how to manipulate humans without the intention of the system designer. In such circumstances we can easily have the case where there is a lack of human autonomy, which additionally justifies fears of some individuals. According to the scientists, the precautionary measures and analyses of the

14 Cf. *Loc. cit.*

15 Nenad Bolf, „Strojno učenje“, *Kemija u industriji*, Hrvatsko društvo kemijskih inženjera i tehnologa, 70(9-10), 2021., p. 591.

16 Domagoj Bebić, „Uloga umjetne inteligencije u stvaranju medijskog sadržaja“, *Suvremene teme : međunarodni časopis za društvene i humanističke znanosti*, Sveučilište VERN, 14(1), 2023, p. 49.

17 Cf. B. J. Copeland, „History of artificial intelligence (AI)“, *Encyclopedia Britannica*, 12/1/2024 <[britannica.com/technology/artificial-intelligence](https://www.britannica.com/technology/artificial-intelligence)> (13/1/2024).

18 Ian Goodfellow – Yoshua Bengio – Aaron Courville, *Deep Learning*, The MIT Press, 2016., pp. 13-14.

scope of AI are indeed justified in the modern context today¹⁹. *Deepfake* technology is especially pronounced here. It is based on AI, to be more precise on the technology of deep learning, that can manipulate photographs, sounds and videos in order to create fake digital content which looks authentic and to present an event that did not happen²⁰. *Deepfake* content is produced with the help of the so called *Generative Adversarial Networks (GANs)*, i.e., two different algorithms for the deep learning technology: one algorithm creates the best possible replica of the real picture or video, and the second one detects whether the replica is fake and, if it is, it reports on the differences between it and the original. The first algorithm creates a synthetic picture and receives feedback about it from the second algorithm. It complements it or reshapes it so that it looks more real. The process is repeated until the moment when the second algorithm does not detect a fake picture anymore²¹. For the technical reasons it is much easier to modify a photo than a video. A photography is static and it misses the elements that are a part of anatomy of a person, like voice or movements. On the other hand, if one wants to manipulate a video, one needs to overcome additional difficulties, including resolution, digital format and the time. In the case of manipulating with photographs, traditionally different techniques were used. The most popular one is the technique of *morphing*, which includes modifying a photo through a metamorphosis in which a picture A can be transformed into a picture B and vice versa. This technique makes it possible to exchange the faces, to integrate the face of one person into the other face or to create comic characters by emphasising some facial features²². Nowadays there is a large number of examples of the photographs created through deepfake technology.

The pictures created through deepfake technology are highly realistic. This can be seen at the webpage *thispersondoesnotexist.com*. Each time one enters the page, a new generated picture of a face is created, that can be downloaded and used for different purposes, even the manipulative ones, like creation of fake profiles on social networks. Bearing in mind the fact that it is difficult to recognize fake photos, Jevin West and Carl Bergstrom, from the University of Washington, developed a webpage *whichfaceisreal.com*, where

19 Cf. Micah Carroll et al., „Characterizing Manipulation from AI Systems“, *AAMO '23: Proceedings of the 3rd ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization, October, 2023.*, Association for Computing Machinery New York, 2023, p. 1.

20 Cf. Mika Westerlund, „The Emergence of Deepfake Technology: A Review“, *Technology Innovation Management Review*, Ottawa, 9(11), 2019, p. 39.

21 Cf. Laura Payne, „Deepfake: AI-generated synthetic media“, *Encyclopedia Britannica*, 13/1/2024 <[britannica.com/technology/deepfake](https://www.britannica.com/technology/deepfake)> (13/1/2024).

22 Cf. Juan-José Boté-Vericad – Mari Váñez, „Image and video manipulation: The generation of deepfakes“, u: Pere Freixa et al, (ed.), *Visualisations and narratives in digital media. Methods and current trends*, DigiDoc Research Group & Ediciones Profesionales de la Información SL, 2022, pp. 117-127.

users can actually practice how to differentiate generated pictures from the real ones²³. Some of the photographs from these webpages have been used as examples in the research about recognizing the photographs generated by AI. To sum up, we can conclude that if we want to recognize fake and manipulative contents, photo deep fake contents, we need an additional set of skills and tools so that we, the media users, can indeed be sure about the credibility and truthfulness of content or source. The media competence, therefore, can not be based only on the possibility of access to information and media contents, but it asks for an additional and continuous learning and mastering new skills, tools and technologies, so that the media user can indeed analyze information and recognize manipulation. The research that was conducted here, testifies about that.

Aims of the research and hypotheses

The aim of this research was to examine public opinion about the usage of AI in media and the ways in which the respondents verify the credibility of media contents with a special emphasis on photography in media. Furthermore, the research was to offer insight into the ability of the respondents in recognizing photographs generated by AI. In accordance with the aims of the research, three hypotheses were set. The first hypothesis claims that general public, consisting of various age groups, with different levels of education and different media competences, sometimes does not manage to recognize photographs generated by AI that are present in media space. Also, although mechanisms and tools for the verification of media contents, including photographs and videos, are being developed on a daily basis, it is expected that the respondents rarely use easily available digital tools like search engines, extensions and applications for verification of photographs. It is also expected that the respondents are of the opinion that AI and photographs generated by AI are often used for the manipulative purposes.

Methodological approach and description of the sample

In the research a quantitative research method was applied. As a measuring instrument a questionnaire was used. The questionnaire was created through online Google forms, and the answers were based on the statements of the respondents. The questionnaire encompassed 18 questions, including closed type questions with the possibility of choosing one or more answers and of Likert scales. The questionnaire was divided into

23 Jevin West – Carl Bergstrom, „Which Face is Real?“, 2019, <https://www.whichface-isreal.com/about.html>, (24/6/ 2024).

5 parts. The first part of the survey questionnaire consisted of the socio-demographic data. The second part questions the opinion of the participant on AI and manipulation. The participants were supposed to express their opinion on how much they are acquainted with the term AI and how much they think the AI is being used for manipulative purposes. In the third part of the questionnaire the respondents were supposed to recognize photographs that were created through AI among various photographs. The fourth part of the questionnaire is about the experience of the respondents on the credibility of the photograph. The final, fifth part deals with the respondents' opinion on the characteristics of AI in journalism, i.e., which characteristics of AI, in their opinion, are used in journalism, which are the drawbacks of the usage of AI and can AI completely replace human autonomy. The data were collected in the time span from 28th December 2023 to 28th January 2024 in the Herzegovina-Neretva Canton and the sample consisted of 100 respondents, aged 15 to 65, 55 % women and 45 % men. The respondents were from various age groups and of various levels of education (completed high school education, bachelor, master's degree).

Statistic analysis

For the analysis of the results, a statistic analysis of the descriptive type was used, i.e., the distribution (representation) of the answers to each question is shown. The results are shown with the help of graphic diagrams. All statistic analysis that was done will be shown in the form of graphs that are to follow in the section *Results of the analysis* under 1.1.1. to 1.1.5.

Results of the analysis

General data

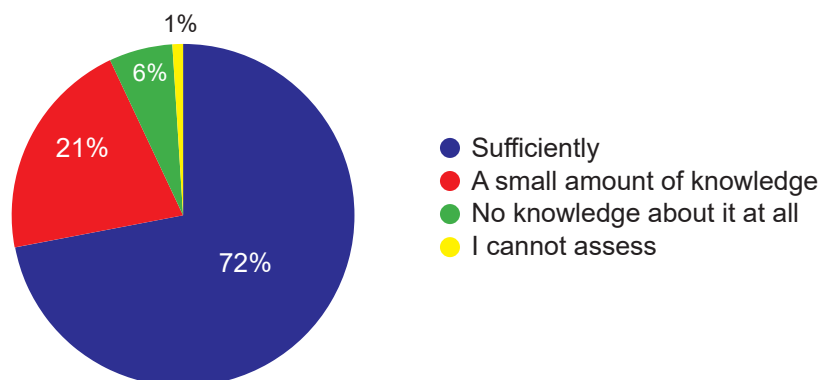
Among the respondents, 55 % were female, and 45 % male. The largest percentage (50 %) was made up of the respondents in the age group 19 – 25. We had 26 % respondents in the age group 26 to 30 years, and 14 % of respondents in the age group 31 to 65 years. The smallest percentage was of the respondents in the age group 15 to 18 years (10%).

Opinion of the respondents on AI and manipulation

Having researched the opinion of the respondents on the acquaintance with the term *artificial intelligence*, it has been found out that 72 % of the respondents are of the opinion that they are enough acquainted with the term. Furthermore, 21 % respondents answered that they are little

acquainted with the AI. Then, 6 % of the respondents could not estimate their opinion, whereas only 1 % of the respondents answered that they believe that they are not at all acquainted with the term.

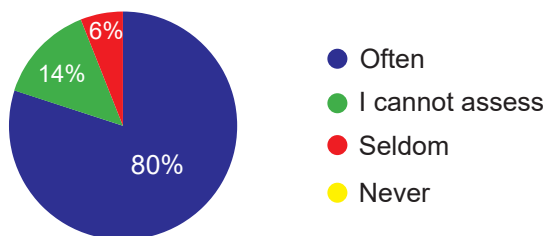
How well are you acquainted with the term „artificial intelligence“ ?



Graph 1.: Acquaintance of the respondents with the term Artificial Intelligence

Having interpreted and analysed the answers of the respondents how often they think AI is used for creating manipulative photographs and videos, we got a result that the largest percentage of the respondents (80 %) answered *often*, 14 % of them could not estimate, whereas 6 % of the respondents is of the opinion that it happens rarely. None of the respondents chose answer with the option *never*.

In your opinion, how much is AI used for the purpose of creating manipulative photographs an videos?



Graph 2.: Opinion of the respondents about the usage of AI for creating manipulative photographs and videos

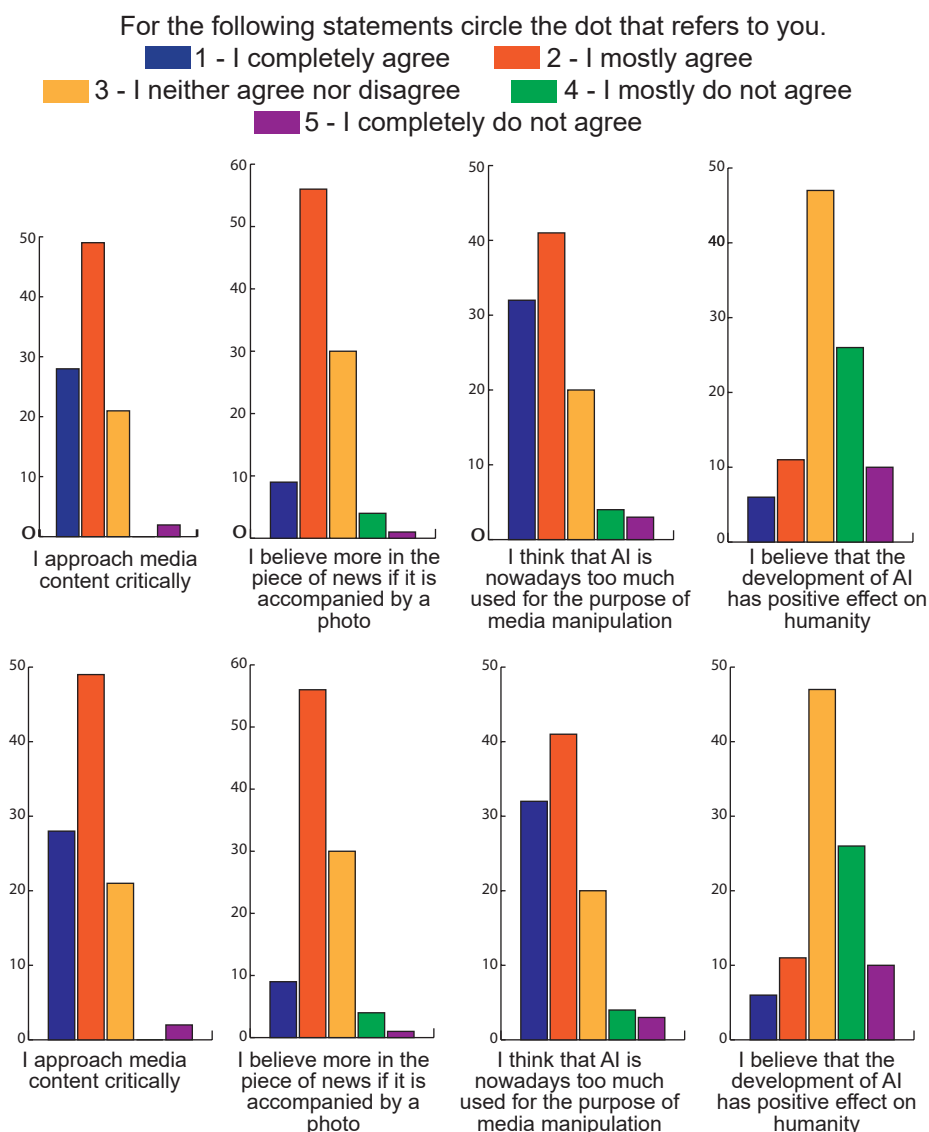
In the next set of questions the respondents were to say how much they agree or disagree with the four statements. The largest percentage of the respondents (49 %) mostly agreed with the first claim that they approach media contents in a critical way. Furthermore, 28 % of them agreed totally,

only 21 % did not have an opinion on it, whereas 2 % of the respondents did not totally agree that they approach media contents critically.

As regards the claim that they believe more in a released news if it is accompanied by a photograph, the majority (56 %) mostly agreed, whereas 30 % held a neutral position. Next, 9% of the respondents completely agreed with the claim, whereas only 4 % of the respondents mostly did not agree, and 1 % completely did not agree.

Taking into consideration the fact that every person who uses Internet or social networks is exposed to suggested information, including news, music, products, free time activities and contents related to their interests, and that every user gets a different collection of the suggested content depending on their search history and personal preferences, the respondents were supposed to answer how much AI is used for the purpose of manipulation. The largest amount of the respondents (41 %) mostly agreed, 32 % totally agreed with the data that AI is nowadays too much used for the purpose of media manipulation. Further, 20 % of the respondents did not have an opinion expressed, in other words they neither agree nor disagree, whereas 4 % partly did not agree, and 3 % completely did not agree with the claim.

Taking into consideration the basic characteristics of AI: the ability or independence of the digital computer or computer controlled robot to preform tasks connected with the intelligent beings and the adaptability which ensures advancements by learning from own experience, the largest number of the respondents (47 %) could not assess the influence of AI development on mankind. The percentage of 26 % of the respondents mostly did not agree with the claim that the development of AI has positive influence on the population, 10 % completely did not agree. With this claim 11 % of respondents mostly agreed, and 6 % completely agreed.

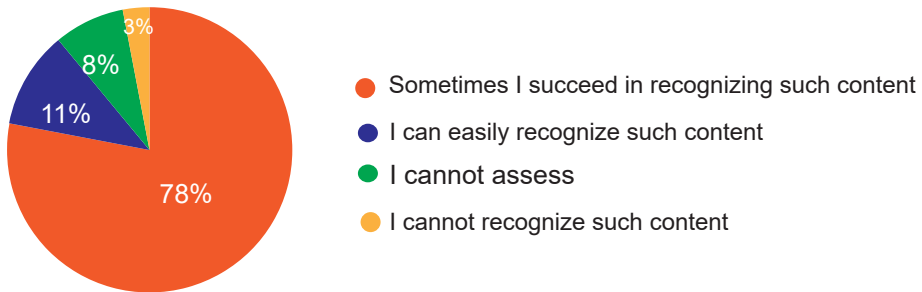


Graph 3.: Likert scale of agreement with the claims about media and AI

Recognition of the photographs created by AI

As regards the attitude and assessment of the respondents regarding the ability to recognize photographs created by AI, the largest number of the respondents (78 %) believes that they sometimes manage to recognize content generated by AI, 11 % of respondents believes that they can easily recognize such content, whereas only 8 % cannot do an estimate. Having checked the answers it was evident that only 3 % of the respondents believes that they cannot recognize content created by AI.

Do you think you can recognize the content created by AI?

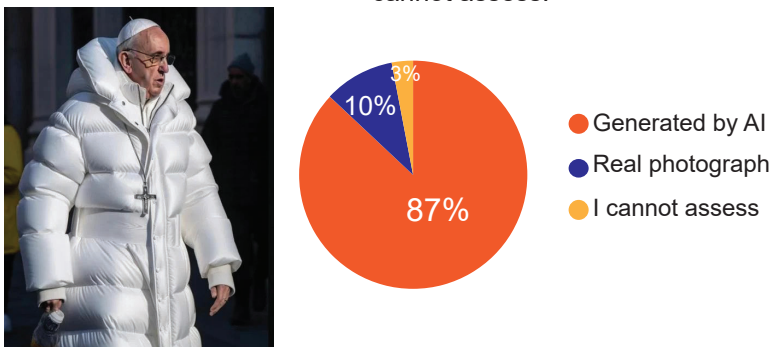


Graph 4.: The ability of the respondents to recognize content created by AI

These questions were followed by a part of the questionnaire where respondents were offered some photographs and they were to assess whether they were original or generated by AI.

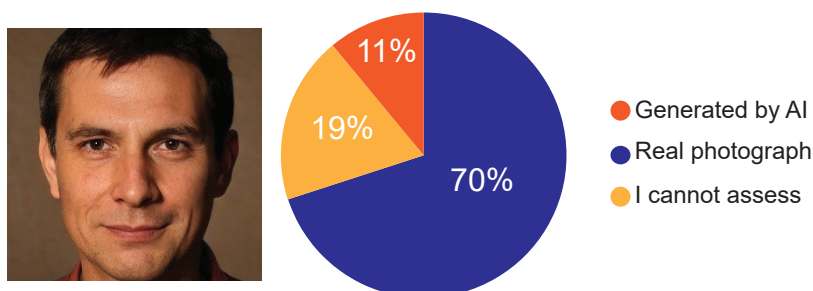
The first photograph that was presented to the respondents was a photo generated by AI that was earlier published in the media and on social networks, showing Pope Francis. In this first example, the majority of the respondents (87 %) recognized that it was a generated photograph of Pope Francis, 10 % believed that it was an original photo, whereas 3 % could not assess.

Some of the following photographs are real and some were generated by AI. Assess which were generated by AI. If you are not sure, choose the option "I cannot assess."



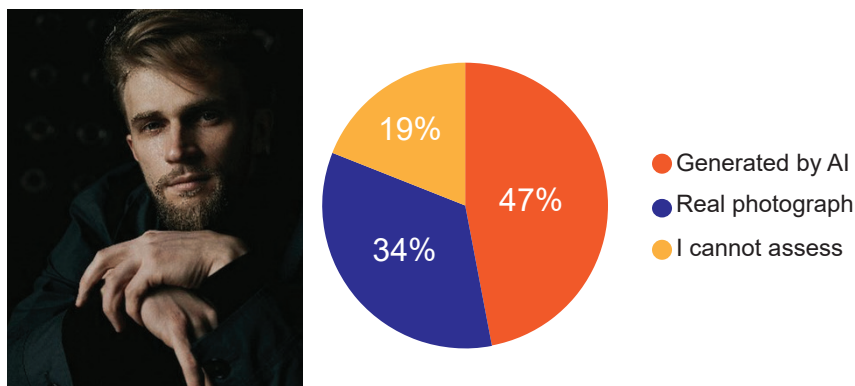
Graph 5.: Assessment of the generated photograph of Pope Francis

About the generated photograph downloaded from the webpage *thispersondoesnotexist.com*, 70 % of the respondents thought it was a real photograph, and 19 % could not assess. Only 11 % of the respondents answered that the photograph was generated by AI.



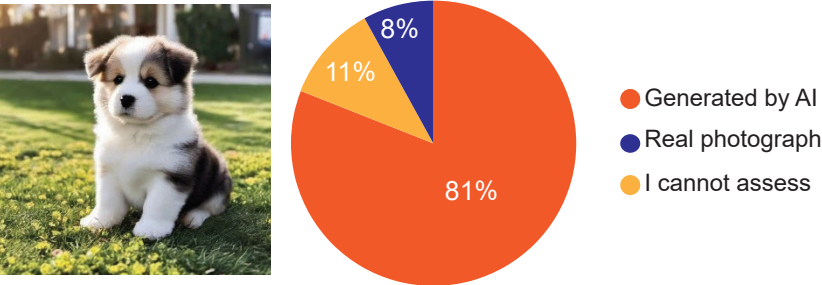
Graph 6.: Assessment of the generated photograph from the page *thispersondoesnotexist.com*

The only real photograph offered was considered to be a creation of AI by the highest percentage of the respondents (47 %), 34 % of the respondents recognized that it was a real photo, and 19 % of the respondents could not assess.



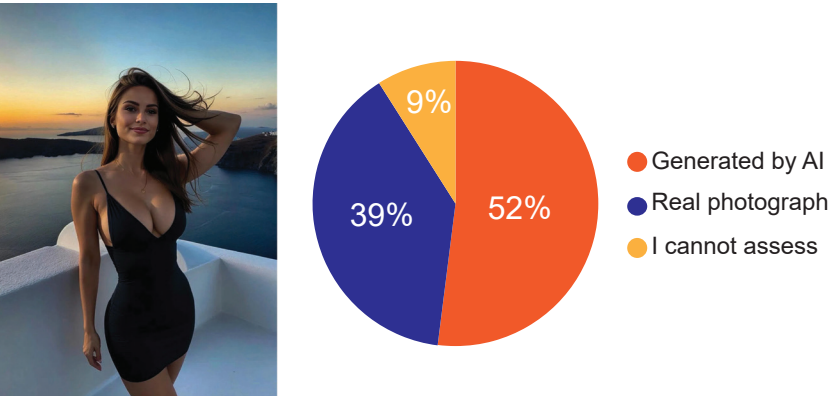
Graph 7.: Assessment of the real photograph

The majority of the respondents (81 %) recognized on the following photograph the AI. The percentage of 11 % of the respondents could not assess, and 8 % thought it was a real photograph.



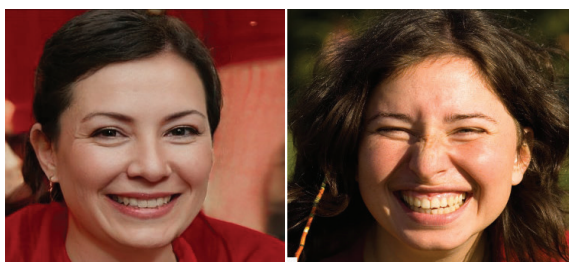
Graph 8.: Assessment of the generated photograph of a dog

The photograph of an AI Instagram model was recognized as a creation of AI by more than half of the respondents (52 %), 39 % of the respondents thought it was a real picture, and 9 % could not assess.

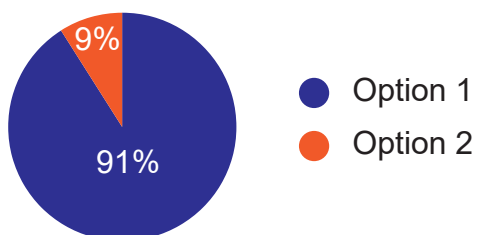


Graph 8.: Assessment of the generated picture of an AI model

The respondents were more successful with recognizing generated photographs when shown two options, one generated and one real picture, taken from the webpage whichfaceisreal.com. In the first example even 91 % of the respondents recognized that the first picture was generated by AI, 9 % were wrong and thought that the second picture was generated by AI.



Which photograph was generated by AI?

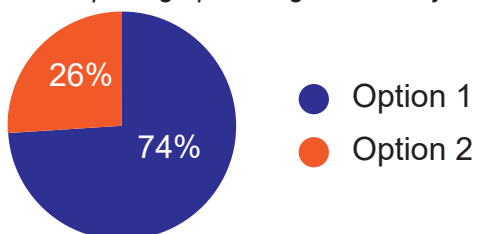


Graph 10.: Recognizing generated picture between two options

In the second example 74 % of the respondents recognized the real person in the second picture, whereas the rest of 26 % thought that the picture was the creation of AI.



Which photograph was generated by AI?

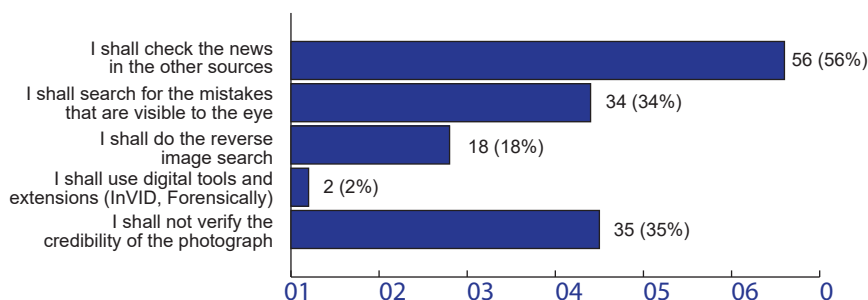


Graph 11.: Recognizing generated picture between two options

Experience of the respondents about verification of credibility of a photograph

The most frequent way of verification of credibility of a photograph in news is through checking the news in other sources, which is done by more than half of the respondents (56 %), 34 % of the respondents will search for the mistakes visible to the human eye, 18 % of the respondents will do the reverse image search, whereas only 2 % will use digital tools and extensions for verifying credibility of a photograph. Even 35 % of the respondents will not verify credibility of the photograph.

If you doubt that the photograph in the news is old, digitally changed or generated by AI, how shall you verify its credibility?

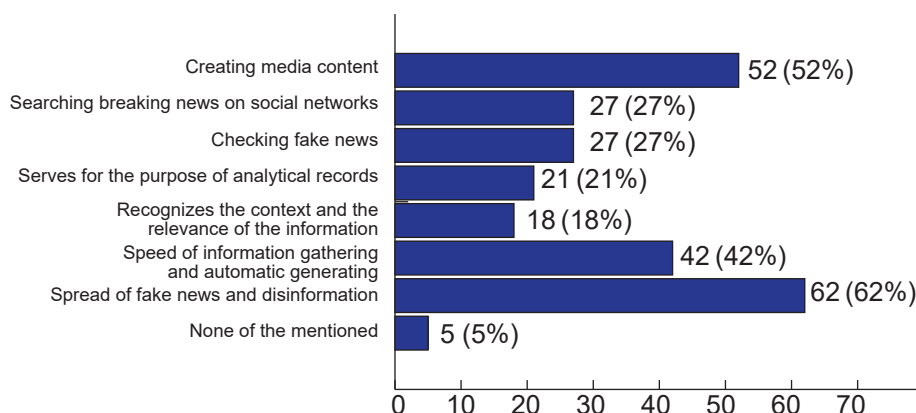


Graph 12.: Experience of the respondents about the ways of verifying the credibility of a photograph

Opinion of the respondents about the characteristics of AI in journalism

Even 62 % of the respondents agreed that the spread of fake news and disinformation are a characteristics of AI in journalism, 52 % believes that a characteristics is also creating media content, in other words that AI does the job of a journalist for them. According to 42 % of the respondents, a characteristics of AI is the speed of information gathering and automatic generating. Also, a characteristics of AI in journalism is searching breaking news on social networks as well as the possibility to check fake news, which is the opinion of 27 % of the respondents. In the opinion of 21 % of the respondents AI in journalism serves for the purpose of analytical records, 18 % thinks that AI can recognize the context and the relevance of the information, 5 % thinks that none of this is a characteristics of AI in journalism.

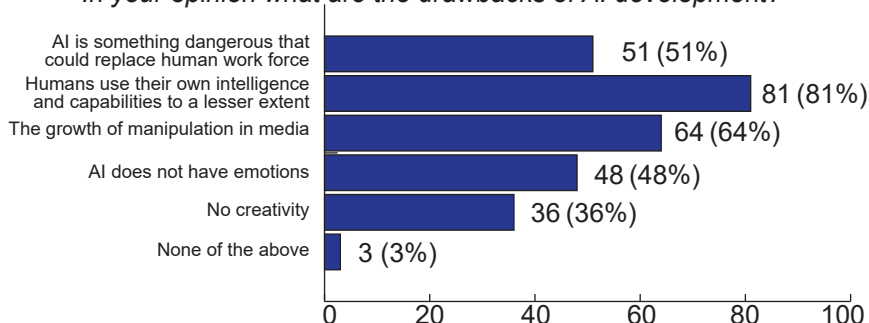
In your opinion, which are the characteristics of AI in journalism?



Graph 13.: Opinion of the respondents on characteristics of AI in journalism

The largest amount of the respondents (81 %) believes that a drawback of AI development is the fact that humans use their own intelligence and capabilities to a lesser extent. The growth of manipulation in media is a drawback according to 64 % of the respondents, 51 % of respondents see AI as something dangerous that could replace human work force. For 48 % of the respondents a drawback of the AI is the fact that it does not have emotions, and for 36 % of respondents the absence of creativity. Only 3 % believes that none of these is a drawback of the AI development.

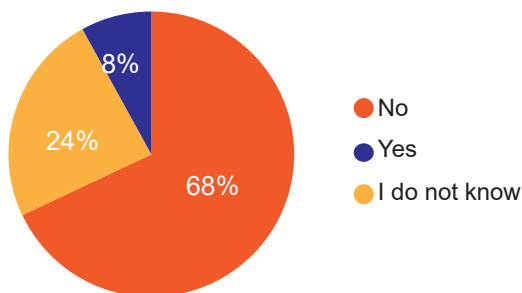
In your opinion what are the drawbacks of AI development?



Graph 14.: Opinion of the respondents about the drawbacks of AI development

Among the research aims, the opinion of the respondents was also asked if they think that AI will ever completely replace humans. The majority (68 %) of the respondents believes that AI will never replace the function nor the role of a human, 24 % does not know the answer to this question, whereas 8 % of the respondents answered „Yes“, i.e., that AI can or will completely replace humans.

Finally, do you believe that AI will ever replace the humans?



Graph 15.: Opinion of the respondents about the possibility that AI completely replaces the humans

Analysis and interpretation of the results

Survey respondents were men and women of different age groups, of different levels of education and with different media competences. Having done the analysis and having checked their answers, we concluded that the majority of the respondents believes that they are sufficiently acquainted with the term *artificial intelligence* and that AI is often used for the creation of manipulative contents, photographs and videos. Furthermore, the research has shown that the majority of the respondents mostly thinks that they have a critical approach to media contents, but also that they believe more in a news accompanied by a photograph. Although the largest number of the respondents did not express an opinion about whether AI development has a positive influence on mankind, the majority mostly agreed that AI is too much used for the purpose of manipulation in the media. When we talk about the assessment and attitude of the respondents connected to the recognition of a photograph created by AI, the majority pointed out that they are sometimes able to recognize such contents. Therefore we can conclude that the respondents are careful when expressing their opinion and competences. Namely, only 11 % of them answered that they can easily recognize the content created by AI. However, we should take into consideration the fact that the answers of the respondents were based on their statements, i.e., the answers refer more to the intuitive perception of the respondents than onto the objective competence.

When the respondents were supposed to recognize the photographs created by AI, and some of the photos were earlier present in the media (like the photograph of Pope Francis), the initial results showed that they can easily recognize a photograph created by AI. However, the percentage got lower when the respondents were offered pictures from the webpages *thisperson-doesnotexist.com* or *whichfaceisreal.com* where upon accessing the page a new generated picture of a face is shown, that they could not have seen earlier. About one of the generated photographs taken from these pages, even 70 % of the respondents thought that it was a real photograph. And vice versa, the largest number of the respondents thought that the only real photograph offered was a creation of AI. Different results were visible also with the photograph of the AI Instagram model, where more than half of the respondents (52 %) recognized that the photograph was generated by AI, whereas 39 % thought that the picture was real. The successfulness of the recognition of the generated photograph was larger in the case when the respondents were supposed to choose one from the two options. Also, one of the research aims and hypotheses was to examine which was the most frequent way of the verification of credibility of a photograph released in a news. The largest number of the respondents answered that they verify credibility of a photograph in a news by searching the same news in other (media) sources. The second most frequent answer was that the respondents will not at all verify credibility of a photograph. As a characteristics of AI in journalism the largest number of the respondents mentioned the spread of fake news and disinformation. As a drawback of the AI development they mentioned that humans use their own intelligence and competences less. However, the majority of the respondents agreed that AI will never replace humans.

The conducted research proved the hypotheses that among public there is an opinion that AI is used for manipulative purposes. The respondents (the public) do not have a habit to verify credibility of a photograph by using tools for that. They check the news most frequently in other sources or they do not verify credibility of a photograph released in media, Internet or on social networks at all.

Taking into consideration the fact that a larger percentage of the respondents did manage to recognize the generated photograph when two options were offered, and they managed to recognize the generated photographs of Pope Francis and of the dog, whereas in the examples that followed that percentage was lower, we did confirm the hypothesis that the public sometimes can not recognize the content generated by AI. Also it is important to take into consideration the fact that this was an isolated research and that the respondents knew that some of the photographs had been created by AI. The results could be highly different if the respondents, in an uncontrolled environment, came across a generated photograph in a news or in the media in general. Furthermore, the respondents could

have known in advance about some of the examples (like the photograph of Pope Francis or of the AI Instagram model) that they were a creation of AI, which could have influenced the results. On the other hand, the results of the unknown and well done example of the photographs from the page *thispersondoesnotexist.com* confirmed that the public can not easily recognize photographs created by AI. Limitations are connected to the convenient sample, which lowers the possibility of generalisations of the results. However, as it has been stated, the research can serve as a starting point, idea or thought for the future research with a larger and more representative sample.

CONCLUSION

We live in the time of domination of the visual contents like photographs and short videos, as opposed to the long, detailed texts. Therefore, visual contents are highly used as media techniques of forming the perception of reality. The abundance and diversity of easily accessible information as well as the possibility of commenting, sharing and selecting the information according to the personal wishes and needs of users have changed the habits of the media users. The public is faced on a daily basis with texts, photographs and videos whose authenticity it is not easy to recognize. Every day it is becoming more and more difficult to identify and recognize truthful, facts grounded and objective media content, especially with the advent of AI and *deepfake* technologies.

Although the public is aware of the current scope and the continuous development of AI and of the possibilities of its manipulative influences in all social segments including media, since there is an absence of the habit to verify credibility of the textual and photographic contents, especially because of the existence of the advanced *deepfake* technology, it is necessary to develop competences of digital literacy. Bearing this in mind it is important that all the actors be included – public and private sector, media, educational institutions and citizens.

From this we can draw a conclusion that media, digital technologies and AI are neither positive nor negative by themselves, but certainly they are not neutral. They are determined (at least for now) by the manner in which people apply and use them. Therefore it is crucial to reach a responsible and ethical application of these technologies. We should arouse the need and raise awareness about the need of the public to develop digital and media competences, which is a foundation for quality journalism, and subsequently for a functional, democratic society.