https://doi.org/10.3311/PPso.40300

Periodica Polytechnica Social and Management Sciences

The Impact of Online Space on Cultural Memory

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Received: 25 February 2025, Accepted: 08 April 2025, Published online: 13 May 2025

Abstract

This study examines how cultural memory is shaped through digital image searches and the selection of female role models by university students, with a focus on technical students' memories of 20th-century female figures. Drawing on Jan Assmann's theory of memory, we explore the interaction between mimetic, object-based, communicative, and cultural memory in online spaces. The paper is structured as follows: first, we provide a theoretical framework based on Assmann's concepts; next, we describe our mixed-method approach, which includes AI tools (e.g., ChatGPT), image analysis software, and content analysis of over 1600 images. Our findings suggest that online spaces both reinforce and transform historical narratives, often favouring mainstream representations of actresses and singers while marginalising lesser-known figures. Google searches and digital archives serve as primary sources of information, while algorithm-driven content influences the visibility of historical figures. This study highlights the challenges of authenticity in search results as well as the role of digital spaces in shaping cultural memory. By applying AI-based analysis, we present a model for integrating AI into humanities research and raise critical questions about digital forgetting, collective memory preservation, and the democratic accessibility of historical narratives. The findings underscore the role of education in promoting awareness of cultural memory in the digital environment.

Keywords

cultural memory, artificial intelligence, female role models, engineering students, ChatGPT

1 Introduction

Cultural memory means that, regardless of our own experiences, we are able to judge past events as true or false, former decisions as right and fair, or wrong and unfair, or even to view them from a distance without any moral content (Kovács, 2012). Among the authors writing about cultural memory, Assmann (1992) stands out, who approaches the written and built memories not only as historical documents of the past, but also examines them with an interdisciplinary approach. Assmann identifies four areas of the external dimension of memory:

- *Mimetic memory* based on imitation, which refers to the action. We imitate others' actions, activities and behaviours, and this is how we learn many habits and moral values.
- The *memory of things* means the messages of the material environment surrounding us. Things (our tools, our clothing, the furnishings in our home, etc.) reflect our personality, past and present.
- *Communicative memory* emphasises the importance of human interactions. Participation in human interactions is the very basis for the development of memory.
- *Cultural memory* fills the previous kinds of memory with meaning and refers to the inheritance of meaning. Mimetic routines are accompanied by intellectual significance; objects also refer to meaning (e.g., they symbolise something); and by extending communication situations, "*(...) meaning breaks through from beyond the current meaning, long-forgotten aspects are raised, traditions are revived, and suppressed contents return*" (Assmann, 1992:p.22). We must imagine these dimensions so that if mimetic memory is ritualised or the memory of things is symbolised and iconised, it can become cultural memory. However, the separation of the various memory dimensions is primarily relevant to the interpreter.

Cite this article as: Kanczné Nagy, K., Ribní, F. (2025) "The Impact of Online Space on Cultural Memory", Periodica Polytechnica Social and Management Sciences. https://doi.org/10.3311/PPso.40300

> In specific recalling and commemorating activities, mimetic, objective, cultural and communicative forms can all come into play (Kovács, 2012).

Assmann's questions focus on what "*channels*" and "*containers*" each culture creates for memory, that is, how culture organises memory, and vice versa, how memory shapes culture. On the other hand, he asks how memory creates a social community from a loosely associated group of people, and how memory creates identity. His approach does not regard memory as an exclusively internal, psychological or biological phenomenon, but instead emphasises its inseparability from the workings of culture. Memory is never given, but is a phenomenon created by society, emerging in the public environment of culture full of continuous developments and redefinitions. It is transmitted via various media and channels (N. Kovács, 2000).

Assmann (1992) believes that we are on the verge of a new era in remembering the past, because with the emergence of external data storage and the electronic genres of artificial memory, we are experiencing a cultural revolution whose importance is equivalent to the invention of book printing and writing. Assmann embeds the effect of media history changes on memory into an interpretation of intellectual history. He interprets the emergence of modern technologies not only as technological developments, but also emphasises the importance of their integration into cultural traditions and social institutions.

Based on Assmann's approach, the effect of the World Wide Web on cultural memory is also examined by O. Réti (2018), who states that the Internet has fundamentally changed the environment and conditions of memory. For example, the abundance of available data can give the impression that everything worth remembering can be found on the Internet. In addition, we also have to take into account that the uploaded pieces of content are linked to each other. However, if the link is not correct, users/those remembering will not be able to access them, so such content can easily be dropped from the active, functional memory.

As the problem of equal and democratic access, O. Réti (2018) mentions first that the Internet to a certain extent appears as a utopia of perfect democracy, since on the one hand everything is available on the Internet. Secondly, the author highlights that no archive can be complete, even though online collections processing the past typically communicate this image. In the network of hypertextual memories, the selective visibility of online memories largely depends on where they are positioned in the network. Preference-based algorithms are designed accordingly. Algorithms that allow personalised search try to figure out what the user needs, and this radically rearranges the structure of the online public. Based on all this, the author states that instead of accumulating the entire knowledge of humankind, the World Wide Web has become a "*filter bubble*" that simply excludes opinions and memories from the user's field of vision that are different than the user's own.

2 Purpose of the research and the sample

We wanted to realise our research on online memories by assessing the effect of the Internet on the cultural memory of university students. The research was carried out by analysing the products of students participating in an elective at the Budapest University of Technology and Economics. The course focused on the history of girls' education from ancient times to the present day. The subject of our analysis was the collections of images made by the students about women living in the 20th century. During the task, they had to answer the question who they thought were the female role models of the 20th century. Using the Internet, they searched for materials and created image collections.

The collections of more than one hundred students (N = 114) participated in the study and we analysed a total of more than a thousand different images (N = 1622).

Our key research questions were as follows:

- RQ_1: Who do engineering students consider the female role models of the 20th century?
- RQ_2: What is the relationship between the search space and the frequency of images of famous women appearing in image collections?
- RQ_3: What are the linking algorithms between the content used on the Internet?

3 The research strategy and the measurement tools

We used image processing and analysis software (IBM SPSS Statistics, online; MATLAB, online; Microsoft Excel, online; ATLAS.ti, online), an AI model (OpenAI, online) and Google's search engine (Google, online) for data collection. The data were analysed with content analysis, using both qualitative and quantitative methods.

The potential for the versatile use of AI has already appeared in several educational science papers (Endrődy and Bahbibi, 2024; Ribní, 2025). During the research, we used artificial intelligence models as analytical tools designed to support research. This approach differs from the general approach found in scientific works, which generally

focuses on the theoretical understanding of the artificial intelligence phenomenon and is often reluctant to put AI to practical use. However, our work clearly represents the so-called application-oriented approach, which can contribute to the wider recognition of the use of AI in research.

ChatGPT (ChatGPT-4) (OpenAI, online) is particularly fast and efficient at image analysis. The tool can process multiple images at the same time, which minimises the need for human resources and significantly reduces the need for human intervention. It works well when processing portraits, full-figure images and other types of image data, which would be particularly time-consuming to analyse manually. When processing high-resolution images, the tool provides accurate results, such as identifying facial features or body characteristics. The tool supports biometric facial recognition algorithms to analyse clothing styles, postures or movement patterns, as well as facial recognition. ChatGPT also works effectively in estimating sensitive biometric features such as gender, age, or ethnicity. Deandres-Tame et al. (2024) conducted a comprehensive analysis of ChatGPT's capabilities in facial biometric tasks. For example, in the Labeled Faces in the Wild (LFW) database (Li, online), the tool achieved approx. ≈ 94% accuracy in checking faces. In the MAAD-Face database (Pterhoer, online), it also scored remarkably high in estimating gender (approx. ≈ 96%), age (approx. ≈ 73%), and ethnicity (approx. ≈ 88%). In addition, its text outputs help better explain the results. Hassanpour et al. (2024) also emphasise that ChatGPT is a reliable image analysis tool with outstanding accuracy and applicability in fast processing of image data and understanding of results.

Its application in image recognition tasks, therefore, speeds up research processes and increases their reliability.

4 Presentation of the results

Role models play an important role in our lives (Bandura, 1986, 1997; Bandura and Walters, 1963; Carr, 1991, 1999; Gibson, 2003; Kohlberg, 1969, 1976; Piaget, 1997; Walker, 1999). Role models are people who are perceived to be similar to some extent by the individual, and because of this similarity, the individual desires to imitate the given person's characteristics and behaviour, writes Gibson (2003), who assumes that role models are important in the individual's life not only for children and young adults, but also in later stages of life. Our first role models come from the family (Berger and Luckmann, 1998; Komlósi, 2004). The experiences of our parents and immediate family members about their relationship with life and the world are the first determining basic experiences. Later, as our living space expands, we get experience not only from home but also from other areas about the inspiring behavioural patterns of people we consider authentic. On the one hand, through personal encounters and educational impacts in secondary socialisation spaces (educational institutions, sports and arts schools, etc.), and on the other hand, we choose them ourselves. We find role models to grow up to (Siba, 2022).

Information tools play a huge role in selecting role models. The "*celebrity culture*" that emerged in the 20th century has had a profound social impact. "*Celebrity worship*" often took people to the level obsession (Brooks, 2021). Fairchild (2007) mentions the phenomenon of the "*idol*", which he defines as a phenomenon based on the creation and maintenance of carefully structured consumer relationships. Successful "*idols*" are becoming more and more well-known brands. According to Galbraith and Karlin (2012), the characteristics of "*idols*" is that they can be both men and women; they are usually young or present themselves as such; they appeal to wide segments of society; they act simultaneously in areas of their own genre and in the media associated with it; they cannot be expected to be talented; in fact, they are interchangeable and disposable "*goods*".

4.1 Who do engineering students consider the female role models of the 20th century?

The identification of the persons in the images was carried out in two phases. In the first phase, we created two groups:

- Group 1: known female role models;
- Group 2: unknown female role models.

In the second phase, we examined the following:

- What profession made the members of the first group famous and what nationalities are they?
- What social group did the members of the second group belong to, and in what fields did they work?

We used the ChatGPT-4 AI model to recognise people and obtain information (OpenAI, online). The prompt used during the research is presented in Fig. 1.

ChatGPT-4 (OpenAI, online) analysed 1622 images (N = 1622), of which it identified 35 different famous people and 1112 non-famous people (Table 1).

4.1.1 Known female role models

In the image collections, we found more than five hundred images depicting famous female role models (N = 510).

1. Identify the ideal woman in the picture (name, nationality, family background)
2. What is she famous for? (examine her life story)
3. In what field was she active? (entertainment, science, etc.)

The woman in the picture is Marilyn Monroe. Here are the details you requested:

1. **Name, Nationality, and Family Background:**
   - **Name:** Marilyn Monroe (born Norma Jeane Mortenson; also known as Norma Jeane Baker).
   - **Nationality:** American.

Fig. 1 Prompts used in the application of the ChatGPT-4 AI model to recognise people and obtain information about them (Source: self-edited (OpenAI, online))

Table 1 The results of the analysis by ChatGPT-4 about the female role models in the images (OpenAI, online)

Student work (N = 114)		
Used images		
Non famous persons	Mean	11.75
	N	1112
	Standard deviation	12.21
Famous persons (AI recognised)	Mean	3.42
	N	510
	Standard deviation	3.22
Number of unique individuals	N	35
Total	Mean	15.17
	N	1622
	Standard deviation	15.43

Source: self-edited

As a result of further analysis, we identified 35 famous people. It is noteworthy that among the celebrities, the figure of Elisabeth Wittelsbach, Empress of Hungary (better known as Sissi), who did not even live in the 20th century, occupied a very distinguished place. Since this 19th-century celebrity appeared in the image collections of several students, at a rate of 5.49% in total, we did not filter it from the sample, but at the same time we examined the relationships of the complex information technology, cognitive and social science factors behind the phenomenon, and compared it with the mechanisms of digital information processing, search engine optimisation and cultural and historical representation. The relevant results are presented in detail in Section 4.3.

The frequency of the appearance of famous female role models in students' image collections is represented in Fig. 2. Hungarian female celebrities part is 40% of well-known people, while the proportion of non-Hungarian female celebrities is 60%.

A further analysis of the number of photos shows that among all the photos (N = 510) depicting famous people in the collections, 22.94% are Hungarian celebrities are included, while the rate of images of non-Hungarian celebrities is 77.06%. However, based on the standard deviation indicators, it can be stated that the selection was more consensual for Hungarian celebrities than for non-Hungarian celebrities (Table 2).

In the second phase of the study, the professions and nationalities of the celebrities were identified. As far as their professions, 54.28% of the famous female role models are actresses or singers or both. Female rulers and wives of heads of state were classified in the category

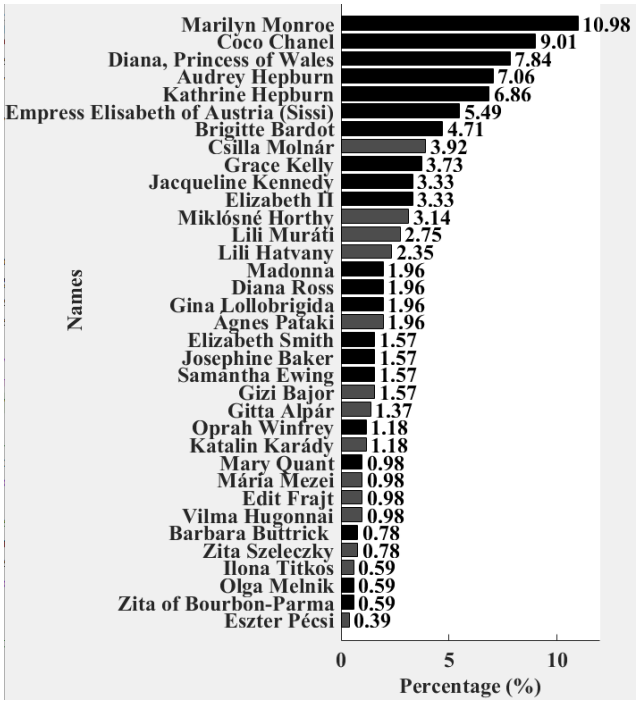

Fig. 2 Frequency of appearance of famous female role models (Source: self-edited (MATLAB, online))

Table 2 Statistical indicators of photos depicting known female role models

	Average	Standard deviation	Min.	Max.
Hungarian celebrities	8.36	5.34	2	20
Non-Hungarian celebrities	18.71	15.66	3	56

Source: self-edited

related to politics. The group of women related to the beauty industry includes famous models, beauty queens or fashion dictators. Famous people in the category of female scientists are the first female representatives of a discipline. Female athletes, individuals famous for their high level of physical activity (Fig. 3).

A further analysis of known individuals by occupation shows that there are more non-Hungarians among actresses and singers, celebrities related to politics and female athletes (Csehiová and Kiss, 2023). This ratio is equal among celebrities related to the beauty industry. Among the scientists, only those of Hungarian origin are included (Fig. 4).

According to a further analysis of nationality at birth, female celebrities are mostly of Hungarian origin (40%), a quarter of them are American (25.71%), 11.42% English, and 23% of French, Italian, German, Belgian and Russian origin (Fig. 5).

In the quantitative analysis of the results, we first examined the category of actresses and/or singers representing the largest group (54.28%). Literature confirms that the social perception and social position of actresses changed significantly in the first half of the 20th century. Acting

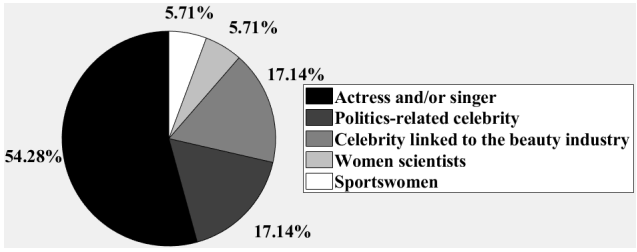

Fig. 3 Occupation of famous female role models (Source: self-edited (MATLAB, online))

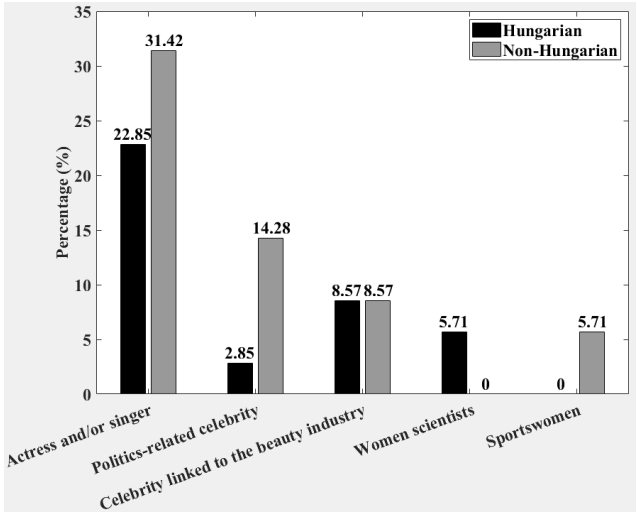

Fig. 4 Occupation of famous female role models according to Hungarian and non-Hungarian nationalities (Source: self-edited (MATLAB, online))

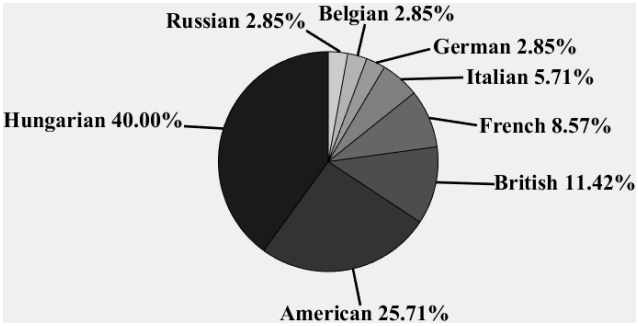

Fig. 5 Distribution of famous female role models by nationality (Source: self-edited (MATLAB, online))

had become a viable career. The developing "*star cult*" was also supported by the press. Numerous theatre magazines and tabloids generated publicity for the actresses of the era (Schreck, 2013). The rise in the social rank of the actresses started with the emergence of women striving for an independent existence instead of women who appeared on stage through family relations and the fans followed the fashion created by their idol. The army of hairdressers created hair styles similar to that worn by the role model. Girls and women used the beautifiers advertised by the elegant, well-groomed ladies known from the theatre and the details of their private lives became more and more public. Since the 1940s, actress and singer celebrities have conquered not only the stage but also the silver screen (Gajdó, 2008).

Based on the above, we analysed the career paths of the actresses appearing in the student image collections using the following criteria:

- How old are female celebrities?
- What was the main branch of art in which they worked?
- Did they get married and how long did it last?
- Did they raise children?
- What other activities characterised their lives besides art?

45.45% of non-Hungarian female celebrities are people living today. It is noteworthy that one of them is not an actress, but a character portrayed by an actress. Samantha Ewing is one of the protagonists of the television series *Dallas*, who is portrayed by actress Linda Ann Gray, but AI did not identify her with her real name in the images in the student image collections. The reason for this is that the photos show scenes from the series, which shows Linda Gray as Samantha Ewing. From this, we can conclude that the students considered the character in the film as a role model, not the actress who played her.

The art of non-Hungarian female celebrities covers multiple genres. They all worked as actresses in real life, even if they initially started their career as models, singers, dancers or presenters. They all got married except for Oprah Winfrey. They all divorced except for Grace Kelly. The number of divorces is more than two among 54.54% of non-Hungarian celebrities. 27.27% of them are childless, 36.36% have 3 or more children. 18.18% also raised or is raising adopted children as well. Some sort of behaviour that attracts the attention of the public, a minor or major scandal can be found in the biographies of all celebrities. At the same time, they are also found working in charitable organisations and turning to the fallen and the needy. In addition to Grace Kelly, who became a member of a royal family, published political activity is found in the biographies of Gina Lollobrigida, Josephine Baker, and Oprah Winfrey.

Among the famous Hungarian female role models, there is only one actress still alive today. The vast majority of them (87.5%) were born between 1893 and 1915, so the world wars affected their lives. Every actress born in this period has an event related to the German occupation in her biography: escape, adversity, helping others, or saving others. Regarding their family situation, 62.5% of them were divorced and 75% were childless.

Female celebrities associated with politics were, with one exception, the wives of heads of state. The exception is Queen Elizabeth II, who was Queen of the United Kingdom for 70 years and 214 days. Some sort of tragedy directly affecting the person is found in the biography of 50% of the female role models in this group. Princess Diana of Wales died in a car accident, Queen Sissi of Hungary was stabbed in the heart by an Italian anarchist, and Jacqueline Kennedy's husband, John Fitzgerald Kennedy, the 35th President of the United States, was assassinated. All of their biographies record activities related to charity and helping the fallen, which is also related to their social status. However, Zita of Bourbon-Parma stands out from the group based on her good deeds, as based on her marital loyalty, love, self-sacrifice, trust in God and human qualities, the process of her beatification began in 2019.

50% of the female celebrities related to the beauty industry are fashion designers, who revolutionised a woman's clothing with their ideas and thus became the symbol of a modern, liberated, elegant and dynamic woman. 33.33% of the female role models in the category became known as models. The previous classifications do not include Lili Hatvany, who was a writer by profession, but her work was mainly related to dressing and the world of fashion.

Two Hungarian celebrities belong to the group of female scientists. Vilma Hugonnai, who was the first Hungarian female doctor and Eszter Pécsi, the first Hungarian female engineer and one of the most prominent figures in Hungary between the two world wars. As women, both had to prove their talents and professional skills, but they differed in that while Eszter Pécsi enjoyed the support of her parents and then her husband, Vilma Hugonnai did not. These circumstances also shaped their maternal involvement differently. The architect was able to create a work-life balance, while the doctor had to copy with a lot of adversity.

Two celebrities still alive today belong to the group of female athletes. One of them is the world champion of women's boxing, and the other is a biathlete.

4.1.2 Unknown female role models

The images depicting non-famous people (N = 1112) were encoded using the ATLAS.ti software (ATLAS.ti, online), which made it possible to identify the social roles and attributes of the female role models in the images. During the encoding process, we first defined the relevant categories and themes, which were compiled based on the different characteristics, behavioural forms and social roles of the women appearing in the images. Here are some of them:

- Shopping: shopping on the market, returning home with bags;
- Working in a factory;
- Wearing a uniform;
- A hairdresser with scissors;
- A dressmaker at a sewing machine;
- A waitress with a tray;
- An office worker at a desk;
- Wearing elegant clothes, attending a fashion show;
- Posing in magazine photos;
- Appearing on advertising posters;
- A demonstrator holding a banner.

Subsequently, the data encoded in the ATLAS.ti software (ATLAS.ti, online) were imported into the SPSS statistical data analysis software, where a factor analysis was performed. The purpose of the factor analysis was to identify the relationships between different codes and the underlying patterns that reflect the social roles and ideals of female role models. Combining the statistical tools provided by IBM SPSS Statistics and the encoding performed by ATLAS.ti allowed us to explore the social representations of female role models in detail and analyse them in a scientific way (ATLAS.ti, online; IBM SPSS Statistics, online).

Fig. 6 illustrates the analysis process, showing the relationships between the codes and the factors.

Before the factor analysis, the KMO value was 0.732 (KMO > 0.6), on the basis of which the variables were considered appropriate and suitable for factor analysis. As a result of the Varimax rotation applied to the four factors, the factors became much easier to interpret. Using the factor analysis, the codes were grouped into four main factors (Table 3):

1. Factor 1 (F1): Housewife:
   - Raising children;
   - Performing household tasks;
   - Shopping.
2. Factor 2 (F2): Working woman:
   - Factory worker;
   - Service worker (e.g., seller, waitress, dressmaker, hairdresser);
   - Office worker (e.g., accountant, secretary).
3. Factor 3 (F3): Fashionable woman:
   - Style icon;
   - Model.
4. Factor 4 (F4): Activist:
   - Women's rights activist.

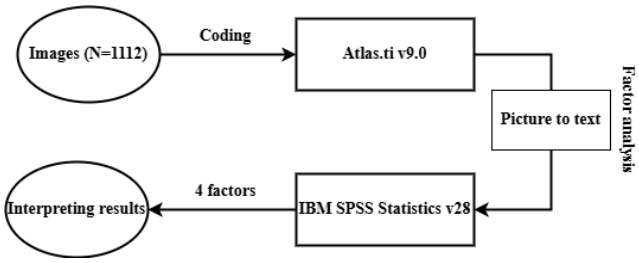

Fig. 6 The process of analysing images of non-famous people (Source: self-edited (Draw.io, online))

Table 3 Grouping of non-famous female role models by factors

	F1	F2	F3	F4
Performing household tasks	**0.80***	0.05	−0.12	0.08
Shopping	**0.78***	0.06	−0.08	0.12
Raising children	**0.92***	−0.01	−0.15	0.10
Factory worker	−0.04	**0.82***	0.15	0.20
Service worker	0.02	**0.88***	0.12	0.18
Office worker	0.10	**0.79***	0.14	0.22
Style icon	−0.08	−0.04	**0.92***	0.30
Model	−0.10	−0.06	**0.88***	0.28
Women's rights activist	−0.15	−0.08	0.05	**0.85***

* The values in bold indicate the grouping of non-famous female role models based on the underlying factors identified through factor analysis. Each bolded item represents a variable that strongly loads on a given factor, suggesting a meaningful association within that thematic cluster. Source: self-edited

F1 represents classic female roles. The female role model is the mother raising her children, the wife serving her husband, who provides the warmth of the home by leading the household.

F2 shows that the 20th century was the beginning of women's emancipation. After World War II, women became more and more involved in the labour market. Their paid employment has increasingly expanded from traditional "*women's*" jobs to areas where only men had worked until then (Domenico and Jones, 2006). In the 1950s, the female employee appeared as an ideal image, a worker who worked hard alongside men, was more asexual than attractive, and also cared for the family. The new family model clearly became that of "*two money makers*", and traditional roles were gradually questioned by the 1980s. The basis of female success has not been a balanced family, many children, but finances, accumulation of wealth, and increase in social status (Moretti, 2008).

The images under F3 show the female role models in terms of dressing. In the 20th century, as a result of the empowerment of women in the social, economic and cultural arenas, the number of women's magazines and fashion magazines has increased, and more and more daily and weekly magazines began to publish several news pieces, articles and pictures about and for women (Ambrusné Kéri, 1997; Gedő, 2018).

The images in F4 show women living in the period of socialism, who formed organisations as working-class women and generally fought for rights for women under the direction of the party (Gaido and Frencia, 2018; Ghodsee and Mead, 2018) (Fig. 7).

4.2 The relationship between the search space and the frequency of images of famous women appearing in image collections

The frequency of the appearance of famous female role models in the Google search space is shown in Table 4.

To calculate the correlation between the size of the Google search space and the search frequency of famous female ideals, we used the Kendall's tau-b correlation index, which better handles smaller datasets and non-linear monotonic relationships, and is less sensitive to extreme values. Our variables for celebrities are discreet and ranked (Table 5).

This means that the larger the Google search space, that is, the wider the spectrum of search options and results, the greater the likelihood that a particular person's images will become available and that students will use them

Fig. 7 One example from each of the images belonging to the four factors (Source: selection from the students' collections)

in their work. The correlation coefficient of 0.478 marks a moderate positive relationship, which indicates that images of female ideals with a large search space are more often included in the selected materials in line with the increase in the size of the search space (Fig. 8).

However, there are some differences between the size of the Google search space and the frequency of images of female ideals preferred by students. Based on the statistical data, it can be stated that the size of the search space does not always accurately reflect the ranking preferences of the students. For example, although Diana, Princess of Wales, has the largest search space (111×10^7 results), the students ranked Marilyn Monroe first with only 87×10^6 results. There are also women of Hungarian nationality who, despite the smaller Google search space, ranked higher in the ranking of students than their non-Hungarian counterparts. For example, Csilla Molnár beat Diana Ross (669×10^5 results) with 197×10^4 Google search results. This suggests that not only the search space played a role in the development of student preferences.

4.3 Linking algorithms between the content used

To search for the keywords "*20th-century female role model*" or "*20th-century female ideal*", online results can be displayed with the following types of content, in which the images are associated with the texts:

- *Historical and social analyses*: articles, studies that discuss female role models and ideals of the 20th

Table 4 Frequency of famous female role models in the Google search space

Names of female idols and the Google search space ranking	
	Google search space
1st Diana	111×10^7
2nd Madonna	261×10^6
3rd Grace Kelly	193×10^6
4th Elizabeth Smith	142×10^6
5th Marilyn Monroe	87×10^6
6th Coco Chanel	776×10^5
7th Diana Ross	669×10^5
8th Jacqueline Kennedy	364×10^5
9th Oprah Winfrey	346×10^5
10th Sissi	344×10^5
11th Audrey Hepburn	245×10^5
12th Josephine Baker	178×10^5
13th Brigitte Bardot	154×10^5
14th Mary Quant	148×10^5
15th Kathrine Hepburn	754×10^4
16th Gina Lollobrigida	459×10^4
17th Samantha Ewing	201×10^4
18th Csilla Molnár	197×10^4
19th Mária Mezei	882×10^3
20th Elizabeth II	562×10^3
21st Eszter Pécsi	494×10^3
22nd Ágnes Pataki	446×10^3
23rd Barbara Buttrick	258×10^3
24th Lili Muráti	222×10^3
25th Ilona Titkos	215×10^3
26th Gizi Bajor	212×10^3
27th Olga Melnik	205×10^3
28th Miklósné Horty	203×10^3
29th Katalin Karády	140×10^3
30th Zita of Bourbon-P.	103×10^3
31st Zita Szeleczky	312×10^2
32nd Lili Hatvany	25×10^3
33rd Edit Frajt	217×10^2
34th Vilma Hugonnai	204×10^2
35th Gitta Alpár	176×10^2

Source: self-edited

Table 5 Kendall's tau-b correlation index

			Google search space
Kendall's tau-b	Number of female idols identified	Correlation coefficient	0.478
		Sig. (2-tailed)	0.000
		N	35

Source: self-edited

Fig. 8 Comparison of the appearance of famous female role models in the Google search space and their frequency found in image collections (Source: self-edited (MATLAB, online))

century, e.g., the influence of the feminist movement, famous female figures such as Marilyn Monroe or activists for women's rights.

- *Cultural and artistic discourses*: content that analyses the changes of ideals, examining female images in the arts, films, literature or media.
- *Social and political contexts*: the impact of ideals and role models on various social and political changes (e.g., women's rights, equality in the workplace, political participation) is also examined.

Search engines select results from relevant documents identified by algorithms and rank them based on the page title, page content, and other factors.

As mentioned above, modern search engines use advanced machine learning algorithms designed to serve user queries as accurately and with as relevant results as possible. However, these algorithms do not only rely on the explicit meaning of the search terms, but also take into account contextual relationships, the frequency of searches, the linking of content and user behaviour. Thus, when searching for the keyword "*20th-century woman*", the system can rank people who did not live in the 20th century, but who may still appear relevant to the search algorithm due to certain cultural, social or historical contexts. On the one hand, through the mechanism of keyword association, the search engine can find the term "*20th-century woman*" on pages where the person's name is listed alongside other 20th-century concepts, such as in the context of feminism, fashion history or political movements. For example, Elizabeth Smith Miller, who lived predominantly in the 19th century and was one of the pioneers of women's reform clothing and feminism (Miller and Miller, 1897–1911), was brought to focus again in the 20th century under the influence of later feminist movements. Thus, content about her is often associated with this era designation.

Elisabeth Wittelsbach, the Empress of Hungary, commonly known as Sissi, has also become a cultic historical figure whose judgment and representation in 20th-century popular culture has changed significantly, which makes her name easily associated with discourses on 20th-century female ideals.

On the other hand, SEO (Search Engine Optimization) or, for example, Wikipedia links play a significant role in producing these types of results. Search engines rely heavily on hyperlinks between content and the popularity of each website. If a Wikipedia article on a historical personality or other referenced source includes terms related to 20th-century female ideals, the algorithm can combine the two concepts, regardless of whether the person's achievements really belong to the era in the search or not (Alfiana et al., 2023; Yalçın and Köse, 2010).

The purpose of search engine optimisation (SEO) is to make a website rank as high as possible in the search engine results list. As a result, the website's visibility, traffic, and thus its brand awareness as well as the number of sales or subscribers may increase. SEO improves your page's ranking by creating keywords, meta tags, and building links and quality content. Its basic concepts include algorithms that determine the hit list of search engines as well as search bots, keywords, indexing and

link building. Search engine optimisation requires continuous work as algorithms and search habits change (Alfiana et al., 2023; Yalçın Köse, 2010) (Fig. 9).

Another important aspect of the distortion of search results is the characteristics of cultural memory. The reconstructive nature of collective memory shapes the forms of memory. "*... cultural memory transforms the factual past into a memorable past, thus converting it into a myth.*"- writes Assmann (2004:p.53). For example, the figure of Elisabeth Wittelsbach also appeared strongly in the 20th-century film industry and literature, especially through the "Sissi" film series starring Romy Schneider in the 1950s (see in the film of *Sissi - A Magyarok Királynéja* (1955) directed by Ernst Marischka). This reorganised cultural representation contributed to the fact that the name of Empress Elisabeth was closely associated with the female ideals of the 20th century, even though she did not belong to this era in her life.

In the myth-making process of famous people, the media and popular culture often shape the figures of historical people with idealised, romanticised narratives. "*Myths are also forms of memory: the difference between myth and history loses its validity here. From the point of view of cultural memory, only the memorable, not the actual history is important*" (Assmann, 2004:p.53).

Visual search engines, such as Google Lens, are particularly prone to ranking the visual representations associated with a particular search term. This means that if the pictorial representations of a specific historical person

Fig. 9 The process of search engine optimization (Source: Yalçın and Köse, 2010)

are included in articles or blog posts about 20th-century women's ideals, the search engine confirms this relationship and is more likely to associate them with each other than later searches. The algorithms do not select the results based on the actual historical affiliation, but examine the correlation between the images and the descriptions belonging to them.

Overall, therefore, the distortions of the results generated by search engines are caused by several factors. Algorithmic search models create complex text and visual data connection systems that do not always reflect historical reality, but are based on associations shaped by the operating principles of cultural memory, popular media and digital information systems.

5 Discussion

As a result of our research, the following findings can be made:

- Regarding the selection of female role models, we can state that the majority of female celebrities selected by the students are actresses and singers. The volume of their selection is in line with the changes in the female roles of the 20th century, in which the artist's career has become socially accepted and has become a professional path, and its representatives have become the female role models of the era.
- Women in the images depicting unknown female figures also depicted the female roles operating in 20th-century society.

Our finding is that the Internet is an archive in which the functional and storage memory positions of the memory contents are significantly affected by the current state of their availability in the search space.

Verification of the authenticity of memory contents obtained during internet searches has also emerged as a problem. In the student works, we found a large number of collections in which we detected the following phenomena:

- The women in the images are not from the 20th century;
- The images are not related to the era, but only contain visual elements that have been identified by the search engine during the search process.

At the same time, it was also found that the selection of images was not only related to the size of the search space, but the individual decisions of the students also had an effect on the preference of female role models. In our

study, we used artificial intelligence models as analytical tools. This approach differs from the general approach found in scientific works, which generally focuses on the theoretical understanding of the artificial intelligence phenomenon and is often reluctant to put AI to practical use. Thus, our work can contribute to the wider recognition of the use of AI in research.

The research also encourages further thinking about certain pedagogical aspects, namely, the problem of forgetting. With knowledge of the mechanisms operating in the online space and also identified by us, it is necessary to draw the attention of the students to the fact that the number of searches brings information to the fore and puts others in the background, which may be important. Through this process, we can lose memories.

6 Conclusion

The Internet's influence on memory has surfaced as a key issue, including challenges in verifying historical accuracy. The use of AI tools supported our analysis and has highlighted the value of application-oriented approaches. Our findings also draw attention to the educational risks of digital forgetting shaped by search algorithms.

Based on the sampling, the conclusions drawn can only be applied to Hungarian students participating in the engineering Bachelor's programme.

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