

# Method of preprocessing information for preparing a description of art objects using artificial intelligence\*

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## Abstract

The use of generative artificial intelligence (AI) in the preparation of artwork descriptions allows automating the process of analyzing and documenting works, improving the accuracy and quality of information. Creating textual descriptions for visually impaired people is a combination of the art of words and inclusive technologies, as it is important not only to convey the meaning of the painting but also to help a person “see” it through emotions, analogies, and sensory sensations. The introduction of this technology will help improve the perception of art, its accessibility to a wide audience, and the quality of educational materials, and proper data preprocessing is a key factor in obtaining relevant and accurate descriptions, which contributes to the development of digital archives, museum collections, and educational platforms. The main goal of the developed method of preprocessing information for preparing art object descriptions using artificial intelligence is to adapt the text to the individual characteristics of user perception, including their emotional, cognitive, and cultural preferences and gender identity. The language models/prompts for the automatic generation of personalized, emotionally colored textual descriptions of art objects obtained as a result of the developed method, as well as the results of their implementation, allow to supplement information technology for ensuring accessibility to art objects for the visually impaired persons with the following functions: generation of personalized, adapted textual descriptions of art objects, taking into account user preferences and gender; generation of detailed audio descriptions of paintings using AI, taking into account the context and emotional component of the work, as well as the ability to adapt the description style to user preferences (for example, a choice between a detailed and concise description); interactive interaction of users with the system through voice commands or textual queries; integration with existing inclusive technologies for visually impaired people.

## Keywords

Information preprocessing, description of art objects, artificial intelligence (AI), generative artificial intelligence (GAI), psychophysiology of attention, focus of attention.

## 1. Introduction

In 2015, there were an estimated 253 million people with visual impairments worldwide, of whom 36 million were totally blind and 217 million had moderate to severe visual impairment [1]. By 2020, this number had increased to 295 million people, including 43.3 million blind and 251.7 million people with severe visual impairment [2]. It is projected that by 2050, the total number of blind or moderately and severely visually impaired people could reach 703 million [2].

According to official statistics, there are approximately 70,000 blind people in Ukraine today, but unofficial estimates suggest that this figure may be three times higher.

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The ratification of the UN Convention on the Rights of Persons with Disabilities obliges Ukraine to create favorable conditions and opportunities for the development of people with disabilities as part of the country's sustainable development [3]. In particular, according to Article 30 of the Convention, the state must ensure accessibility of television, cinema, theatrical performances and other cultural events for persons with disabilities; the possibility of visiting cinemas, museums, libraries and other cultural institutions; conditions for creative self-realization of persons with disabilities; access to cultural heritage for persons with various forms of disability; adaptation of cultural works for visually impaired persons without infringing copyright.

Today, in Ukraine, as well as around the world, painting and visual arts in general remain almost inaccessible to people with visual impairments. At the same time, two-thirds (66.9%) of such people in Ukraine consider art and participation in cultural life important to them: 42% completely agree with this, and another 24.9% rather agree [4]. In addition, almost 62% of people with visual impairments are convinced that the state should ensure equal rights for people with disabilities in the field of culture, which is in line with the general sentiments of Ukrainian society [4, 5].

Modern medical information technologies play an important role in the lives of visually impaired people [6, 7]. Medical information technologies greatly facilitate the lives of visually impaired people, enabling them to integrate into society, access information and actively participate in cultural, professional and personal life [8, 9]. Thanks to innovative technologies, visually impaired people can significantly improve their quality of life, increase their level of independence, and take an active part in public life. This helps to reduce barriers and ensure equal opportunities for all people, regardless of their physical disabilities.

Artificial intelligence can be used to adapt media resources to the needs of visually impaired people, for example, by creating automated descriptions for paintings, accurate audio or tactile descriptions for accessing cultural objects and other elements of the environment.

Thus, it is obvious that creating an accessible artistic environment for visually impaired people is an *important task* today. This can be realized by improving the previously designed information technology [5], which will not only transform 2D images into 3D models, but also generate descriptions using artificial intelligence, which will be converted into Braille using specialized software and into audio recordings.

## **2. Psychophysiology of attention. Focus of attention depending on gender.**

The physiological basis of attention is the processes of excitation and inhibition and the peculiarities of their mobility and interaction in the cerebral cortex [10].

The directionality of higher nervous and mental activity is always associated with the excitation of some cortical areas and the inhibition of others according to the law of induction [11, 12].

Among the excited cortical areas, the one that is most important at that moment stands out and begins to dominate all others. This ensures the selectivity of our activity and control over its course, so we can keep our attention on an object for a long time [13].

Any selective activity of the brain is associated with a certain level of its activity, which in turn is set by a special brain apparatus, including the reticular formation and the frontal lobes of the brain [14, 15].

Brain activation can be associated with physiological needs or environmental stimuli [16].

Stimuli can affect brain activity in two ways: through the reticular formation; through specific sensory areas of the cortex and frontal lobes.

This mechanism of brain activation is the basis of involuntary attention (attention caused by external causes – certain features of objects that affect a person at that moment) [17, 18].

Voluntary attention (active; a controlled and conscious process in which the subject actively chooses an object that is meaningful to him or her) is associated with the activity of the frontal lobes

of the cerebral hemispheres and the formation of a dominant in a certain center of the brain (dominance of the focus of excitation) [19].

Both attention mechanisms also include the limbic system, which provides vegetative and emotional support for mental activity.

A person's focus of attention may differ by gender due to biological, cognitive, and social factors. Men and women can perceive and interpret art differently, paying attention to different aspects of works. This is due to the influence of social, cultural and psychological factors that shape their aesthetic preferences and perceptions. Women are characterized by distributed attention (they are able to concentrate on several tasks at the same time – multitasking); they notice small details, non-verbal cues and emotions of the interlocutor better (context); focus on interpersonal interactions, relationships and non-verbal communication (social orientation); notice changes in the environment faster, especially in social or emotional aspects. Men have a stronger ability to tunnel vision (concentration on a single task); are better at spatial orientation, noticing global structures and directions (spatial orientation); tend to pay attention to logical connections and mechanical details (analytical approach); may be less emotional about facial expressions and gestures (less sensitive to social cues). However, these features are generalizations, and the focus of attention is also influenced by individual characteristics, experience, and training [20-22].

Other key factors also influence the characteristics and focus of attention [23-25]:

- Hormones – estrogen and testosterone levels can affect cognitive processes. For example, estrogen improves verbal memory and the ability to multitask, while testosterone promotes focus on a single task.
- Evolutionary features – some researchers suggest that historically, women have developed distributed attention skills due to the need to care for children and manage the household, while men have had an advantage in narrow focus for hunting or defense.
- Social and cultural factors – upbringing and societal expectations influence how men and women develop their attention. For example, girls are more likely to be taught to be attentive to the emotions of others, while boys are more likely to be taught to be attentive to technical details.
- Neuropsychology – MRI brain scans show that women have more active areas related to verbal communication, and men have more active areas related to spatial thinking. This may explain the difference in attention span.
- Personality traits – regardless of gender, people differ in their attention types (concentrated, distributed, selective, etc.) due to genetics, experience, and professional activities.

Given these key factors, men and women can perceive paintings differently due to the peculiarities of attention, emotional perception, and cognitive processes [26, 27].

Women pay attention to [28-30]:

- Emotional mood and atmosphere – women are more likely to analyze the feelings evoked by a painting, pay attention to the color scheme and light play, facial expressions, character interaction, color and texture nuances that evoke feelings of compassion, care or tenderness; they pay more attention to the softness and depth of emotions conveyed through the composition.
- Minor details, context and symbolism – they are interested in minor elements that may carry hidden meaning or reinforce the overall message of the picture; they are more inclined to interpret symbolism related to personal or social aspects of the picture; they may focus on those details that express subtle social or psychological messages, relationships between characters, as well as aspects related to human emotions and the inner world.
- Images of people and their emotions – women are more likely to read facial expressions, gestures, and postures of characters; are more interested in studying the interaction of

characters in a picture, especially if it concerns emotional connections or social relationships; pay attention to details related to social roles, facial expressions, and bodily movements that reflect relationships between people.

- Harmony and aesthetics – they evaluate the smoothness of lines, softness of transitions between shades, and overall compositional balance.
- Color and texture – they often respond more emotionally to the color palette, especially to shades that can evoke feelings of warmth, calmness, or even melancholy; may pay attention to textures and smooth color transitions that create a sense of depth and tenderness.
- Personal preferences and social stereotypes – may be more interested in details that depict human interaction and emotional depth, as they traditionally place more emphasis on human relationships.

Men pay attention to [28-30]:

- Composition and structure – men are more focused on the construction of the scene, the logic of the arrangement of elements, perspectives; more likely to focus on aspects that reflect strength, dynamics or energy, such as color contrasts, compositional elements that create a sense of tension or movement; pay more attention to structural details and elements that convey activity or dynamism.
- Dynamics and movement – they are more likely to notice tension in poses, character interactions, and overall plot development; focus on more “active” aspects such as lines, shapes, and objects that create images of strength, struggle, or action; may pay attention to proportions and structural elements that give a painting visual strength and impact.
- Contrasts and technique – men may pay attention to the play of light and shadow, expressive brushstrokes, clean lines, and texture; may focus on color contrasts, bright and saturated hues that draw attention and create more intense visual effects; pay attention to sharpness and clarity of lines that enhance the sense of movement or force.
- Plot and logic of events – it is important for them to understand what exactly is happening in the picture, how characters and objects are connected to each other; they may pay more attention to the overall context and compositional elements, in particular to the aspect of historical or cultural significance, where attention is focused on the big picture, dynamics, or images of struggle or victory.
- Personal preferences and social stereotypes – may be more focused on aspects related to activity, movement, large spaces, strength, and interaction with objects.

Of course, these are not hard and fast rules, but generalizations that may differ depending on the individual and cultural background. The true perception of a painting depends on the individual experience and the socio-cultural context in which the viewer is located. Gender can influence which aspects of a painting are particularly salient through emotional, symbolic, or other socially determined factors. This approach allows for a better understanding of how different audiences may perceive art in different ways and helps to create more adapted and inclusive descriptions for different groups of viewers. It is these differences that are taken into account, for example, in advertising, design, and the creation of visual content for different audiences. These differences should also be taken into account when creating a description of an art object (painting), as the description of a painting should change depending on whether it is aimed at men or women, as men and women often pay attention to different aspects of a painting.

An example of a painting description for women: “The painting radiates tenderness and depth; every stroke conveys the elegance of details. Soft colors create an atmosphere of peace and harmony, and smooth lines add emotional warmth to the composition. An important role is played by the play of light and shadow, which emphasizes the subtlest shades of feelings. The heroine (or the central image) is filled with inner peace, her gaze is mysterious, and her posture is natural and relaxed. The

painting seems to invite personal reflection, awakening memories or dreams”. An example of a description of the painting for men: “The painting impresses with its dynamics and compositional balance. Contrasting colors and sharp lines create the effect of depth, and the accuracy of the details adds to the realism. The central image or the main figure stands out due to the light and shadow accents, which makes the scene lively and full of character. There are no random elements here - every detail is subject to the general idea, creating a strong visual effect. The painting arouses interest in the details and technique of execution, encouraging a logical analysis of its content”.

Both descriptions reflect the same painting, but emphasize different details according to the perception of men and women. Although these descriptions are generalized, they demonstrate that men and women's attention can focus on different aspects: women are more likely to notice the emotional component, atmosphere, and subtle details, while men are more focused on structure, composition, and technique. Thus, research shows that men and women may have different preferences in terms of presentation style, word choice, and aspects of art that interest them, which requires personalization of content, including by gender.

### **3. Method of preprocessing information for preparing a description of art objects using artificial intelligence**

Modern artificial intelligence technologies open up new opportunities for analyzing and describing artworks. Generative artificial intelligence (GAI) allows automating the process of generating textual descriptions of paintings, sculptures, and other works of art. This helps to expand the accessibility of cultural heritage for the visually impaired. However, creating textual descriptions of paintings for visually impaired people requires a special approach. Such a description should be not just informative, but also figurative, emotionally colored, detailed, and understandable, so that the listener can “feel” the painting through words. One of the important aspects of developing such descriptions is personalizing the content in accordance with the peculiarities of information perception by different audiences, in particular, taking into account gender differences. Therefore, taking into account gender specifics can improve the user experience and increase engagement in the study of art objects. Therefore, the effective use of GAI requires high-quality preprocessing of incoming information.

The main stages of the method of preprocessing information for preparing a description of art objects using artificial intelligence:

*Input:* digital or 3D images of art objects.

1. Data collection and preprocessing – collection of digital or 3D images of art objects, accompanying metadata (author, year of creation, dimensions, materials, style, etc.) and available descriptions from various sources (museum catalogs, literary descriptions, scientific articles); processing of text, graphic and metadata; data cleaning and normalization (elimination of noise, duplicates, inaccuracies; conversion of unstructured data into a structured format); data formatting (bringing images to a single format).
2. Image segmentation – division of an image into areas that differ in certain characteristics; these areas correspond to real objects or their parts, and their boundaries coincide with the contours of the objects. The main purpose of segmentation is to simplify or change the image representation in such a way as to facilitate its further analysis. This stage includes automatic or semi-automatic separation of the picture into different components or objects that may be important for further description: highlighting the main parts of the picture (characters, objects, background); identification of various aspects of the composition (for example, color contrasts, textures, elements in the foreground and background).
3. Image analysis – computer vision and image analysis methods can be used to obtain comprehensive information about the painting: object recognition (identifying the main elements in the painting), color scheme determination (classification of primary colors, their combination and shades used), structural analysis (determining the compositional features of

the painting, its perspective, chiaroscuro and texture), contextual analysis (identification of style, historical period, context of creation).

4. Identification of key characteristics of the art object – analysis of shape and composition (computer vision methods, for example, OpenCV), color analysis (clustering by color, contrast and lighting analysis), texture analysis (identifying features of brush strokes, surface material), object-oriented analysis (recognition of characters, objects, background).
5. Semantic analysis and classification – defining categories (genre, style, technique) using neural network classification models (ResNet, EfficientNet, VGG-16).
6. Determination of the target audience for further adaptation for different categories of users (for example, taking into account their gender) – before generating a description, it is important to determine what it is intended for and for whom, as the style and level of detail may differ: scientific research – detailed technical description, references to sources, art historical analysis; museum catalogs – structured description with an emphasis on historical and cultural context; educational materials – simplified but informative presentation of material for students and teachers; popular resources – emotionally colored descriptions adapted for the general public (this style is especially important when describing art objects for the visually impaired); women (more likely to notice the emotional component, atmosphere, and subtle details, so it is important to focus on emotionality, symbolism, connection to everyday life, social and cultural aspects) or men (more focused on structure, composition, and technique, so it is important to focus on historical facts, technical characteristics, analysis of artistic techniques and styles), etc.
7. Choosing the style and tone of the text – generative AI can adapt the style of the text depending on the task: formal style – an academic approach using specialized terminology; descriptive-artistic style – an emotionally expressive text that conveys the atmosphere of the work, the impressions that the work evokes in the viewer, what feelings it evokes in the viewer (style is especially important when building a description of art objects for people with visual impairments); commercial style – an emphasis on the uniqueness and value of the work for auctions, sales.
8. Generating the structure of the description – determining the title, author, year of creation; building a general compositional scheme with a description of key elements.
9. Forming the substantive part of the description – determining the main plot of the work, detailing the elements of the painting, including a description of the main objects and their mutual arrangement, revealing the meaning and emotional component of the work of art, analyzing the color palette and painting style.
10. Ensuring adaptation for people with visual impairments – using accessible descriptions of paintings and adapting them to the standards of inclusive description, formulating clear and detailed text explanations for audio description, using terminology that contributes to the perception of the texture, shape, space and emotional coloring of the depicted. The main principles of forming a description for people with visual impairments: clarity and structure (the description should be logical and understandable, divided into blocks), imagery and detail (using metaphors, comparisons, descriptions of texture, depth, colors and light and shade), using sensory analogies (comparison with tactile or sound sensations), lack of excessive terminology (if art terms are used, they should be explained), preserving the author's intention (transmitting the emotional impact of the painting).
11. Developing a language model / prompt for automatic generation of text descriptions – configuring generative AI to create natural and meaningful descriptions; training the model on a large volume of artistic descriptions that take into account style, historical context, artistic means; using quality control methods to check the accuracy and correspondence of the descriptions to the original works.

*Output:* language model / prompt for automatic generation of personalized text description of art objects.

The use of generative artificial intelligence (AI) in the preparation of artwork descriptions allows automating the process of analyzing and documenting works, improving the accuracy and quality of information. Creating textual descriptions for visually impaired people is a combination of the art of words and inclusive technologies, as it is important not only to convey the meaning of the painting but also to help a person “see” it through emotions, analogies, and sensory sensations. The introduction of this technology will help improve the perception of art, its accessibility to a wide audience, and the quality of educational materials, and proper data preprocessing is a key factor in obtaining relevant and accurate descriptions, which contributes to the development of digital archives, museum collections, and educational platforms. The main goal of the developed method of preprocessing information for preparing art object descriptions using artificial intelligence is to adapt the text to the individual characteristics of user perception, including their emotional, cognitive, and cultural preferences and gender identity.

## 4. Results

As a result of the research, two gender-oriented prompts were created to create personalized descriptions of Vincent van Gogh's painting “Starry Night” for people with visual impairments.

Thus, a gender-oriented prompt for creating a personalized emotionally colored description of Vincent van Gogh's painting “Starry Night” for women with visual impairments looks like this: “Create an emotional and sensual description of Vincent van Gogh's painting “Starry Night,” focusing on its symbolism, emotional color scheme, and the impact of the images on the viewer's mood. Create a detailed verbal description of the painting for people with visual impairments. Use emotional and figurative language to convey the atmosphere, color palette, and plot of the work. Avoid complex terms, make the text accessible and understandable”. The result of executing such a prompt in ChatGPT is presented in Fig. 1.

A gender-specific prompt for creating a personalized description of Vincent van Gogh's Starry Night through the prism of history, technique, and artistic style for men with visual impairments looks like this: “Briefly describe Vincent van Gogh's Starry Night in terms of history, technique, and artistic style. Focus on the details of composition, perspective, and context. Create a detailed verbal description of the painting for people with visual impairments”. The result of executing such a prompt in ChatGPT is presented in Fig. 2.

Taking into account the research conducted in Chapter 2 on how gender affects the focus of attention when studying a painting, a gender-based segmentation of Leonardo da Vinci's Mona Lisa was also conducted and two gender-based personalized descriptions of the painting were created for people with visual impairments. Description of the painting "Mona Lisa" by Leonardo da Vinci for women with visual impairments taking into account gender-based segmentation of the image (Fig. 3) and with an emphasis on emotions, textures and soft details:

- Upper part (face and hair): The focus is on the woman's face. It is oval with soft, smooth lines. The skin is light, smooth in appearance. The eyes are dark, their gaze is gentle and calm, creating the feeling that she is looking right at you. The lips are slightly raised in a mysterious smile, which arouses curiosity. The hair is dark, smooth, falls in soft waves to the shoulders, adding femininity.
- Middle part (hands and clothes): Her hands are folded one on top of the other on her lap – this pose creates an impression of calm and restraint. The fingers are long and thin. The clothing is dark in color, the fabric looks dense, but with soft folds. Sheer fabric is visible on the chest, which adds lightness to the image
- Lower part (background and surroundings): The background is a landscape with soft shapes: calm lines of roads, a winding river and distant mountains. The colors of the background are muted, which helps to highlight the figure of the woman in the foreground. The nature behind her seems to complement the calm nature of the portrait.
- Focus for women: gentle gaze, softness of facial lines, texture of hair and a sense of calm in the position of the hands.

Create an emotional and sensual description of Vincent van Gogh's painting "Starry Night," focusing on its symbolism, emotional color scheme, and the impact of the images on the viewer's mood. Create a detailed verbal description of the painting for people with visual impairments. Use emotional and figurative language to convey the atmosphere, color palette, and plot of the work. Avoid complex terms, make the text accessible and understandable.

Vincent van Gogh's "**Starry Night**" is a painting that stirs the heart and soul, offering a deep emotional experience through its colors, shapes, and energy. Imagine a **night sky** filled with **swirling motion**, as if the stars are dancing and the heavens themselves are alive. The sky isn't calm—it's full of movement, as if the air itself is trembling with unseen forces. You can feel the **vibrancy** of the night—there's no quiet darkness here. The colors are rich and full of life.

The background of the sky is **deep blue**, like the calm of the night, but it's not still. The blues swirl in sweeping, **fluid strokes**, giving the impression of a sky that is **alive**, full of energy and emotion. In the center of it all, the **stars shine brightly** in golden yellows, almost like **flames** of light. These stars seem to **pulse** and shine with warmth, bringing a feeling of hope, **comfort**, and wonder to the otherwise restless sky. The moon, a crescent shape, glows softly in the sky, like a gentle whisper among the stars.

Below the glowing stars, there's a **dark, tall cypress tree** reaching up to the sky. Its black, twisted form creates a sense of **contrast**, almost as if it's trying to touch the stars, yet it is still rooted to the earth. It feels **heavy**, but at the same time, it's filled with longing. This tree, dark and solid, stands still amidst the chaos of the sky, like a symbol of **desire, yearning, and stability** in the middle of the night's storm.

The painting's mood is **melancholic yet hopeful**. The bright yellows and soft whites of the stars seem to shine through the blues and greens of the night, offering moments of light even in the darkness. It's as if the artist is sharing a personal moment of **longing**, a desire for connection, and the quiet beauty of the universe, despite the overwhelming struggles of life. The **colors** in this painting tell a story of deep **emotion**—the blue representing **calmness** mixed with **sadness**, and the yellow bringing moments of **brightness** and **joy**.

In the end, "Starry Night" is a painting about the contrast between light and dark, calm and chaos. It feels like you're being pulled into the **vastness** of the universe, where the stars are both distant and close, unreachable yet always shining, just like dreams and hopes. It is a reminder that even in the restless and sometimes overwhelming moments, there is always **light**—a sense of hope that never fades. The swirling night sky captures the feeling of **longing, wonder**, and the quiet beauty of the world, offering a sense of peace and wonder that stays with **you**, even after you've stopped looking at it.

**Figure 1:** The result of completing the prompt to create a personalized, emotionally colored description of the painting "The Starry Night" by Vincent Van Gogh for women with visual impairments.



Briefly describe Vincent van Gogh's *Starry Night* in terms of history, technique, and artistic style. Focus on the details of composition, perspective, and context. Create a detailed verbal description of the painting for people with visual impairments.

**Vincent van Gogh's "Starry Night"** (1889) is one of the artist's most famous and emotional works. Painted while Van Gogh was staying at a mental asylum in Saint-Rémy-de-Provence, the piece reflects his inner turmoil and fascination with the night sky. The scene shows a vibrant night, with swirling stars, a crescent moon, and a peaceful village below, all rendered in deep, expressive colors.

**Technique and Artistic Style:** Van Gogh used **impasto**, a technique where thick layers of paint are applied, allowing the brushstrokes to stand out and give the scene texture. His style belongs to **Post-Impressionism**, marked by bold colors, emotional expression, and a departure from realistic representation. The sky, filled with swirling stars and dynamic movement, stands in contrast to the calm and orderly village.

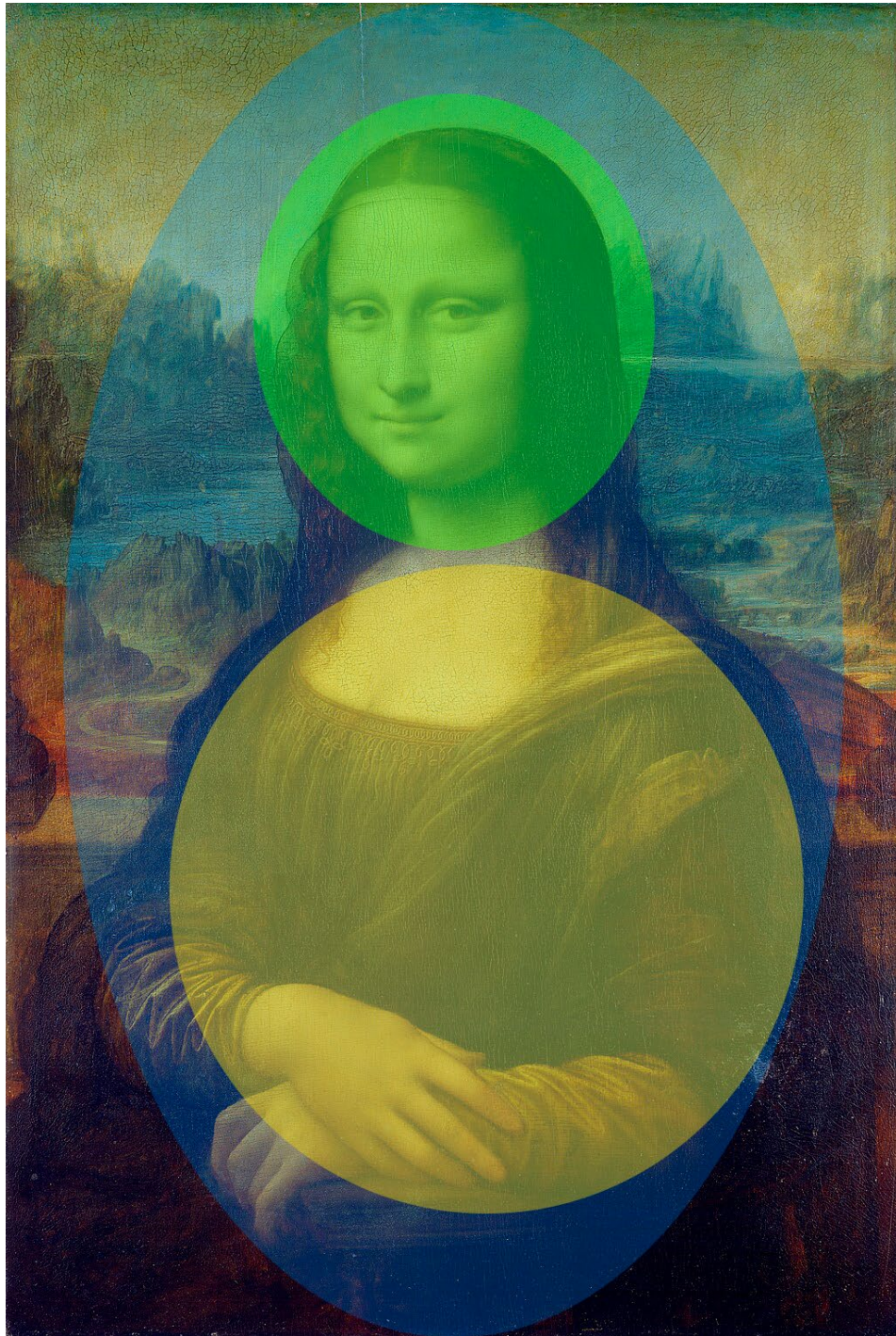
**Composition and Perspective:** The foreground features a large **cypress tree**, which stands tall and dark against the sky. This tree extends upward, almost as if reaching for the stars. Below it lies a quiet village with simple, curved rooftops. The **perspective** is unusual; the sky seems to be swirling and flowing, drawing the viewer's eyes upward in a sense of motion and energy. The perspective of the sky contrasts with the stillness of the ground, emphasizing the vastness and power of the cosmos compared to the tranquility of human life.

**Context:** Created during a time of personal struggle, the painting is not just a representation of the night sky but a reflection of Van Gogh's emotional state. The swirling stars and luminous moon suggest a world filled with mystery and energy, yet the still village below portrays a sense of calm and order. For Van Gogh, the scene symbolizes both the chaos and peace he felt in his life.

**Description for people with visual impairments:** Imagine a night sky that feels alive. Above, the stars swirl in large, circular patterns, their light shining brightly in contrast to the deep blue sky. The moon is crescent-shaped and glowing. A tall, dark **cypress tree** rises up, its sharp, reaching shape contrasting with the flowing, wavy sky. Beneath the tree lies a **village**, peaceful and calm with gently curving rooftops, showing no signs of movement. The mood of the painting is both **restless**—through the swirling sky—and **calm**—through the quiet, still village. The colors are rich and emotional, with deep blues, vibrant yellows, and soft whites creating a sense of contrast and depth. The entire scene feels as if it's breathing with energy, yet the stillness of the village below gives it a sense of quietness and introspection.



**Figure 2:** The result of completing the prompt to create a personalized description of the painting "The Starry Night" by Vincent Van Gogh through the prism of history, execution technique, and artistic style for visually impaired men.



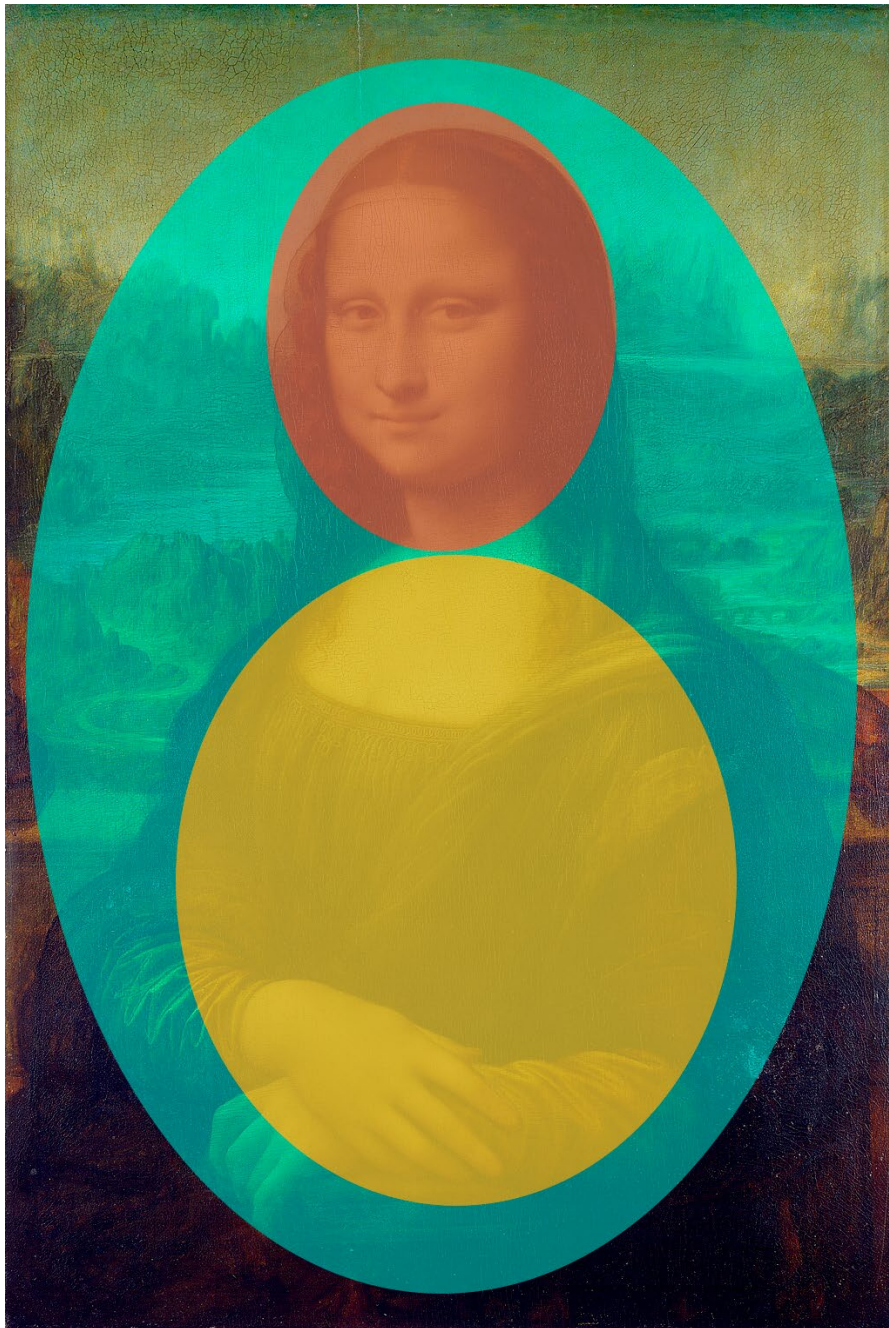
**Figure 3:** Segmentation of the painting "Mona Lisa" by Leonardo da Vinci to form a description for women: green segment – upper part (face and hair), yellow segment – middle part (hands and clothes), blue segment – lower part (background and surroundings).

Description of the painting "Mona Lisa" by Leonardo da Vinci for men with visual impairments, taking into account the gender-oriented segmentation of the image (Fig. 4) and with an emphasis on structure, spatial arrangement and contrast:

- Upper part (head and shoulders): The woman's face is located in the upper central part of the canvas. Its shape is oval with clear but soft contours. The eyes are located on a horizontal axis and look straight ahead, which creates a focus for the viewer. Above the eyebrows is a smooth curve of the forehead. The lips are compressed, forming a barely noticeable smile. The hair is dark, symmetrically framing the face.



- Middle part (torso and arms): The body is turned at a slight angle to the left, but the head is pointed straight ahead. This creates a dynamic composition. The arms are folded in front, forming a horizontal line that balances the vertical lines of the body. The clothing is dark with clearly defined folds that add texture.
- Lower part (background and perspective): The background starts at about shoulder level and extends into the background. Behind is a series of winding lines representing roads and a river that lead the eye into the distance. Mountains on the horizon create depth and perspective. The contrast between the dark figure and the lighter background emphasizes the main subject.
- Focus for men: the structure of the figure, the spatial arrangement of elements, the clarity of lines, and the contrast between the foreground and background.



**Figure 4:** Segmentation of the painting "Mona Lisa" by Leonardo da Vinci to form a description for men: red segment – upper part (head and shoulders), orange segment – middle part (torso and arms), turquoise segment – lower part (background and perspective).

The language models/prompts for the automatic generation of personalized, emotionally colored textual descriptions of art objects obtained as a result of the developed method, as well as the results of their implementation, allow to supplement information technology for ensuring accessibility to art objects for the visually impaired persons, early designed in [5], with the following functions:

- Generation of personalized, adapted textual descriptions of art objects, taking into account user preferences and gender.
- Generation of detailed audio descriptions of paintings using AI, taking into account the context and emotional component of the work, as well as the ability to adapt the description style to user preferences (for example, a choice between a detailed and concise description).
- Interactive interaction of users with the system through voice commands or textual queries.
- Integration with existing inclusive technologies for visually impaired people.

## 5. Conclusions

An important task today is to create an accessible art environment for people with visual impairments. This can be implemented by improving the previously designed information technology for ensuring accessibility to art objects for the visually impaired persons [5], which will transform 2D images into 3D models and use artificial intelligence to generate their description, which will be converted into Braille using specialized software and into audio recordings.

Gender can affect which aspects of a painting attract special attention, due to emotional, symbolic or other socially determined factors. Men and women may focus on different aspects: women are more likely to notice the emotional component, atmosphere and fine details, while men focus more on structure, composition and execution technique. Thus, research suggests that men and women may have different preferences for presentation style, choice of words and aspects of art that interest them, which requires personalization of content, including depending on gender. This approach allows for a better understanding of how different audiences may perceive art differently, and helps create more tailored and inclusive descriptions for different groups of viewers.

The use of generative artificial intelligence (AI) in the preparation of artwork descriptions allows automating the process of analyzing and documenting works, improving the accuracy and quality of information. Creating textual descriptions for visually impaired people is a combination of the art of words and inclusive technologies, as it is important not only to convey the meaning of the painting but also to help a person “see” it through emotions, analogies, and sensory sensations. The introduction of this technology will help improve the perception of art, its accessibility to a wide audience, and the quality of educational materials, and proper data preprocessing is a key factor in obtaining relevant and accurate descriptions, which contributes to the development of digital archives, museum collections, and educational platforms. The main goal of the developed method of preprocessing information for preparing art object descriptions using artificial intelligence is to adapt the text to the individual characteristics of user perception, including their emotional, cognitive, and cultural preferences and gender identity.

The language models/prompts for the automatic generation of personalized, emotionally colored textual descriptions of art objects obtained as a result of the developed method, as well as the results of their implementation, allow to supplement information technology for ensuring accessibility to art objects for the visually impaired persons, early designed in [5]m with the following functions: generation of personalized, adapted textual descriptions of art objects, taking into account user preferences and gender; generation of detailed audio descriptions of paintings using AI, taking into account the context and emotional component of the work, as well as the ability to adapt the description style to user preferences (for example, a choice between a detailed and concise description); interactive interaction of users with the system through voice commands or textual queries; integration with existing inclusive technologies for visually impaired people.

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## Declaration on Generative AI

During the preparation of this work, the authors used Grammarly in order to: grammar and spelling check; DeepL Translate in order to: some phrases translation into English; ChatGPT in order to: conduct experiments as a prompt-based tool for creating automated descriptions of art objects. After using these tools/services, the authors reviewed and edited the content as needed and take full responsibility for the publication's content.

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