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Can Vandalism Reshape the Way We Perceive Cultural Heritage?

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***Abstract* – Through an empirical approach, this article examines people's responses to vandalism on cultural heritage using eye-tracking technology. Analysing visual heatmaps, the work provides some preliminary insights into vandalism's influence on individual's visual perception and appreciation for cultural heritage. The results indicate that acts of vandalism on cultural sites evoke varied visual and symbolic responses and are not perceived in a uniform manner. Four are the key factors appear to influence the visibility of graffiti and vandalism acts: position, visual salience, content, and context.**

I. INTRODUCTION

Vandalism refers to a human act intended to destroy or damage other people's property for recreational purpose, negligence or unawareness of the existing regulations [1]. This act can be motivated by various reasons, including the expression of anger, the desire to protest, or the search for social attention [2]. Vandalism attacks have several forms of execution ranging from the application of graffiti, use of arson, physical and chemical defacement. Cultural heritage vandalism threatens the preservation of history immensely as it can cause the irreversible destruction of artifacts, monuments, and buildings that reflect a people's heritage and history.

A common question that arises in response to acts of vandalism on cultural heritage is: what impact do such acts have on observers? To help answer to this question, eye-tracking technology can be useful. Eye-tracking is used for the measurement and analysis of human eye movements. It offers insight into visual attention, cognitive function, and human interactive behaviour by monitoring in which and how the eyes move. Therefore, movement of the eyes is monitored, and the direction of the eyes is deduced using the eyes-tracking equipment. It is usually performed with the help of infrared cameras that sense the reflection of the cornea and the centre of the pupil to infer the location or direction of the user's gaze [3-5]. Eye trackers either rely on head-, desk-, or glasses-mounted designs. The technology finds extensive applicability in all walks of life across numerous domains like Psychological and Cognitive Research [6], Marketing and Advertising [7], Education and Learning [8], Medical Research [9] and crime [10]. However, to the best of the authors' knowledge, no studies have specifically employed eye-tracking technology to analyse individual's perception of vandalism on cultural heritage, despite its use in various other areas of heritage research. For example, eye-tracking is considered to assess how accessible mobile augmented reality applications are when used within cultural heritage destinations [11]. Eye-tracking is also considered to create more interactive and personal experiences within museums [12-13].

To investigate how individuals perceive the occurrence of vandalism on cultural heritage, this article discusses an empirical study using the eye-tracking approach offering some preliminary indications analysing visual heatmaps. By observing the way participants visually process vandalized heritage, we gain a deeper insight regarding how such actions influence public perception and appreciation of cultural sites.

II. DATA AND METHODOLOGY

The study began with fieldwork involving the collection of photographs depicting cultural heritage sites affected by varying degrees and typologies of vandalism. Studies in landscape visual assessment, such as Bulut & Yilmaz (2008) [14] proved a high degree of consistency between photo-based and in-person evaluation results.

Images were captured on clear days to ensure optimal visibility, focusing on architecture and sculptures from a typical visitor's perspective. A total of ten photographs were taken (eight in Rome and two in Florence) as part of a broader historical investigation into the phenomenon of vandalism affecting cultural heritage in Italy. The photographs depict both architectural and artistic heritage assets, specifically including fountains (4), palaces (1), monuments (2), bridges (1), churches (1), and temples (1) (Table I). The two on-site photographs taken in Florence were captured using a SONY DSC-HX100V camera on 22 September 2024. The eight photographs from Rome were taken with a SONY DSC-H300 between November 2024 and January 2025.

The photos were shown to 28 university students (aged between 22 and 25; 10 males and 18 females) of *Università Sacro Cuore di Piacenza* to evaluate their visual behaviour through eye-tracking.

Cultural heritage	Historical description
Fontana dei Putti, Rome (Figure 1a)	The fountain was built at the beginning of the twentieth century on commission from George Wurts and his wife Henrietta Tower.
Fontana delle palle di cannone, Rome (Figure 1b)	The fountain, built in 1927, consists of a mask, placed at the centre of a pyramid, made up of overlapping stone balls that pour water into the underlying basin-trough for horses.
Fontana in Piazza Pia, Rome (Figure 1c)	They are two fountains, located at the head of two buildings and formed by a large pool, delimited by a plinth.
Fontana del Babuino, Rome (Figure 1d)	Built around 1576, the fountain consisted of a Roman-era basin in grey granite, on which was placed a life-size statue in sculpted tuff depicting a Silenus lying on a rocky base.
Monumento a Cavour, Rome (Figure 1e)	Built between 1885 and 1895, the monument consists of a granite base, on which is inserted a with the bronze statue of Cavour. At the base there are four bronze sculptural groups, with figures alluding to the Unification of Italy.
Statue representing summer on Ponte Santa Trinita, Florence (with) (Figure 2f)	The Santa Trinita bridge, built in wood in 1252, but rebuilt several times following floods. In 1608, statues depicting the four seasons were placed at the four ends, including the statue representing summer.
Liceo Classico Michelangelo, Florence (Figure 2g)	The building consists of a fifteenth-century nucleus, which housed a Cistercian convent, composed of the cloister and the Chapter House with a fresco by Perugino.
Tempietto di San Giovanni in Oleo, Rome (Figure 2h)	The small temple is dedicated to Saint John the Evangelist, in the place traditionally indicated as that of his attempted martyrdom.
Piazza S. Callisto, Rome (Figure 2i)	The square takes its name from the church located there, built on the Roman house where Pope Callixtus I retreated to escape the persecution of Alexander Severus.
Ponte Sisto, Rome (Figure 2l)	The bridge was built by Pope Sixtus IV, from whom it takes its name, between 1473 and 1479 to allow the crossing of the Tiber on the site of an older Roman bridge.

T*able I- Brief description of cultural heritage depicted in the photos used for the eye-tracking experiment*

All participants had normal or corrected-to-normal vision. They were seated approximately 50 cm from the eye-tracking device screen (laptop), and the procedure and requirements of the experiment were explained in advance. However, the specific purpose of the study was not disclosed to avoid influencing participants' visual attention and responses. Following a calibration phase, each participant was shown ten photographs of vandalized cultural heritage. These were alternated with images unrelated to the topic, to avoid pattern recognition or bias. Each image was displayed for 7 seconds. All 28 recorded data were deemed valid, with gaze capture rates exceeding 80%. The experimental setup employed a Tobii Pro Fusion eye-tracking device operating at a sampling rate of 120 Hz. Data collection and analysis were conducted using Tobii Pro Lab software (version 1.241). In this article, we focus on the discussion of fixation duration heatmap. In the heatmap, red areas indicate locations where participants spent the most time looking, green areas show shorter fixation durations, and transparent areas represent regions that did not attract any visual attention [15].

III. RESULTS AND DISCUSSION

The eye-tracking heat map of *Fontana dei Putti* in Rome (Figure 1a) indicates that visual attention is mostly directed towards the faces and symbolic features at the centre, while the amputated limbs and signs of vandalism remain largely absent from attention. This is echoed in earlier research indicating that human observers attend more strongly to faces and expressions [16-17]. The missing limbs fail to draw attention directly towards themselves because they lack strong chromatic and visual contrasts and because viewers might be unfamiliar with how the sculpture originally appeared in its intact form. In the heat map for the *Fontana delle Palle di Cannone* in Rome (Figure 1b), the vandalized inscription "NERI"- "Blacks"- (highlighted by the rectangle in the Figure), while visible enough, receives small amounts of visual attention. This could be explained through its placement in a peripheral area, its low level of visual salience, or its lack of emotionally evocative context failing to appeal to viewers' attention. Observers direct their attention towards the sculptural piece at the centre meaning that textual features lacking contrast and appearing in a peripheral location fail to attract visual attention. In a similar manner, the heat map of *Fontana in Piazza Pia* in Rome (Figure 1c) indicates a focusing on the water jet and the fountain basin that implies a dynamic or functional preference in perception. The vandalism on the left (engraved writings in the rock highlighted by the rectangle in Figure 1c), although visible in the image, is largely overlooked. This is presumably because it is located laterally, is poorly legible, and is neither visually nor semantically captivating. Furthermore, the uniform travertine rock does not have ornamental elements that

guide the gaze laterally, so the eye remains anchored to the central area.

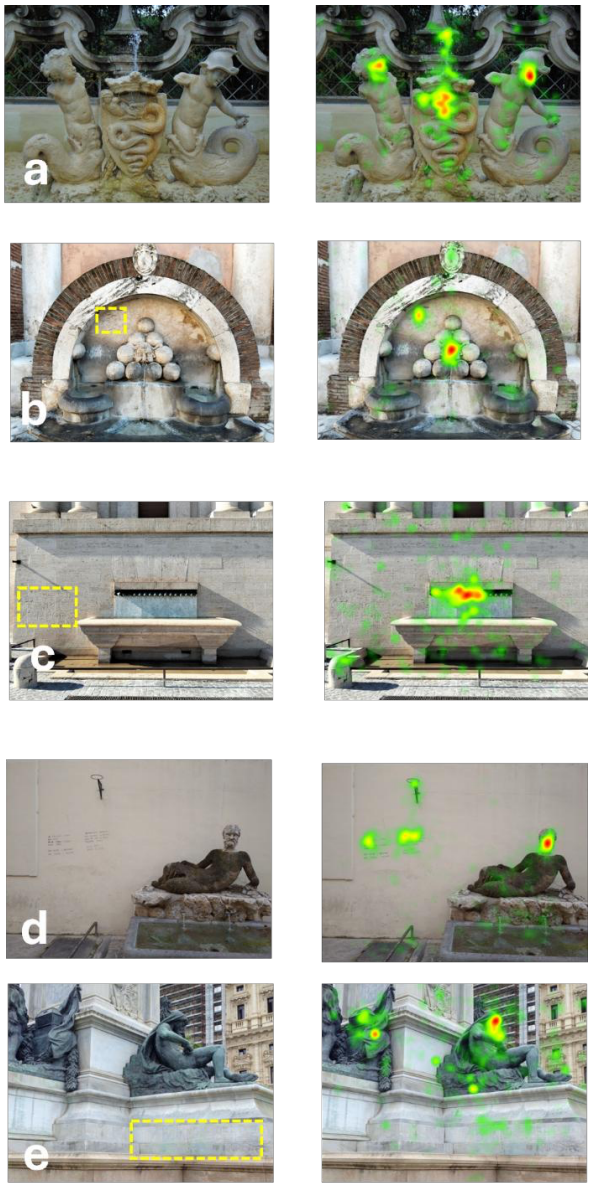

Figure 1 – a: Fontana dei Putti; b: *Fontana delle Palle di Cannone*; c: *Fontana in Piazza Pia*; d: *Babuino*; e: *Monumento a Cavour (photo credits. Cristina Cumbo and Fabrizio Terenzio Gizzi)*

The *Fontana del Babuino* (Rome) heat map (Figure 1d) further illustrates peoples' innate tendency to look at faces because most visual attention is being given to the facial features of the statue. Partial attention is being given to the defaced text, especially in its centre-right area, while other aspects along with its floor remain mostly ignored. Although visible, however, its low contrast and poor legibility combined with its dominance by figural elements take away its visual appeal and make it a secondary feature at best and even a disruptive one at worse in the wider aesthetic experience. In brief, their artistry and figural elements generally captivate viewers' attention more than their textual elements do, and text considered vandalistic, especially if it is poorly integrated both visually and emotionally, acts more as an outer distraction than as a centre point.

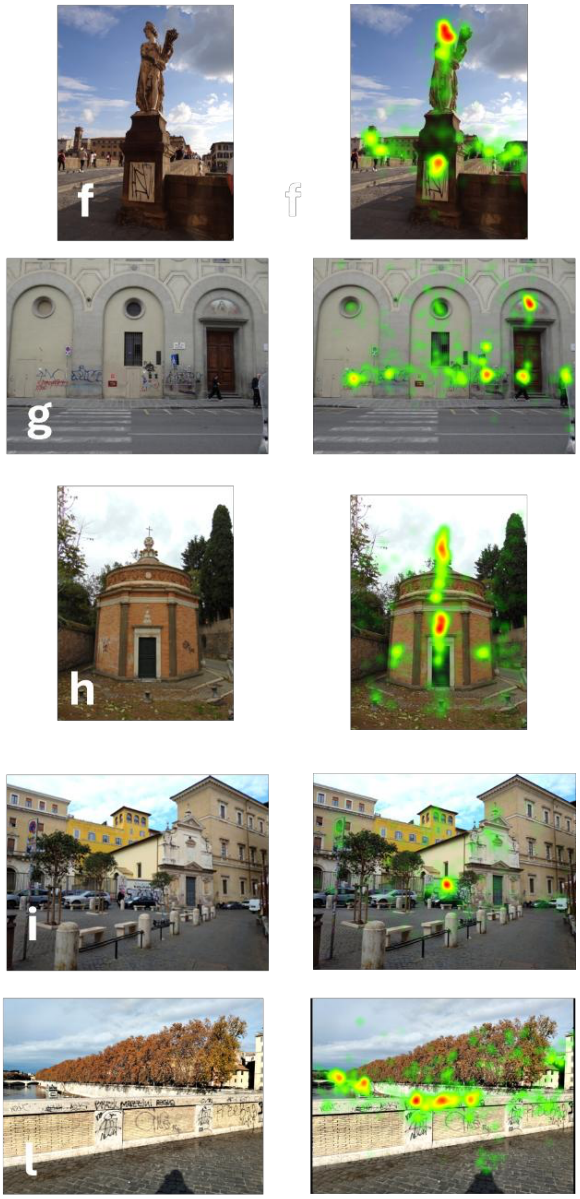

Figure 2 – f: Statue representing summer on Ponte Santa Trinita; g: Liceo Michelangelo; h: Tempietto di San Giovanni in Oleo; i: Piazza San Callisto; l: Ponte Sisto (photo credits. Cristina Cumbo and Fabrizio Terenzio Gizzi)

The heat map of the *Monumento a Cavour* in Rome

(Figure 1e) shows that the body and face of the seated allegorical figure guide visual attention. Interest is also naturally guided toward the areas with greater morphological articulation and visual richness testifying to the tendency that the human eye is attracted by complexity [17]. The vandalistic writing at the bottom right (shown by the rectangle in the Figure), although visible in the photo, does not attract students' attention probably because of its peripheral position, poor readability and competition with the imposing central sculptural figure.

In the case of the *Statue representing summer on the Ponte Santa Trinita* in Florence (Figure 2f), the vandalistic writing at the bottom is clearly perceived by the observers. The face and the upper part of the statue are the areas that attract the most attention, according to a natural tendency to search for human faces and details. However, the vandalistic writing also receives a significant amount of visual attention. It is a graffiti drawn with black spray paint, which fills a light marble square on the pedestal. What seems to make it visually relevant is the strong chromatic contrast, the frontal position and the abstract symbolic content. The act of vandalism therefore interrupts the artistic reading of the work, generating a perceptual friction between art and vandalism. Unlike other cases, therefore, here the graffiti becomes a central part of the visual experience, altering the cultural perception and the aesthetic value of the place.

The heat map of the fifteenth century building that houses the *Liceo Michelangelo* in Florence (Figure 2g) also shows that the graffiti significantly attract visual attention. Some writings are legible ("NO", "ROGO", "ALFREDO LIBERO", "SIM"), others are just tags and graphic scribbles. Especially the central writings and those with political content such as "ALFREDO LIBERO" (Free Alfredo) catch the individuals' eye as they have a clear communicative intention, suggesting that semantic content partly guides attention. The colour and contrast make the graffiti salient with respect to the historical façade and the painting located above the entrance door, highlighting a perceptual conflict between monumentality and degradation, where the graffiti distract the gaze from the architectural elements.

In the case of the *Tempietto di San Giovanni in Oleo* in Rome (Figure 2h), the graffiti are instead little noticed by the students, with minimal visual fixations. In fact, the attention is focused on central architectural elements (door, decorations, cross) while the graffiti, although visible, are peripheral in the perceptual hierarchy. Their colour and insignificant content are not enough to make them salient. However, their presence seems to interfere with the overall aesthetic perception, generating a sense of visual degradation even if it does not capture the gaze directly.

In the case of *Piazza San Callisto* (Figure 2i), the graffiti on the wall next to the church attract more visual attention than the main facade of the church, where the interest is less and more widespread. The central position of the graffiti, the contrast and the size make them highly salient. It follows that this degradation distracts the gaze from the historical elements, altering the perception of space and reducing its symbolic and cultural value.

Finally, the observer of *Ponte Sisto* in Rome (Figure 2l) has a wide and suggestive view of the Tiber, with the perspective of the bridge, the docks and the autumn vegetation. However, in the heat map it is noticeable that the fixations are short and peripheral. The most observed part of the landscape is the initial stretch of the river, near the edge of the parapet, but it does not reach the visual depth that one might expect from such a scenographical perspective. The trees, the river and the sky attract little attention. The graffiti on the parapet strongly attract visual attention, especially because they are central, at eye level and well contrasted with a continuous horizontal distribution that probably favours the visual flow of the text. The presence of legible texts and marked strokes intensifies the perceptual impact. Vandalism therefore becomes a visual protagonist, compromising the enjoyment of the landscape, urban context and the historical architecture of the bridge.

IV. CONCLUSION

Vandal graffiti on cultural property do not have a uniform visual and symbolic effect. Not all vandalic graffiti are thus experienced in an identical manner; most remain invisible, while others become striking points in the visual image.

The key factors that seem to influence the visibility of graffiti and vandalism acts are *position*, *visual salience*, *content*, and *context*. Regarding position, graffiti at the bottom, on the edges or very high up are often ignored. The importance of visual salience emerges because light graffiti on a light background or dark graffiti on a dark background are less perceptible. Content also seems to influence perception: insignificant words or poorly legible tags attract less attention than clear or provocative messages. Even abstract symbols tend to draw visual attention as individuals attempt to interpret their meaning. Finally, context also seems to be relevant. If the graffiti is placed next to a face, a human figure or a central architectural point, it is more easily noticed. In fact, the human gaze, particularly in a complicated urban context, automatically turns towards faces (statues, anthropomorphic figures), centripetal and symmetrical elements in building design, functioning and dynamic points (spouts for water pouring out, doors and windows, crosses and signs). Vandalic graffiti that do not find themselves positioned strategically relative to same elements do appear to go undetected during the first stage of visual screening. On the contrary, when the vandalism is in full line of sight, is large and relevant in content

(e.g., *Ponte Sisto*, *Piazza San Callisto* and *Liceo Michelangelo*) these elements actively capture the attention of observers, competing visually with the artistic or architectural value of the asset. This visual interference leads to a perceptual distraction of the monument and an alteration of the perceptual hierarchy of the heritage. Therefore, vandalic graffiti do weaken the visual, emotive and cultural quality of urban space to various extents. From the point of view of possible indications for restoration, priority seems to emerge in the removal of the most visible graffiti, which most alter the perception of heritage. Even less visible graffiti must be kept under observation as they still degrade aesthetics. In some cases, partial action through fading and rubbing might suffice to attenuate visual intensity and "deactivate" vandalism's adverse visual effect in observers' perception. However, additional study will be necessary to further elaborate and solidify these provisional deductions.

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