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Reimagining Urban Riverfront Revitalization: Extracting Pasig River's common landscape characteristics oninstagram for genai prompt engineering

Ruben M. Felizarte Jr.[12*], Nappy L. Navarra[3]

**Corresponding Author*

[1] Doctor of Philosophy in the Designed and Built Environment Student, College of Architecture – Integrated Graduate Program, University of the Philippines Diliman, Quezon City, Philippines

[2] Faculty, Department of Architecture, Institute of Architecture and Fine Arts, Far Eastern University, Manila, Philippines

[3] Faculty, College of Architecture – Integrated Graduate Program, University of the Philippines Diliman, Quezon City, Philippines

Email of All Authors: rmfelizarte@up.edu.ph, nlnavarra@up.edu.ph

Tel: +6329171139480

Abstract

The use of Generative Artificial Intelligence (GenAI) is becoming more accessible and prevalent. Democratizing the tool emerged from creative explorations and output assessments. In this study, we introduced a novel method that uses digital landscape aesthetics, a GenAI pipeline, and image generation to examine how contemporary urban needs can be visually represented. The digital artifact created from these processes revealed a landscape composition that aligns with the visual cues and emerging meanings from the digital commons. We argue that GenAI can visualize data from the digital realm, demonstrating the tool's reliability in capturing common landscape characteristics needed to reimagine urban riverfronts.

Keywords: GenAI, Pasig River, revitalization, urban landscape

DOI:

1.0 Introduction

The rise of Generative Artificial Intelligence (GenAI) text-to-image technology has been instrumental in generating urban landscape scenarios (ULS) that reflect improved urban quality of life (QoL). The potential of GenAI to visualize ULSs has been utilized as an interactive and inclusive tool to generate images from community-driven planning and design for various open spaces. This has been an effective medium to enhance stakeholder relationships more efficiently and engagingly in urban design and landscape architecture studies (Kapsalis, 2024; Guridi et al., 2024; Philips et al., 2024; Felizarte, 2024). This process has been determined under generative urban design (GUD). GUD is a process in which design solutions at the early design stages leverage artificial intelligence (AI) and computational design to achieve high efficiency (Kavouras et al., 2024). However, few studies have integrated GenAI text-to-image technology into the GUD process, and they are limited to small-scale testing or experimentation, traditional sources of landscape information, and typical GenAI pipelines. To explore its technological capabilities for larger-scale studies, this research developed unique techniques and prompt engineering processes to optimize GenAI as a reliable tool for reimagining ULSs based on contemporary sources of digital landscape information- the online commons.

As we examine the complex layers of urban landscapes, we need to understand how urban spaces are experienced every day- the daily urban life. A critical lens through which to examine these emerging, reliable, and accessible sources of information on urban change is digital devices. Social, experiential, and physical urban experiences are mediated using smartphones and their cameras and apps, influencing how we socialize, travel, and eat (Rose et al., 2022). This means that everyday life can be understood as mutually constituted by the use of a smartphone app and its spatial aspect (Kitchin & Dodge, 2011). In recent years, digital platforms such as Airbnb,

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Facebook, Instagram, and various ridesharing and food delivery apps have played a crucial role in understanding how cities are digitally mediated and are gradually transforming their urban fabric. Some discussions have also begun to consider how platforms are shifting the experience of urban life. Urban dwellers now shop, play, eat, communicate, and work through them (Barns, 2019). Gradually, urban dwellers influence how digital platforms are used for real-time local connectedness, thereby revealing the vital life patterns that require understanding (Ash et al., 2027; Leszczynski, 2019). This landscape information, as described by Rose et al. (2022), is characterized by layers of complex data that span digital platforms and everyday urban life and are experienced visually at a large scale. Digital imagery largely captures these contemporary urban lifestyles, revealing meanings of appreciation, aesthetics, preference, and perception through visual translation. Analyzing landscape data from these digital artifacts is a promising method for observing emergent, diverse, and meaningful psychosocial factors of urban activities. This phenomenon is what the Theory on Post-media Aesthetics (Manovich, 2001) decodes, revealing the connection between information behavior and social media. It cites the evolution from traditional art media to digital software, which shapes how we communicate and express ourselves using multimedia, such as text, photography, graphics, and video, to capture the layers, complexity, and visual characteristics of urban life. Digital urban navigation through these programs has become a behavioral tactic for mediating real-time local community connectedness, unpacking complex urban data that are experienced and organized by users, revealing an ideal urban QoL. Findings in these digital platforms scaffold the vital infrastructure for modern community building, similar to how the Theory on Social Capital (Putnam, 2000) emphasizes the value derived from social networks, trust, and cooperation. Subsequently, this forms the contemporary manifestation of the former theory, extending aesthetic information from mere visual representation to an operator of digital information exchange, a builder of reciprocity and social networks among urban actors, and a transformer of fragmented urban experiences into collective urban aspirations.

Exploring relevant sources of landscape information, such as the online commons, can suggest valued visual characteristics (Bimbao & Navarra, 2023). By assessing the significance and meaning of landscape information from online data mining, a collective landscape perception of online migrants emerges, revealing signs of digital placemaking (Soedarsono et al., 2021; Sugangga, 2021). Studies by Bimbao and Navarra (2023) and Sungangga et al. (2021) recognized the importance of understanding visual values on Instagram, which digitally mediate urban spaces and contribute to urban revitalization ideas. Instagram image posts can reveal timely patterns of change that require observation and adaptation. In this research, we adapted the use of the program to propose an exploratory method, grounded in two theories: 1) Theory of Post-media Aesthetics (Monovich, 2001), and 2) Theory on Social Capital (Putnam, 2000), to assess the reliability of GenAI to visualize common landscape characteristics as expressed visually in digital landscape aesthetics information. Further, the Image of the City (Lynch, 1960), was used to analyze the spatial aspect of the gathered landscape data. Supplementally, the Convivial Public Space Framework Prompt (Shaftoe, 2012; Guridi et al., 2024) and Sense of Place (Montgomery, 1998), were infused to enrich the latter theory to engineer a prompt that can visualize the rich dataset from the social media platform, capturing various elements needed to visually render the dataset. We set the Pasig River in Manila, Philippines, as our case study for a potential urban riverfront revitalization (URR)— a realm to reimagine and ground our investigation into how the merging of social media, GenAI, and visual assessment provides a synthesis for visually communicating emerging contemporary urban needs. The output of this study is a structured combined prompt that integrates relevant landscape information as visual descriptions, extracts it into a scene format, and includes advanced prompts for designers and the general public to use as a framework for generating ideal ULS to improve urban QoL (see Figure 1).

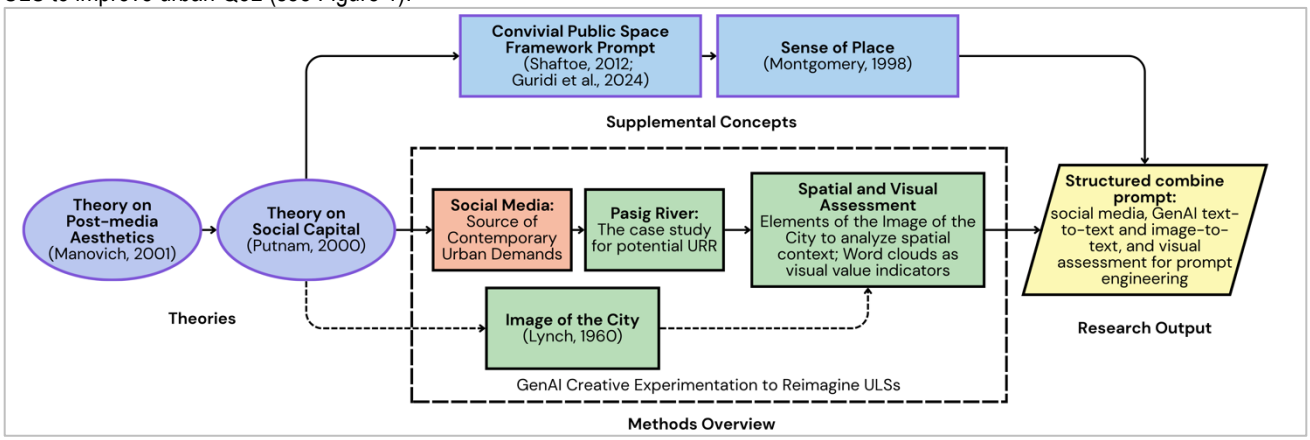

Fig. 1: The theoretical and conceptual framework.
(Source: Author)

2.0 Methods

2.1 Data Mining

The data mining method was designed to extract common landscape aesthetics as common characteristics supporting the URR of the study area. Adapted from studies by Bimbao and Navarra (2023) and Sugangga et al. (2021), 100 images were collected from the #pasigriver top posts on Instagram to explore the complex meanings of contemporary urban lifestyle. The latter author indicated that 100 initial samplings were used to obtain sufficient data on photo spots and the visual components of revitalization. Image posts were collected from January 2021 to June 2024 to identify indicators of landscape preference- a subject of scrutiny for the URR of the

riverfront- considering the pre- and post-construction phases of the Pasig River Esplanade, a URR-related project. The following information was downloaded and collated from publicly available image posts: 1) actual image file, 2) username, and 3) geographical coordinates. The latter was converted into a CSV file and loaded into QGIS 3.28. Subsequently, the dataset was processed in the software to generate a map showing information hotspots on a base map showing a political spatial boundary of the City of Manila, extracted from shapefile data, Philippine Standard Geographic Code (PSGC) - Level 4: Barangays and Sub-Municipalities.

The following conditions were established to determine the final sampling: 1) the image must be geotagged within the study area, and 2) must have perceptible landscape elements in at least two image layers. The latter condition was employed using the subjective perspective of the researchers based on the following landscape layers: 1) the foreground (ex. hardscapes and softscapes materials, etc.) 2) the middle ground (ex. trees, structures, buildings, etc.), and 3) the background (cloud formations, city skyline, etc.). Selfies and other large-focus image formats of entities or objects that block other image contents were omitted (see Figure 2) (see Table 1).

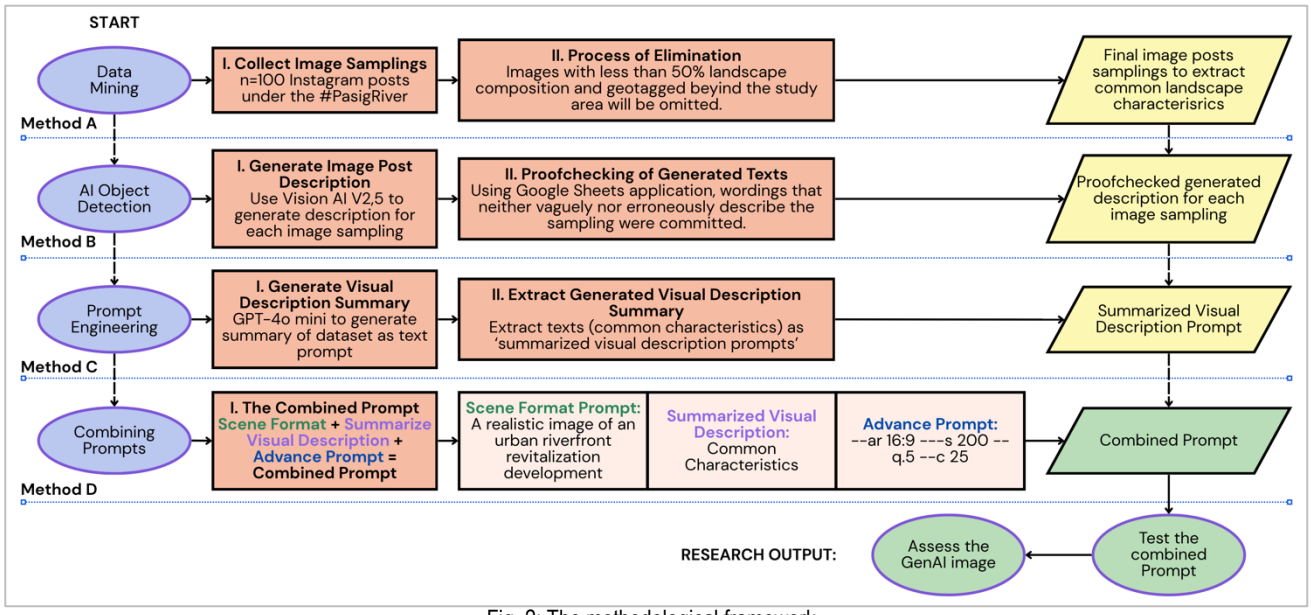

Fig. 2: The methodological framework.
(Source: Author)

Table 1. Sample data from data mining

Image Post	Latitude, Longitude	Checklist & Image Assessment Description	Decision
 Sample 1	14.5896, 120.9808	**(✓) Foreground** Note: There is an evident dominance of shrubs lining the rive edge, mostly filling the foreground layer of the image. River is also determined as part of the layer. **(✓) Middle ground** Note: The image composition consists of natural and built environment, specifically the river, structures, and buildings, largely forming the middle ground. The bridge presents a visually contrasting element, complementing the city skyline- the background. **(✓) Background** Note: The image background presents cloud formation with basic forms, seemingly redirecting the visual focus to the bridge and complementing structures and buildings. Together with the city skyline, these components form most of the image background layer.	Accept
 Sample 2	14.58234, 121.09885	**(X) Foreground** Note: The foreground layer in the image is not visually represented as the perceived components, the balustrade, seemingly falling under the middle ground layer. **(X) Middle ground** Note: The middle ground layer is indistinct given the image angle, forming a hard-to-digest visual content that is perceived as interchangeable layer of either foreground or middle ground. **(✓) Background** Note: The background layer is mostly composed of large format component of a classical lamp post and a pedestal, few building forms, and river edge development. Other elements are imperceptible given that the image output has a low exposure.	Reject

(Source: Author)

2.2 AI Object Detection

The final samplings from the data mining method were uploaded individually to the online AI-object detection software, AsticaVision,

versions 2.1-2.5. The application processed each image by detecting objects, figures, and elements. Ultimately, the application provided a description of the image that captures the simultaneous existence of all detected entities. Upon checking the generated data, some of the texts neither vaguely nor erroneously describe the uploaded image. To eliminate invalid information, output for each image was reviewed by checking whether the visual information provided exists in the actual visual content of the sampling. Ultimately, filtered descriptions were recorded, collated, and saved as a 'portable document format' (PDF) file. This file was used as part of the prompt engineering process to generate text prompts representing common characteristics (see Figure 1).

2.3 Prompt Engineering

The prompt engineering method was devised to systematize the generation of ULSs that integrates the common characteristics of URR from Instagram. To formally begin with the 'text prompt' formulation, the texts gathered from the latter step were processed using ChatGPT-4o mini to summarize the content and generate a prompt describing a collective visual interpretation of the data source visual cues. ChatGPT-4o mini was asked the following command containing prompt elements based on the four elements of Convivial Public Space Framework Prompt by Shaftoe (2012) and Guridi et al. (2025) and Sense of Place by Montgomery's (1998): "Please provide a summarized visual description for an image scenario in one paragraph that captures the place's atmosphere, activities, landscape features, emotions, and sense of place of the following data: *upload the PDF file of the collated data set then press enter.* Upon receiving the response from ChatGPT4.0, the data was copied to serve as the 'summarized visual description prompt'- part of the seed text or simply the collection of texts that GenAI depends on to visualize the collective landscape aesthetics information from Instagram. Further, this will be supplemented by an 'advance prompt,' basically setting the image quality output, consisting of the following: a) image aspect ratio (ar), b) stylized creativity input (s), c) quality input (q), and d) chaos for unusual variations (c). These parameters were set at mid-range values between two extremes to imitate a close-to-reality image. Ultimately, the 'scene format prompt,' 'summarized visual description prompt,' and 'standardized advance prompt' yield the 'structured combined prompt,' used to instruct the GenAI to generate ULS for the set case study and realm (see Figure 2).

2.4 Generating Urban Landscape Scenarios: Testing the Combined Prompts

GenAI application Midjourney, via a Discord bot, an application known to perform best in text-to-image technology, was used to process and convert combined prompts into ULSs (Philips et al., 2024) (see Figure 2). The following steps were executed based on the study by Felizarte (2024): 1) the word "/imagine" was typed into the command bar of the Midjourney-Discord bot interface, and then the "enter" key was pressed on the keyboard; 2) the entered prompt will enable succeeding prompts to be typed, each set prompts separated with space and comma: *type the scene format prompt*, *type the extracted summarized visual description prompt*, and *type the standardized advance prompt;* 3) upon the completion of typing the combined prompts, the "enter" key was pressed on the keyboard; and 4) ultimately, the entered combined prompt will generate a set of four unique images (see Table 3). These processes were repeated to produce at least 15 samplings as recommended in the study of Guridi et al. (2024), to overcome multiplicity and ambiguity of GenAI visual interpretation. However, 16 image samplings were considered in this study given the programmed output of Midjourney. On the other hand, to determine the final sampling, a random selection process was operated using the online random selector application Picker Wheel via www.pickerwheel.com. All ULS image samplings were uploaded to the application, where a wheel game randomly selects the final sampling. Randomizing the final sampling eliminates bias in selecting the ideal image, providing a single representation of the prompt output.

Table 3. Devised combined prompt to generate ULSs.

Devised Combined Prompt	
Scene Format Prompt	Established Scene Format
	A realistic image of an urban riverfront revitalization development featuring
Summarized Visual Description Prompt	Digital Landscape Aesthetics as Common Landscape Characteristics
	a tranquil riverside scene merges nature with urban life, framed by a serene river reflecting the evening sky and city lights, A prominent bridge spans the water, connecting vibrant urban skylines, while lush greenery enhances the setting's charm. Scattered boats glide peacefully along the calm surface, blending leisure with daily life. The warm glow streetlights and towering skyscrapers casts a cozy and sophisticated ambiance. Individuals gather leisurely, suggesting a community immersed in harmony with its environment, evoking a contemplative and inviting sense of place
Advance Format	Standardized Advance Prompt (Image Format)
	--ar 16:9 --s 200 --q .5 --c 25
Combined Prompt	Scene Format Prompt + Summarized Visual Description Prompt + Advance Prompt = Combine Prompt
Output	A realistic image of an urban riverfront revitalization development featuring a tranquil riverside scene merges nature with urban life, framed by a serene river reflecting the evening sky and city lights, a prominent bridge spans the water, connecting vibrant urban skylines, while lush greenery enhances the setting's charm, scattered boats glide peacefully along the calm surface, blending leisure with daily life, warm glow of streetlights and towering skyscrapers casts a cozy and sophisticated ambiance, individuals leisurely, suggesting a community immersed in harmony with its environment, evoking a contemplative and inviting sense of place --ar 16:9 --s 200 --q .5 --c 25

(Source: Author)

3.0 Results, Findings, & Analysis

3.1 Landscape Data from Instagram

Typically, all image samplings have captured the second condition; thus, the omitted samplings mostly fail to satisfy the first condition.

From the initial 100 image posts, 85 contents satisfied both conditions and were selected as the final samplings (n=85). Most final samplings captured the vista of the Pasig River, various landscape features, and tourism-related attractions. Image posts generally exhibit a composition in which bridges serve as a contrasting middle ground that harmonizes with the Pasig River serving as the foreground, complemented mostly by urban skyline backgrounds.

The geospatial information from the online commons' dataset was converted to points. The following physical elements were observed using the study of Lynch (1960): a) there is a clustering of points concentrated on areas of the Manila Central Post Office, Escolta, and Arroceros Forest Park- strategically located on the edge of the river, b) there are also a concentration of points in city nodes such as the Jones Bridge, Manuel L. Quezon Memorial Bridge, Escolta Ferry Station, and Arroceros Forest Park, c) some of the edges and nodes are also seen as landmarks such as the Manila Central Post Office Building, Jones Bridge, and Manuel L. Quezon Memorial Bridge, and d) in most landscape composition, clustered points areas features paths where it serves as the standpoint to capture images of the edges, nodes, and landmarks (refer to Figure 5 and 6). Landscape data suggest that digital landscape aesthetics are linked to the appreciation and preference for various landscape elements and forms within these cultural heritage resources, with digital artifacts curated to communicate four physical elements: edges, nodes, landmarks, and paths, understood as visual values offering common design cues for URR of the study area (refer to Figures 5 and 6). This information is useful for visually and spatially communicating the future development of the urban riverfronts within a dynamic urban environment with better legibility, improved wayfinding, and a strong cultural identity. Further, it positions our understanding of the digital medium used in the study as a source of relevant information capable of revealing patterns of contemporary urban use and preferences, from which common landscape aesthetics can be derived.

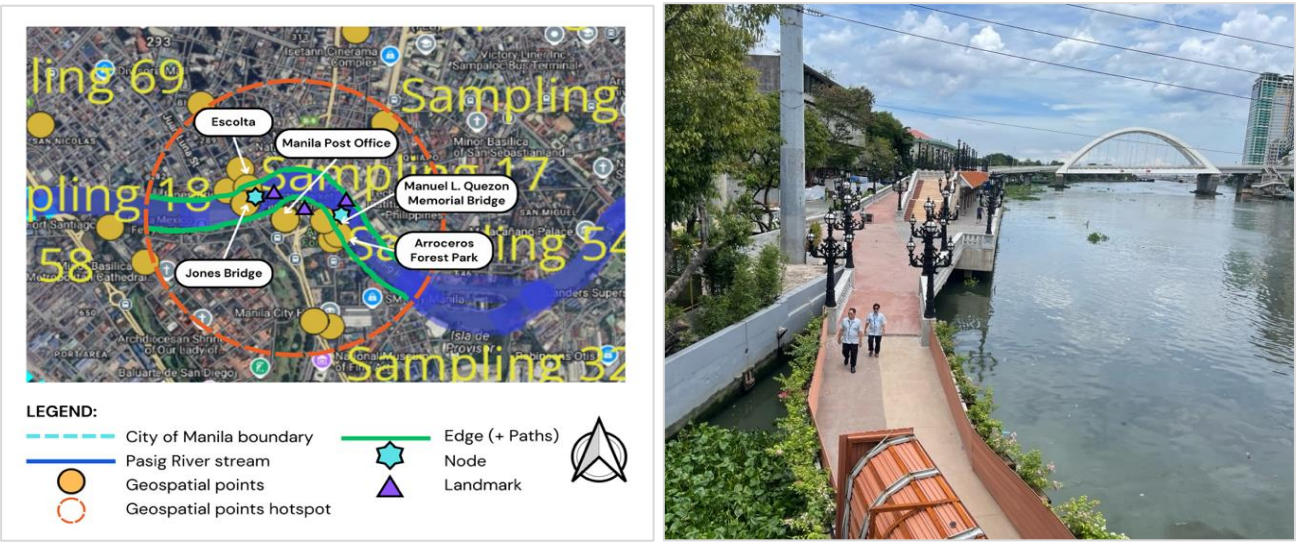

Fig. 5 & 6: a) Map of geospatial points, hotspots, and physical elements of the city; and
b) the view of the Pasig River Esplanade from the Jones Bridge.
(Source: Author)

3.2 Landscape Data Extracted from the AI Object Detection Method.

Most image posts collected lacked visual descriptions, such as captions and hashtags; therefore, an AI object detection method was employed to generate text descriptions for each image. Table 2 shows a sample extracted AI-generated description. Upon examining the generated texts, some outputs are vague and do not clearly represent certain visual content. To omit erroneous landscape information, we subjectively removed words that inaccurately described tangible landscape components. The final landscape information consists mostly of descriptions that best visualize the image sampling. Subsequently, the proof-checked data was collated and loaded into the WordIt application to generate a word cloud. In this case, the program selected the first 100 words based on their frequencies. This output will be used to examine recurring themes from the digital medium dataset.

Figure 7 shows the graphical representation of word frequencies, with the word 'river' having the highest frequency of 110, followed by the word 'scene' with 100 frequencies. Third is the word 'image' with 87 frequencies, followed by 'bridge' with 82. Lastly, the word 'water' comes fifth with 77 frequencies. The first five words convey that the landscape data depicts a river scene with a bridge. Landscape data analysis suggests a prominent similarity in how the top five words relate to three physical elements identified in the former method: edges, nodes, and landmarks. These findings support the idea that digital landscape aesthetics from the digital artifacts are mostly consistent with those of the determined elements from the spatial analysis, positing congruence and emphasis on how the two theories embedded in the study worked to support the first two methods. Furthermore, our understanding deepened to see social media as more than just curated content. As a new medium for sharing collective landscape preferences, it acts as social capital, offering resources and valuable information. This helps shape physical spaces and boosts public trust, community reciprocity, social cohesion, and civic engagement, ultimately improving urban QoL (Manovich, 2001; Putnam, 2000).

Table 2. Sample data from data mining

Checklist & Image Assessment Description*	Proof-checked description

A large building with a clock on the front of it is depicted in the image. The building features streetlights on the side and has a bell tower. The scene is set at night, with the building illuminated in white light. The clock tower stands out prominently against the dark background. The architecture of the building is characterized by a classic design with intricate details. The overall color scheme of the image includes shades of brown, gray, and white. The image evokes a sense of grandeur and elegance, with a focus on the clock tower as a central feature.	A large building is depicted in the image. The scene is set at night, with the building illuminated in white light. The architecture of the building is characterized by a classic design with intricate details. The overall color scheme of the image includes shades of brown, gray, and white. The image evokes a sense of grandeur and elegance.
Reference Image	Information
	Username: @unlawyer Date of image post: 29 October 2023 Geotagged location: Manila Central Post Office, Manila, Philippines Latitude, longitude: 14.59500° N, 120.97934° E

**Note: Erroneous image descriptions were highlighted in yellow.*

(Source: Author)

Fig. 7: Graphical representation of word cloud frequencies from Instagram landscape data..
(Source: Author)

3.3 Testing the Combined Prompts

Inputting the 'combined prompt' into Midjourney via a Discord bot generated a ULS dataset in which landscape elements and forms reflect common characteristics of URR, based on the digital artifacts. Landscape compositions from most of the dataset align with most Instagram image post final samplings, capturing urban river scenery and emphasizing vibrant urban life settings that offer various river-related leisure activities. To further examine how the digital information aligns with the generated ULSs, word clouds were formed from the 'summarized visual prompts' using the WordIt application. Figure 8 demonstrates the visual frequency of the words where the word 'urban' appeared thrice while 'life' appeared twice. Seemingly, as these words appear in the pool of other words, this implies that 'urban life' is expressed in multitudes of landscape compositions for urban city life. Further, words such as 'river,' 'riverside,' 'riverfront,' 'bridge,' 'sky,' 'skylines,' 'streetlights,' 'boats,' 'development,' 'city,' 'nature,' 'lush,' and 'water,' each with a single frequency, are clearly depicted in most generated ULS landscape elements and compositions, dominating landscape element renders across the three landscape layers examined. This data suggests that the devised multi-methods to enrich the 'summarized visual prompts' as part of the 'combined prompt' were instrumental in reflecting the common characteristics of URR from the online commons. However, other words not clearly depicted but shown through distinct visual renderings in a subjective proposition, such as 'leisurely,' 'warm,' 'glow,' 'vibrant,' 'revitalization,' and 'serene,' are visually connected to the image. Additionally, words such as 'reflecting,' 'suggesting,' 'featuring,' 'blending,' and 'inviting' are seen as 'visual connectors' to the high-frequency words, clearly depicted words, and subjectively depicted words, while the remaining words supplement them. Hence, by using these various techniques and given the landscape elements and composition quality of most ULS generated, GenAI users can optimize the use of the technology, limiting the trial-and-error phase to generate ULS according to their landscape preference and available online landscape resources.

Fig. 8: Graphical representation of word cloud frequencies from the 'summarized visual description prompt.'
(Source: Author)

4.0 Discussion

Figure 9 shows the final ULS sample depicting a vibrant urban river scene at night, a prominent bridge, various river-related activities, and linear parks. The landscape elements and forms in this ULS are similar to those in most of the ULS sampling dataset. The final sampling, determined through the devised random selection process, is considered an ideal representation of the 16 samplings from the Instagram landscape dataset, omitting ambiguous visual interpretations of the collected landscape information from the online commons. However, other ULS datasets depict the 'combined prompts' vaguely, suggesting that the machine learning technology in operation requires repetitive processing of combined prompts to capture evident landscape elements and compositions from the landscape data collected. Some samplings go beyond most ULS, featuring estero-type waterways, canal-type waterways, and various scales of unusual development along linear parks. Although some erroneous visual depictions of landscape information exist, the ULS dataset, in its entirety, is useful for visually representing the common characteristic of URR for the Pasig River.

This study explored the synergy of three components: crowd-sourced digital data, GenAI, and prompt engineering, to inform URR strategies for the Pasig River. By extracting the geospatial data and visual narratives from the digital medium, the research revealed that urban landscape aesthetics strongly align with cultural heritage assets in riverfronts characterized as edges, nodes, landmarks, and paths. Translating these collective narratives into a refined text prompt enabled successful ULS generation via GenAI, accurately depicting and rendering desired riverfront aesthetics, communicating local connectedness through shared aspirational content for socially cohesive, leisurely spaces, and a culturally vibrant urban environment, through digital informational behavior agency. Consequently, the implications of the research highlight the importance of social media as an important platform to examine new forms of social capital, a source of practical and data-driven urban planning and design interventions.

Fig. 9: The final urban landscape scenario (ULS) sampling.
(Source: Author)

5.0 Conclusion & Recommendations

This study's multi-method GenAI experiments explore how digital media serve as social capital, reflecting landscape aesthetic preferences through images (Monovich, 2001; Putnam, 2000; Bimbao & Navarra, 2023). Analyzing visual values using the Image of the City (Lynch, 1960) shows landscape information extends beyond preferences to key spatial components, highlighting patterns of urban use. This aids prompt engineering to create an ideal URR, using frameworks like the Convivial Public Space (Shaftoe, 2012; Guridi et al., 2024) and Sense of Place (Montgomery, 1998), structured around themes capturing visual cues from images. Program tools, like AI object detection and GenAI summarization, help assess reliability by recognizing residual ambiguity, mitigated by proof checks and random sampling. Despite limitations, these AI tools are valuable for reimagining urban environments when carefully reviewed. The research advances design and the built environment by promoting GenAI-assisted iterative design ideation, conceptualization, and experimentation, while also employing digital commons as a perspective on urban needs. Limitations include a focus on image content; hence, future work should explore video and text data on social media and develop new frameworks for topic-specific insights. Scholars are also encouraged to examine other GenAI technologies, such as text-to-video and text-to-audio, to challenge design discourse and reimagine urban landscapes for improved urban QoL.

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