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Disegno publishes original research papers, essays, and reviews on all aspects of design cultures. We understand the notion of design culture as resolutely broad: our aim is to freely discuss the designed environment as mutually intertwined strands of sociocultural products, practices, and discourses. This attitude traverses the disciplinary boundaries between art, design, and visual culture and is therefore open to all themes related to sociocultural creativity and innovation. Our post-disciplinary endeavour welcomes intellectual contributions from all members of different design cultures. Besides providing a lively platform for debating issues of design culture, our specific aim is to consolidate and enhance the emerging field of design culture studies in the Central European academia by providing criticism of fundamental biases and misleading cultural imprinting with respect to the field of design.

All research papers published in Disegno undergo a rigorous double-blind peer review process.  
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# **CITYSCAPES TRANSFORMED:**

## **IMMERSIVE EXPLORATION AT THE INTER-SECTION OF CULTURE, COMPUTATION, AND CURATORIAL PRACTICES**

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***Iacopo Neri, Darío Negueruela del Castillo,  
Pepe Ballesteros Zapata, Valentine Bernasconi,  
and Ludovica Schaerf***

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### **ABSTRACT**

*Designing a novel approach to existing art collections requires a shift in perspective. Computational approaches allow for an agnostic approach to cultural assets—akin to distant reading—,affording a capacity for embracing estrangement as a fertile design strategy. This paper investigates the potential convergence of these fields through the lens of machine curation and audience engagement, specifically examining the influence of contemporary machine learning models on curatorial methodologies. This investigation takes the form of a project conceived for the 2023 Helsinki Art Biennial and as a collaboration between the Centre for Digital Visual Studies (MPG, University of Zurich) and the media artist Yehwan Song, aptly titled Newly Formed City. Exploring the art collection of the Helsinki Art Museum (HAM), we seek to reinterpret the cityscape of Helsinki through a machine-oriented perspective. Utilising visual-textual models, we relocate unexhibited artworks to public locations, where, through the creation of context-based computer generated 360-degree panoramas, artworks are placed. Consequently, the outdoor sites are changed by the presence of the artworks, creating a new speculative geography where the city and its art collection are visually fused together. Interaction is achieved through a web interface, offering visitors the opportunity to move through an alternative version of the city and interact with its cultural heritage on a large scale, exploring the capacities for creativity located at the crossroads of a reflective exchange between vicinity and ignorance, machinic analytical prowess, and the uncanny and the unexpected.*

#digital humanities, #computational art, #urban cultural studies, #machine learning, #curation

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## 1. INTRODUCTION

The present paper describes the computational-based curatorial work: *Newly Formed City*, presented at the 2023 Helsinki Art Biennial as a collaboration between the Centre for Digital Visual Studies (MPC, University of Zurich) and the media artist Yehwan Song. Holding under the biennial motto: *New Directions May Emerge*<sup>1</sup> it aims to design a curatorial AI agent to find alternative ways to experience artworks using the Helsinki Art Museum (HAM) digital collection. Our approach is rooted in the hermeneutical premise that there exists a profound interconnection between public monuments, such as statues and memorials, and the public spaces that encompass them. The reciprocal dialogue between the public artworks and their public spaces, similarly to the dualism of content and form, or stage and piece, acts as a city's unique cultural repertoire. In this regard, we consider the question of how digital technologies can support us in the creation of new media to experience art? And more precisely, how can a city be used as a platform to see a digital art collection? What will be left of our mental image of the city afterwards? The proposal places unexhibited artworks in urban settings, setting them free to digitally re-interpret the physical location in their surroundings and to render a hybrid city space of Helsinki where recognisable features blend into surprising ones. It offers not only an engaging platform to discover the city and its paintings, but also to discuss novel approaches and aesthetics in design, supported by data and computation. In this regard, our project embraces the ethos of speculative design as a method, "to create spaces for discussion and debate about alternative ways of being, and to inspire and encourage people's imaginations to flow freely," and where "design speculations can act as a catalyst for collectively redefining our relationship to reality." (Dunne and Raby 2013, 2)

From the theoretical, computational and curatorial point of view of the design process, this work stems from the hypothesis that machine perception offers a fruitful estrangement and re-contextualisation of artistic data. We use deep learning models to learn visual and textual attributes from the public monuments of the city of Helsinki. These attributes are used to feed predictive similarity-based models that place unexhibited paintings within the city, based on the location of semantically similar public artworks. Through the extraction of 360-

<sup>1</sup> See <https://helsinkiennaali.fi/en/story/helsinki-biennial-2023-brings-together-29-artists-and-collectives/>.

<sup>2</sup> *These two concepts arguably belong to different frameworks, formalist for Shklovsky, and dialogic for Bakhtin, but we consider the common element of distancing or estrangement as discussed by Emerson.*

<sup>3</sup> *See <https://ham.finna.fi/?lng=en-gb> for the full collection*

degree panoramas for each location, we use diffusion-based models to imagine the machinic space they inhabit according to their semantic and stylistic attributes. Secondly, as an interface to such a collection of spaces, the project sees the development of a web-based navigation tool by Yehwan Song, where the user is able to experience the curatorial process, interact with the works of art in the city of Helsinki at scale, and explore an alternative arrangement and view of the city through the lens of machine perception.

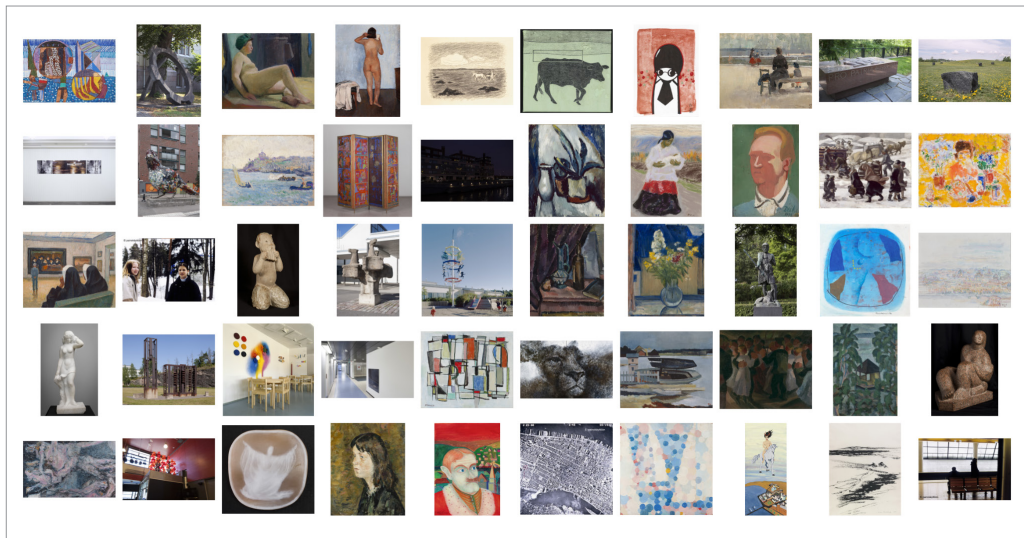
Drawing inspiration from a semantic field delineated by the concepts of “vnenakhodimost’” (outsideness) by Viktor Shklovsky and “ostranenie,” (estrangement) by Mikhail Bakhtin (Emerson 2005, 642). which emphasizes estrangement and cognitive awakening in artistic endeavours<sup>2</sup>, the project employs a deliberate strategy of distancing to awaken the potentials of art. It provides for an exploration that is both remote and immersive, engaging in an operation of estrangement that is proposed as an explicit modus operandi in designing data intensive cultural interfaces for our globalised and largely machinic world. Additionally, it actively contributes to the ongoing discourse on generative AI, creativity, and its role within artistic and aesthetic practices. By inhabiting the uncanny valley (Mori [1970] 2012) that has been identified as one of the most interesting and fertile effects or outputs of generative AI models (Hazan 2023), it questions the capacities of state-of-the-art generative machine learning models to produce something which is simultaneously a familiar place (with a clear connection or kinship to the original artworks and the real location’s geometries and spatial configuration) and somewhere radically other.

In the following sections, the work is presented as an intertwined process of data—as a multidimensional entry point, spacing from semantics to geography—and design—as its creative structuring practice and tangible interface. Rather than seeing them as separate entities, their productive collaboration in the formation of novel platforms to support Digital Humanities studies is emphasised. A detailed exploration of the technical aspects behind the machine learning models involved is covered extensively in a separate paper (Schaerf et al. 2023).

## **2. DATA: THE HAM DATASET**

The project uses as a primary source the digital collection of the Helsinki Art Museum (HAM)<sup>3</sup>. The museum owns predominantly Finnish artworks, spanning the city of Helsinki, as they define themselves as “a city-wide art museum.” In total, HAM holds about 10,000 artworks, around 2,500 of which are publicly accessible throughout the city, while the remainder are exceptionally on exhibition inside the museum if not stored at the depot. We divide the collection in two types: the public artworks, located mostly outdoors in public spaces, and the indoor unexhibited collection, of the works within museum walls.

In order to take into account the spatial and urban factors related to the public artworks, we compute geographical information (latitude and longitude) of 488 outdoor public artworks.



Additionally, we selected 1,744 artworks from the indoor collection (fig.1) to be placed around the city. Each selected artwork has the following information: title, date of creation, name of the artist, keywords in English, Finnish, and Swedish describing the piece, and the object ID in the official collection.

**FIGURE 1.** Random subset of the accessed HAM collection

### 3. DESIGNING DATA-STRUCTURES: A WAY TO REINVENT THE CITY AND ITS ARTWORKS.

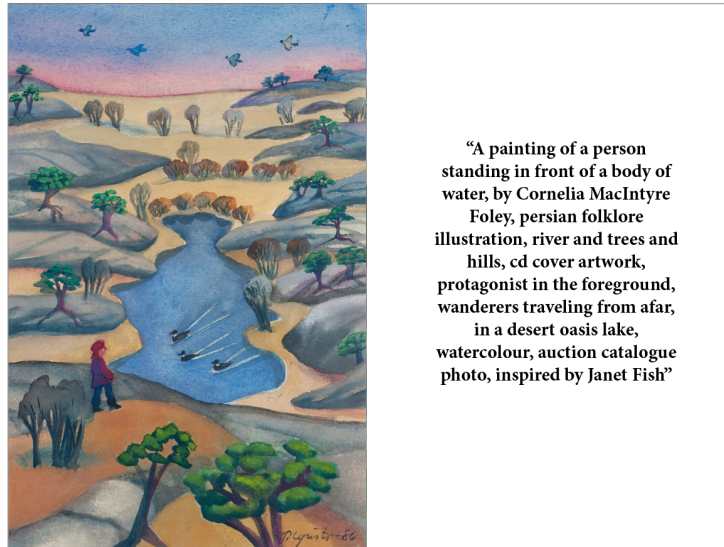
The aim of the first part of the project is to simultaneously provide contextualisation and recontextualisation of the artworks. Firstly, this entailed assigning a physical location to the artworks of the indoor collection that currently are not displayed. Thus, we first address the problem of fictional localisation of the artworks. We approach this task by first creating a machinic representation of the artworks using an image-to-text model which extracts a compressed representation of both the outdoor and indoor artworks. We exploit this representation to identify the most similar outdoor public artworks to each unexhibited indoor artwork, assigning a fictional coordinate to the indoor collection item that indexes a location between the most similar publicly accessible works. Once the locations for all artworks are available, we can finally induce the artworks to embody their surrounding space: we obtain the panoramic 360-degree view of each artwork from its corresponding location and use diffusion-based models (Rombach 2022) to turn the



<sup>4</sup> See <https://github.com/pharmapsychotic/clip-interrogator>

**FIGURE 2.** Example artwork with CLIP extracted prompt. Courtesy of Schaerf et al. (2023)

panoramas into an immersive space representing it. The text-to-image models then use the text extracted by the image-to-text model previously used on the original artworks and the depth map of the 360-degree views to generate a final work representing the original artworks guided by the depth of the scene at its fictional location (fig.3).



#### 4. PLACING ARTWORKS IN THE CITY VIA CLIP REPRESENTATIONS

To analyse the artworks, we use the CLIP-based model (Radford et al. 2021) CLIP-Interrogator,<sup>4</sup> which extracts visual and textual features from images (fig.2). We store the model's outputs, including prompts and embeddings. Each image is mapped to an image embedding using the ViT-L-14 model, consequently mapped to text embeddings and further decoded into text prompts. Therefore, by combining linguistic and visual information, we represent each artwork as a concatenation of its visual and textual representation. Next, we determine fictional coordinates for the indoor artworks using the known geolocations of public artworks and the feature vectors obtained in the previous step via a similarity-based method inspired by GPS technology. Once we estimate these fictional locations of the indoor artworks, we examine the local conditions of each location using Google Street View panoramas. We use the Google Street View API to gather the street view panorama at each predicted latitude and longitude. Because some locations do not have a street view available, we iteratively query the API with increasing radii to find a nearby panorama while allowing for local adjustments.

## 5. GENERATING ART PANORAMAS FROM CLIP PROMPTS AND 360-DEGREE IMAGES

Finally, using the panorama views of each location as depth maps and prompts, we generate landscape artworks that semantically depict the original art piece but use the real context as the canvas. To this end, ControlNet<sup>5</sup> (Zhang 2023) plays a key role in guiding the generation with an input depth map, computed via MiDaS (Ranftl 2020) from the panorama views. Through their combination—assisted with asymmetric tiling<sup>6</sup>—we influence the Stable Diffusion generation towards pertaining visual consistency between the real and the imagined landscapes. Additionally, the resolution of the artwork is increased fourfold by using ESRGAN (Wang 2018), leading to the resulting art panoramas (fig.3).

<sup>5</sup> We use the code from the official release on <https://github.com/llyasviel/ControlNet>, v1.0.

<sup>6</sup> See <https://github.com/tjm35/asymmetric-tiling-sd-webui>

<sup>7</sup> See <https://newlyformedcity.net/>



**FIGURE 3.** Images involved in the immersive panorama generation of figure 1 (left). Panorama of predicted location (top right), depth map (middle right), art panorama using depth map and CLIP prompt (bottom right). Courtesy of Schaerfet al. (2023).

## 6. DESIGNING INTERFACES: AN IMMERSIVE TOUR IN A QUASI-REAL SPACE

Once the panorama generation process is over, an equally important design phase addresses the rendering of the now-enriched HAM collection as an artistic digital installation. 1,744 four-dimensional objects constituting the image of the original artwork, the CLIP extracted prompt, the generated 360-degree panorama and the geographical location are displayed on a website<sup>7</sup> for the visitors to imagine—and question—the city of Helsinki. Avoiding a unique rigid structure to the HAM collection becomes a prerogative of the interface, which challenges principles of user-friendly design to trigger a subtle sense of confusion in the eyes

of its viewer and reveals only bits and pieces of information as more interaction takes place. Entering the website is the start of a journey in a quasi-real space, only recognisable from the coastline of the city of Helsinki and a series of spheres emerging from the land towards the viewer's point of view, up in the sky (fig.4). The resulting feeling is the one of landing in Helsinki from a different planet, alienated from any preconceived knowledge about the city and with only our motion skills at disposal for discovery (the visitor is invited to fly over the city with a joystick). In this regard, geography emerges as the preferred dimension to introduce the database, providing a distant yet understandable medium to engage with the installation: a map and an external angle.

Technically, we organise the interface into two distinct virtual spaces: an outer point of view, which includes three sub viewpoints, and an immersive perspective (one for each artwork). Both spaces exploit geography to organise data, but with a crucial difference: the former suggests a reading from the general to the specific via a map, allowing for comparisons and ad-hoc selection, the latter favours the opposite approach, stimulating the viewer to find their way up from the specific to the general and forging the image of the city one 360-degree panorama at a time.

**FIGURE 4.** Homepage of the NewlyFormedCity website showing the Landing view and the machinic path.



## 7. SEEING THE CITY FROM AFAR

The first encounter with the digital installation (the outer point of view) showcases the data from its collective aspect and presents a *metamorph* of the enriched dataset as a geometrical expression of its metadata. A multitude of spheres wrapped with the generated panoramas are placed in space not only according to the inferred geographical location, but to a vertical factor identifying a journey through a selection of artworks. This route undergoes daily changes through a process of programming. It begins from an arbitrarily selected artwork and is drawn by connecting it to its closest neighbouring location in an

iterative manner. The process continues until a specific number of locations have been visited, and with each iteration, the route gains elevation so that starting and ending points represent its highest and lowest peaks. Randomly selecting starting points permits the map to never show the same data twice, while the increasing number of stops (artworks) for the path contextualises it within the Biennial, reaching completion only at its end when all artworks have finally been visited. To further enable alternative readings, the outer point of view presents three viewports to its map and path. First is the previously mentioned landing view, which constitutes the homepage of the website as well as the main lens of this section with its flying animation and textual introduction, followed by two other viewports: the map view and the list view, where XY and Z coordinates are kept separate, respectively on a flat map or in an elevated axonometry. Immersion and further inspection of the panoramas is enabled by clicking on the spheres, independently of which view the visitors find themselves in.

**8. SEEING THE COLLECTION FROM WITHIN**

While the outer point of view favours a general overview of the dataset contrasted only by the unpredictability of the path that undercuts its conclusive understanding, an opposite situation exists in the immersive perspective. Here, the spectator is free to navigate the plethora of artworks from a situated lens, absorbed within each generated panorama and with only a selection of the neighbouring artworks to build their journey. Serendipity, taste, and intuition, as opposed to the above mentioned machinic distance criteria, are the only guides for discovering the collection, as interactive bubbles of the closing artworks float in the viewport waiting for a click to move ahead (fig.5). In this regard, the selections are collected as visitors navigate the installation to build a collective database of human paths for future curatorial art studies.



**FIGURE 5.** Immersive perspective showing an example of a generated 360-degree panorama, alongside the map location (top left), its metadata and original artwork (bottom left) and the extracted CLIP prompt (bottom right). In the centre a bubble invites the spectator to the next neighbouring artwork.

Additional elements reveal the process behind the 360-degree panorama generation allowing the user to question the machine learning models involved in the process. At the bottom, a banner showcases the original artwork linked to the HAM website for further inspection and, more importantly, the CLIP prompt describing it. Having the two extremes of the process at hand, the visitor is called to ponder on the legitimacy and depth of the machinic interpretation of the work of art, similarly speculating on both interpretation and representation in a multimodal manner.

## 9. DISCUSSION

In this paper, we presented a multi-faceted process, combining deep learning models and diffusion-based methods within the context of an AI curatorial exercise. Deep learning models were employed to learn visual and textual attributes from public monuments in Helsinki, forming the basis for placing indoor paintings based on similarity measures. Consequent to the gathering of panoramic 360-degree views for each location, diffusion-based models imagined the machinic space that these artworks inhabit, using the artistic attributes as generation seeds. Such explorations culminated in a web interface, enabling users to navigate the HAM collection within the city of Helsinki at large. Initially producing an intentional sense of disorientation, the interface gradually reveals information as it fosters a deeper connection between the user and the artworks by autonomous discovery. Human choices as opposed to programmed ones are central to the artwork, which collects visitors' journeys as data for future art curatorial studies.

Geography plays a pivotal role as an intermediate dimension between Helsinki and its art, now so entangled that we inevitably wonder whether one predominates on the other. On the one hand, the panoramic views perform a seamless fusion of the artworks and their physical surroundings, exploiting the city as a canvas. On the other hand, the digital collection offers an unconventional lens through which we perceive and interact with the city that transcends traditional physical boundaries, making the artwork a gateway. These intertwined perspectives raise profound questions about the nature of perception, representation, and the relationship between physical and digital as they invite us to reflect on if it is the city transformed and reinterpreted by the presence of the digital collection, or it is the digital collection that relies on the physical space as a contextual framework. Through this conversation, the project reminds us that a city and its culture are not separate entities, but rather interconnected dimensions of a larger cultural and social narrative.

Parallely, another concept important to the project concerned the intricate interplay between data and design at the intersection of technology, humanities, and art. We approach the HAM collec-

tion as data, being the primary material under study, while both the website and the computational pipeline with its resulting 360-degree generated panoramas are considered as design in a twofold manner, respectively being the interface and the conceived generation process. It is worth noting how the latter, and more specifically the panoramas, could be seen as a starting point for further exploration, rather than a final solution. Challenging the data-design dichotomy, the project highlights the autopoietic nature of artistic research, where what acts as design in one instance plays the role of data in a future iteration.

Lastly, the paper reflects on the ephemeral nature of the Biennial and contemplates what remains after its conclusion. The non-hierarchical approach to the HAM digital collection and the emphasis on the specific moment in time and space situates the project within a precise context. While machine learning models will continue to advance and experiments may evolve, the significance of this exercise lies in its current manifestation and in the questions that it triggers. It represents a unique exploration of the intersections between art, data, and design, providing valuable insights into the dynamic nature of digital humanities.

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