

Smart Bremen The Forgotten City

Unveiling Bremen's Unseen
Layers: Exploring the Informal City
for Enhanced Integration into
Smart Bremen



What are cities?

Cities are expansive networks composed of various interconnected systems, including population dynamics, infrastructure, governance, economic activity, and cultural vibrancy.



Why cities are important?

When considering the multifaceted nature of a city, it becomes clear that its essence is shaped by a duality of processes: **formal** and **informal**. Both formal and informal processes are integral to the city's dynamics, each contributing to the complex tapestry of urban life that defines the character and rhythm of the city.



The **formal city** responds to the structured, official, and often bureaucratic element.



The **informal city** are the organic, sometimes spontaneous activities that give a city its character and soul.



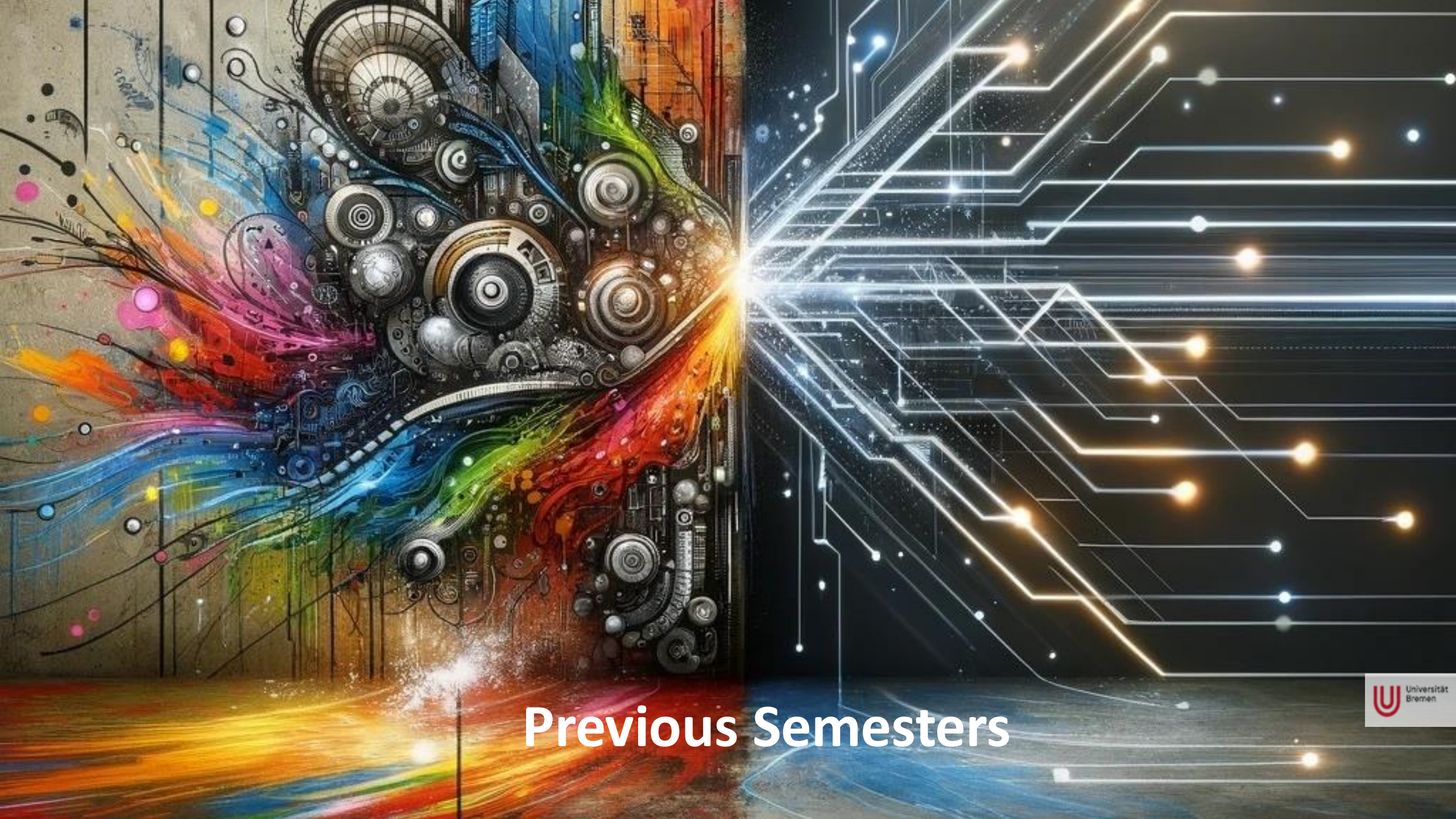
Street art: Graffiti, stencil, sticker.



Street art: dance, circus, other performance.



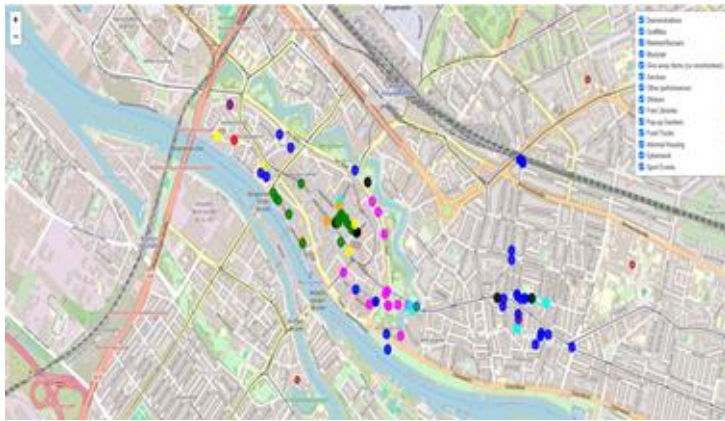
Street art: instruments, singing, other sound performance.



Previous Semesters



1st Semester



Database ER-Model:



Database Relational Model:



Used tools:

Mapping and Visualization: Leaflet.js

Data Processing: Python, CSV, JSON

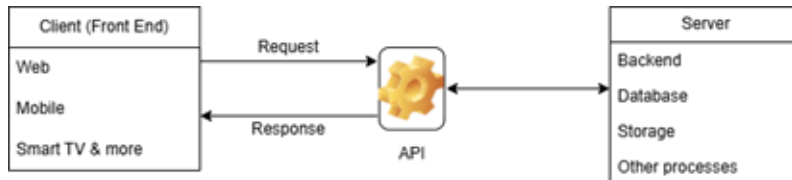
Map link: <https://skb-rmn-fhb.github.io/map4.html>

How API works:

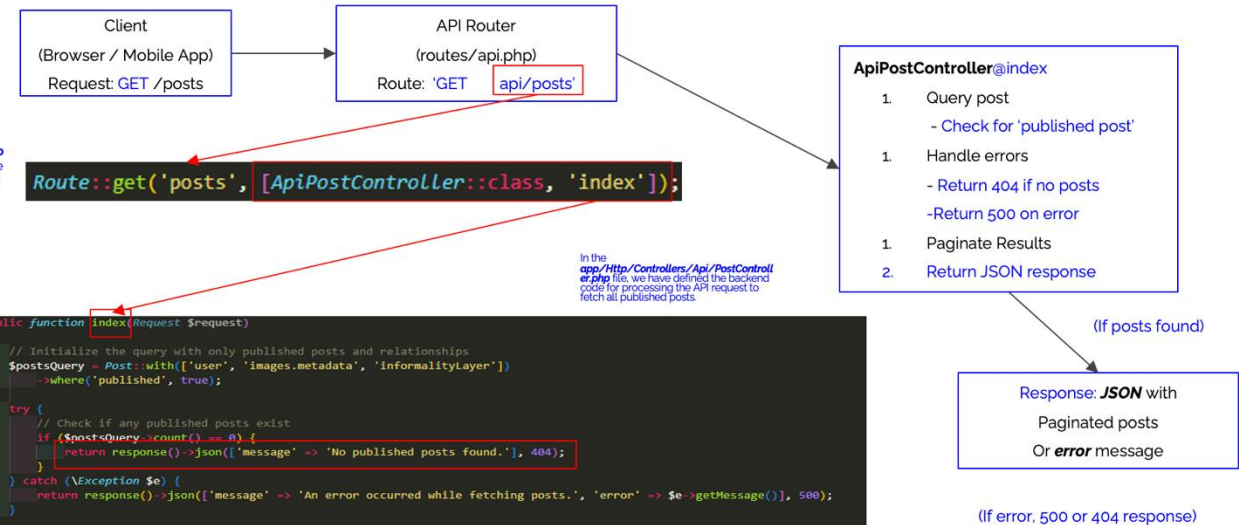
Application Programming Interface

Allows frontend to communicate with backend.

- Receives request from user
- Sends request service provider/task processor
- Sends the result generated by service provider to the desired user



How API (Application Programming Interface) works:



In the `Api/api.php` file, we have defined the following routes to handle the retrieval of published posts.

```
Route::get('posts', [ApiPostController::class, 'index']);
```

In the `app/Http/Controllers/Api/PostController.php` file, we have defined the backend code for processing the API request to fetch all published posts.

```
public function index(Request $request)
{
    // Initialize the query with only published posts and relationships
    $postsQuery = Post::with(['user', 'images.metadata', 'informalityLayer'])
        ->where('published', true);

    try {
        // Check if any published posts exist
        if ($postsQuery->count() == 0) {
            return response()->json(['message' => 'No published posts found.', 404]);
        }
    } catch (\Exception $e) {
        return response()->json(['message' => 'An error occurred while fetching posts.', 'error' => $e->getMessage(), 500]);
    }

    // Paginate the results
    $paginatedPosts = $postsQuery->paginate(10);
}
```

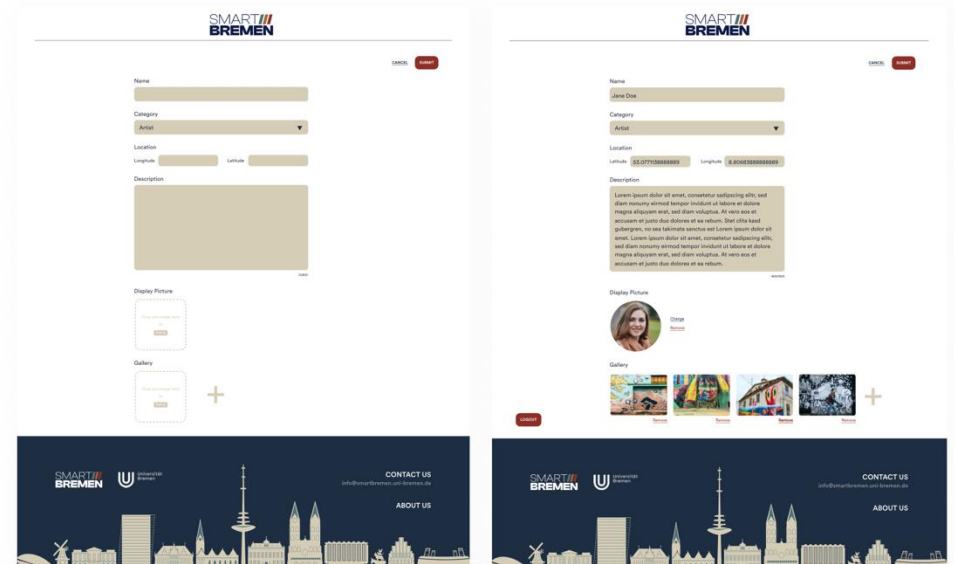
- We followed **UI/UX** best practices to ensure an intuitive user experience.



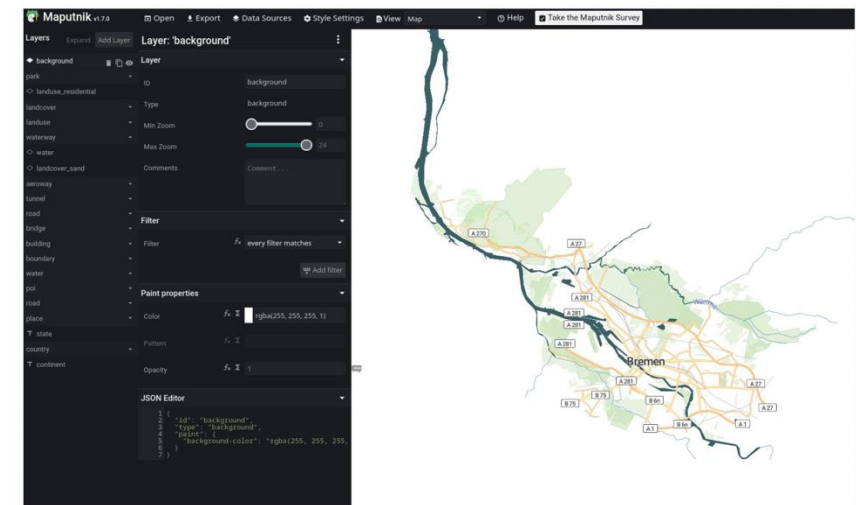
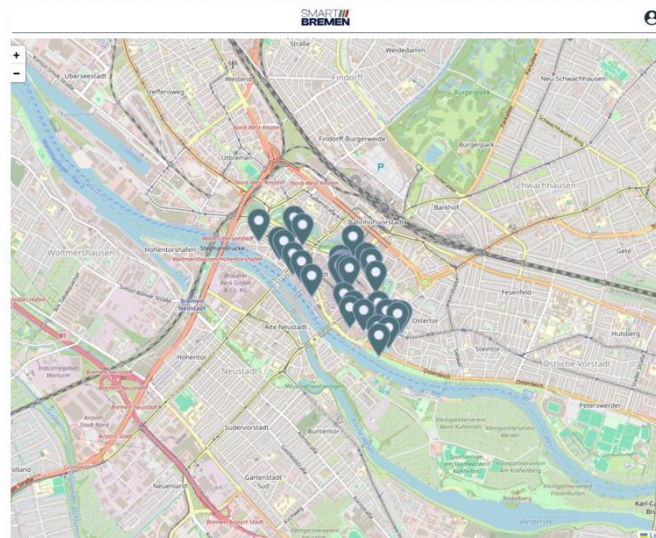
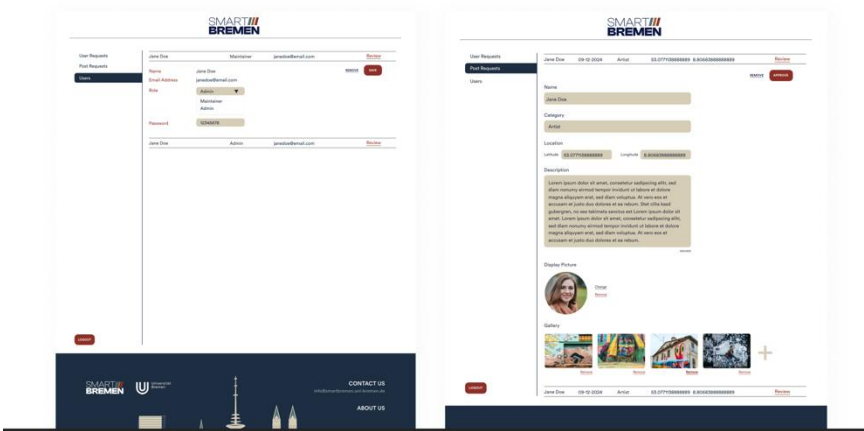
- Used **React & CSS** to create a modular and maintainable front-end.



- **Add, Edit, Delete** locations



- User friendly, **user** and **post** management





2nd Semester

KEY TECHNOLOGIES USED

- SmartBremen is a full-stack web app built with React and cloud services
- It uses Firebase for login and data, Cloudinary for images, and React-Leaflet for the interactive map
- The system is well-structured and secure, with clear separation of logic, UI, and access control



FEATURE	TECHNOLOGY
Frontend	React + TypeScript
Backend	Firebase (Firestore, Auth)
Image Storage	Cloudinary (with transformations)
Map	React-Leaflet + MapTiler
Clustering	react-leaflet-cluster
Authentication	Firebase Auth
Role Management	Firestore user profiles
File Uploads	FormData API + Cloudinary
API Security	Security SHA-1 signatures

INTEGRATION OF FRONTEND AND BACKEND

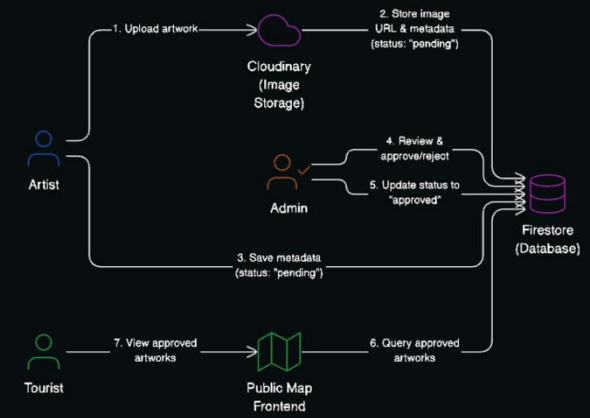
Data Flow: Artist Upload → Admin Approval → Public Display

Upload & Review Process

- Artist uploads artwork; images go to Cloudinary
- Artwork data is saved in Firestore with status pending
- Admin reviews submissions and approves or rejects them

Public Display

- Approved artworks are updated in Firestore
- Public map fetches only approved artworks
- Tourists can view artworks but cannot upload



INTEGRATION OF FRONTEND AND BACKEND

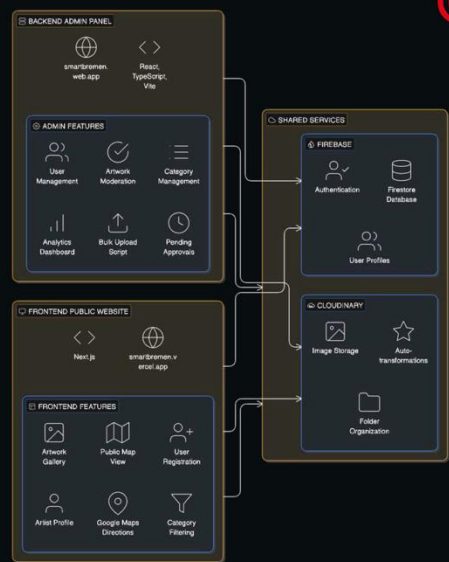
System Architecture

Role-Based Actions

- Artist uploads content
- Admin manages approvals
- Tourist only views approved artworks

Controlled Data Flow

- Firestore controls artwork status
- Public map displays approved data only
- Ensures quality control and clean data flow



INTEGRATION OF FRONTEND AND BACKEND

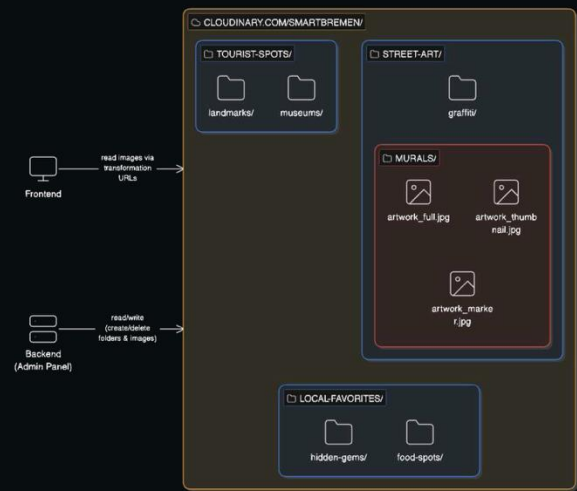
Shared Cloudinary Structure

Folder & Image Organization

- Images stored under cloudinary.com/smartbremen
- Categories and subcategories mapped to folders
- Each artwork has full, thumbnail, and marker images

System Access

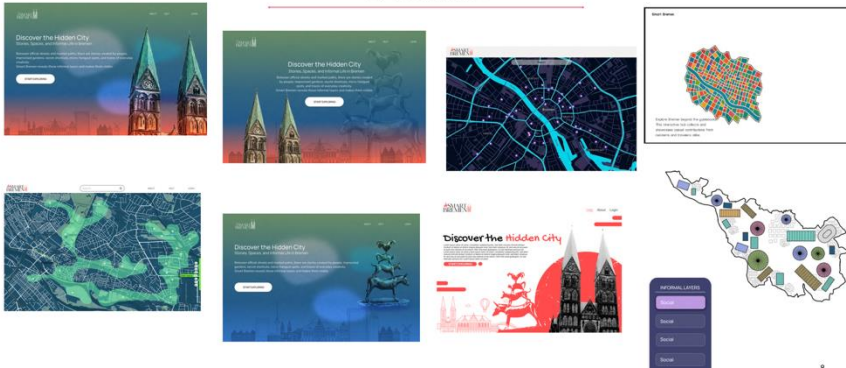
- Frontend reads images using transformation URLs
- Backend (Admin) can create and delete folders
- Keeps media storage organized and scalable



LO-FI WIREFRAMES



UI UX R&D



VISUAL DESIGN SYSTEM

We designed a system that feels approachable for the public but structured enough for research content.



The logo combines Bremen's colors and landmarks with a modern mapping idea to create a unique, place-based visual identity.

TYPOGRAPHY

Aa
Manrope

Clean, modern, and highly readable across screen sizes.

COLOR PALETTE



The primary colors of the Smart Bremen interface are derived from the official colors associated with the city of Bremen.

ICONOGRAPHY

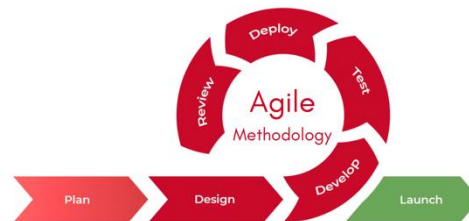


We created an artistic icon system based on informality categories to make map layers more expressive, recognizable, and human-centered while keeping visual consistency.

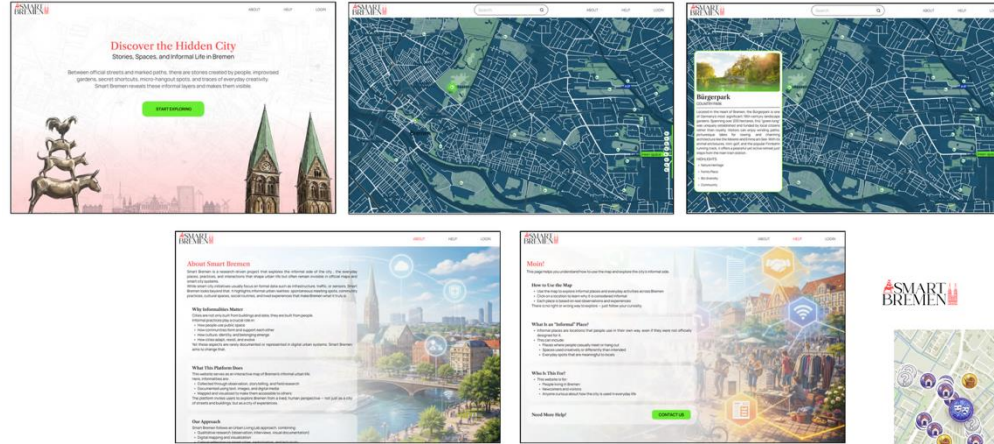
UI COMPONENTS



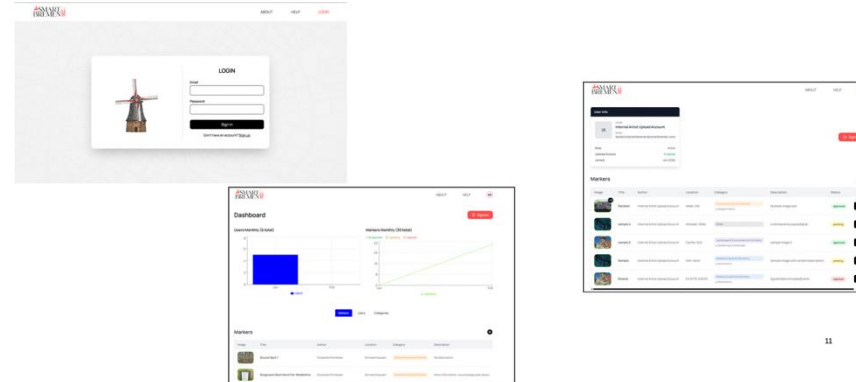
Our UI components were designed using the project color palette and accessibility guidelines, with strong contrast, clear states, and consistent styling to ensure usability and visual coherence.



HI-FI WIREFRAMES (FINAL)

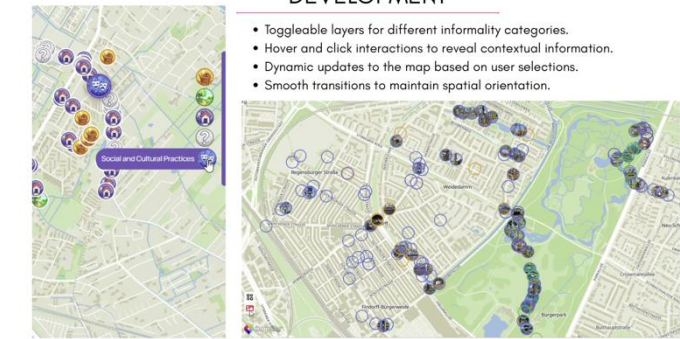


HI-FI WIREFRAMES (FINAL)



DEVELOPMENT

- Toggleable layers for different informality categories.
- Hover and click interactions to reveal contextual information.
- Dynamic updates to the map based on user selections.
- Smooth transitions to maintain spatial orientation.



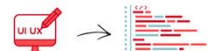
DEVELOPMENT



Map Rendering

Leaflet used to:
Render interactive city maps
Handle zooming, panning, and user interaction

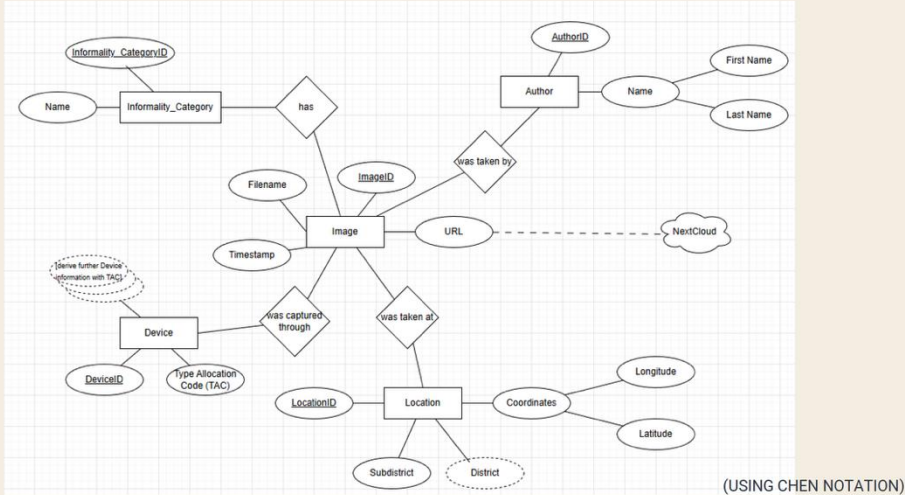
MapTiler provided:
High-quality, customizable base maps
Clear urban context for Bremen
Layer-based approach to visualize different informalities.



Design Handoff

- UI and interaction flows were designed in Figma.
- Design system translated into reusable components in Next.js.
- Next.js provided with Automatic Static Optimization and Partial Prerendering with automatic removal of unused actions.
- Tailwind CSS ensured consistency between design and implementation.
- Close alignment between visual design and front-end logic.

ENTITY RELATIONSHIP MODEL DIAGRAM



LAYERS OF INFORMALITIES (OUR FINAL CATEGORIES AND SUB-CATEGORIES)

- **Social and Cultural Practices**
 - Cultural Events & Sites
 - Demonstrations
 - Hangout Spots
 - Musicians & Freelancers
 - Legends, Retellings & Ephemeral
 - Sports Events & Facilities
- **Informal Economies & Exchanges**
 - Give-Away Items & Rentals
 - Markets & Sales Stands
- **Material & Spatial Informality**
 - Decorations
 - Graffiti & Street Art
 - Lost Things & Places
 - Memorials
 - Utilities & Information
 - Stickers
 - Passages
- **Landscape & Environmental Informality**
 - Gardening & Landscape
- **Other**

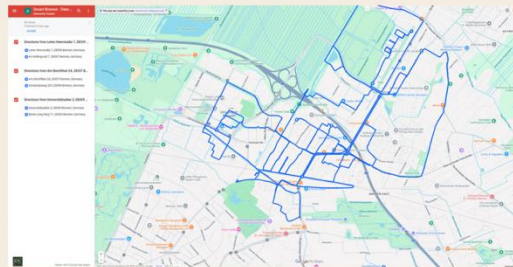
TRACKING THE JOURNEY



COVERAGE

Route Documentation

The traversed routes were documented (manually) in a Custom Google Maps map ensuring that the "Forgotten City" was explored beyond the main thoroughfares.



Systematic Area Coverage

This feature could be integrated into the admin view of the project platform (as an idea for the next project run), being a useful feature for keeping track of the data collection progress.

CLASS ACTIVATION MAPS (CAM)

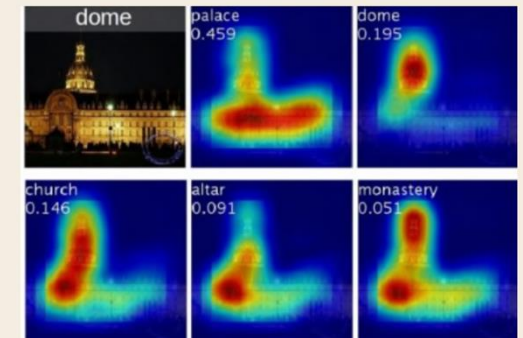


What CAM is

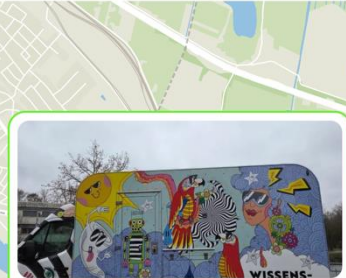
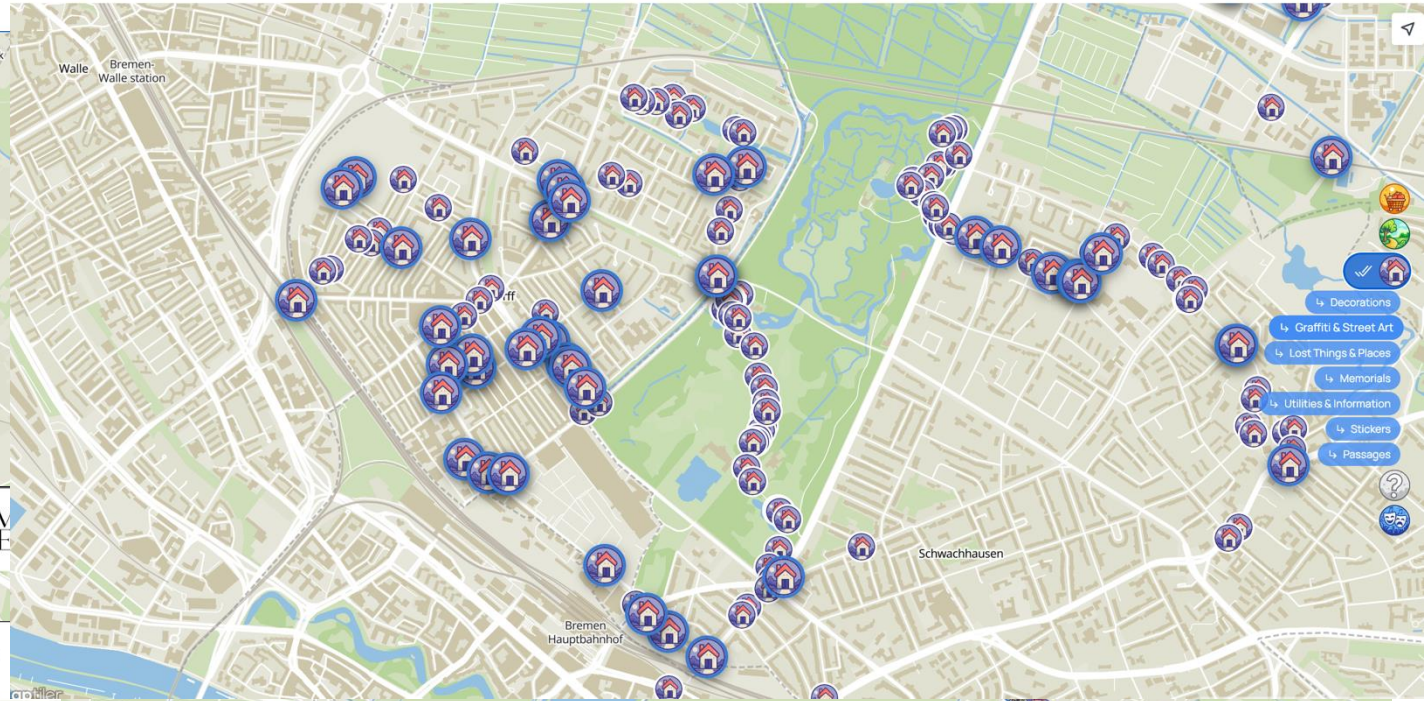
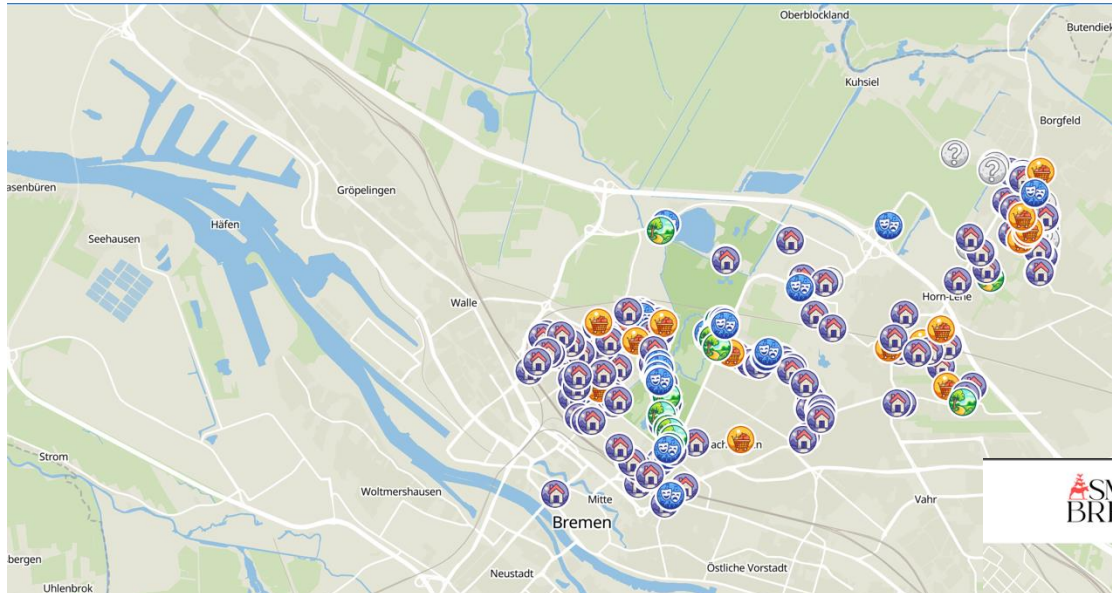
- A heatmap showing which image regions influenced a prediction
- Computed from a classification model
- Bright regions = strong influence

Why CAM is widely used

- Works with image-level labels
- Provides approximate localization
- Makes model behavior inspectable



Zhou, B., Khosla, A., Lapedriza, A., Oliva, A., & Torralba, A. (2016). Learning deep features for discriminative localization. In Proceedings of the IEEE conference on computer vision and pattern recognition (pp. 2921-2929).



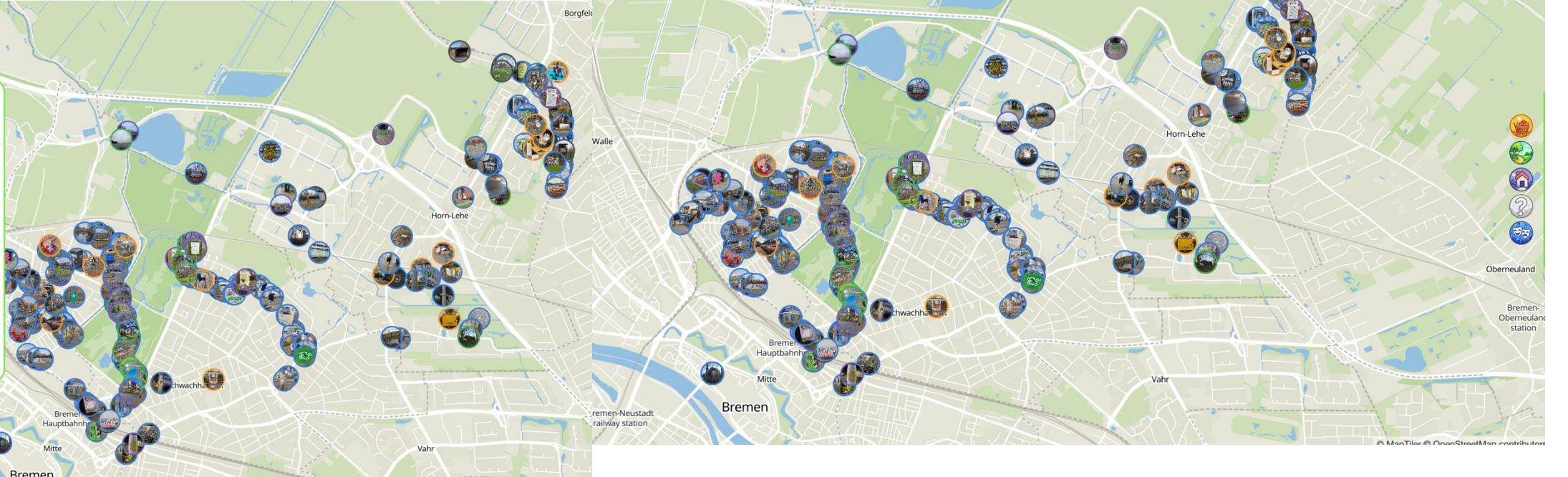
Mobile Knowledge Kiosk 1

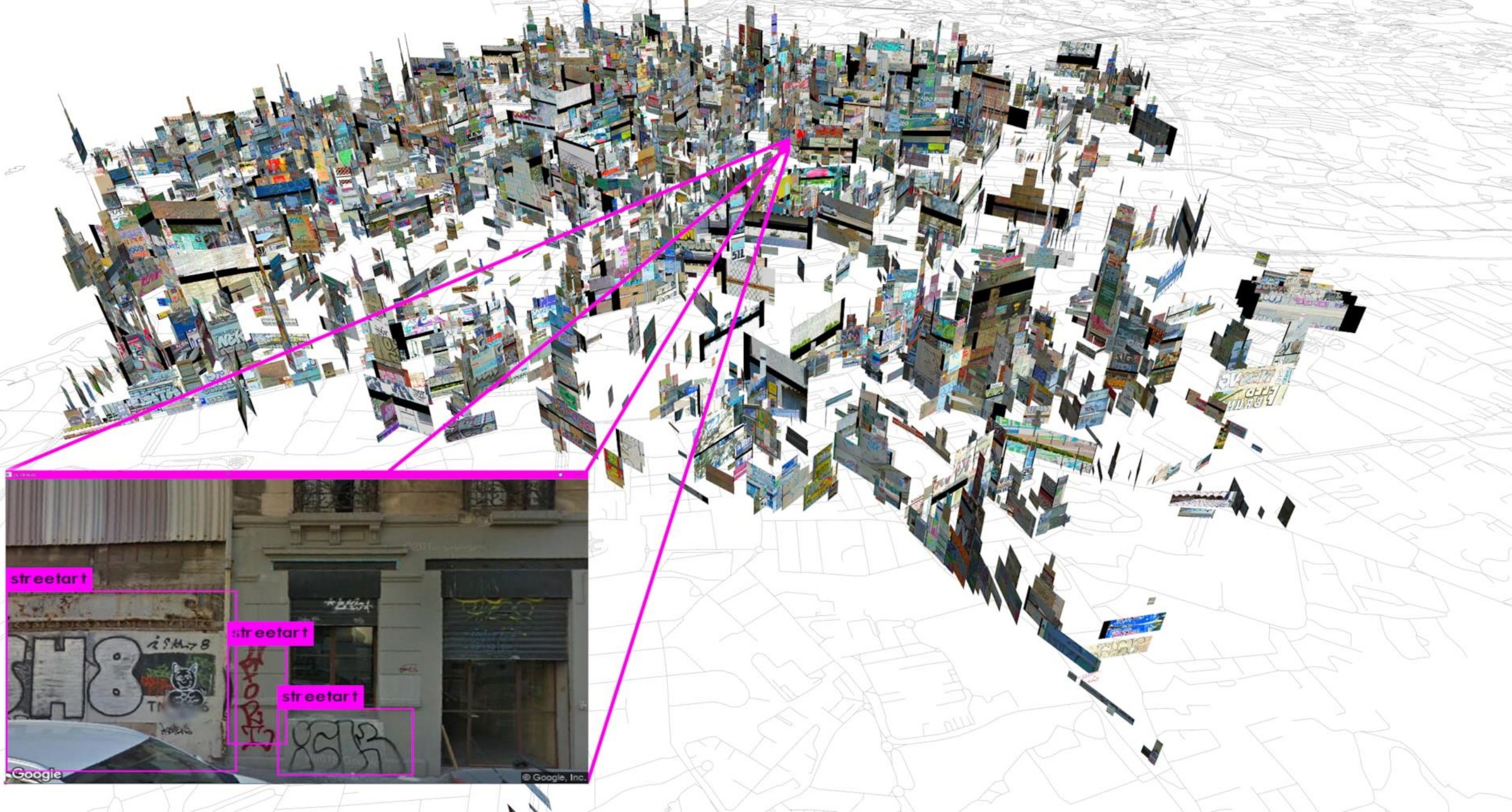
Social and Cultural Practices
Cultural Events & Sites

📍 53.1047, 8.8518 📅 Feb 5, 2026

★ Duc Tung Luu & Ghaith Ben Hnia

A mobile Wissenskiosk trailer in a public space, offering informal opportunities for learning, information, and exchange. The temporary structure and colorful design encourage spontaneous interaction with passersby.

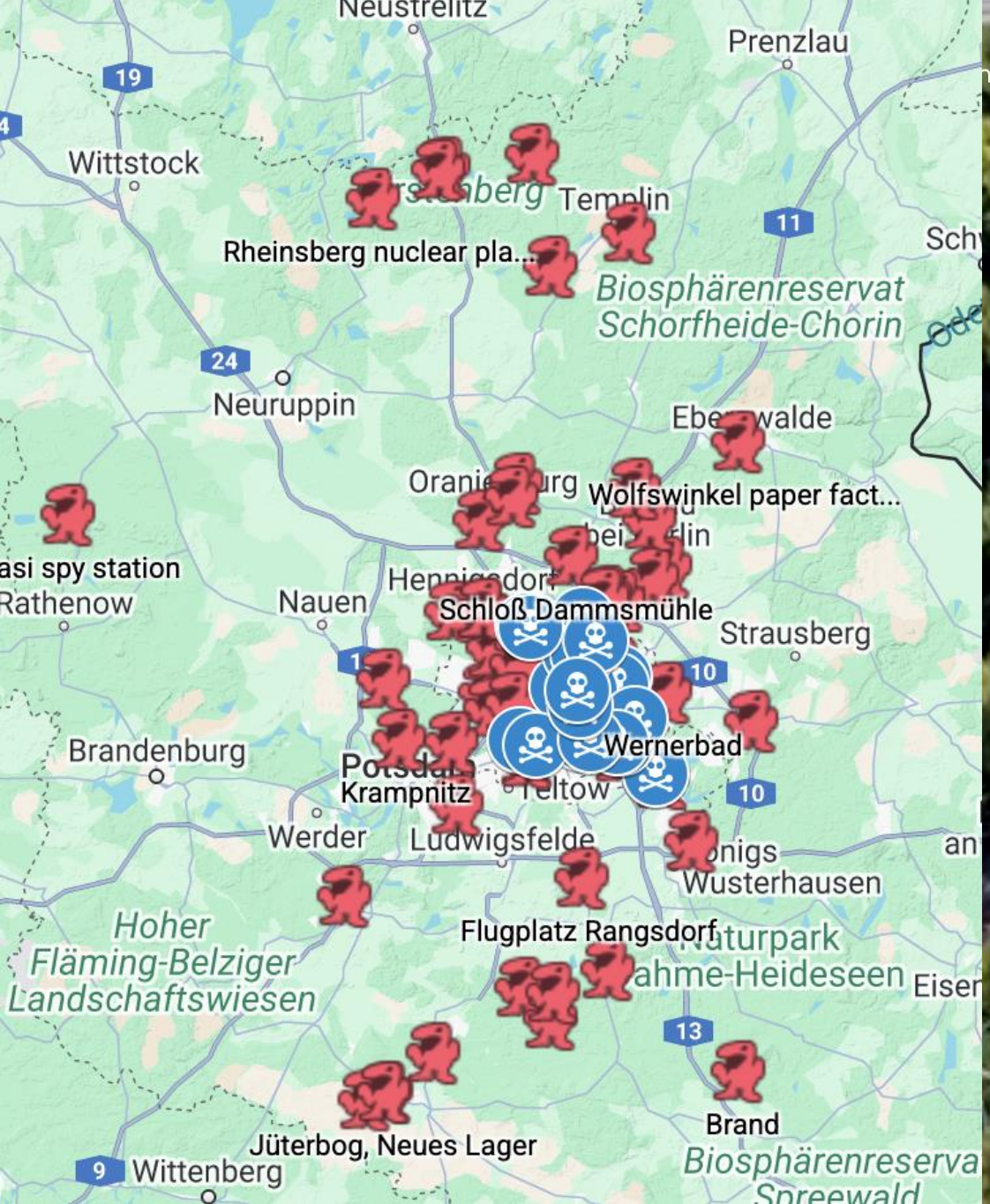




Related works & possibilities.



Street art route.



ABANDONED BERLIN

RUINS, RELICS AND DERELICT PLACES

if it's verboten it's got to be fun

tall tales of trespass and anecdotes of fear

Abandoned Berlin – Map of abandoned buildings in Berlin + the history of each place.

HUMANS


AN INTERNATIONAL PROJECT

In 2013 I took my first international trip to Iran. With the aid of an interpreter, I was able to capture portraits of random Iranians on the streets of several cities. Later that year I partnered with the United Nations for the 'UN/HONY World Tour,' where I photographed and interviewed random people in twelve different countries including Iraq, South Sudan, and The Democratic Republic of Congo. Over the next several years I would profile people on the streets of 40 different countries. In 2020 the work from these travels was turned into a book of international stories called *Humans* which was released in 2020.





Open to other possible projects

- 
- Previous requirements:
 - Curiosity about the intersection between art and technology applied into the urban context and more specific, the city of Bremen.
 - Photography, video edition, 3D modeling might be used.
 - Different skills depending on each project but there's no need for a prior knowledge, skills would be developed through the course.
 - **One semester project**



Thank you!
Questions?

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