Selected Works 2021 / 2024

M.Arch
B.Eng

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PLAYBACK

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PLAYBACK

Playback is a collection of my work that uses cutting-edge technologies to revisit timeless human experiences—love, memory, and relationships with companion species. The series explores the cyclical nature of life, where familiar themes are reinterpreted through new technological lenses. Each project includes a "*Core Memory*" and a "*Tool for Playback.*" By looking back with modern tools, we create visions of the future, using today's technology to reshape enduring stories.

In this interactive PDF, the play, pause, rewind, and fast-forward buttons transform the experience into a time-based medium. You can engage with the work by playing, pausing, fast-forwarding, or rewinding the narrative at your own pace.

Enjoy the journey!

◎ *Core Memory*
× *Tool for Playback*

◎ *Culture*
× *VR / Robotic Fabrication*

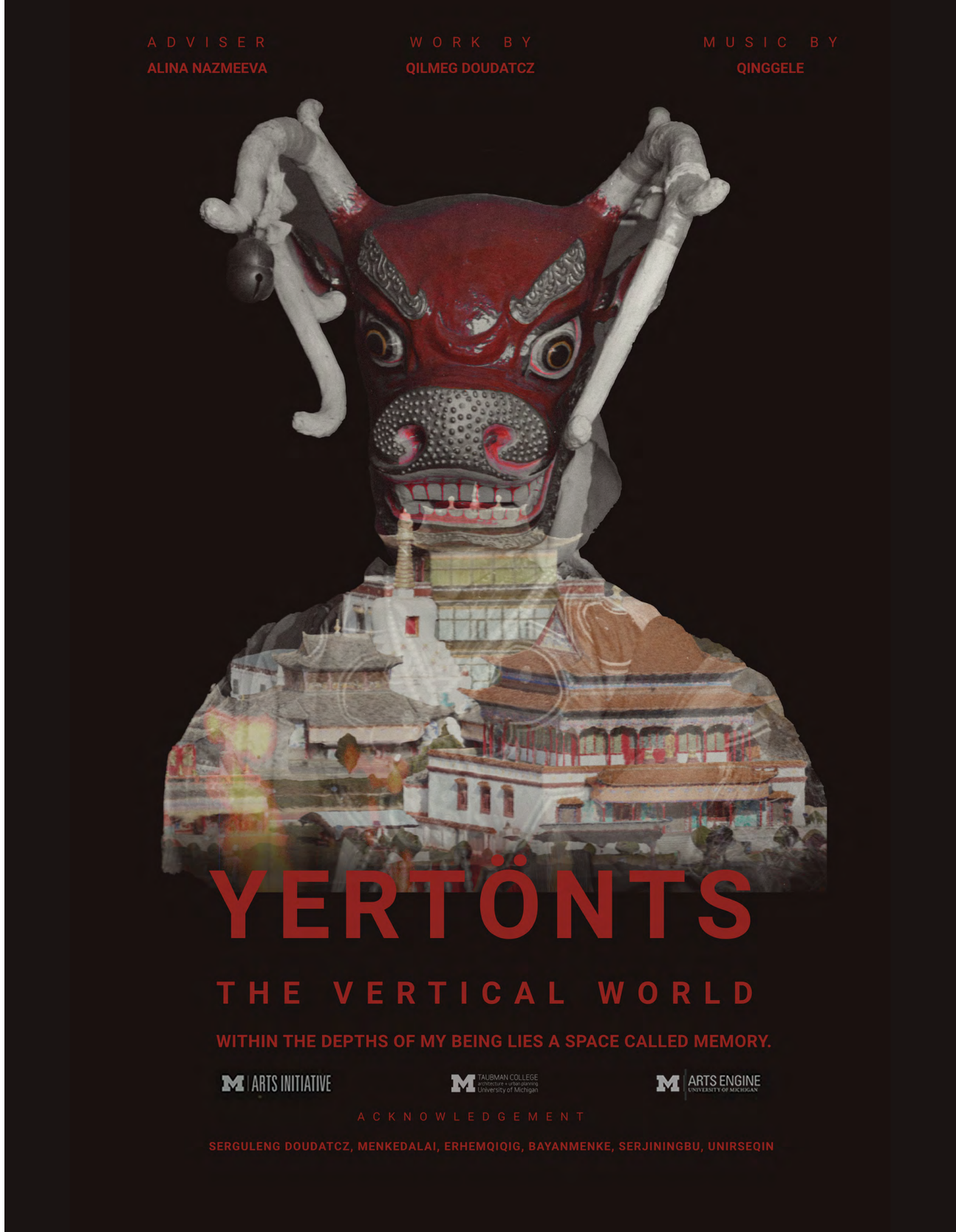
Yertönts, the Vertical World

Thesis, 2024
Burton L. Kampner Memorial Award Winner Project
RIBA President's Medals, Silver Medal Nominee
Advisor: Alina Nazmeeva
Music: Qinggele
Link to Video
Funded by University of Michigan Arts Initiative, ArtsEngine

According to CNN, one-fifth of the world's more than 7,000 languages are projected to become dormant or extinct by the end of this century. Currently, approximately nine languages vanish each year, equating to one disappearing every 40 days.

Traditional Mongolian is the only language in the world that's still written vertically. Despite efforts by young Mongolian artists and programmers, smaller languages struggle to keep up with the rapidly changing contents and trends in both pop culture and academia. This leads to my thesis question: When the decay of certain cultures in the material world is unavoidable due to complex reasons, how can we preserve the culture, which is inherently a fluid entity, in another world without reducing it to just a static repository of collective memories? Conversations about digital preservation typically focus on losses during translation. However, my persistent curiosity centers on how introducing a real-world environment into the digital space can breathe life into a culture during translation between different media.

In collaboration with many local Mongolians and young Mongolian musicians from Inner Mongolia, this project tries to reconstruct the circular world of one's memory, Yertönts, in digital space and make one's memory an interactive experience in the VR world. Religions build conceptual worlds, imagining realities that are patterned and purposefully regulated. In this project, the circular form of the world not only is linked to the meaning of the Mongolian term for memory, "ergentsüülel," which means cycling back, but also comes from the circular traditional nomadic Mongolian housing unit, the Mongolian yurt. Samsara, the fundamental concept in Buddhism that is linked to the karma theory and refers to the belief that all living beings cyclically go through births and rebirths, also serves as the main theoretical base for worlding and capturing the glitches and fuzziness of the world of memories.



UXIN JU TEMPLE

Uxin Ju Temple is the largest temple of Uxin Ju, Ordos. The Uxin Ju Temple complex comprised 24 halls, 21 living quarters for the living Buddha, 3 main stupas, 108 subsidiary stupas, and hundreds of monk dormitories, forming a Sino-Tibetan architectural complex. At its zenith, it housed over a thousand lamas, decreasing to around six hundred in 1949. From the Anti-Rightist Campaign in 1957 until the Cultural Revolution, Uxin Ju endured significant damage, with only the Sukhavati Palace, Dongkeri Sang, The Hall of Tara, the Living Buddha Laboleng, and the Gegen White Pagoda surviving. In July 1984, the People's Government of Uxin Banner designated Uxin Ju as the religious activity site for Uxin Banner. The original monks gradually returned, overseeing the restoration of the monastery and reinstating various religious gatherings. The temple not only served as a site for religion, but it has also supported the homeless population in Uxin Ju and has served as a primary school for children in rural areas for many years.

Sukhavati Palace

Gegen White Pagoda

Demchok

Zharongashar

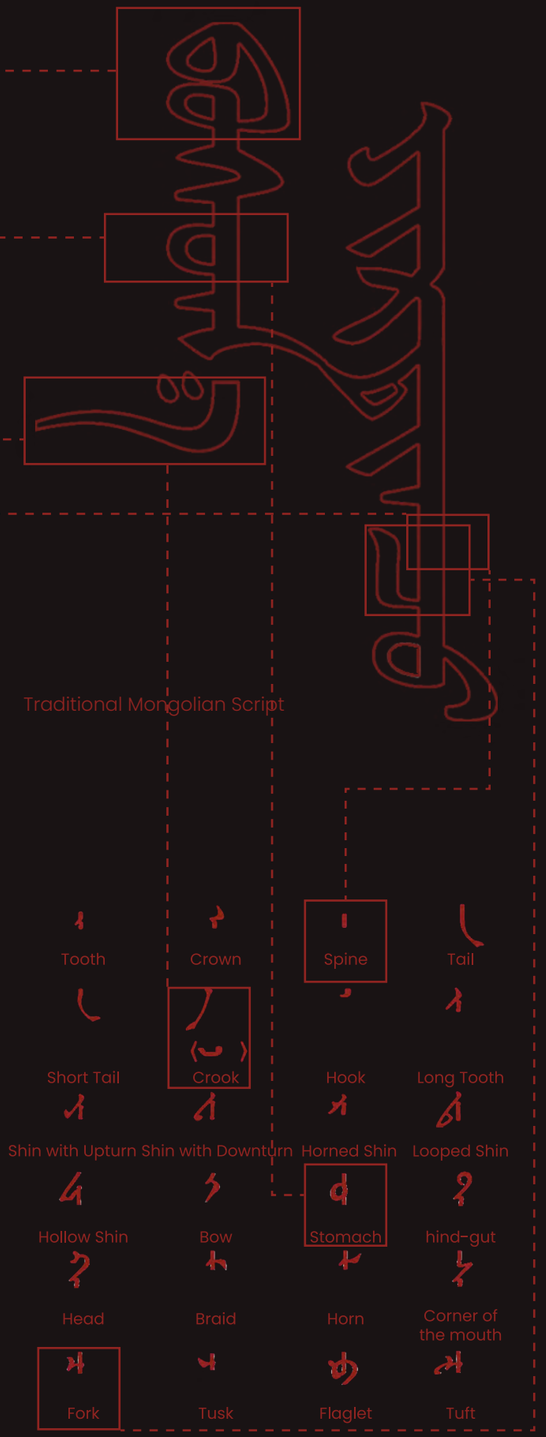
Local Mongolian Community

Uxin Ju Temple

THE VERTICAL SCRIPT

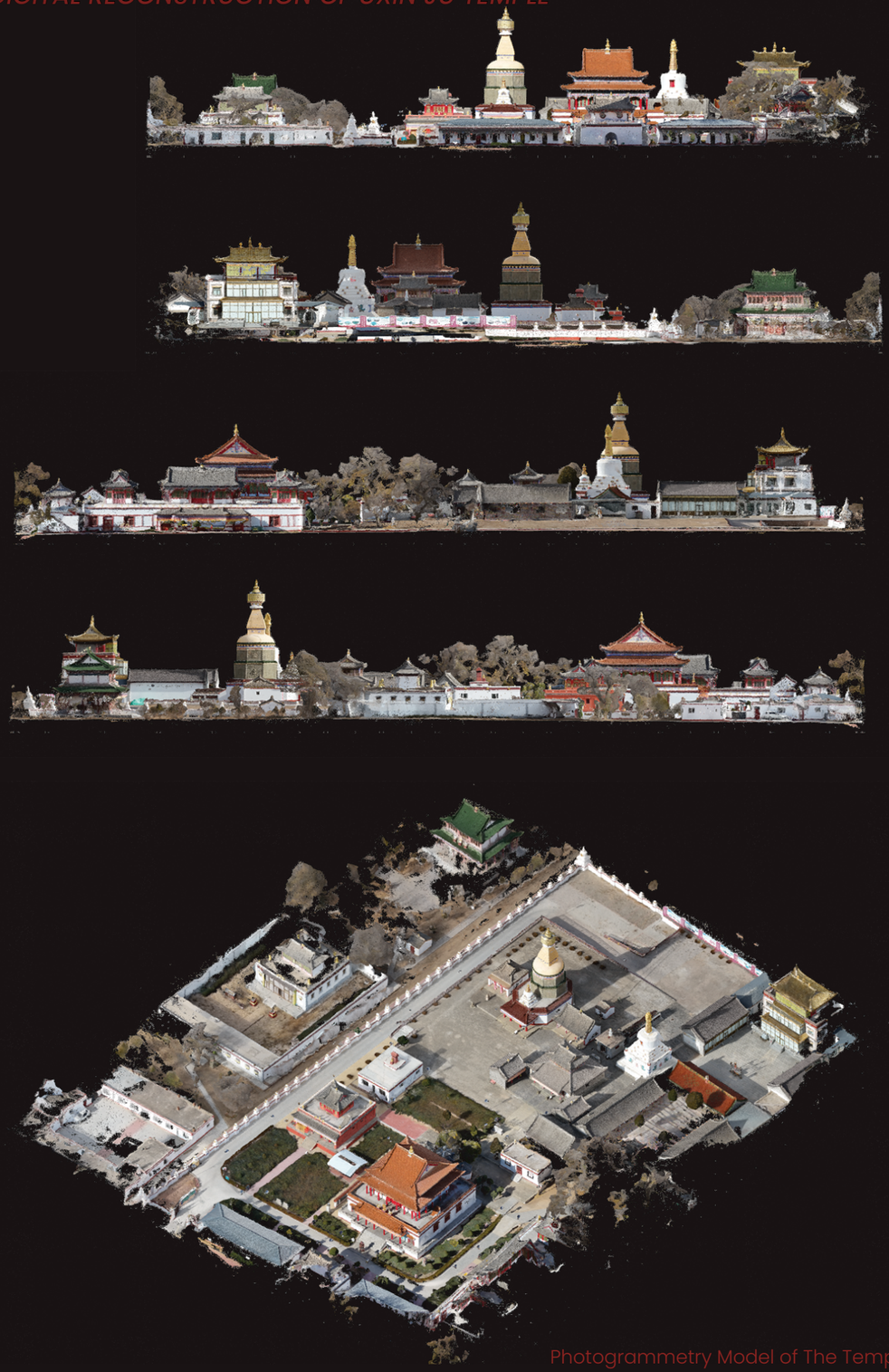
Human Body

Traditional Mongolian Script



Common Components of Traditional Mongolian Script

DIGITAL RECONSTRUCTION OF UXIN JU TEMPLE



Photogrammetry Model of The Temple

CHAM DANCE

With the help of a local Mongolian drone pilot and the permission from the monks of Uxin Ju Temple, we gathered hundreds of gigabytes of drone video and image footage of multiple architectures in the Uxin Ju temple, including Sukhavati Palace, Dongkeri Sang, Zharongashar, Gegen White Pagoda, The Hall of Tara, and The Hall of Three Longevity Deities. These videos and images were processed and imported into Reality Capture, a technology within Epic Games' ecosystem designed to capture real-world environments and objects for integration into virtual spaces, to generate photogrammetry models. This marks the first time in history that Uxin Ju Temple has been documented and reconstructed as a 3D model in digital space.

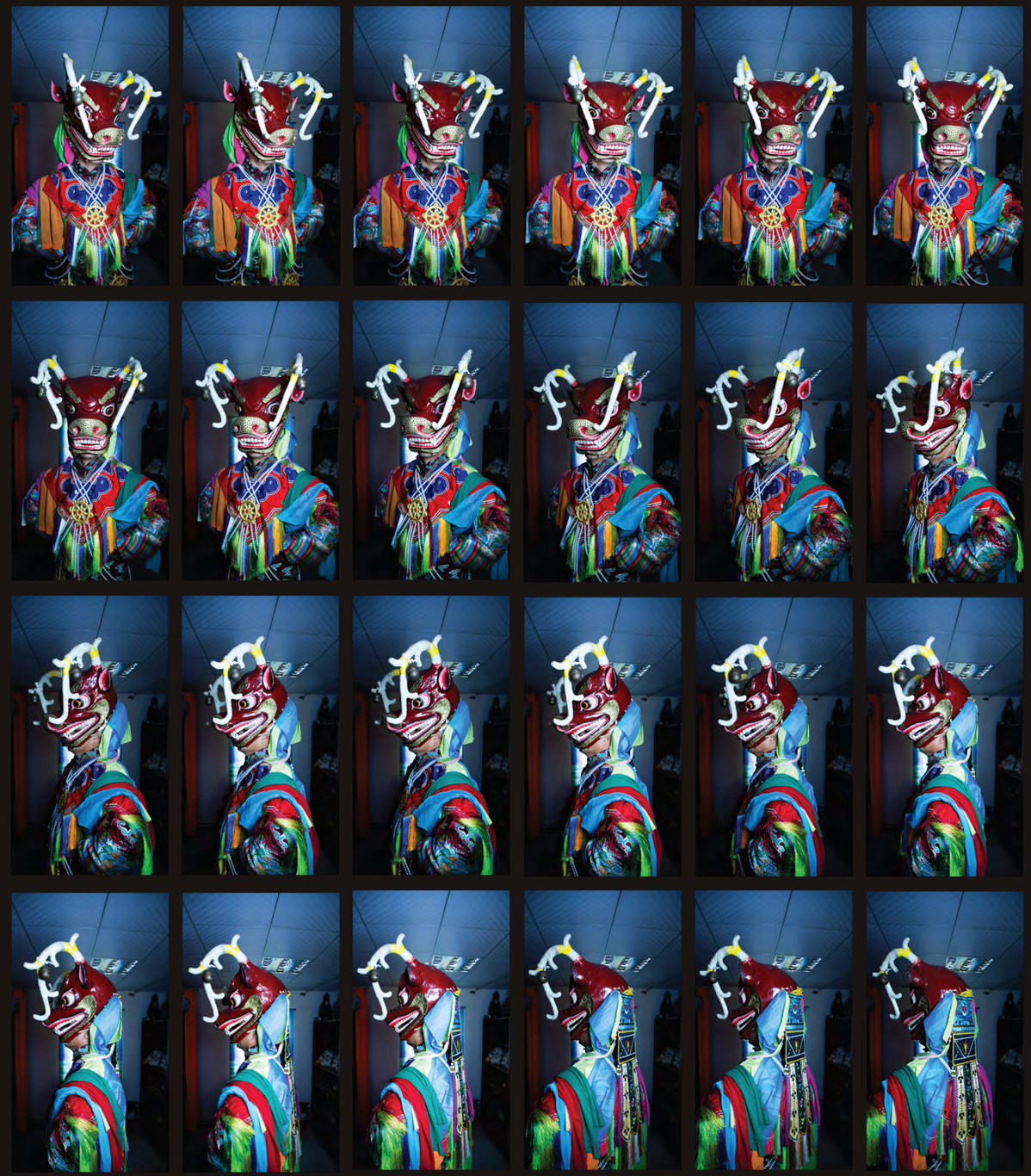
The Cham Dance, a significant ceremonial ritual, takes place on the fifteenth day of the sixth month in the lunar calendar at Uxin Ju Temple. Featuring fifteen different scenes, it is typically performed in the plaza in front of Sukhavati Palace. This ritual holds deep religious significance and serves as an annual community gathering, supporting local vendors. The shared experience of watching the dance fosters community bonding, with performers and audience members on the same plane.

In collaboration with the monks of Uxin Ju Temple, we motion-captured the Cham Dance using four cameras. We organized the video footage from 2021-2022 based on the dance script and cataloged the different types of masks used in the ceremony. Additionally, we used photogrammetry to reconstruct one of the cham masks, creating detailed textured mesh models. This marks the first time the Cham Dance of Uxin Ju has been documented and reconstructed in such a comprehensive manner.

Cham Dance Motion Capture Process

Cham Mask Collection, 2021-2022

CHAM MASK



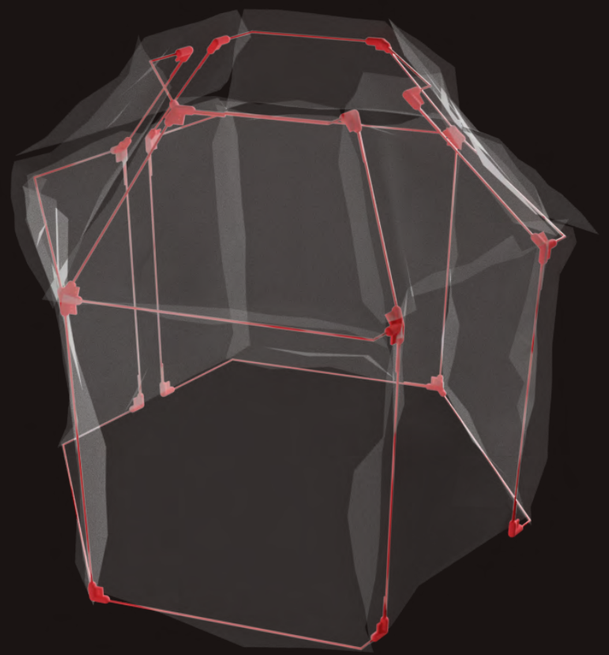
SAMSARA

"The cycle of death and rebirth to which life in the material world is bound."

With all the footage gathered, I started building a Virtual Reality (VR) experience in Unreal Engine. The entire experience includes six different spaces corresponding to six different categories of memories, each representing the six realms of Samsāra in Buddhism.

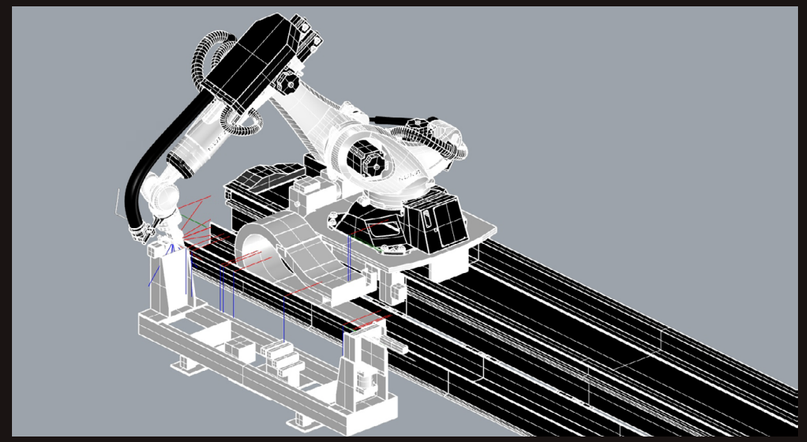
Buddhism was introduced to the Mongols during the Yuan dynasty and has gradually emerged as one of the major religions in Inner Mongolia. Samsāra translates to "wandering" and "world," denoting "cyclic change." As a fundamental concept in Buddhism, Samsāra is tied to the theory of karma and signifies the belief in the cyclic nature of birth and rebirth for all living beings. In the Buddhist context, Samsāra represents the cycle of existence across six realms or worlds.

Notably, the whole experience also includes six different soundtracks specially composed for this project by a young Mongolian musician.

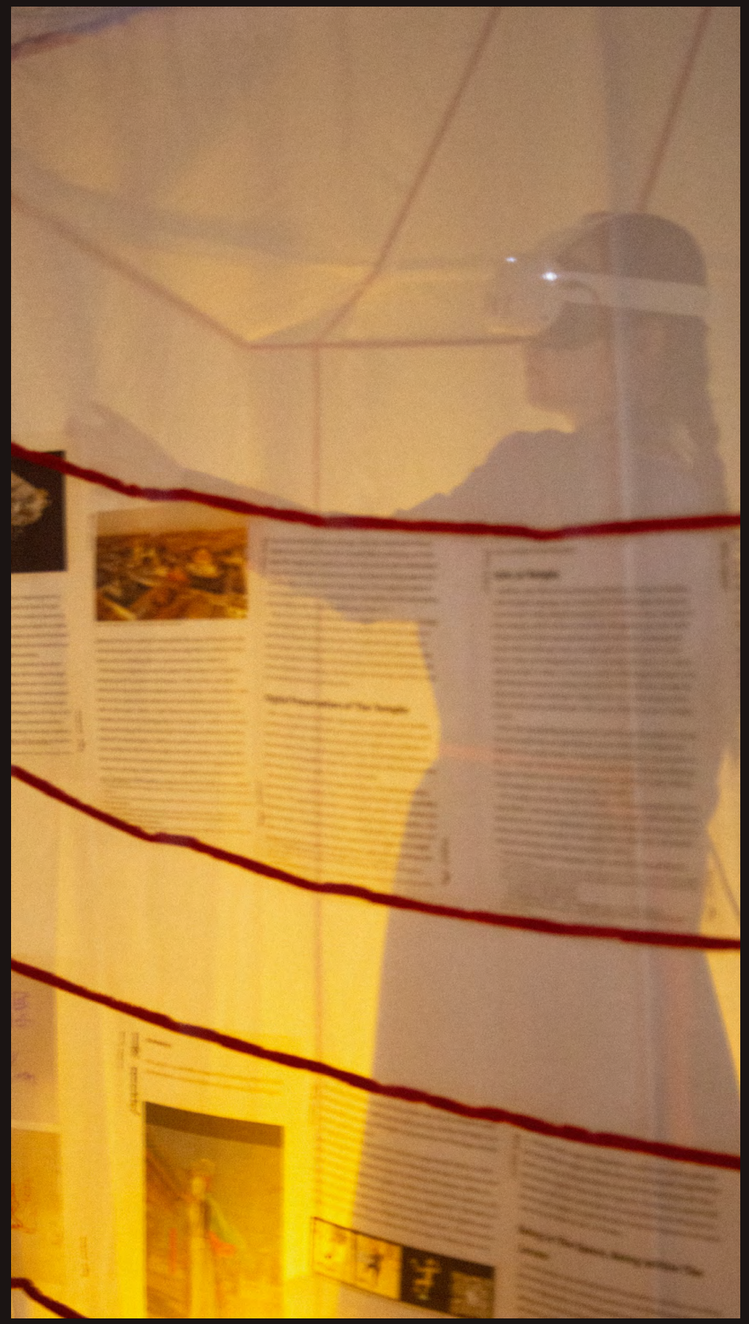


THE YURT

The thrilling part of curating a Virtual Reality experience is that the audience must physically move through and navigate the virtual space with their own bodies, requiring an intimate scale of void in the physical space for the player to move through.
To enhance this experience, I designed and built an 8-foot diameter physical yurt installation for the VR experience. The physical yurt, like a typical Mongolian yurt structure, is made up of a framework, fabric, and a rope system. However, this installation is an abstraction of the traditional Mongolian yurt, with the metal framework bent and built by the KUKA robotic arm, the semi-translucent fabric, the 3D printed joints, and the red yarn threading and tying all my previous research printed on translucent papers.
The scene that the player sees in the VR headset is also projected by a projector next to the yurt installation. This design makes the audience not just the player wearing the headset, but also the people who see the player's body moving through the installation and the 3D VR experience translated as 2D projections on the wall, becoming part of the audience as well.

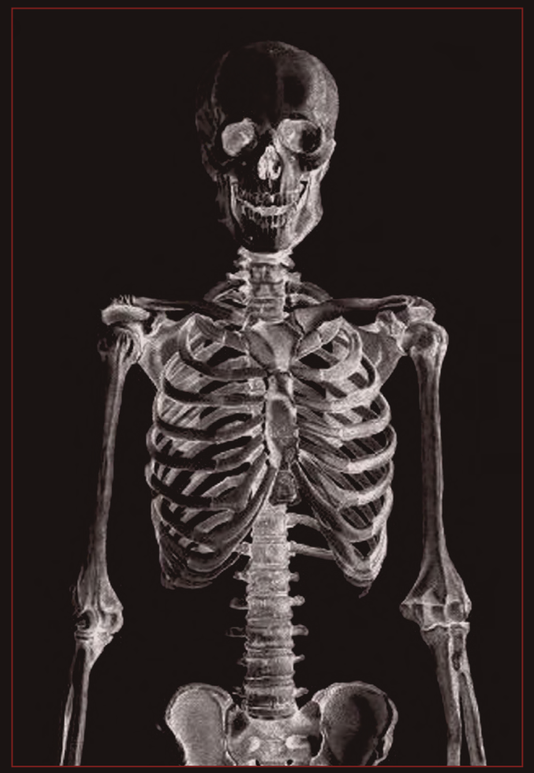


CYBORG IN THE YURT



My Body is My First and Last Territory.

CHARACTERS



The Vertical Body

As shown previously, traditional Mongolian scripts are a metaphor for the upright human body. Many Mongolian artworks and articles highlight the way they treat texts as if they are human, using adjectives such as “standing proudly with a straight spine” to praise one’s penmanship.
This project also explores the verticality of words from an architectural perspective. On level two of the VR experience, I extruded and assembled different texts to create the entire yurt structure out of words instead of traditional architectural components.

The Dancer

The moment a monk dons a specific cham mask, they embody the spirit of that mask, performing the memories and stories of people from long ago as if they were that character.
This also mirrors the goal of the VR experience in this project: to immerse the player in the memories and cherished moments of the Ordos people, making them feel as if they are the character themselves.

Horwoo

Horwoo, meaning “world” in Mongolian and a popular girl’s name, is the main character of this project. The VR game has its own background setting.
The game starts by stating the context: She uploaded her memories into The Yertönts. This moment served as both her wedding and her funeral—the last human on Earth who spoke the ancient language had passed away. What you see is what she saw; what you hear is what she heard; what you experience is what she experienced. Yet, this journey isn’t solely about what you perceive; it’s also about how you perceive it.

The Player

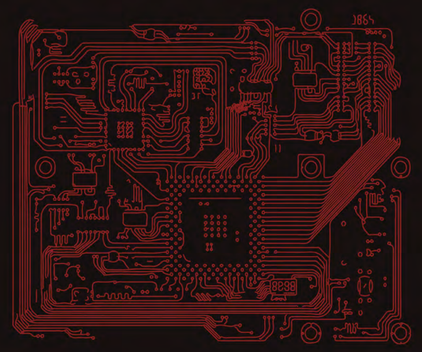
The player navigates through the VR experience within the yurt installation. Although they are the participant in the game, the fact that their view is projected on the screen next to them also makes them a performer.
The truly beautiful part of this process is that both the player and the observer are experiencing the same memory, which has undergone different layers of translation—from 2D to 3D and back to 2D. This captures the fuzziness of how memories persist within oneself.

ORDERING THE WORLD

"Cosmos comes from the Greek word for order. Religions build conceptual worlds, imagining realities that are patterned, purposefully regulated - in a word, ordered-thus inhabitable. "

-- Gregory Spinner

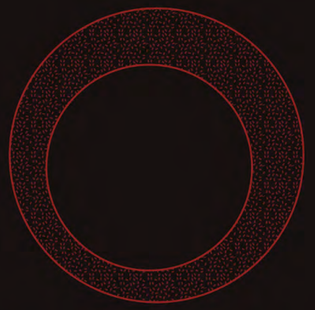
This diagram helps make sense of the structure of the world. The outer periphery represents the VR headset, and delves deeper into the digital world layer by layer.



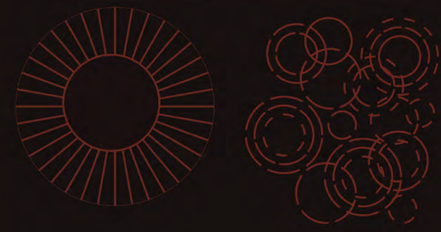
1 VR Headset: The extension of the body, the outer boundary of the digital space.

2 Human Mind: The space where all the memories and cognition resides.

3 Terra: The lands and water of Ordos, Inner Mongolia.



4 Horoo: The outer periphery of the yurt where all the livestock resides.



5 Ger: The Mongolian Yurt, the typical structure and furniture of a yurt.

6 Toono: The central skylight of a Mongolian yurt that serves as a natural clock. Underneath it is the fireplace, and above it, the universe.

◎ Optical Illusion
✕ XR / LED Stage

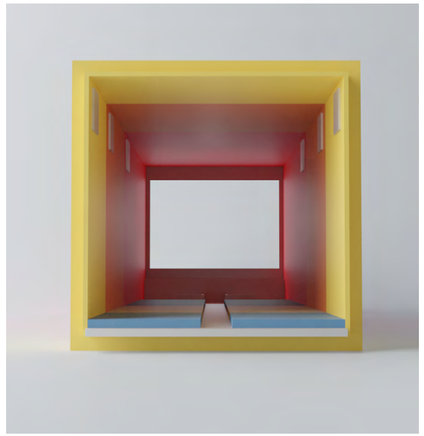
More Room at The Table

Pressing Matter Grant Project, 2023
Professors: Jonathan Rule, Ana Morcillo Pallares, John McMorrough, Julia McMorrough
Research Assistant: Ann Borek, Ella Edelstein, Axel Olson

"More Room at The Table" is a Pressing Matter Grant research project that explores the concept and history of depth, investigating various architectural precedents that employ spatial gestures such as forced perspectives to create the illusion of spatial depth.

In my role as the XR specialist for this project, my main responsibilities encompass two distinct parts. Firstly, I bring the digital models created by my coworkers into VR headsets, establishing a controller-free VR navigation experience. Secondly, I bring the assets into AR, enabling the audience to navigate through the content on their phones.

Galleria Spada
1653



Bayer Cinema
1925

Santa Maria Presso San Satiro
1472

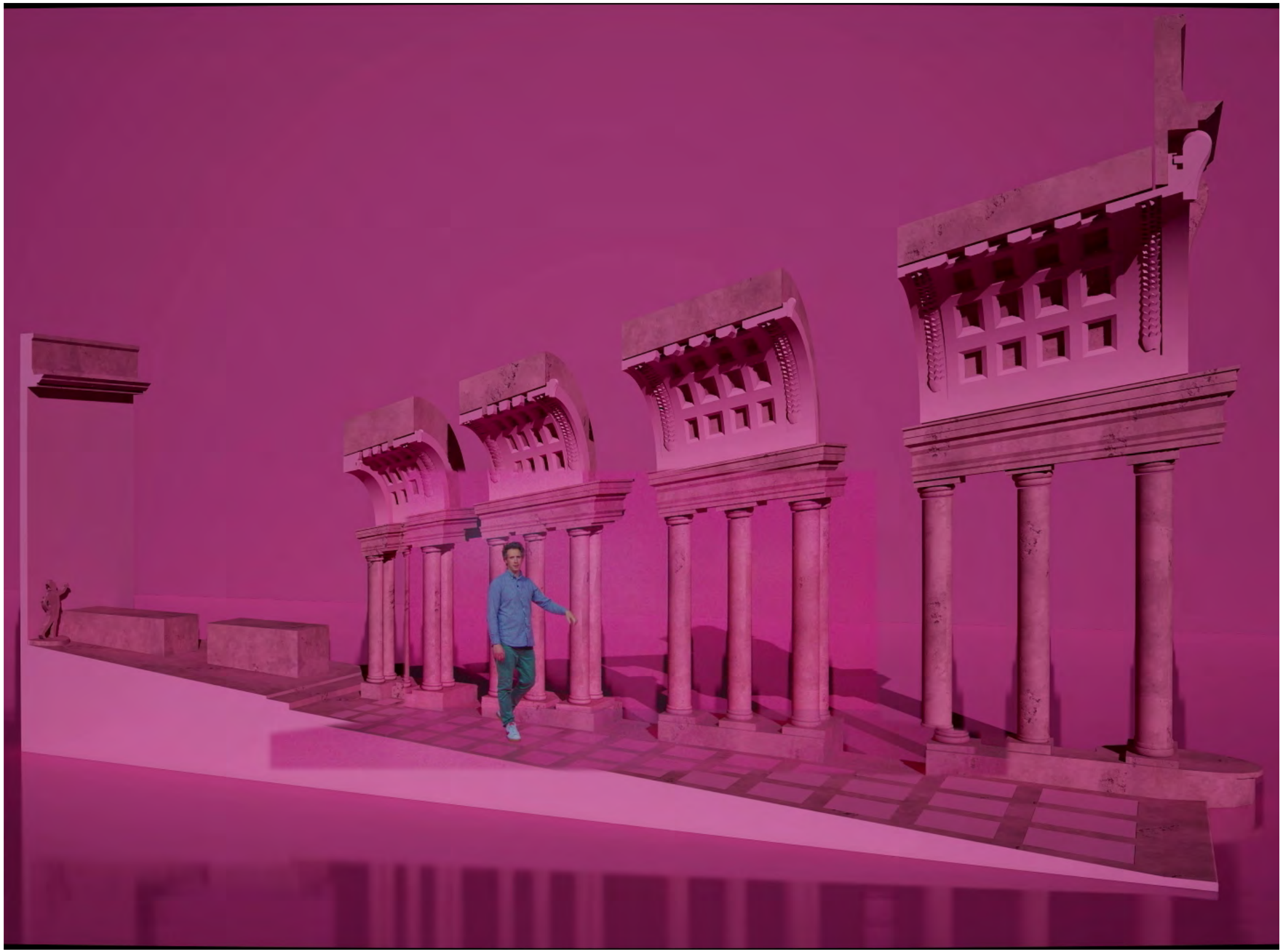
Temporary Theater, Serlio
1566







XR STAGE PRODUCTION AT CENTER OF ACADEMIC INNOVATION,
UNIVERSITY OF MICHIGAN



Galleria Spada

San Marco

Bayer Cinema

Temporary Theater, Serlio

◎ Digital Representation
✕ LiDAR / Photogrammetry

Empathy in Point Clouds

2022 - 2024
Advisor: Dawn Gilpin, Robert Adams

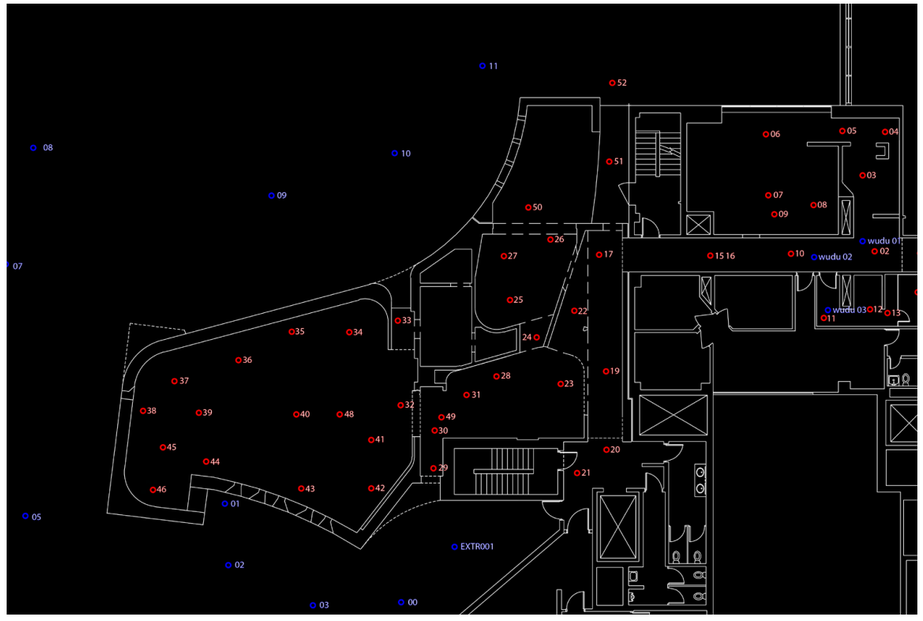
Empathy in Point-Clouds (EIPC) is a faculty-student research group that aims to redefine the parameters for creating radically accessible and inclusive architecture.

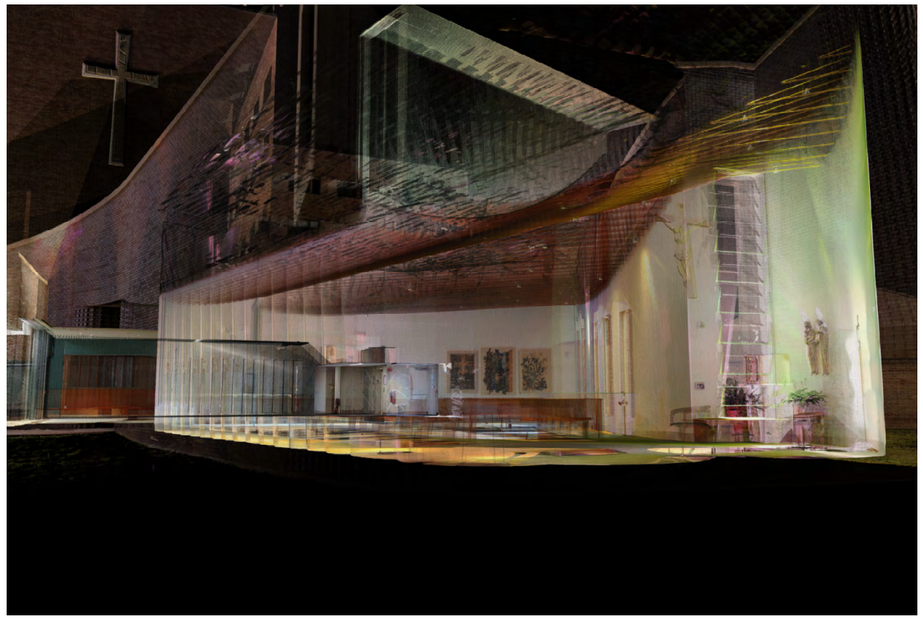
EIPC's focus ranges from physical buildings and environments to digital infrastructure and urban technologies. The team leverages LiDAR scanning technologies to develop project-based workflows. We create and visualize point clouds using LiDAR scanners, photogrammetry models, live performance motion-capture animation, and other immersive technologies.

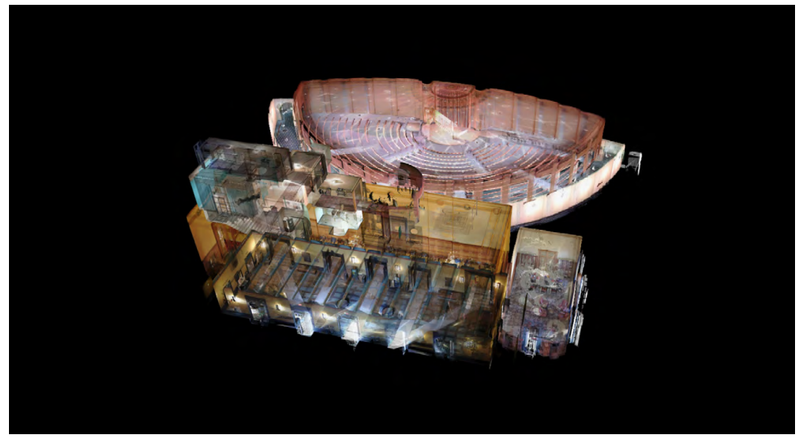
EIPC utilizes the University of Michigan campus and faculty-designed architecture, collaborating with institutions like The Cosanti Foundation to prototype, test, and validate complex design methodologies.

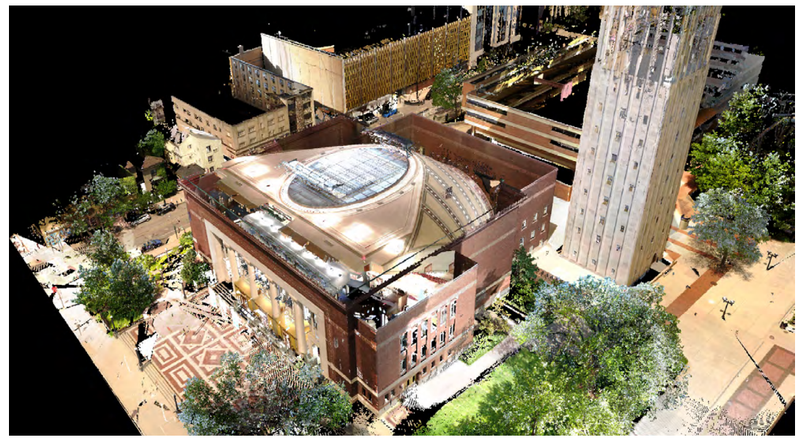
As a research assistant and the point person for VFX development, website construction, and data visualization, I contribute to these efforts. This portfolio showcases selected LiDAR and photogrammetry scan projects and highlights our collaborative experience in the MiDEN CAVE.

LIDAR SCAN WORK SELECTION









◎ *Nursing*
× *VR*

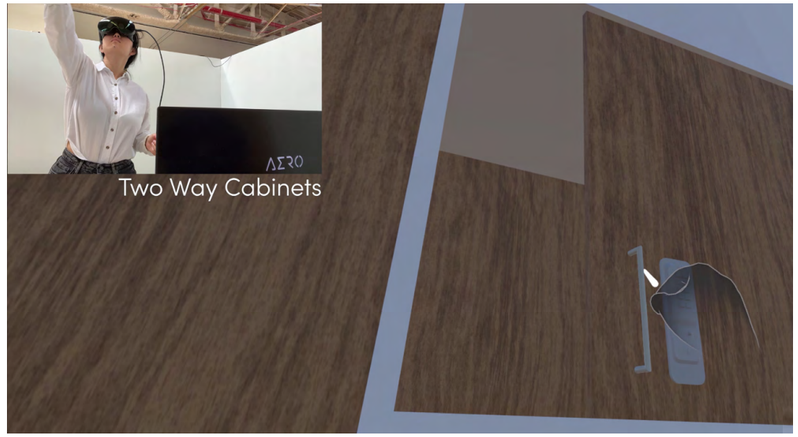
CareSpace XR

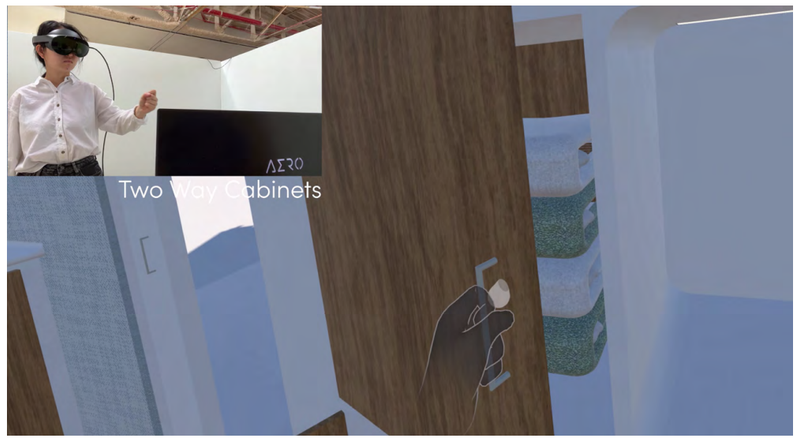
Winter, 2023
Group Work with Mardy Hillengas and Einas Elamin
Advisor: Jonathan Rule

CareSpace XR is a patient care room design project in collaboration with the University of Michigan School of Nursing. The project began with interviews conducted by architecture student groups with nursing student groups to explore real-life challenges that nurses commonly encounter in patient care rooms. Subsequently, we visited a patient care room at the School of Nursing, where we used Gravity Sketch for spatial documentation and ergonomic studies.

We devoted considerable effort to synthesizing the information gathered from on-site AR documentation and interviews, translating these data into spatial organization problem. Next, we transferred our initial design into Arkio and conducted a virtual meeting with professors and students from the School of Nursing for a VR project review.

The final design was imported into Unity, and by leveraging the latest Oculus Interaction SDK, we developed a controller-free, hand-interactable VR Patient Care Room project.



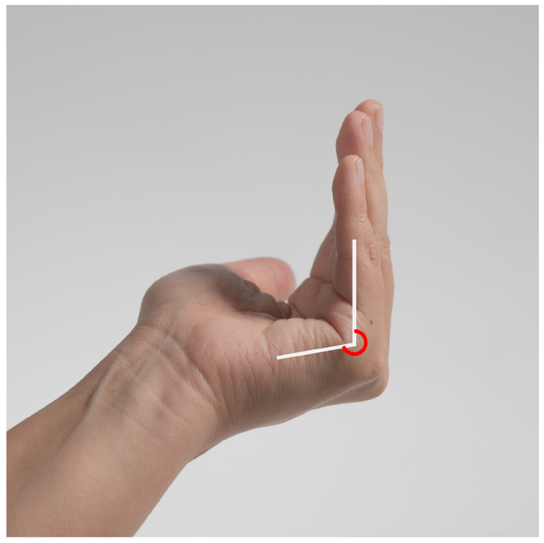


Game Play Demo

Curl

Represents how bent the top two joints of the finger or thumb are. This feature doesn't take the Proximal (knuckle) joint into consideration.

Open: Fingers are fully extended straight.
Neutral: Fingers are slightly curled inwards, as if they were wrapped around a coffee mug.
Closed: Fingers are tightly curled inwards such that the tips are almost touching the palm.



Flexion

The extent that the Proximal (knuckle) joint is bent. Flexion is only reliable on the 4 fingers. It can provide false positives on the thumb.

Open: The first bone on the fingers is fully extended and is parallel to the palm.
Neutral: Somewhat bent.
Closed: Knuckle joint is fully bent (pictured).

Abduction

The angle between two adjacent fingers, measured at the base of those two fingers. Abduction measures the angle between the given finger and the adjacent finger that's closer to the pinky. For example, Abduction for the index finger is the angle between the index and middle finger.

Open: The two fingers are spread apart.
Closed: The two fingers are tightly compressed together.
None: Not currently used.

Opposition

How close a given fingertip is to the thumb tip. Can only be used on index, middle, ring, and pinky fingers.

Touching: The fingertip joints are within ~1.5cm.
Near: The fingertip joints are between ~1.5cm and ~15cm apart.
None: The fingertip joints are greater than ~15cm apart.

DETAILED RENDER

MEDICAL INNOVATIONS IN EXTENDED REALITY INDUSTRY MEETING
UNIVERSITY OF MICHIGAN, 2023 JUNE

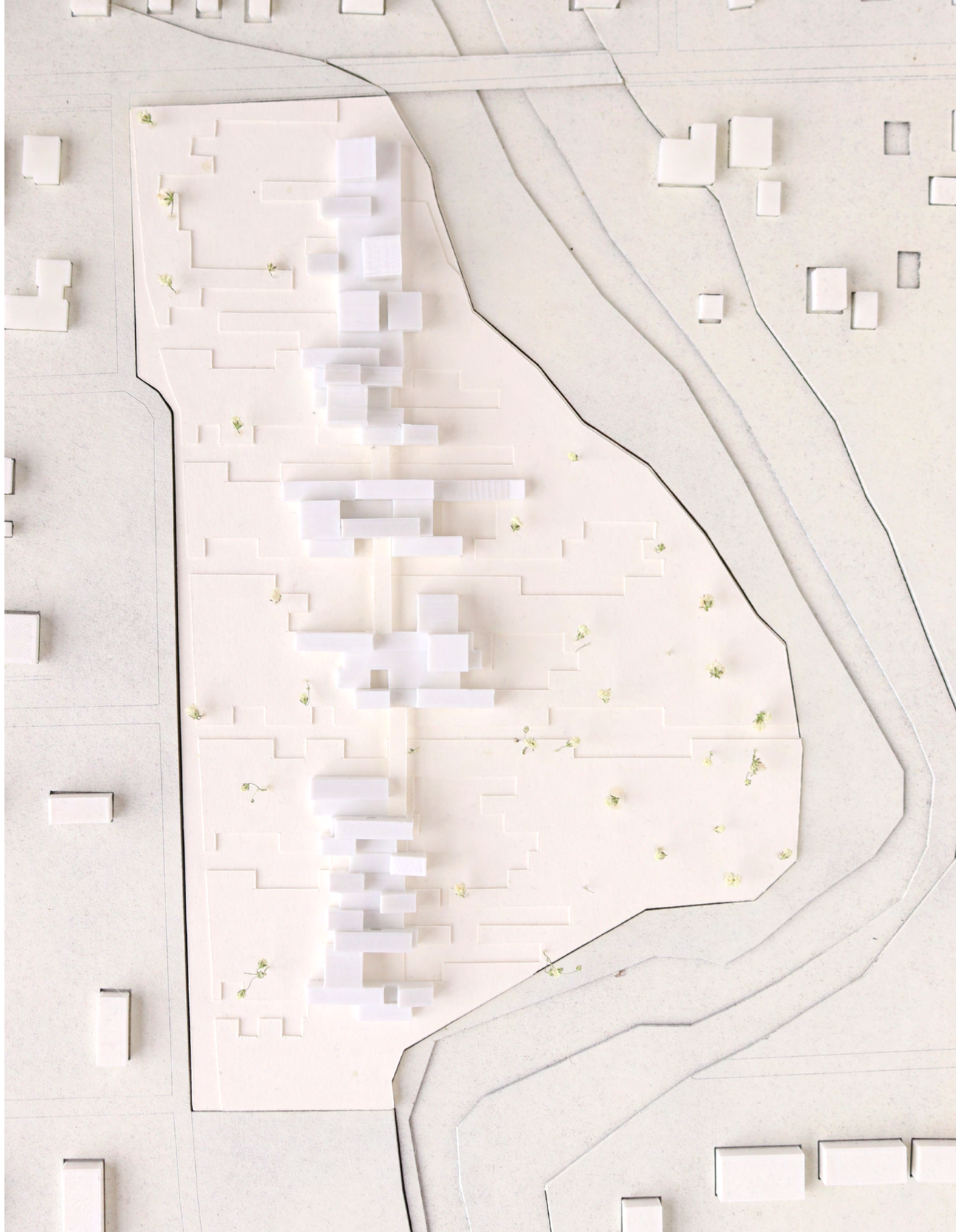
◎ *Resource / Education*
× *Collective Housing*

The Rural Bridge House

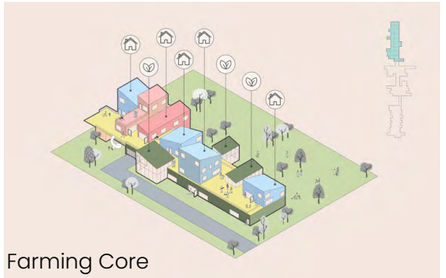
Winter, 2023
Group Work with Timothy Jockers and Michael Thut
Advisor: Jonathan Rule, Kathy Velikov

The project aims to establish a vibrant community in Port Austin by integrating public and private spaces; and fostering a hybridized work/life environment with housing, youth education, and public engagement initiatives. Formally, this project features a central core with programming branching out. It can be likened to a tree, with the central trunk connecting the entire building and smaller branches of programming extending from it. Key public infrastructures, such as farming, education, and woodworking, are located on the ground floor to engage both residents and the existing community.

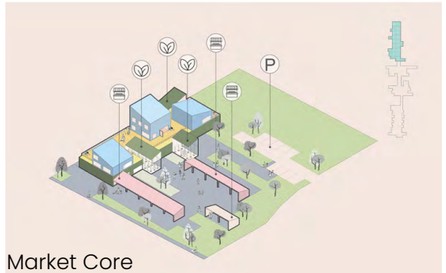
The project considers seasonal variations in Port Austin's activity and features infrastructure designed to activate the site year-round, including camp units and the planting of cherry, maple, pine, and oak trees that serve multiple functions, such as wood production and fruit and sap harvesting.



Ground Floor Plan



Farming Core

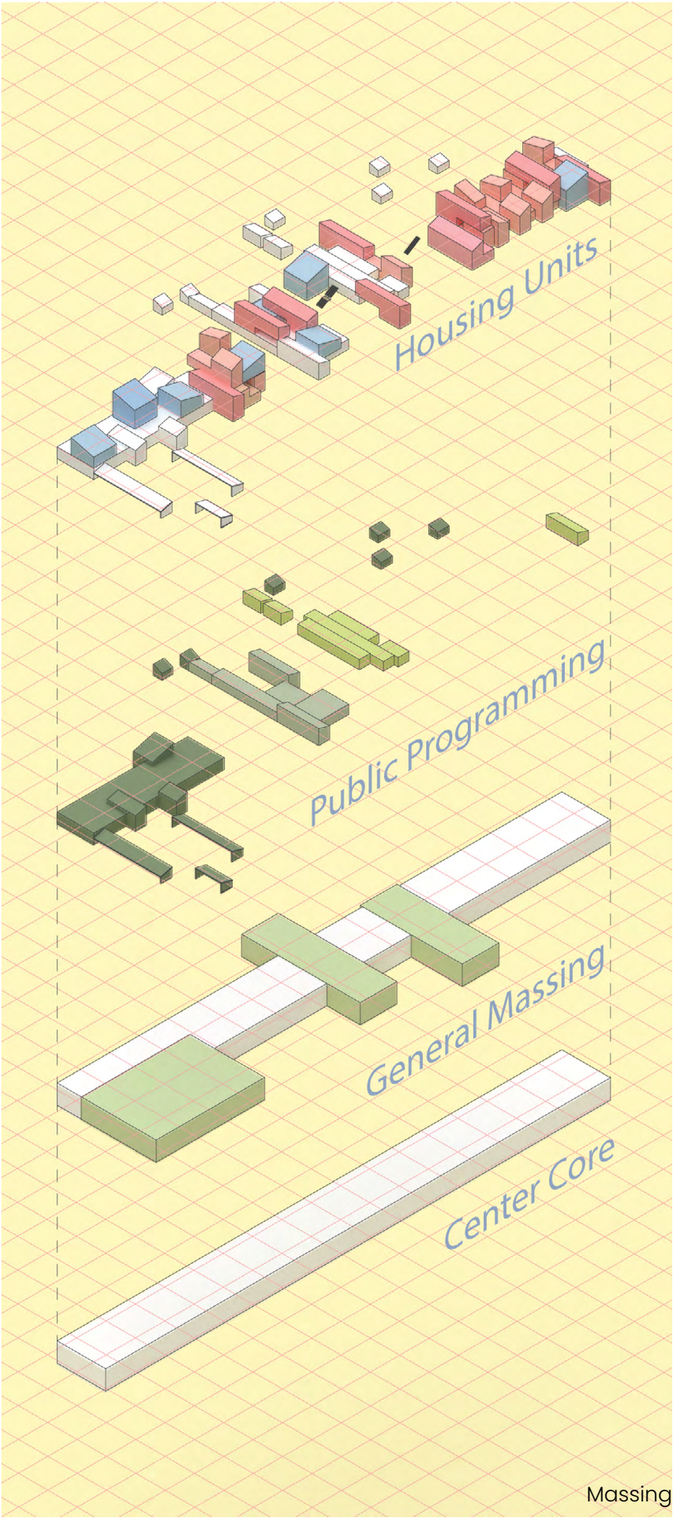


Market Core

Education Core

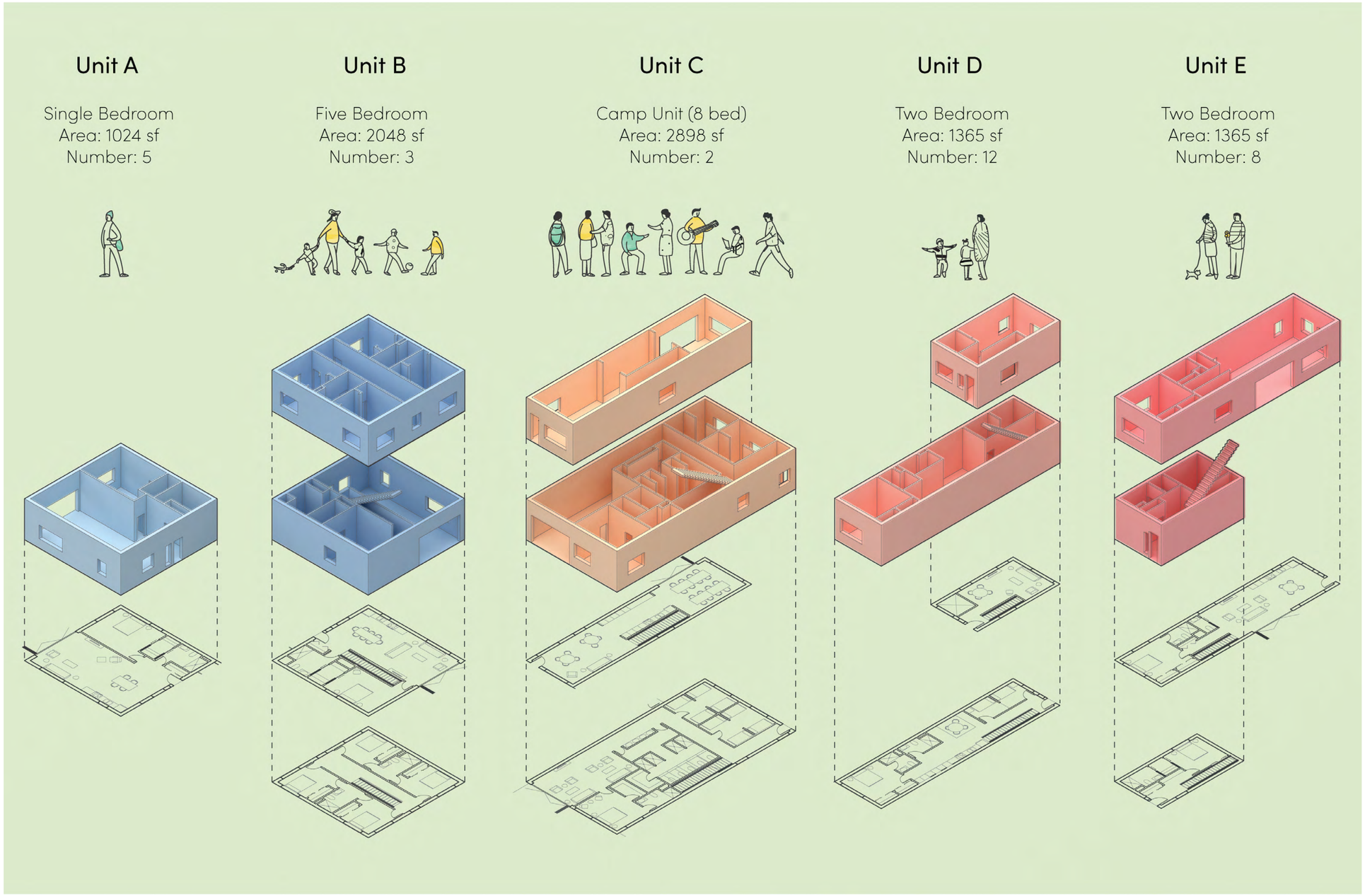
Public Core

Housing Core



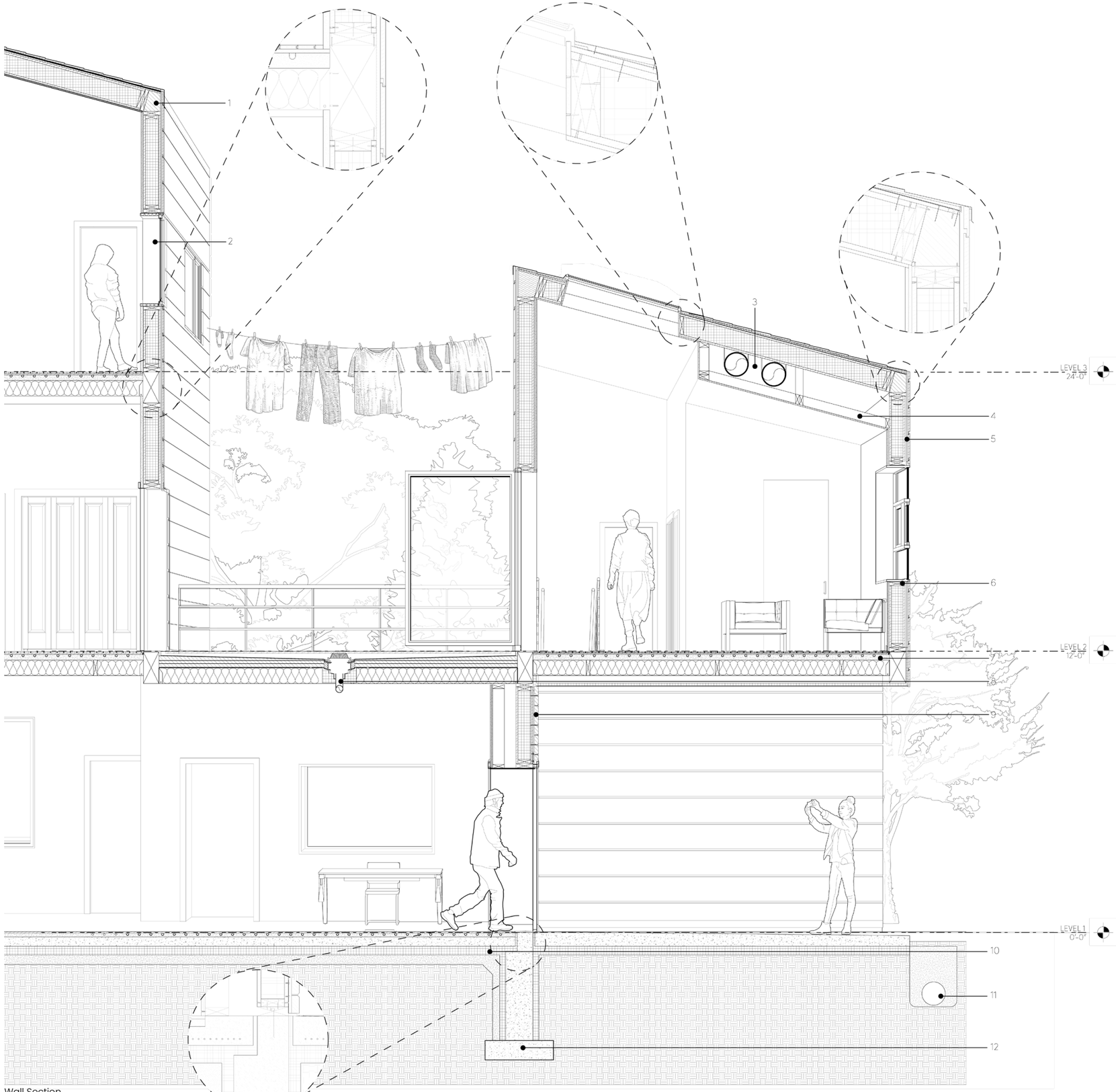
Massing

To foster a vibrant and inclusive community in Port Austin, we've designed five different housing units, ranging from traditional single and double bedrooms for individual families to larger five to eight-bedroom units for collective living conditions, catering to younger populations. These housing units also take into account both temporary and permanent residents on the site. Consequently, temporary housing units are strategically distributed next to public programming areas, while permanent housing is concentrated in the housing core on the south end of the site.

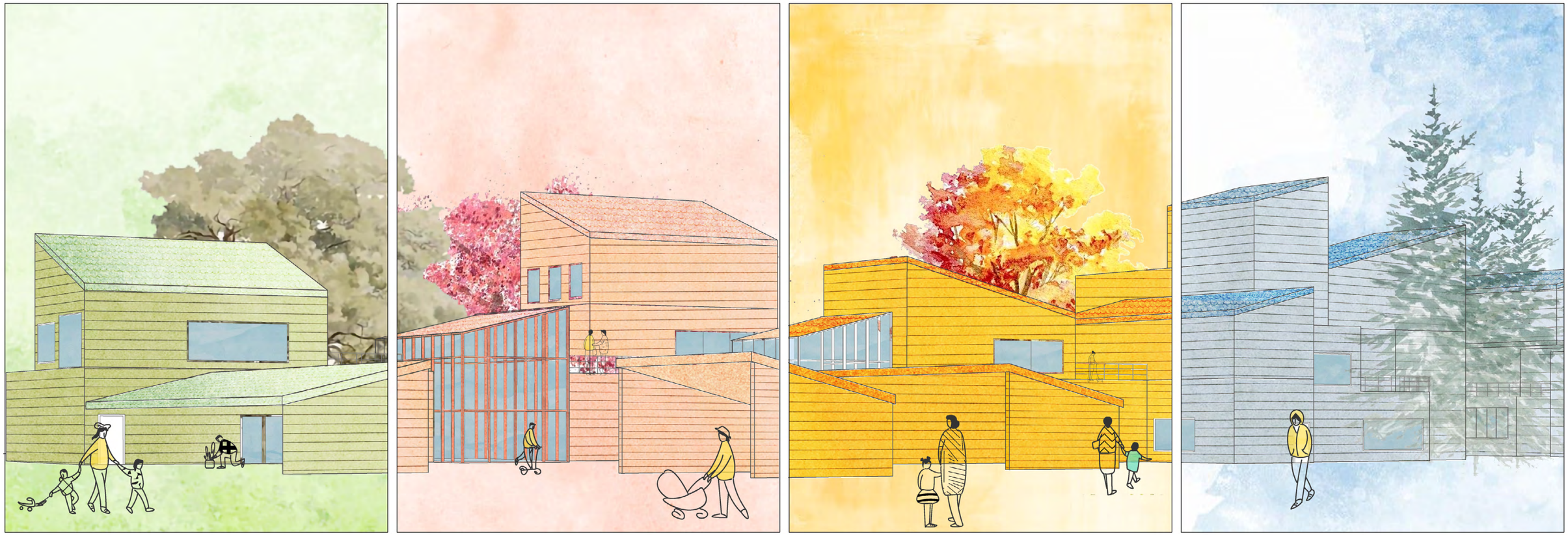


Housing Unit Types

1. Custom wooden wedge that will run the length of the unit.
   Beams to be rip cut to accommodate the 15 degree
2. SIP Panel roof.
   Non-operable window
   Drip edge across window header
   Air channel for drainage
3. Wooden slat facade
   Mechanical ducts measuring 1’ in
4. diameter carrying supply and return air for the unit.
5. Bulkhead:
   1’-6” Horizontal chase providedfor MEP systems
   Unit Wall:
   Exterior rain screen - wooden slats
   Vertical battens
6. Waterproofing layer
   SIP Panel
   Double layer of finish gyp (5/8”)
   Sill Plate Detail - Bottom to Top:
   2x8 brace sill plate
   Aluminum sill
7. Window
   Aluminum top plate
   Double stud lintel (2x8 & 2x6)
   Unit Flooring:
   ¾” hardwood floors
   ¾” subfloor radiant floor tubing gypcrete
   2x8 Joists w/ 3 diaphram bracers
8. 8” BATT insulation
   Rigid insulation
   Waterproofing
   2nd Floor Circulation Pathway -
   Typical wood decking slats
   Sloped roof to a 1:80 slope (0.72 degree)
9. Rigid insulation stacked for slope
   Central roof drain placed 8’ from grid lines
   2” pipe directing water to sewer
   Public Cladding:
   2-¾” brick veneer.
   Air channel for drainage
10. weep hole at the base
    Steel shelf tied into SIP panel to hold brick.
    Tiebacks added for additional stability
    Interior finish is double layer of 5/8” gyp
    Public Floor Structure:
    Slab on grade
11. Epoxy poured floor finish
12. 3” of gypcrete holding more
    Radiant floor tubing
    Rigid insulation wrapping the slab
    French Drain
    Foundation 48” below grade
    10” x 20” Footing with rebar inforcing



Wall Section



Seasonality on The Site

The Amphitheater

The Housing Units

The Sky Bridge

The Sky Bridge

QILMEG DOUDATCZ

Qilmeg Doudatcz (she/her) holds a Master of Architecture from the University of Michigan's Taubman College and a Bachelor's in Civil Engineering from Southeast University, China.
Born and raised in Ordos, Inner Mongolia, her architectural work is informed by her cultural background and focuses on using immersive technologies and parametric design methods for cultural preservation and heritage protection.
She specializes in digital visualization, LiDAR and photogrammetry scanning, and digital fabrication, integrating VR and AR into architectural design. Her thesis on cultural protection, created in collaboration with Mongolian communities, earned the 2024 Burton L. Kampner Thesis Memorial Award and was nominated for the 2024 RIBA President's Medals Entry for the Silver Medal by Taubman College.
Qilmeg has experience in teaching and research in architecture and engineering, emphasizing the use of advanced technology and cultural sensitivity.

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