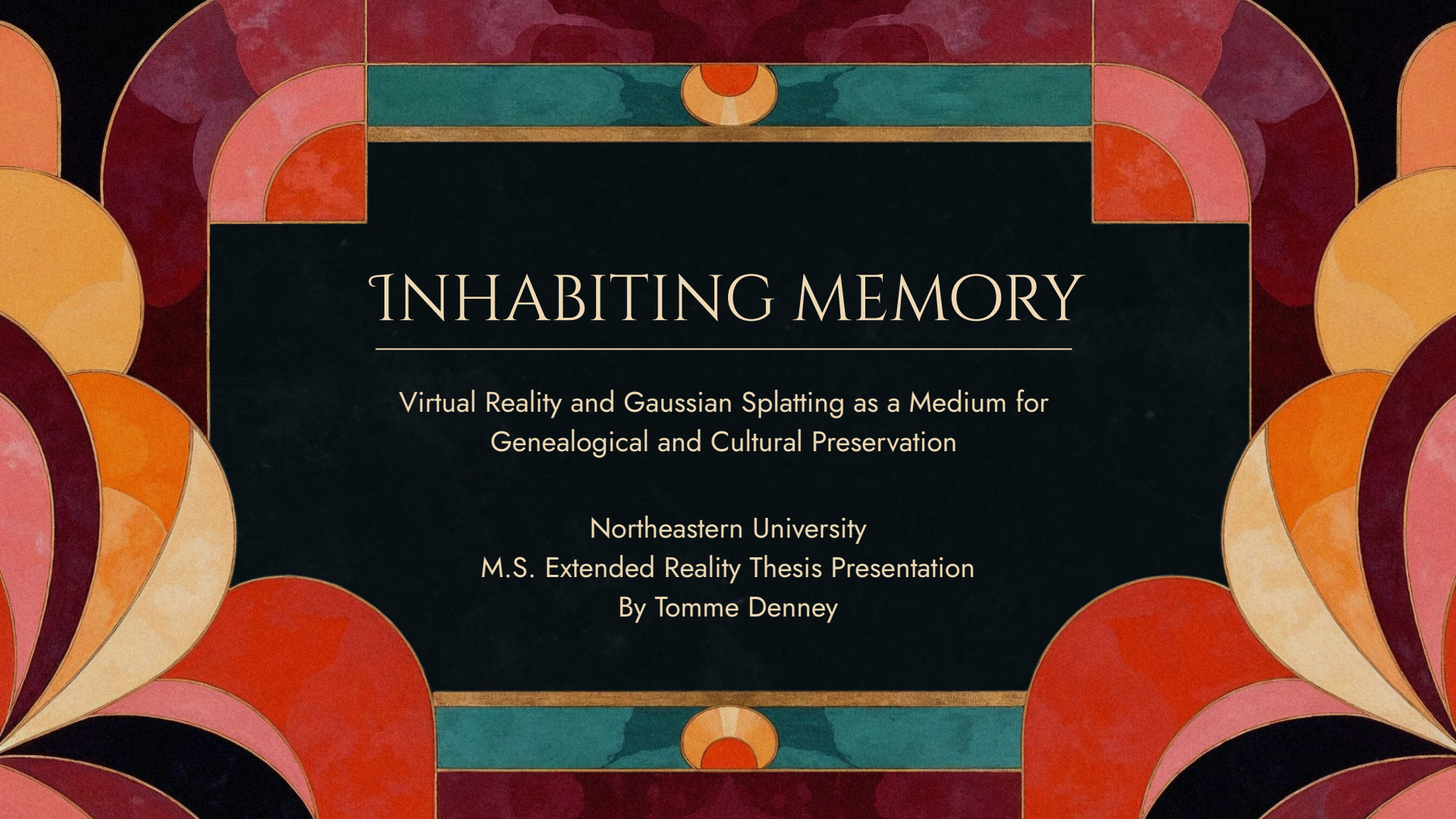




INHABITING MEMORY

Virtual Reality and Gaussian Splatting as a Medium for
Genealogical and Cultural Preservation

Northeastern University
M.S. Extended Reality Thesis Presentation
By Tomme Denney



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Memory deserves more than
a fixed perspective

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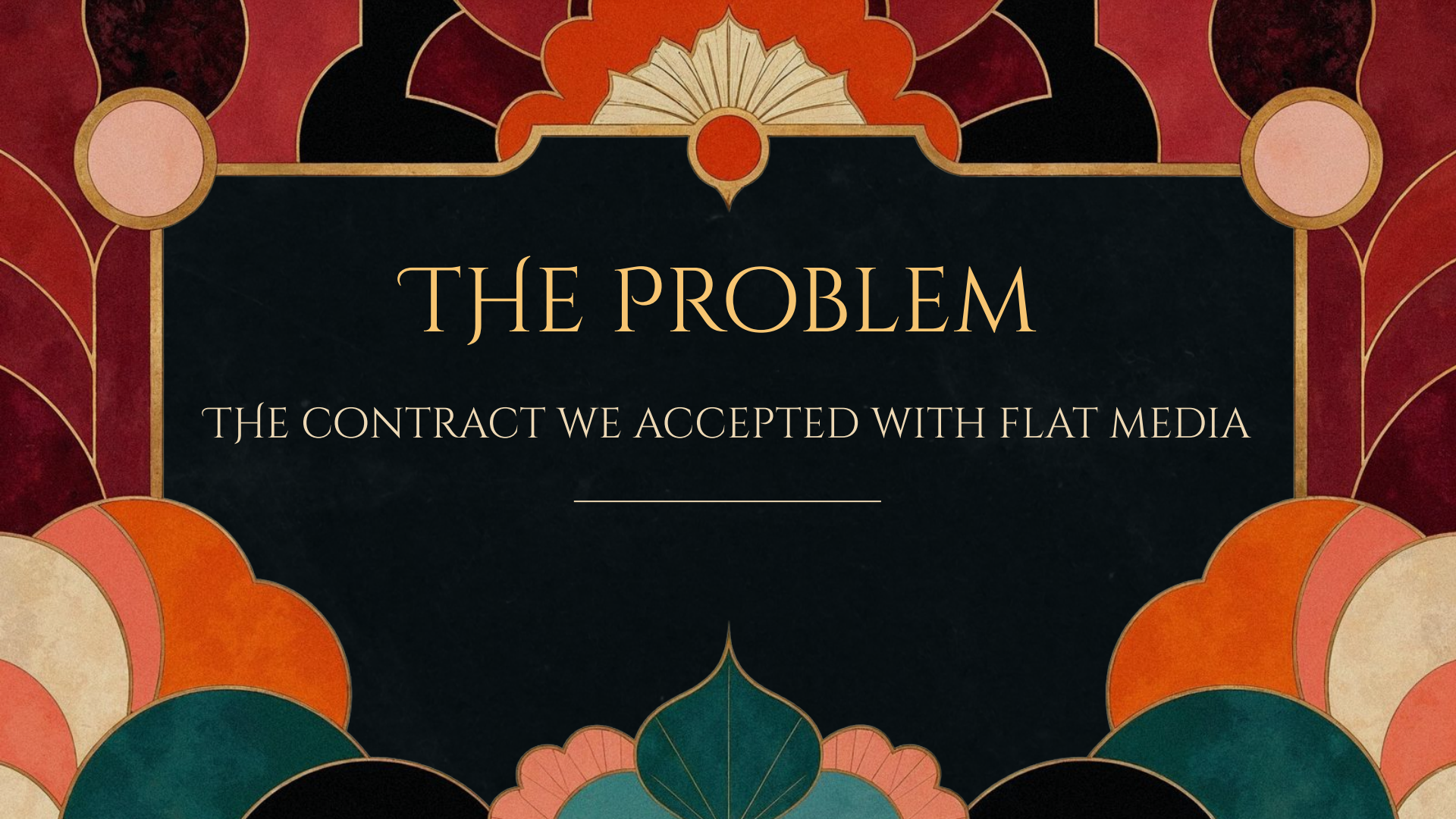
The Experience

A museum of family built
and represented in VR

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What this means for the
future of XR



THE PROBLEM

THE CONTRACT WE ACCEPTED WITH FLAT MEDIA



EVERY PHOTOGRAPH IS A NEGOTIATION WITH LOSS

We point a camera at a moment we love and accept that what returns will be a flattened echo. Two dimensions where there were three. Stillness where there was motion. Photography and video fix a single perspective and ask the viewer to accept it.

There is no agency, no movement through space, no sense of being inside the moment. But we don't remember the way a photograph looks. We remember the feeling of being somewhere, the texture of a space as we moved through it. Flat media was never built to carry the full weight of what memory feels like.



WHY NOW?

The generation holding living memory of the 20th century is aging. Oral histories, inhabited spaces, and embodied knowledge of who families were is at risk of collapsing into flat records. VR headsets are now in living rooms and classrooms. The tools to preserve more than flat records exist. What's been missing is a framework that takes the emotional capacity of immersive media seriously.

DISTANCE VS. PRESENCE

What Photography Does

Fixes a single perspective.
Removes agency and movement.
Flattens space and time into
something we observe from the
outside.

What Memory Requires

Embodiment. The sense of
being inside a moment, not
outside looking in. The texture of
a space as you moved through
it.



WHERE THIS SITS

Digital Heritage & Memory Studies

Preservation isn't just storage. The human need to feel reoriented within the past, not just recall it.

VR Presence Research

Spatial embodiment produces emotional and psychological responses flat media cannot replicate.

Genealogy as Cultural Practice

Family history is not data about ancestors. It's identity, belonging, and intergenerational connection.





THE THESIS

THE BRIDGE THAT CONNECTS PRESERVATION TO PRESENCE

OBSERVATION VS. INHABITATION

Observation

A photograph asks you to look at a moment. A video asks you to watch it. Both keep you on the outside. The viewer is always separate from the memory.

Inhabitation

A Gaussian splat reconstruction asks you to step inside. You move through the space. You are present within the memory. The medium disappears and the moment remains.





THE RESEARCH QUESTIONS

This project proposes the practice of using spatial and experiential media to preserve family history in forms that future generations can not just access but inhabit.

- How can immersive spatial media be designed not just to document human memory, but to make it inhabitable?
- What becomes possible for cultural and genealogical preservation when the medium of immersive technology is built around inhabitation rather than observation?



THE EXPERIENCE

A MUSEUM OF FAMILY, BUILT TO BE WALKED THROUGH

THE DESIGN ARGUMENT

Gaussian Splats (Documentary)

- Real captured environments
- Photorealistic 3D reconstructions that preserve space as it actually existed
- 3D gives back a place
- 4D gives back a place as it was unfolding

Personal Galleries (Artistic)

- Interpreted identity.
- Symbolic environments designed with each family member.
- The back wall is removed, the space opens into who that person is.

THE ROOMS

Jasmine

- Burgundy and gold
- Harry Potter inspired
- Insulin vial rain for Type 1 Diabetes daily life representation

Mom

- Gardening
- Painting
- Clear Sky

Troy

- Moon surface DJ setup
- Earth rising
- Speakers and turntables

Dad

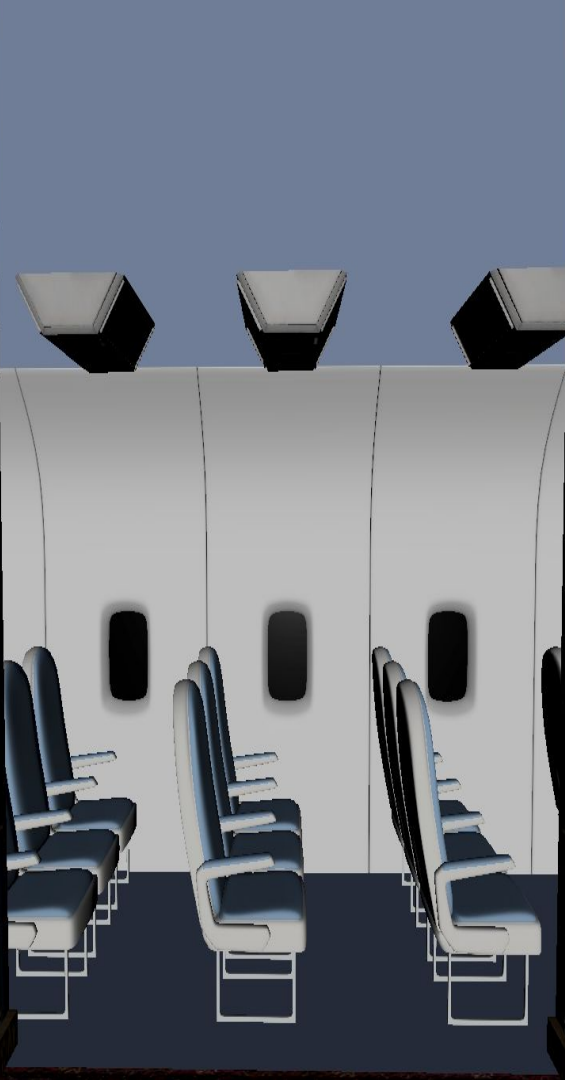
- Fishing boat
- Lake Environment

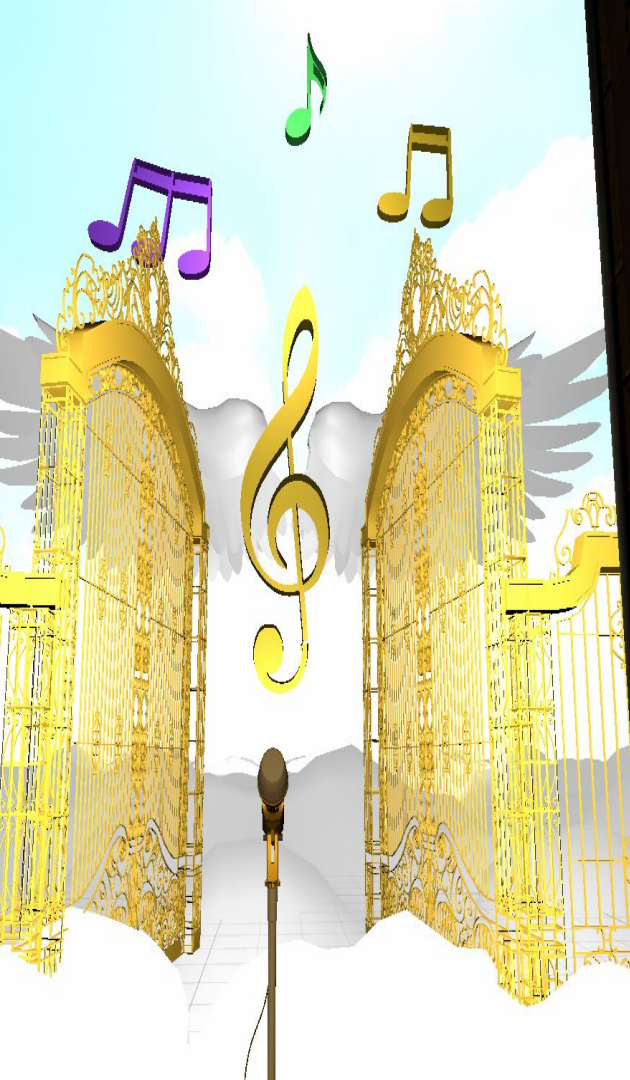
Ryan

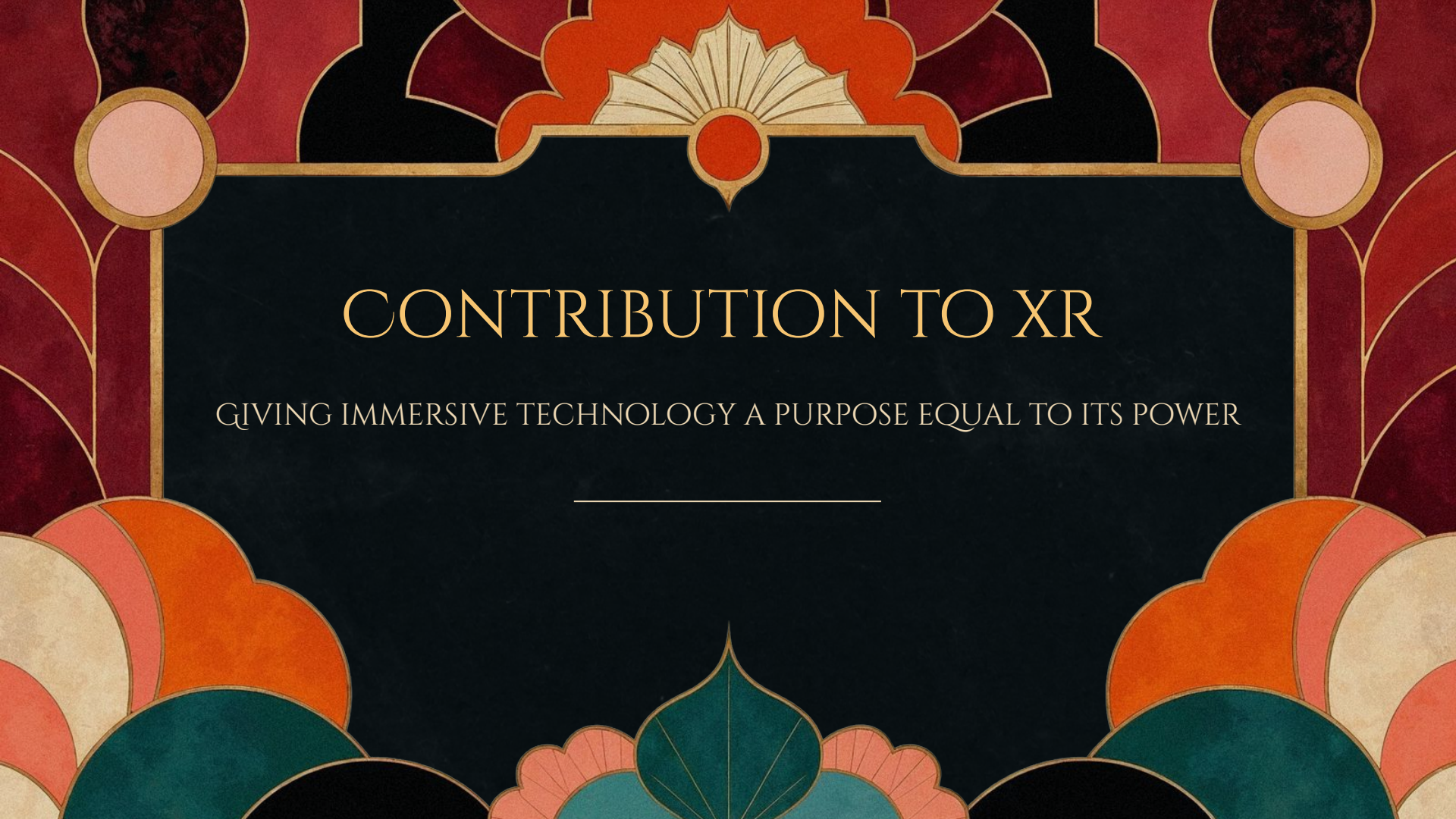
- Religious aesthetic
- Winged treble clef and music notes
- Microphone to Sing

Tomme

- Airplane for travel
- Window showing favorite travel locations







CONTRIBUTION TO XR

GIVING IMMERSIVE TECHNOLOGY A PURPOSE EQUAL TO ITS POWER

THREE CONTRIBUTIONS

Gaussian Splatting as Preservation Medium

Not a tech demo. A working tool. 3D gives back a place, 4D gives back a place as it was unfolding with movement and life.

Practical Framework for Immersive Genealogy

Working PCVR experience on Meta Quest 3 with hand tracking, spatial family tree, and real Gaussian splat reconstructions.

The Case That XR Is Being Underused

The technology has always had the power to create genuine emotional bonds. This project gives that power a purpose equal to it.





THE TENSION TO NAME HONESTLY

Gaussian splatting produces presence that photogrammetry struggles to match. But when it fails, it doesn't fail quietly. Artifacts, flickering, and unstable geometry break the emotional contract. A user who came to inhabit a memory and encounters a glitching space isn't disappointed by the technology. They're distanced from the memory itself. This project pushed that threshold through 4DGS temporal improvements, batch pipelines, and quality control.



THANK YOU

The question has never been whether the technology is ready. The question is whether we're willing to use it for something that matters this much.

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