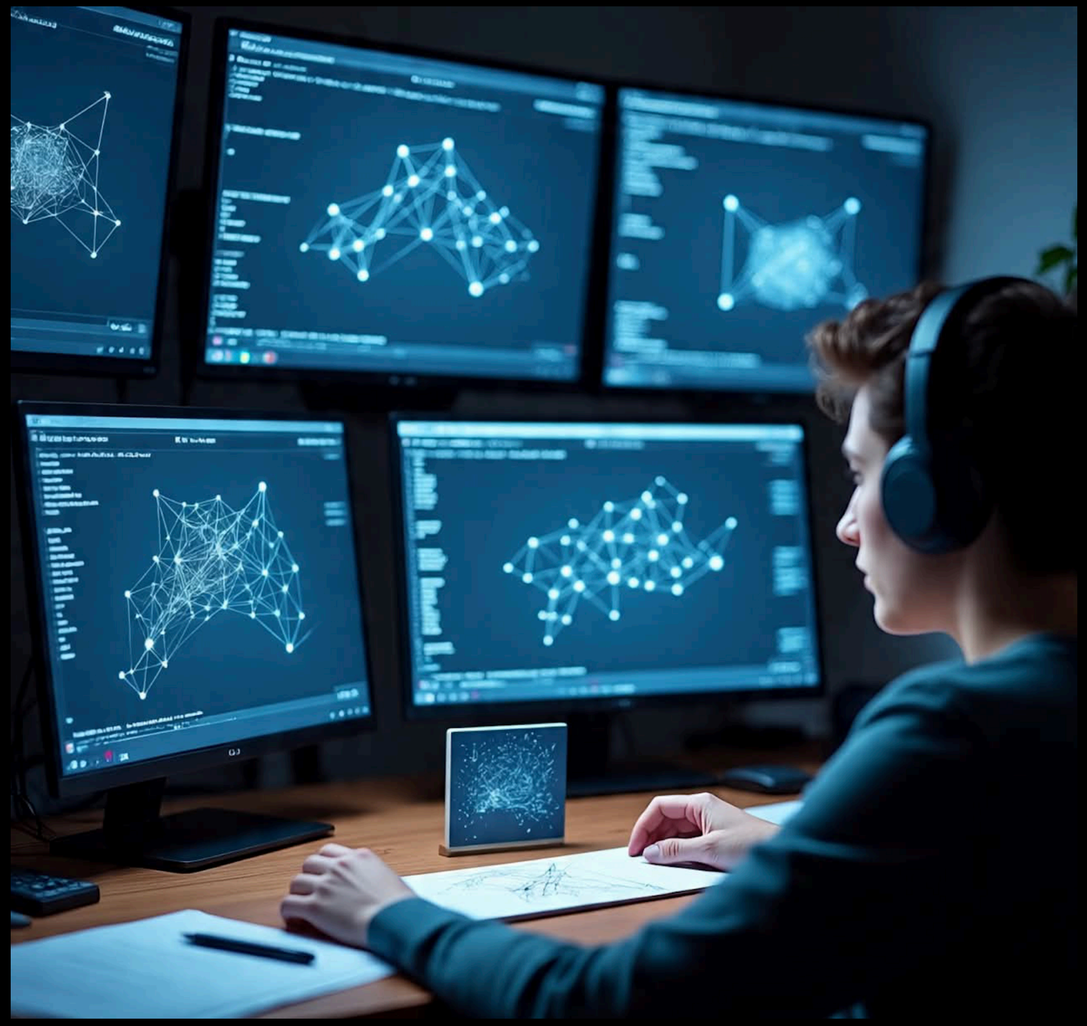
SiGraDi Workshops

Online - 2025

Quantum Collective Design: Assembled Learning and Quantum Clustering in Architecture



Jose Luis Reategui, Universidad Peruana de Ciencias Aplicadas, Lima, Peru

Quantum Collective Design: Assembled Learning and Quantum Clustering in Architecture

This 3-day workshop explores supervised, unsupervised, and assembled learning in architecture using Minduss and Grasshopper3D. Participants will train AI models, apply quantum clustering, and co-create responsive design projects through collective intelligence.

Quantum Collective Design: Assembled Learning and Quantum Clustering in Architecture

Day 1 – Supervised Learning,

Day 2 – Unsupervised Learning & Quantum Clustering

Day 3 – Assembled Learning & Project Presentations

Orchestrating Design Intelligence Through Conversational Protocols

Junling Zhuang, Columbia University, New York, USA
Shaw Chen, Harvard University/Reer, Inc., Boston, MA, USA
Connie (Yihan) Hui, Harvard University/Reer, Inc., Boston, MA, USA

Orchestrating Design Intelligence Through Conversational Protocols

This workshop introduces architects and designers to the Model Context Protocol (MCP) ecosystem—a revolutionary framework that enables Claude AI to orchestrate multiple design tools through natural language. Participants will explore how MCP servers create an interconnected design environment where RhinoMCP for 3D modeling, SQLite MCP for data management, and AI rendering tools work seamlessly together through conversational commands.

MCP represents a paradigm shift from isolated software to an integrated design intelligence system. Through SQLite MCP, designers can query and manage complex architectural databases—material specifications, structural dimensions, cost estimates, supplier catalogs, building codes, and environmental performance metrics—then instantly translate this data into parametric geometry via RhinoMCP. Imagine asking: "Create facade panels using materials under $50/sqm from our database with thermal resistance above R-20" and watching the design generate automatically.

By workshop's end, participants will understand how MCP transforms fragmented digital workflows into coherent design conversations, making advanced computational design accessible regardless of coding expertise.

Orchestrating Design Intelligence Through Conversational Protocols

Day 1 - November 1: Foundation & Form Exploration: "From Setup to Complex Geometry"

Morning Session (9:00-11:00):

1.Welcome and MCP ecosystem overview
2.Complete setup of Claude AI + RhinoMCP environment
3.First connection and troubleshooting
4. Basic natural language commands

Afternoon Session (11:30-14:30):

1.Exploring complex form generation through conversation
2.Advanced geometry manipulation and transformations
3.Testing compatibility with existing Rhino workflows
4.Complex geometric patterns and parametric variations
5. Challenge: Generate forms impossible to model manually
6. Quick introduction to SQLite MCP setup for Day 2

Day 2 - November 2: Data-Driven Design & MCP Ecosystem: "From Database to Geometry to Custom Tools"

Morning Session (9:00-11:00):

1.SQLite-Rhino Integration:
2.Building architectural databases (materials, dimensions, costs)
3.Connecting database queries to geometry generation
4.Real-world scenarios: inventory-driven facades, code-compliant layouts
5. Real-time cost and carbon tracking dashboard

Afternoon Session (11:30-14:30):
1.Build Your Own MCP Ecosystem:
2.Introduction to MCP tool library (Weather, Image, Web Scraper, Excel MCPs)
3.Selecting and configuring tools for your workflow
4.Creating personalized MCP tool chains
5.Testing custom configurations
6. Begin individual projects with chosen MCP stack

Day 3 - November 3: Project Development & Presentations": Implementing Your Design Intelligence"

Morning Session (9:00-11:30):
1.Intensive project development with chosen MCP tools
2.Advanced troubleshooting and optimization
3.One-on-one consultations
4. Peer debugging sessions
5. Documentation of workflows

Afternoon Session (12:00-14:30):
1.Final project presentations (8-10 minutes each)
2.Live demonstrations of custom MCP workflows
3.Peer feedback and discussion
4. Sharing MCP configurations and discoveries
5. Future directions and community building
6. Resources for continued exploration

Adaptive Pavilion with Meta-Responsive Scissor-Like Elements

Ladan Vojdanzade, Independent Researcher & Workshop Instructor, Tabriz, Iran

Adaptive Pavilion with Meta-Responsive Scissor-Like Elements

This online workshop explores the intersection of geometry, adaptability, and motion through the design of meta-responsive pavilions based on scissor-like mechanisms (SLMs). Participants will investigate how simple geometric principles can be transformed into dynamic and adaptive structures capable of responding to environmental stimuli.

Over five online sessions, the workshop combines theoretical grounding, algorithmic modeling, and project-based learning. Participants will begin by understanding the logic, geometry, and typologies of scissor-like mechanisms — translational, polar, and angular — and then extend them into 3D configurations. Using Rhino and Grasshopper, they will simulate scissor systems that respond to environmental parameters such as sunlight, wind, and temperature through the Ladybug plugin.

The pedagogical approach emphasizes experimentation, iteration, and reflection. By developing visual logic maps, participants will translate geometric principles into algorithmic workflows and test the adaptive behavior of their designs. The workshop culminates in the creation of a parametric pavilion prototype that embodies meta-responsiveness, demonstrating how computation, motion, and environmental performance can converge within architectural design. This hands-on and research-driven format aims to build cross-disciplinary understanding of responsive design, bridging mechanical intelligence, digital fabrication logic, and environmental awareness within the broader SIGraDi 2025 theme.

Adaptive Pavilion with Meta-Responsive Scissor-Like Elements

Day 1 – Introduction to Scissor Mechanisms and Meta-Responsive Logic: Exploring geometric typologies and algorithmic modeling foundations.

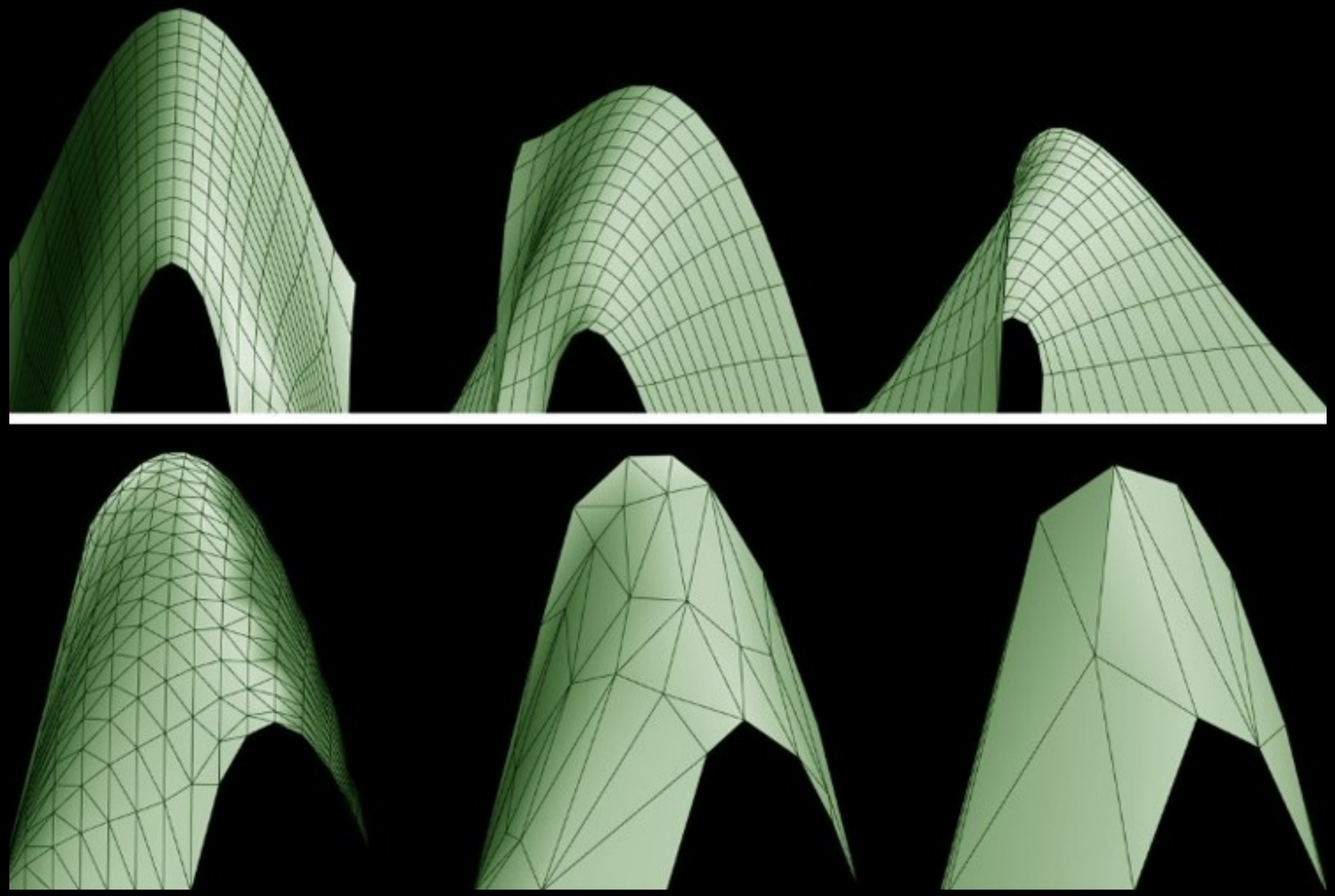
Day 2 – Advanced Algorithmic Modeling and Environmental Control with Ladybug

Day 3 – Participants' Proposals and Discussion

Day 4 – Design Development and Critique

Day 5 – Final Presentations and Reflection

LIVARC 5DW: Form-finding for Living Architecture with Grasshopper and Kangaroo



Mauro Costa Couceiro, ISTAR, ISCTE - University Institute of Lisbon, Portugal

LIVARC 5DW: Form-finding for Living Architecture with Grasshopper and Kangaroo

This workshop translates the advanced computational strategies of the "Living Architecture" (LIVARC) research project into a hands-on digital and analog learning experience. We will explore how to design resilient, nature-inspired structures by simulating their physical behavior. The central goal is to empower participants with a powerful workflow for generative design, using Grasshopper and the physics solver Kangaroo to create optimized, compression-only shells suitable for bio-integrated habitats.

Participants will learn to set up a physics simulation from scratch, defining forces, anchors, and material constraints to guide the form-finding process. This "Meta-Responsive" approach allows us to generate complex and efficient architectural forms that are computationally validated before they are built.

The second part of the workshop bridges the digital-physical divide. We will cover techniques to rationalize and "unroll" the complex 3D surfaces generated in Kangaroo into 2D patterns. These patterns can be printed on simple cardstock and hand-assembled, creating tangible, physical prototypes that accurately represent their digital counterparts. This process simulates the logic of advanced robotic fabrication through accessible, DIY methods.
The workshop will be conducted in English, with native support in Portuguese and Spanish, fostering an inclusive and dynamic environment for exploring the future of generative and sustainable design.

LIVARC 5DW: Form-finding for Living Architecture with Grasshopper and Kangaroo

November 1 (Day 1): Foundations of Generative Design.

Morning: Introduction to the LIVARC project's concepts: biomimicry, vernacular architecture, and symbiotic habitats.

Afternoon: Introduction to the Grasshopper interface. Essential concepts: data structures, list management, and parametric thinking.

November 2 (Day 2): Introduction to Kangaroo Physics.

Morning: Core principles of physics-based simulation. Setting up a Kangaroo engine with goals: anchors, loads, and length constraints.

Afternoon: Hands-on exercises in form-finding for simple tension and compression systems.

November 3 (Day 3): Advanced Form-finding for Shell Structures.

Morning: Techniques for creating mesh geometry for structural simulation.

Afternoon: Applying Kangaroo to generate and optimize compression-only vaults and shells, simulating the behavior of the proposed living envelopes.

November 4 (Day 4): From Digital to Physical.

Morning: Methods for rationalizing and "unrolling" complex 3D mesh surfaces into 2D printable templates using Grasshopper.

Afternoon: Finalizing digital models and preparing the 2D patterns for printing and assembly.

November 5 (Day 5): Analog Prototyping & Final Presentations.

Dedicated time for participants to cut, fold, and assemble their physical prototypes.

Final session for presenting the prototypes and discussing the workflow and results.

Imagination in the Loop: Meta-Responsive Workflows between Grasshopper and Stable Diffusion

Victor Sardenberg, Universidade Presbiteriana Mackenzie, São Paulo, Brasil
Camila Zyngier, Universidade Federal de Minas Gerais, Minas Gerais, Brasil
Marcella Carone, M3C1, Mackenzie University, São Paulo, Brasil
Gustavo Sousa, Tutor Assistant, Brasil

Imagination in the Loop: Meta-Responsive Workflows between Grasshopper and Stable Diffusion

This technical workshop explores how Stable Diffusion can be directly integrated into Grasshopper, enabling a fluid exchange between parametric design and generative visual imagination. Participants will construct a workflow where parameters, geometry, and views from Grasshopper are translated into inputs for Stable Diffusion, and where the resulting images feed back into the parametric model—establishing a continuous human–machine co-imagination loop.

The session frames meta-responsiveness not only as real-time reaction to data but as a deeper reciprocity between computational systems and creative reasoning. Through guided exercises, designers will learn to:
- Link parametric variables to semantic prompts;
- Trigger Stable Diffusion generations from within Grasshopper using Python or Hops components;
- Visualize AI outputs inside the Rhino environment; and
- Use these images as catalysts for further geometric transformation or aesthetic speculation.

Rather than positioning AI as an external image generator, the workshop treats it as a co-designer—a partner that expands perception, provokes interpretation, and reflects human intent through difference. Participants will discuss how prompt logic, randomness, and aesthetic bias can become productive elements in a meta-responsive workflow that merges analysis, intuition, and speculation.

By the end, each participant will have a functioning Grasshopper ↔ Stable Diffusion prototype, a library of parameter-prompt pairings, and a reflective framework for practicing human–machine co-imagination. The workshop aims to advance SIGraDi's theme of Meta-Responsive Approaches by demonstrating how parametric design and generative AI can co-evolve—transforming computational tools into dialogical spaces where imagination becomes hybrid and feedback becomes creative.

Requirements: Basic Grasshopper knowledge.

Imagination in the Loop: Meta-Responsive Workflows between Grasshopper and Stable Diffusion

November 5 (14:00 to 17:00 Brasília): Intro to Stable Diffusion - Grasshopper Integration

November 6 (14:00 to 17:00 Brasília): Experimentation and discussion

Sistemas Sensibles: exploraciones en diseño paramétrico y adaptación contextual

Raquel Landenberg, Facultad de Arquitectura Universidad Nacional de Córdoba, Argentina
Javier Castillo, Instructor autorizado de Rhinoceros, Fundador de Parametric Mind y SolvexLabs, Madrid, España

Sistemas Sensibles: exploraciones en diseño paramétrico y adaptación contextual

El workshop propone explorar Grasshopper como una herramienta para la creación de sistemas responsivos, capaces de articular datos contextuales y geometrías repetitivas en configuraciones adaptativas. El ejercicio central se enfoca en la construcción de patrones dinámicos, entendidos no como dibujos fijos, sino como redes de relaciones entre inputs paramétricos (distancia a atractores, radiación solar, valores numéricos) y outputs geométricos (escala, rotación, densidad).

A través de procesos de discretización, mapeo de datos y control de geometría, los participantes comprenden cómo un mismo sistema puede responder de forma diferenciada según las condiciones locales, integrando así variables ambientales y de desempeño. El carácter iterativo del diseño paramétrico permite generar variaciones múltiples en poco tiempo, favoreciendo la experimentación y el pensamiento crítico sobre el rol del patrón como estrategia de desempeño ambiental, expresividad y confort.

La propuesta se inscribe en el campo del Diseño Responsivo en arquitectura, invitando a reflexionar sobre cómo las disciplinas creativas pueden anticipar y adaptarse a los desafíos contemporáneos mediante tecnologías emergentes y nuevas lógicas digitales.

El workshop se estructura en 2 jornadas:

- *Día 1 (3/11): desarrollo geométrico del sistema paramétrico. (2.5hs)*
- *Día 2 (4/11): incorporación de agentes ambientales con Ladybug y optimización con Galapagos. (2.5hs) y ejercicio práctico*

De este modo, se plantea un espacio experimental donde el diseño digital se proyecta como práctica crítica, sensible y proactiva frente a los retos del contexto actual.

Sistemas Sensibles: exploraciones en diseño paramétrico y adaptación contextual

Día 1 (Noviembre 3): desarrollo geométrico del sistema paramétrico. (2.5hs)

Día 2 (Noviembre 4): incorporación de agentes ambientales con Ladybug y optimización con Galapagos. (2.5hs) y ejercicio práctico

Building Game V2: Spatial Intelligence from Contextually Aware XR to Generative Concepts

Mohamed Khaled Ashmawy, University of Applied Sciences and Arts OWL, Detmold, Germany

Building Game V2: Spatial Intelligence from Contextually Aware XR to Generative Concepts

This hands-on workshop equips architects and designers to build spatially aware XR applications that harness 3D generative AI to open a new perspective in prototyping and design iteration. Using Unity and the Meta XR All-in-One SDK, participants will create an XR scene that understands its 3D context—surfaces, volumes, and anchors—and leverages that information to drive AI-assisted design moves. We will integrate 3D genAI models to generate and iterate on massing options, enabling rapid what-if exploration and constraint-aware adjustments.

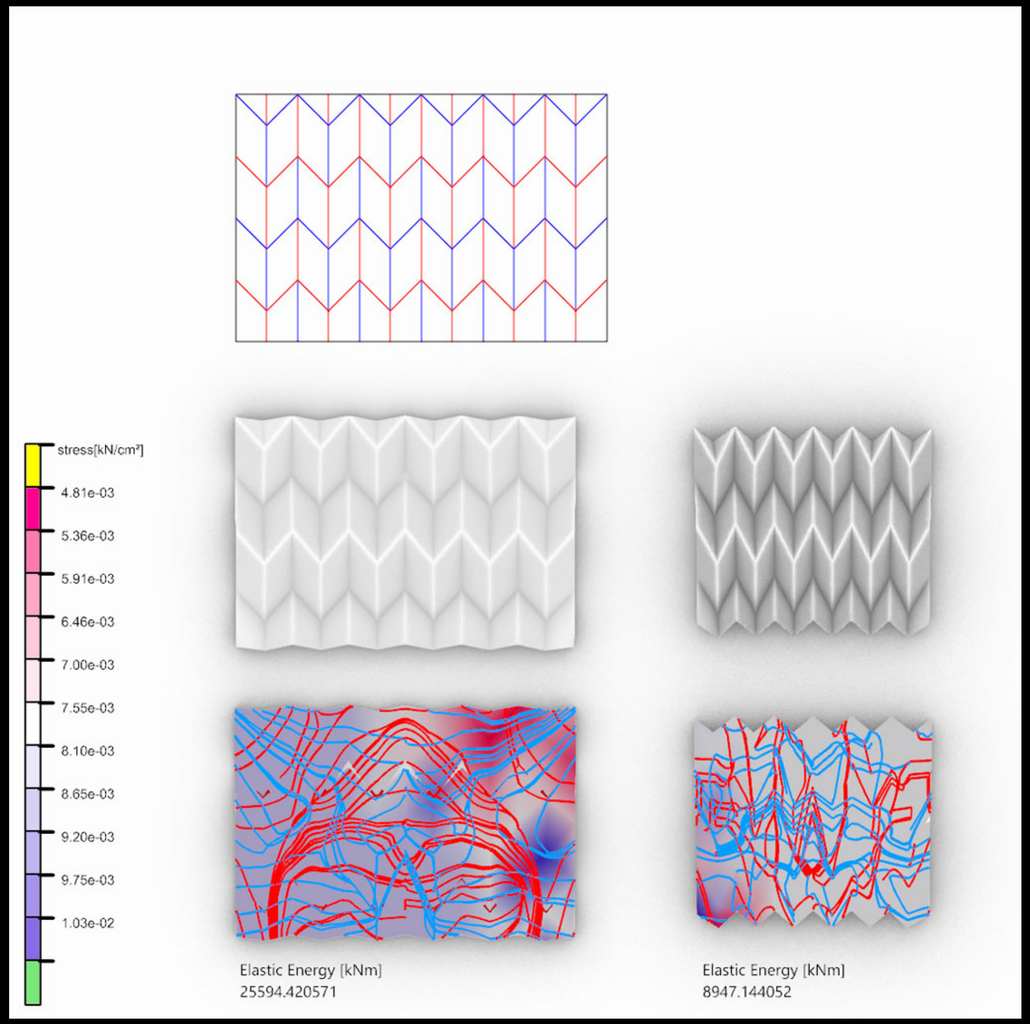
Attendees will implement workflows where the XR app captures contextual cues from the live scene (e.g., room scale, spatial layout, occlusion, hand/controller input) and feeds them to AI services to propose geometry edits, alternative assemblies, and visual refinements. The session covers best practices for real-time performance on Quest devices, managing AI round-trips with low latency, and structuring prompts and metadata for robust, reproducible results. By the end, participants will have a working Unity project that combines Meta XR's spatial understanding with 3D generative AI to speed early-stage ideation and iteration while maintaining designer control and traceability. No prior XR experience is required; basic familiarity with Unity or C# programming is helpful.

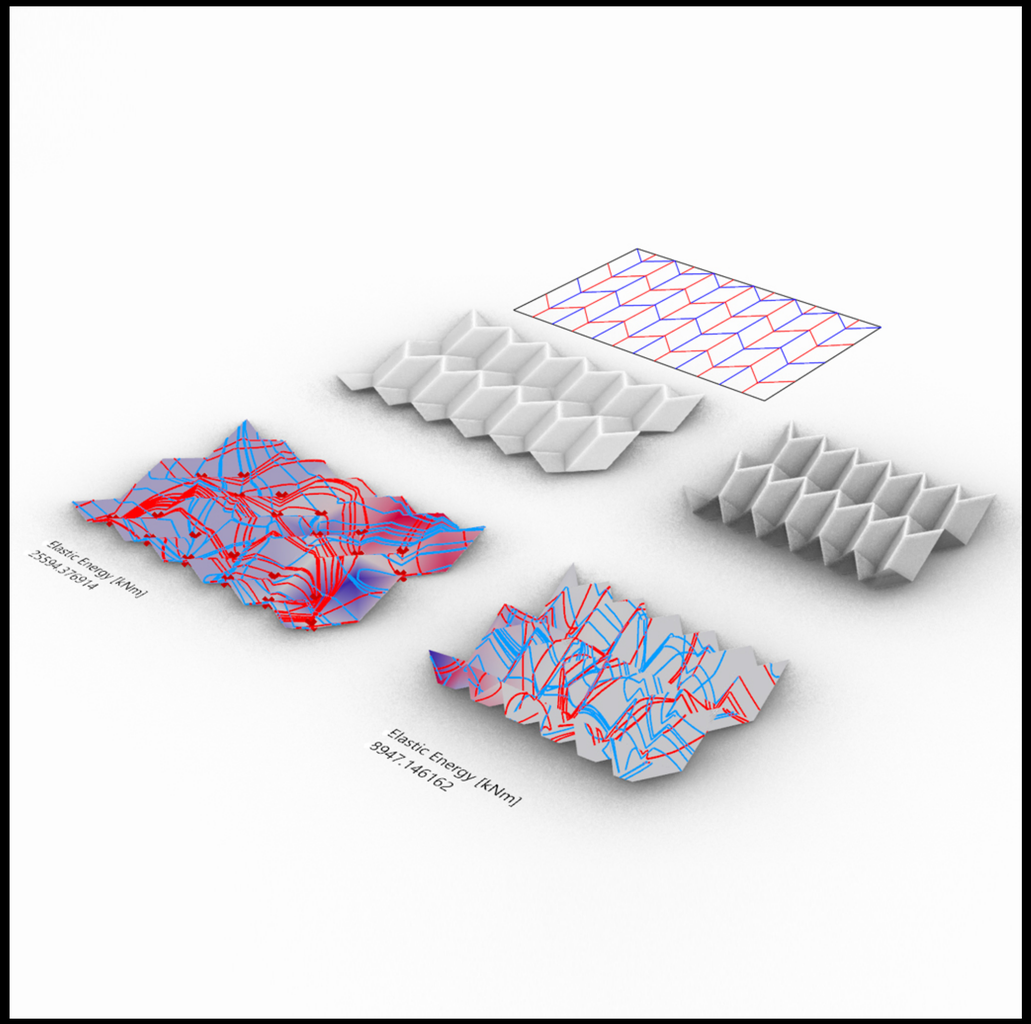
Building Game V2: Spatial Intelligence from Contextually Aware XR to Generative Concepts

November 1: Introduction to Unity3D, Meta All in One SDK (day 1)

November 2: Coding and implementing AI based workflows in XR (day 2)

Modular Origami: From Design to Structural Analysis





Marina Borges, Faculdade de Arquitetura da Universidade do Porto, Portugal
Marina Brant, Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, Brasil
Vitor Borges, Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, Brasil

Modular Origami: From Design to Structural Analysis

This workshop proposes to explore origami as a tool for the development of parametric modular structures, integrating digital simulation, fabrication, and structural analysis. Based on three classical folding patterns (Miura-Ori, Yoshimura, and Waterbomb) participants will investigate how different types of folds influence the structural behavior of systems, understanding the fold as a rigid element, reinforcement, and connection.

Using Rhinoceros 7 and Grasshopper, along with the Crane and Karamba 3D plugins, the workshop combines folding simulation, digital fabrication, and structural analyses of principal stresses, stiffness, displacements, and global stability, enabling participants to evaluate the mechanical performance and material efficiency of generated forms. These analyses allow for a deeper understanding of how geometry governs force transmission and deformation, highlighting how different origami topologies can achieve structural stability and thus reveal their potential for material reduction and lower emissions associated with production.

The proposal adopts a meta-responsive approach, in which geometric and structural rules guide performance and material based design processes, fostering experimentation and reflection on the potential of parametric design in conceiving lightweight, efficient, and transformable structures.

Modular Origami: From Design to Structural Analysis

Time: 7:00 – 8:30 PM (Brasília Time, GMT-3)

November 1: Introduction to Folding Patterns
November 2: Folding Simulation
November 3: Digital Fabrication
November 4: Structural Analysis
November 5: Final Presentations

Artificially Generated Living Seawalls

Alberto Fernandez Gonzalez, Lecturer UCL The Bartlett/ UCH FAU, London - Santiago, UK - Chile
Smaro Katsangelou, FAU PhD candidate CA-AI Lab, Florida, USA

Artificially Generated Living Seawalls

In response to the escalating vulnerability of coastal cities to sea level rise—where vast portions of the built environment lie within flood-prone areas and much of the coastline is privately owned—this workshop explores how computational and bio-informed design can reimagine the seawall as a living, adaptive infrastructure.

At the core of this investigation is the integration of Cellular Automata (CA) and AI-driven generative design within a phygical design workflow, where digital simulation and physical prototyping operate as a single, iterative system. CA offers a rule-based framework for modeling emergent ecological behaviors, where simple local interactions produce complex, self-organizing patterns—mirroring the decentralized logic of marine ecosystems such as coral reefs, mangroves, or mussel colonies.

By coupling CA simulations with machine learning models (including LoRA and diffusion systems), participants will generate a broad spectrum of adaptive geometries informed by site-specific environmental data. These models will serve as engines for exploring form, material behavior, and biological performance across scales.

The workshop engages participants in an oscillating process between algorithmic simulation (using Grasshopper and ComfyUI) and hands-on prototyping with 3D-printable models. This bidirectional flow between digital experimentation and physical validation fosters the development of seawall elements that are not only structurally responsive and fabricable but also biologically performative—supporting marine life through calibrated porosity, texture, and spatial complexity.

Ultimately, this workshop proposes a shift from static, monolithic coastal defenses to dynamic, organism-informed infrastructures. By blending CA logic, AI generativity, and phygical fabrication, we aim to cultivate new coastal morphologies—responsive, resilient, and regenerative systems that grow with the environment rather than resist it.

Artificially Generated Living Seawalls

Time: 10:00 – 13:00 PM (GMT-3)

November 6: Introduction to modelling tools rhino grasshopper (day 1)

November 7: AI work with ComfyUI(day 2)

November 8: Participant's Proposals (day 3)

Application Link: https://forms.gle/mJH6QM2iFmcBGWGLA

Payment Link $33 USD (SiGraDi 1 year Membership):

https://links.plexo.com.uy/sigradi/2/33/4e2096d0-2569-425d-8314-ac73146a9258

sigradioficial@gmail.com

SiGraDi Workshops

Online - 2025