



Harvard University  
Graduate School of Design

# Laboratory for Design Technologies

*Improving the Human Condition*



2023-2024 Academic Year

## **Harvard University's Graduate School of Design**

The Harvard University Graduate School of Design (GSD) has a rich legacy of design leadership and innovation, pushing the frontiers of knowledge and research across all design disciplines for more than 80 years. As a leading global design school, the GSD offers programs in architecture, landscape architecture, urban planning and design, design studies, and design engineering. And as a global leader in each of these fields, the GSD is redefining design as a critical response to increasingly complex issues faced by people, cities, and ecologies, across the United States and around the world.

The GSD's method of design education involves transdisciplinary collaboration across all of the School's departments and programs, as well as with other schools and units at Harvard. It is through this cross-practice that the GSD fosters a deep connection between design and other academic fields, which is reflected in the joint degree programs with the Harvard John A. Paulson School of Engineering and Applied Sciences, the Harvard T.H. Chan School of Public Health, the John F. Kennedy School of Government, and the Harvard Law School.

The GSD educates leaders in design, research, and scholarship who will directly impact and improve the built environment to create a resilient, just, and beautiful world, now and in the future.

## **Laboratory for Design Technologies**

Technology is accelerating profound changes throughout society, affecting how we live, work, produce, build, and think. The ubiquity of data and computational power impacts all systems—from mobility and health to government and construction. The Laboratory for Design Technologies (LDT) at the Harvard Graduate School of Design is a collaborative platform that investigates the challenges and opportunities at the intersection of design technology and the built environment. It advances design as a catalyst of change and leverages innovative research methods to understand the architecture of complex issues.

### **LDT Research Tracks**

The Laboratory for Design Technologies has established a collaborative platform to pursue work by faculty in multiple research units.

#### **Material Processes and Systems Group Martin Bechthold DDes '01**

The Material Processes and Systems Group (MaP+S) is a research lab that takes materials as a starting point for a broad set of research investigations that involve computation, robotics, and material science. MaP+S advances the aesthetic and functional agenda of materials in the built environment. The group, which evolved from the previously established Design Robotics Group, looks at materiality as a starting point for design research, with a special interest in robotic and computer numerically controlled (CNC) fabrication processes, as well as small-scale work on nano materials.

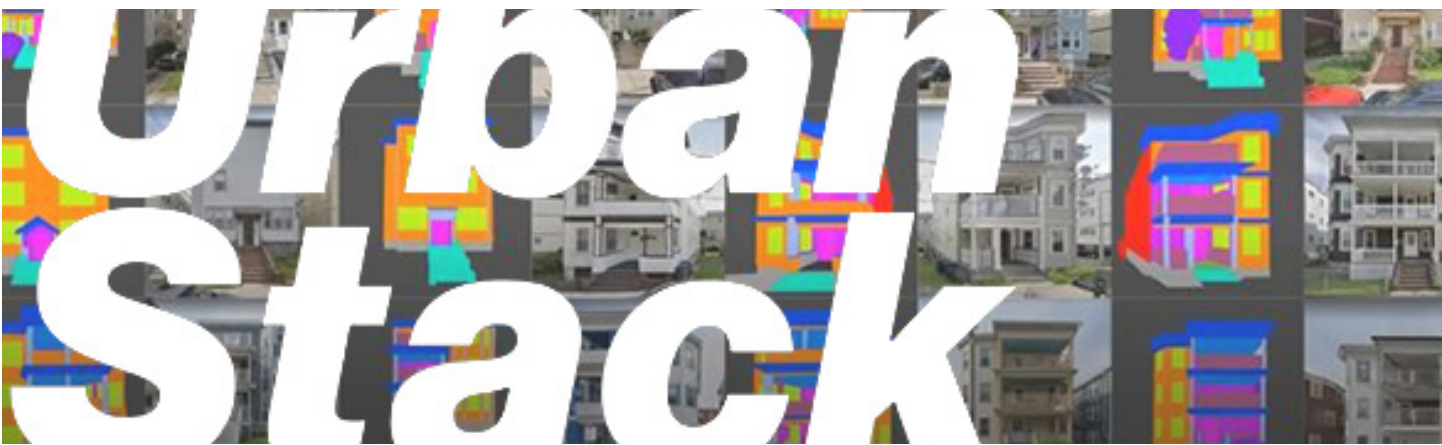
#### **Geometry Lab Andrew Witt MArch '07, MDes '02**

The Geometry Lab researches the intersection of design and the science of shape and form, aided by computational tools and design intuition. This Lab combines computational, formal, architectural, and historical research in a heterogeneous yet synthetic agenda. The objectives of the Lab are to produce and disseminate new knowledge, to generate broad, scalable solutions to big problems, and explore the associated cultural and human implications.



# Computational Geometry Lab

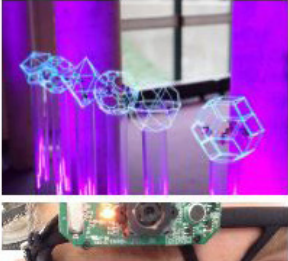
Andrew Witt // Associate Professor in Practice, GSD  
Hyojin Kwon // Lecturer, GSD



RESPONSIVE ENVIRONMENTS & ARTIFACTS LAB  
HARVARD UNIVERSITY GSD



All Works ARTIFACTS BUILDINGS CITIES LANDSCAPES



## **The Responsive Environments and Artifacts Lab (REAL Lab)** **Allen Sayegh MDes '96**

The Responsive Environments and Artifacts Lab (REAL) is a research lab that pursues the design of digital, virtual, and physical worlds as an indivisible whole. It recognizes the all-pervasive nature of digital information and interaction at scales ranging from our bodies to the larger urban contexts we occupy and the infrastructures that support them. REAL takes an interdisciplinary look at the design of the built environment from the lens of technologically augmented experiences, with a strong focus on the sustainability and longevity of technology. Putting the human being at the center and forefront, from the micro (bodily sensors, smart product design, augmented interfaces) to the macro (interactive buildings, information infrastructures, communication frameworks), researchers at REAL examine the emerging ways in which technology fuses into the ways we live, work, and play.

## **Urban Stack** **Elizabeth Christoforetti MArch '09** **Carole Voulgaris**

The Urban Stack Lab (USL) explores the impact and opportunities presented by the emergence of scalable systems in the built environment and is building and testing productive overlaps between the digital, social, and design processes that shape urban form and civic futures in 21st century urban places. Faculty are developing technologies that embrace the complexity of social infrastructures and market dynamics to produce new modes of design practice. The persistent and growing challenge of housing supply and quality is a primary focus of current USL research.

## **A High Visibility Partnership**

The GSD invites leading companies to engage in LDT by becoming members of the Industry Advisors Group, a unique philanthropic network where experts from industry and the public sector join with faculty and researchers from the GSD and the greater Harvard community to shape the future of the built environment through innovative design research.

The real-world perspective of the Industry Advisors helps to bridge the gap between discovery and the advancement of ideas and transforms inspiration to activation. Operating from a platform of shared knowledge, industry leaders work with a committed group of internal and external stakeholders to accelerate the development of new products, processes, and systems.

The Industry Advisors Group members help to guide forward-looking projects in areas such as artificial intelligence and machine learning, adaptive material systems, multidimensional computational simulations and spatial analysis, and multimedia design interfaces. It is a vigorous forum for thought leaders in fields including construction, fabrication, material production, design and engineering, real estate, technology, government, and international development. Alongside faculty, members focus on broad-based, strategic research questions—at a fraction of the cost that such high-risk, high-reward investigations would require if conducted at in-house corporate R&D facilities. Participation represents a low-risk investment that could yield visionary results.

**2023-2024 ACADEMIC YEAR  
HARVARD GRADUATE SCHOOL OF DESIGN  
LABORATORY FOR DESIGN TECHNOLOGIES | INDUSTRY ADVISORS GROUP**

**INDUSTRY MEMBERSHIP**

- General Annual Membership for Industry Advisors Group: \$100,000

**INDUSTRY ENGAGEMENT**

- Annual meeting for all Industry Advisors Group members, guests, faculty, and students
- Annual research topic workshop for Industry Advisors Group members and faculty
- Active engagement with faculty, researchers and students
- Opportunities for informal interaction on research projects
- Participate in the discourse of the future of design research
- Access to faculty and students
- Research debriefs throughout the year

**RESEARCH TOPICS**

1. Human-Robotic Interaction
  - Manufacturing and Construction: Collaborative robots are increasingly placed in manufacturing and other settings that benefit from close interaction of machines with people. Safety and productivity have traditionally been the focus of these designs. We propose to develop new prototypical interaction models that integrate spatial and human factors based on psychophysiological data with the goal of human wellness.
  - Home & Office Robotics: This project adapts and hacks off-the-shelf robotics in combination with bespoke hardware, software, and sensors to develop new home and office robots at the furniture and architecture scales. One specific focus may be furniture for the elderly or mobility-impaired, where furniture robots could allow better options for aging in place.
2. Future of Practice and Innovation with emerging technology
  - Quantify the various effects that material choices have on building occupants
  - The development of low to zero carbon materials for buildings and products
  - Future of human creativity in the context of AI and Robotics.
  - Quantifying perceptual design decisions of different scales and contexts, particularly in the areas of future of mobility, future of retail and future of work
  - AI classification of materials in 3D scanned building
  - Innovation diffusion in the public sector
  - Applying machine learning to housing and zoning

## **Laboratory for Design Technologies Faculty**

### **JOANNA AIZENBERG**

Amy Smith Berylson Professor of Material Sciences at Harvard John A. Paulson School of Engineering and Applied Sciences  
Professor of Chemistry and Chemical Biology in the Department of Chemistry and Chemical Biology

### **MARTIN BECHTHOLD DDes '01**

Kumagai Professor of Architectural Technology  
Interim Director, Doctor of Design Program  
Associate Faculty, John A. Paulson School of Engineering and Applied Sciences  
Director, Material Processes and Systems (MaP+S) Group

### **ELIZABETH CHRISTOFORETTI MArch '09**

Assistant Professor in Practice of Architecture

### **JOSE LUIS GARCÍA DEL CASTILLO Y LÓPEZ MDes '13, DDes '19**

Lecturer in Architecture

### **JONATHAN GRINHAM DDes '18**

Assistant Professor of Architecture

### **ALLEN SAYEGH MDes '96**

Design Critic and Senior Interaction Technologies Fellow  
MDes MEDIUMS Domain Head  
Director, Responsive Environments & Artifacts Lab (REAL)

### **CAROLE VOULGARIS**

Assistant Professor of Urban Planning

### **ANDREW WITT MArch '07, MDes '02**

Associate Professor in Practice of Architecture  
Director, Geometry Lab  
Co-Director of the Master of Design Engineering program

### **HYOJIN KWON**

Design Critic in Architecture

**The Graduate School of Design  
educates leaders in design,  
research, and scholarship  
to make a resilient, just,  
and beautiful world.**



Harvard University  
Graduate School of Design

For more information, please contact:  
Courtney Ward  
Managing Director of Development  
Harvard University Graduate School of Design  
[cward@gsd.harvard.edu](mailto:cward@gsd.harvard.edu) | (978) 505-5426