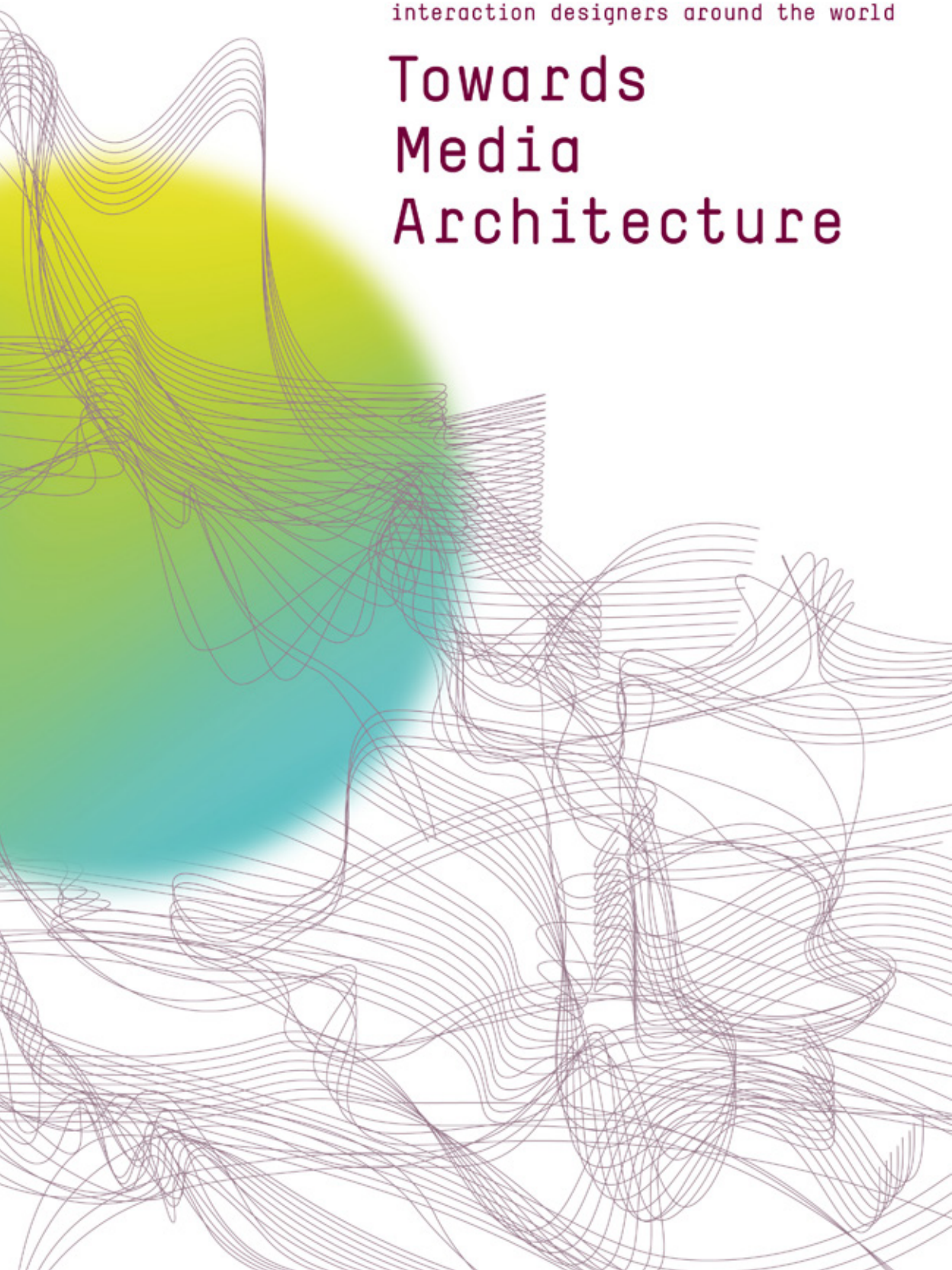
Educating the next generation of urban interaction designers around the world

Towards Media Architecture



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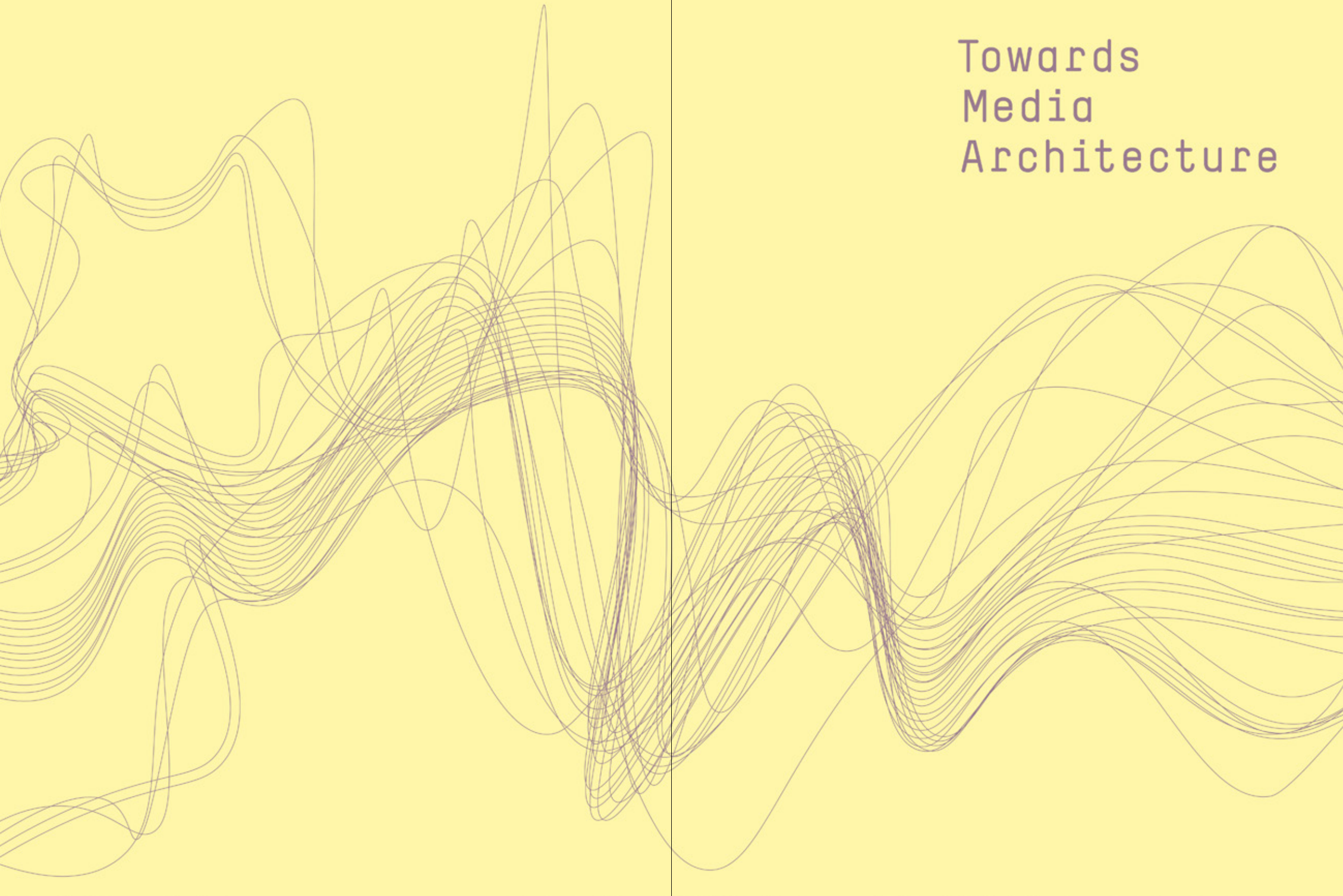
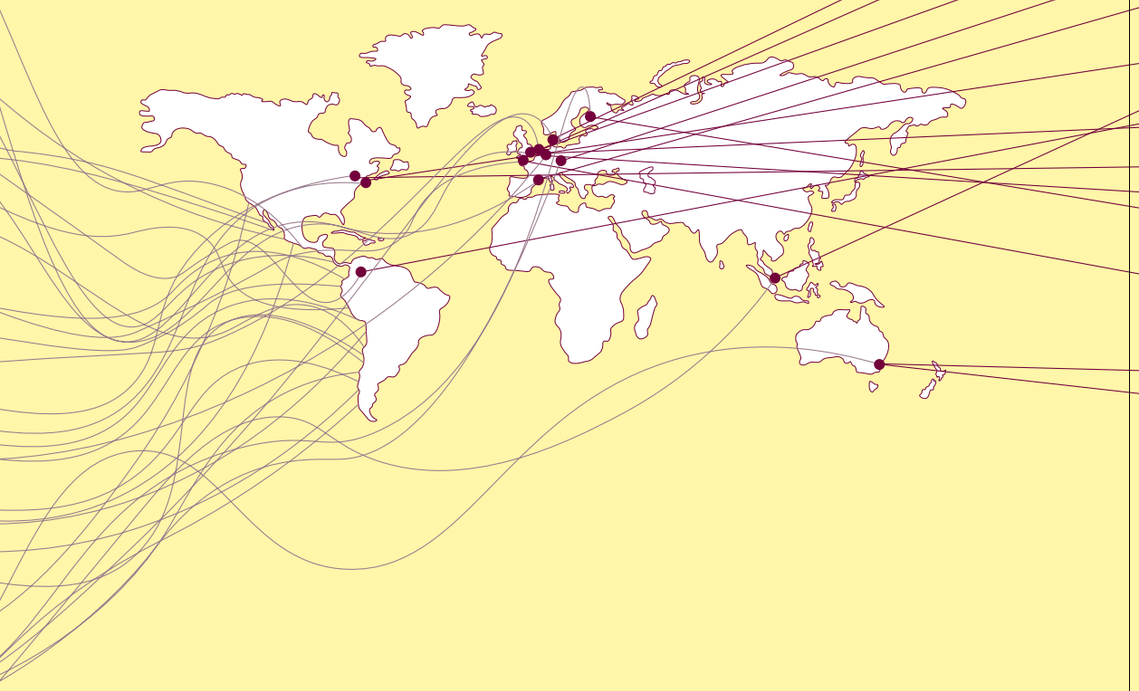




/ Katharine Willis, Nanna Verhoeff, Michiel de Lange, Alex Aurigi

Media Architecture in the Academy
Shaping the Future of Media Architecture Research and Education

Media architecture and urban interaction design is an emerging (inter)disciplinary field, with educational programs, research groups and design offices around the world exploring its aims, methods, futures and boundaries. Many individual practitioners and researchers working in this new field run into similar questions and issues: what competencies do professionals in the field need, what methodologies are best suited for combining design, education and research?

In order to develop the field, there is a need to develop a shared agenda for media architecture research and professional training through creating platforms for exchanging knowledge and inspiration, and by sharpening and articulating our needs and ambitions. This will involve inter-disciplinary knowledge exchange based on practices from all over the world, from early-career and more senior practitioners and researchers.

The Media Architecture Biennale Academy

The MAB Academy, launched as a new initiative at the 2020/21 edition of the Media Architecture Biennale has the goal to contribute to the development of media architecture as an academic and pedagogical field. The aim of the MAB Academy is to support research and teaching in this new and fast-developing field, and to create platforms for the exchange of knowledge around the practices, collaborations and frameworks that shape its educational and academic infrastructures, internationally. The MAB Academy invites creative professionals, academic researchers, students, educators, and program coordinators to explore and exchange experiences, insights, and ideas about and from research, learning, and teaching in the field of media architecture. On our agenda are the following aims, questions, and plans:

Practices

Our aim is to share and disseminate experiences and best practices. We need to address: How do we teach the interdisciplinary field of media architecture, what theoretical inspirations, creative methods and research formats are we using? We plan to address this by creating platforms for exchanging knowledge and inspiration, and by articulating our needs and ambitions.

Collaborations

Our aim is to bring together leading academics, practitioners and educators to head the development of the activities. In order to do this we need to explore if we can work more closely together as a field and simultaneously forge crossovers with adjacent fields (including computer science, urban planning, policy science, social sciences, philosophy and other fields in the Humanities). We plan to develop a series of activities and communal tactics for carving out and strengthening the field.

Frameworks

We aim to develop the methodological, pedagogical and institutional frameworks needed for the field of media architecture to develop as an academic and professional field. This means we should consider which methodological, pedagogical and institutional

frameworks are needed in order to make the field of media architecture grow and blossom, through e.g. funding schemes, different review procedures, curriculum changes, organizational changes and industry involvement. We will formulate longer term strategies for anchoring media architecture institutionally.

Mapping Pedagogies

From the ambition to develop a series of activities and formulate longer term strategies for strengthening the field and anchoring media architecture institutionally, we very much welcome this publication. Initiated by The Learning Community Urban IxD of the Amsterdam University of Applied Sciences, it draws together work across a range of disciplines and educational programs at international institutions. It is an invaluable step in developing and advancing the field of media architecture and facilitating international and inter-disciplinary dialogue and collaboration.

/ Marjolijn Ruyg, Martijn de Waal, Somaya Ben Allouch
Troy Nachtigall, Andre Neumann

Educating the next generation of urban interaction designers

More than 25 years ago, De Digitale Stad ('The Digital City') was founded as an online community and meeting ground in Amsterdam, with the aim of enabling Amsterdammers to access the internet. This online version of a city was built up around digital 'squares' and 'houses' (homepages) reflecting the wish of its founders to develop the internet as a new type of public space that would be taken care of by a community of residents. The reference to the city was used as a metaphor to structure social interaction. After all, at that time, the internet was seen as a domain separate from the real world, as an online space of pure communication, as a new territory called cyberspace. At the same time, already in its early days, this new domain for human interaction was not completely separated from the physical city. At various locations in Amsterdam, such as the town hall, the library and the museum,

physical terminals were installed to provide citizens with a portal to what was then called the information superhighway.
At those sites, passers-by and visitors would be notified through the buzzing and screeching sound of telephone modems that these places had now become a first instance of hybrid spaces.

Entanglements

Since then, the entanglement between the physical and digital worlds has increased significantly. By now, these two worlds can no longer be distinguished from each other. In the past decade, a new set of (mobile) media, technologies, software and cultural practices have emerged, changing the ways in which we experience our cities, re-shaping our urban culture. Hardly anybody now leaves home without their mobile phones, carrying their portals to the online world of information and social contacts in their pockets. Urban screens, digital facades and interactive installations have popped up all over our cities. And the sensors and algorithms of the smart city have started to reorder urban infrastructural use in real time, based on their data-fed feedback loops.

Designing hybrid environments

This has brought a new question to the forth: how do you design such hybrid environments? What knowledge and skills do you need as a designer to create urban experiences in which the physical and the digital are closely intertwined? And - just like the founders of Amsterdam's digital city proposed a quarter century ago - how could this newly emerging 'hybrid' or by now perhaps even 'post-digital' city be shaped as a public space, with its technology, interfaces and user experiences designed around public values?
Those questions are not only pertinent for designers - be they urban designers seeking to understand the logic of digital platforms or interaction designers coming to terms with broader debates on urban culture and the public realm. These questions are all the more urgent for those of us who educate the next generation of designers, as they will be joining a working field that increasingly demands an understanding of both spatial and mediated experiences of social interaction in situated contexts and the digital mediation of these interactions through online platforms.

Exploring and shaping a discipline

How can students be trained to deal with this complexity? And how can they be made critically aware of the underlying values and

/ Marjolijn Ruyg, Martijn de Waal, Somaya Ben Allouch
Troy Nachtigall, Andre Neumann

logics in the design of digital interfaces and infrastructures and how these could contribute to the experience of public spaces?
The Learning Community Urban IxD of the Amsterdam University of Applied Sciences was established in 2020 with the aim of creating an educational and professional community that promotes the link between research and education and stimulates the exchange of knowledge and skills in the field of Urban Interaction Design. Together, we would like to explore and shape this newly emerging discipline. Interface Design, Research through Design, and Critical Design are central to this, as well as a linkage to Value Based Design.

With this publication we would like to further instigate the debate about the implications of our increasingly hybrid cities for educating the next generation of media architects and urban interaction designers. How do various educational programs approach this new space?
In close cooperation with the network of the Media Architecture Biennale and its Media Architecture Biennale (MAB) Academy, we organised a first exploration amongst some of our colleagues at various universities around the world. Through its various social channels, we invited the members of the Media Architecture Network to nominate educational

programs in this field. Next, we approached those institutions and set up brief interviews with its programme managers.

Initial overview

Needless to say, this overview is far from complete and was not meant to provide an exhaustive overview of the field. Rather we wanted to start with a first attempt of bringing together a number of different perspectives on education in the fields of Media Architecture and Urban Interaction Design. Questions we put forward were: What are the core competencies that students are expected to learn by the end of the program? What types of projects/briefs do students work on?
What methods are considered important?
In addition, we looked at the students following these courses, the kinds of backgrounds they had and the kinds of skills they developed.
Seen from the perspective of the professional field, we looked at the kind of designers that were actually needed. What type of competences and skills are required by offices working in this field? What is it that future employers expect? What is it they think students should learn?

/ Marjolijn Ruyg, Martijn de Waal, Somaya Ben Allouch
Troy Nachtigall, Andre Neumann

Diversity in hybrid practices

The first thing that is striking about the 15 study programs contacted is the enormous diversity of approaches and perspectives. Thus, we see that the field of Urban Interaction Design has an enormous width with a myriad of different applications. Some programs focus on data analysis, other courses have taken a design perspective, whereas some others have taken a more theoretical approach. Different design methods and visions are used. Some center around Design Thinking as an approach to address wicked problems, others bring out Speculative Design, allowing for an experiential view of the future. In many programs Value-Sensitive Design approaches are playing an important role, departing from human and increasingly 'more-than-human' values, employing methods like (more than) Human-Centered Design.

We see a trans-disciplinary and problem-driven approach in many courses, as well as the collaboration with real-client projects. In many courses, the city itself is used as a 'living lab', where prototypes are tested, conversation pieces are developed in consultation with citizens for co-creation, and 'provocatypes' are used to help think about the future.

Prepping the next generation

As said, this publication is a first attempt to map this emerging field of Urban Interaction Design and Media Architecture courses and is meant to initiate and conduct a discussion on how these new types of designers can be trained. After all, our purpose as researchers, educators and professionals is not to just understand our current cities better, but also to be able to shape them from both the requirements of the professional field as well as the needs of society itself; we kindly invite all of you to join our discussion. Whereas the founders of the digital city envisioned a future in which the digital domain could be shaped as a city, today the city is increasingly shaped according to the logic of 'the digital', and this makes the questions we have raised above all the more urgent.

Interviewee Martin Brynskov, PhD, Associate Professor and Center Director, Researcher at CAVI Location Aarhus, Denmark Faculty Arts Duration 2 years
Students 70 per year Active Since Master 1986, Bachelor 1989
Website bachelor.au.dk/digitaldesign

Digital Design
Aarhus University

Critically Engaging
with Interactive Digital Media

/ vision

The Bachelor and Master programs in Digital Design at Aarhus University focus on how information technology affects our everyday lives. Students are immersed in the topics of aesthetics, digital culture and design. The curriculum is a balance between the theoretical and the practical, teaching students how to navigate between the two and use one to inform the other. Students are encouraged to use practical making skills to reflect on the learned theory as well as use the theory as inspiration to prototype digital objects and interventions. There is an emphasis on critically studying the influences of digital technologies and data within society to gain an understanding of its place in the civic space. The program teaches students to think critically about 'the digital', a practice that holds a strong tradition in Scandinavian culture.

/ competencies

The core competencies of the program fall into two categories: critical reflection and practical construction skills. Through research and artistic exploration, students obtain a great deal of knowledge about digital aesthetics, digital media design language, genres in digital art and culture and creative practices in the field. Students also develop skills in how to design user-centered digital artifacts through iterative processes. The curriculum requires students to analyze, interpret and communicate each step of their work and fit it into a larger view of society. They often work with data in areas such as privacy, consumption and sustainability and, through this, learn how to collect, process and present information in relation to its significance and context. Overall, the goal is for students to learn how to critically engage with interactive digital media in a contextual way and design artistic interventions to further explore the interconnections between people, computers and culture.

/ program content

One of the key attractions to this program is its connection to CAVI (Center for Advanced Visualization and Interaction) and the Digital Design Lab. Students have access to these centers to make prototypes and engage with research. They are used as instruments within the study program. At CAVI, students are able to explore their coursework and design projects from a more spatial, large-scale perspective, such as media architecture. And in the Digital Design Lab, students have space to explore physical computing through the resources there, which include sensors, actuators, robotics and other materials.
In the Bachelor program, students take courses such as Digital Aesthetics, Design and Creativity in Art and Design. The Master program builds on these skills in courses including Data and Digital Culture, Experimental Interaction Design, Strategic Design and Methods and Practices in Digital Design Research. The teaching environment is a mix of lectures, group lessons and project work. Students prepare literature for class discussions and spend time designing digital prototypes to test their theory in practice.

/ students

In Denmark, it is typical for students to follow the bachelor and master courses one after the other, making the full duration of their studies five years made up of three years as a bachelor student and two years as a master student. Students who enter this program come with an existing interest in digital media and its associations with society and aesthetics.
Graduates tend to fall into these career paths: digital product and service development, teaching, digital communications and marketing. They hold roles such as user experience designers, concept developers, information technology teachers, design teachers, interaction designers, project managers and digital consultants.

SMART CITY
IN A SUITCASE
"Smart City in a Suitcase" aims to communicate what a "smart city" really means and how data is used in cities. The case has a working weather station with temperature, pressure and humidity measurement which is displayed on a small screen in the "city". There are plans for further iterations to demonstrate more types and further uses of data in cities.

Metropolitan Analysis, Design and Engineering
AMS Institute

Interviewee **Arjen Zegwaard, PhD, MSc, Program Director**
Location **Amsterdam** Faculty **Interfaculty** Duration **2 years**
Students **120 students in total** Active Since **2016**
Website **ams-institute.org**

Educating the Next Generation
of Interdisciplinary Engineers

/ vision

The Master in Metropolitan Analysis, Design and Engineering (MADE) at the Amsterdam Institute for Advanced Metropolitan Solution (AMS Institute) is a joint degree between Delft University of Technology and Wageningen University and Research focused on educating the next generation of interdisciplinary engineers. AMS Institute is focused on connecting research, expertise and knowledge to re-invent cities and provide solutions to complex urban challenges. MADE approaches topics such as circularity, mobility, energy, water, waste and health. The program focuses on exploring these complex problems through a socio-technical lens, and students are encouraged to integrate physical, social and digital environments in their solutions for the city.
AMS Institute was founded on the idea that the world can be changed through education. Because of this, students get the chance to work on relevant projects and co-create with real stakeholders in Amsterdam through the Living Lab. Additionally, the program has an emphasis on developing an entrepreneurial mindset, to give students the opportunity to bring their innovative ideas to life.

/ competencies

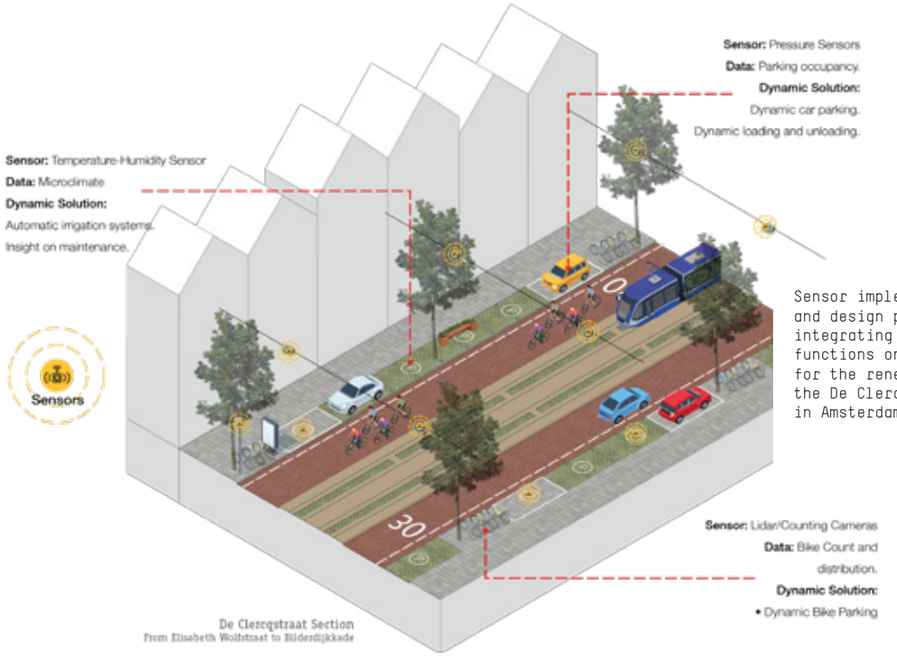
Students in this program develop a mix of hard and soft skills. On the one hand, they learn how to understand big data at an urban scale, conduct academic research on metropolitan metabolism, work with emerging technologies and design and build sustainable solutions. On the other hand, they learn how to approach problems from a socio-technical point-of-view, engage in entrepreneurial activities, critically think about urban challenges, manage stakeholders, design through an iterative process and translate insights into lessons learned.
This program teaches students how to take an interdisciplinary approach to urban topics such as energy and waste. They are encouraged to consistently reflect on the interconnectivity of science, technology and society as they become innovative and entrepreneurial analysts, designers and engineers in the metropolitan space.

/ program content

The teamwork-focused curriculum of this program brings the city into the lecture room as much as possible. In the first year, students take courses on topics such as metropolitan challenges, metropolitan solutions, metropolitan data and entrepreneurial skills. These courses take a hands-on approach to learning about socio-technical theory and interventions, design thinking, design processes and big data. Students are encouraged to preserve the knowledge they learn from their classes and activities into "knowledge clips" to give back to the city and future students.
In addition, students have the freedom to take electives from both Delft University of Technology and Wageningen University and Research. Based on their past experience and career aspirations, they have significant freedom on how they want to structure their learning in these electives.
In the second year, students apply their new knowledge to a longer-term project where they work with stakeholders within the municipality, an NGO or a private partner. At AMS Institute, there are lots of spaces for students to build and collaborate together, both peer-to-peer and with researchers at the institute.

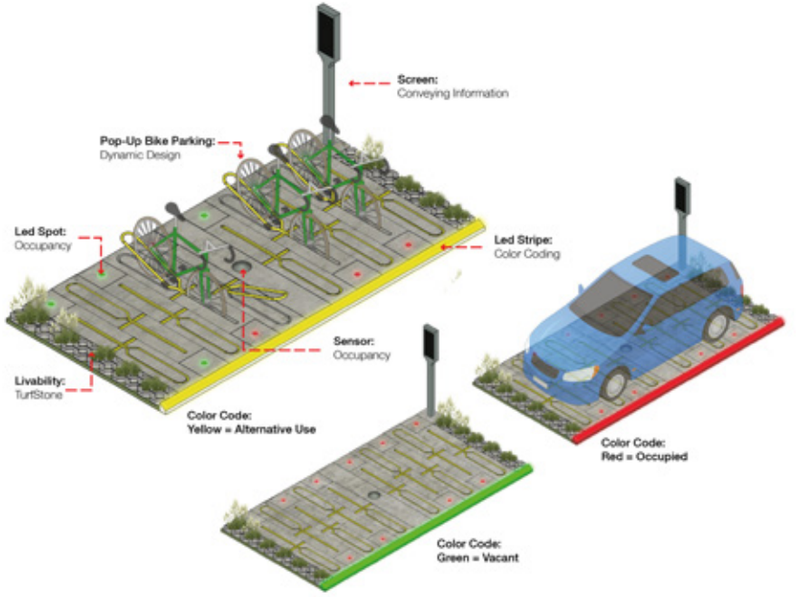
/ students

The students that come into this program already have a technical background from their previous education. Typically, they come from study programs in civil engineering, the built environment, land and water management, environmental sciences and industrial design.
Graduates take on varying roles between the spaces of research and academics, public policy and consulting, and business and entrepreneurship. Often, they end up working as consultants, within municipalities, as researchers or for their own start-up. There is a start-up booster at AMS Institute that students can apply to join after graduation, if they wish.



Sensor implementation and design proposal integrating different functions on the curb for the renewal of the De Clercqstraat in Amsterdam.

FUTURE AMSTERDAM CURBS
The Future Curbs of Amsterdam investigates how people interact with and use the curbs in the City of Amsterdam. It does this by leveraging existing static data about the city and computer vision streetscape analysis to quantify the characteristics of the built environment for every 100 by 100 meter square in Amsterdam. These 100 by 100 meter squares are then divided up into 8 typologies of the Amsterdam curbs by using unsupervised hierarchical clustering. These typologies lay the foundation for starting the design process of dynamic curb solutions together with stakeholders. Additionally, these typologies could be used to scale up potential solutions for specific issues, such as high parking pressure and too little loading and unloading zones, to parts of the city with similar curb characteristics.



Dynamic curb specifications, the design of the bike parking is inspired by the Align design by Design Academy Eindhoven and Milou Bergs.

Interviewee Marjolijn Ruyg, Head of Program Location Amsterdam, The Netherlands
Type Learning Community engaged with master & bachelor programs
Faculty Digital Media and Creative Industry Active Since 2020 Website hva.nl

Learning Community Urban Interaction Design

Amsterdam University of Applied Sciences

/ vision

The Learning Community (LC) Urban Interaction Design at the Amsterdam University of Applied Sciences is embedded within media and design programs in education and research across the university. It initiates transdisciplinary projects and events that connect these various programs around urgent design issues and questions about major societal issues and concerns regarding the role of digital media and technologies in urban culture and public spaces and the (future) development of cities. In these projects, the learning community brings together students and teachers from various courses in our educational programs, professionals and researchers to explore practices of co-creation and bottom-up approaches to urban design. The exchange of knowledge and experiences, and the dialogue about these issues, is the main focus of LC. The Learning Community revolves around three themes: *Responsive public spaces* (spaces that make use of interactive technologies to adapt to users and situations to enhance the quality of the space as a public realm), *Smart Cities* and *Smart Citizens*, and the forcefield between those two. The vision of the LC continues to be inspired by Amsterdam's historic and current vision of respecting citizens' digital rights as well as vision of the internet as a potential public space, due to the 1994 creation of the first internet community in the Netherlands, the Digital City, to their present attendance in the coalition Cities for Digital Rights.

/ competencies

As a Learning Community, it offers students a new lens of urban interaction theory and practice to learn from, furthering and facilitating experimental education through critical thinking about design in and for urban public spaces. The students are challenged to reflect critically on their own role and responsibilities as designers, and to develop an ethical sensitivity and empathic attitude towards their possible impact. They are spurred to develop the ability to assess and evaluate how emergent technologies can be both instruments of positive change or threats to liberties and rights. They are prepared with the knowledge to understand and reflect upon the impact that digital media can exert on the physical space and infrastructure of the city, city life and culture. At its core, the LC supports educational programs with a framing and understanding of the multifaceted complexity of urban problems, and it

/ program content

actively supports transdisciplinary teamwork and aids the students throughout their concepting and design phases. To achieve this, students are taught how to address, approach, and solve design challenges through various methods such as design thinking, research through design, value sensitive design, speculative design, critical design (critical making), more than human-centered design and participatory design. Both the bachelor and master programs encourage students to expand their creative problem-solving skills and innovate with technology.

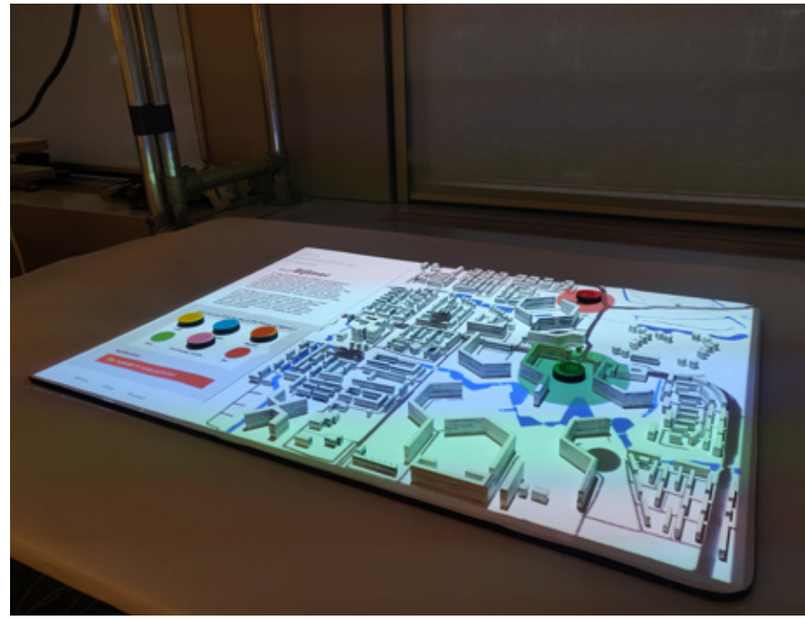
The Learning Community works in close co-operation with the Bachelor program Communication & Multimedia Design (CMD), the Master program Digital Design (MDD) and the research groups (lectorates) Civic Interaction Design, Digital Life, Fashion Research & Technology, and Spatial Urban Transformation. Outside of the university, it has close connections with the Academy of Architecture, the Academy for Theatre and Dance, The Netherlands Film Academy, and the Rietveld Academy of Amsterdam, as the LC acknowledges the potential that artistic explorations and techniques can offer to widen its investigative perspectives and issues of concern. Additionally, collaboration is maintained with various players in the Creative Industry in and around the city. Within the Bachelor program the LC engages with the courses (minors) Designing User Research, Global Trendwatching and Immersive Environments. The students of the Master Digital Design occasionally work on projects relating to the built environment. The students approach real client briefs of challenges in the professional field; in these projects students work in close connection with industry partners to develop designs that can be implemented in real life. Students work on their projects in transdisciplinary groups and are encouraged to use the city as a living lab to test their designs.

/ students

As the LC works across various programs within the university, the student make-up is quite varied. At the master program, there is a mix of Dutch and international students, which brings in a diversity in experience and interests including interaction design, graphic design, product design, industrial design, architecture, business and psychology (behavioral studies). After completing their respective study program, students take on creative roles such as digital designers, digital design strategists, user researchers, design team leader and creative director.

4D CITYMAKING
Two student teams were asked to look at how a mix of tangible media and technology can interact within a physical space. Their brief was to explore how a city model could be transformed into a tool to showcase, experience and discuss the future of the city in an experiential and inclusive way.

This prototype combines projection mapping with object tracking. The game pieces represent different attractions the user wishes to see in their neighborhood, such as a park, cafe, playground, community center, etc. As the users move the game piece onto the model, a data visualization is triggered.



This prototype combines a physical paper printed map with AR technology that allows the map to come alive and present different scenarios. users are free to explore different scenarios and datasets around the concept of a 30-hour work week in Amsterdam. This can be done individually or collaboratively. In the app, users can send messages and save changes.

Master MediaArchitecture
Bauhaus-Universität Weimar

Interviewee Dr. Sabine Zierold, Head of Program Location Weimar, Germany
Degree Master (M.Sc.) Faculty Architecture & Urbanism Duration 4 semesters
Students 20 students per year Active Since 2005 Website uni-weimar.de

At the Intersection of Architecture,
Urbanism, Media, Art & Design

/ vision

The Master in Media Architecture at Bauhaus-Universität in Weimar is an interdisciplinary design and research program taught at the intersection of architecture, urbanism, media, art and design. The fields in focus include engineering within digital spaces and immersive media, computational architecture, information technology, human computer interaction, social and resilient urban planning, presentation methods and interface design. The course follows in the footsteps of the historical Bauhaus program of Art and Technology, a new Unity.
The program views architecture in special alliance with media and encourages students to use urban structures as a medium and tool for communication, such as media interfaces reflecting on public values. This master program focuses on breaking down disciplinary boundaries and emphasizes research and experimentation in overlapping fields. Through a hands-on approach, students gain experience and understanding of how new technologies and new media fields can expand the definition of architecture.

/ competencies

The core trait that is taught in this program is adaptability. The curriculum teaches students how to design for an ever-evolving world, in terms of technological advancement and societal changes. Students must always know how to apply best design practices to different situations. The program teaches students how to contextualize problems through human-centered design thinking approaches. They are taught how to design for these contexts and build functional prototypes. Creating these designs requires technical training and knowledge in making, creative coding and electronics. Students learn how to refine and iterate their designs, as inspired by a culture of continuous learning.

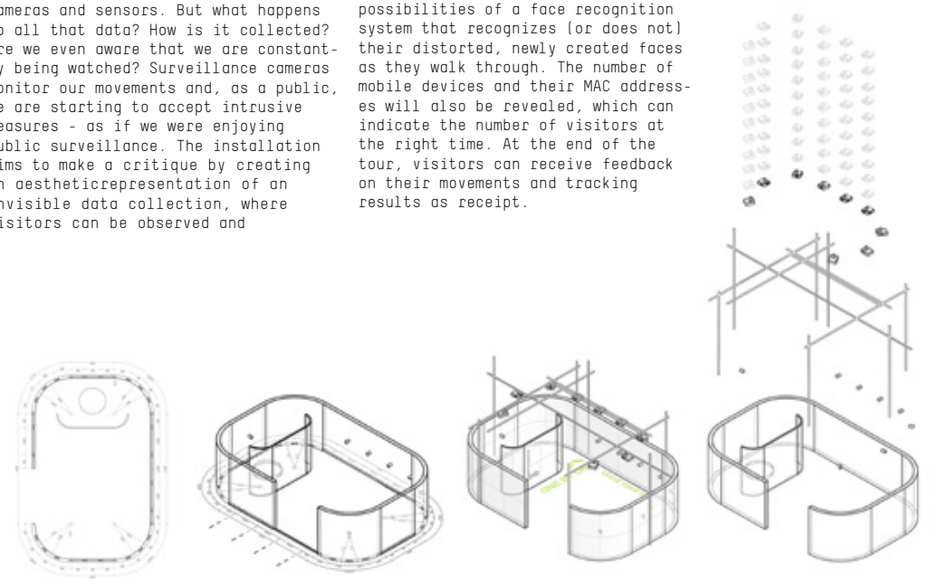
/ program content

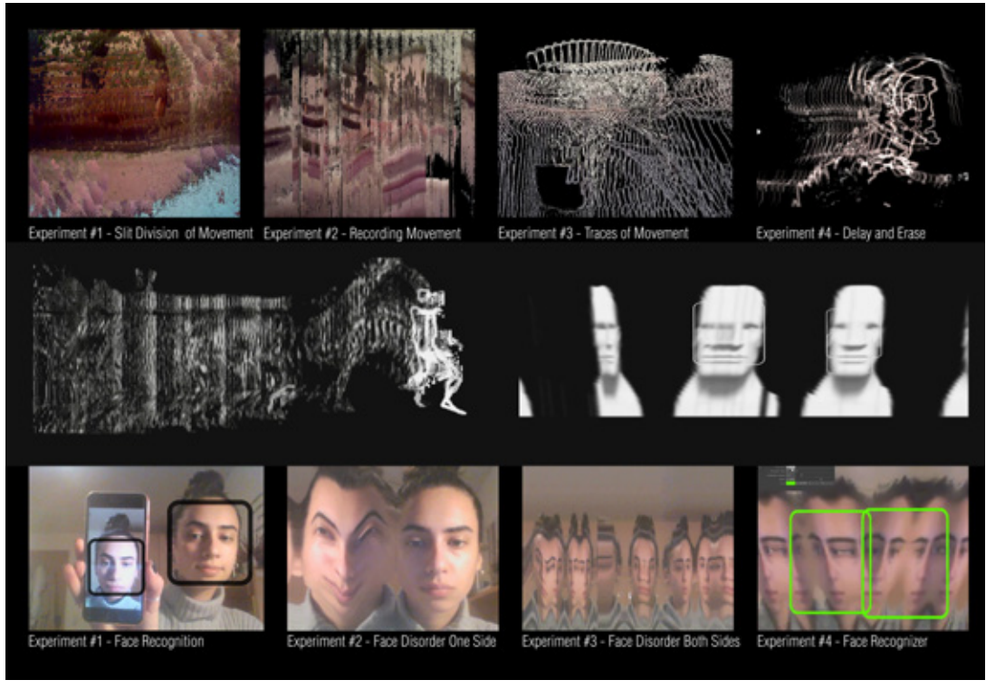
Each cohort of students influences the definition of what media architecture is. They explore new possibilities through research and projects in a studio environment. Students engage in a multitude of workshops to learn and practice technical skills, such as programming, presentation and building. On a theoretical side, courses in the Master program teach students how to understand the complexities of architecture as a medium through literature and case study analysis. They take courses in the Architecture & Urbanism faculty, the Media faculty and the Art & Design faculty to gain an interdisciplinary mindset of how to design mediated communication.
Students are encouraged to create context-based, innovative and well-designed prototypes of architecture and installations that include a special communication concept with narration for social participation or interaction. The topics for their projects change every semester. Recently, with the theme of "What is new nature?", students designed public interactive installations to communicate their research about climate change and nature. Students are also occasionally invited to realize real-life projects like local light festivals.

/ students

The program is open to applicants from the fields of architecture, media and other comparative fields, though the majority of students come from an architectural background. The program finds it interesting and exciting when interdisciplinary matches can be made. The courses are taught in both English and German, which invites many internationals. Students can also apply to do a dual-degree program in combination with the University at Buffalo, State University of New York which allows them to study their full program in English across both schools.
Most graduates go on to work in interdisciplinary fields such as exhibition design, whether that be for a museum or for more temporary exhibitions used to open discourse about urban topics in public space. Some graduates also go into urban planning and use their skills in new programming tools to generate and evaluate urban designs before realization.

OBSERVATORY STATION (2020)
We collect and provide huge amounts of data during our daily routine, through social platforms, surveillance cameras and sensors. But what happens to all that data? How is it collected? Are we even aware that we are constantly being watched? Surveillance cameras monitor our movements and, as a public, we are starting to accept intrusive measures - as if we were enjoying public surveillance. The installation aims to make a critique by creating an aestheticrepresentation of an invisible data collection, where visitors can be observed and discovered using cameras and sensors. Visitors will leave their traces of movement in space and observe the possibilities of a face recognition system that recognizes (or does not) their distorted, newly created faces as they walk through. The number of mobile devices and their MAC addresses will also be revealed, which can indicate the number of visitors at the right time. At the end of the tour, visitors can receive feedback on their movements and tracking results as receipt.





Interviewee Dr. Areti Markopoulou, Program Director Location Barcelona, Spain
Faculty Advanced Architecture Group Duration 1 or 2 years
Students 25 students per year Active Since 2015 Website iaac.net

Master in City & Technology
Institute for Advanced Architecture of Catalonia

Developing the New "Urban Technologist"

/ vision

Situated in the city that invented urbanism, the Master in City & Technology at the Institute for Advanced Architecture of Catalonia (IAAC) in Barcelona experiments with and tests different technologies in urban environments. In 2011 when the smart city model was becoming mainstream, the founders of the program noticed that these influential urban transitions were leaving many important perspectives out of the conversation. IAAC saw it as imperative to bring multidisciplinary perspectives, such as those of architects and urbanists, to the table to incorporate a deeper understanding of the complex workings of the city. The vision of this program is to develop a new profile of the "urban technologist" as a person that has a rich understanding of urban and architectural thinking but also has deep knowledge of what technologies can be used to achieve more citizen-centered and ecological cities.
This master program launched to bring architects, engineers, data scientists and computer scientists into the same arena. Through teaching, research projects and pilot projects in Barcelona, the program aims to rethink the way that traditional top-down, approximate-data-driven urban planning has been tackled in the past and replace it with big data and urban analytics driven approaches to urban design and regeneration.

/ competencies

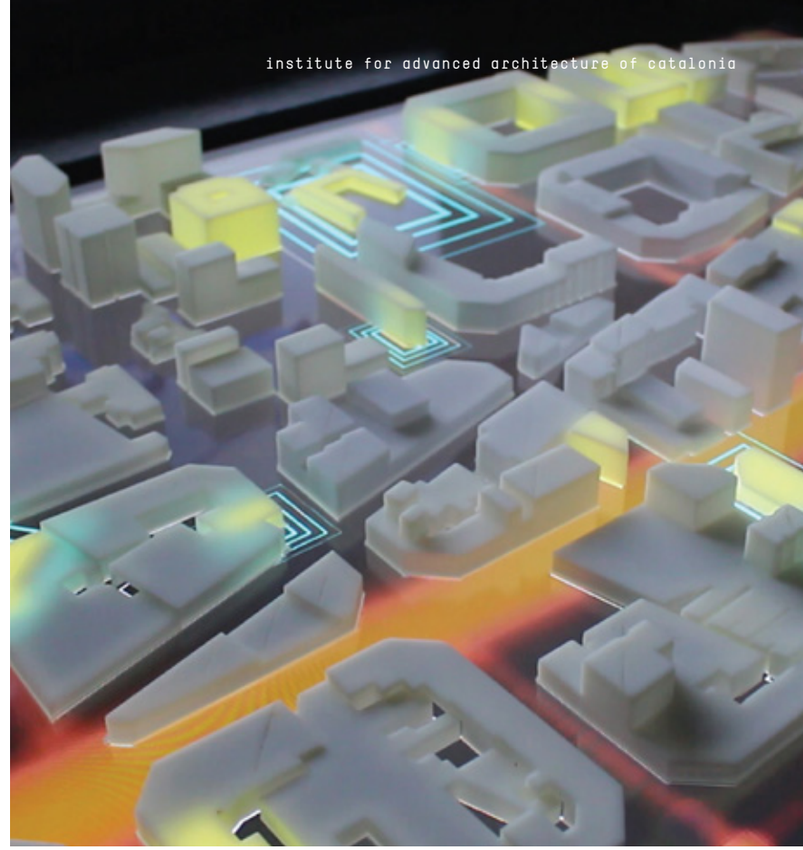
The core competence of this master program is to teach students how to work and think in a multidisciplinary way. It is important for students to gain a deep understanding of both urban complexities and technological opportunities. By the end of the program, students are fluent in finding, capturing and working with big data and also have the ability to analyze and visualize them. They work with computational urban design processes, as they operate as data analysts, data scientists and computational designers. The program puts great emphasis on teaching novel processes in the field, focusing on bottom-up processes combined with top-down strategies to propose solutions for urban regeneration, sustainability, planning and design. Students are taught to approach all of the work through a citizen-centered lens. They are inspired by being in a city that, itself, respects and prioritizes digital democracy.

/ program content

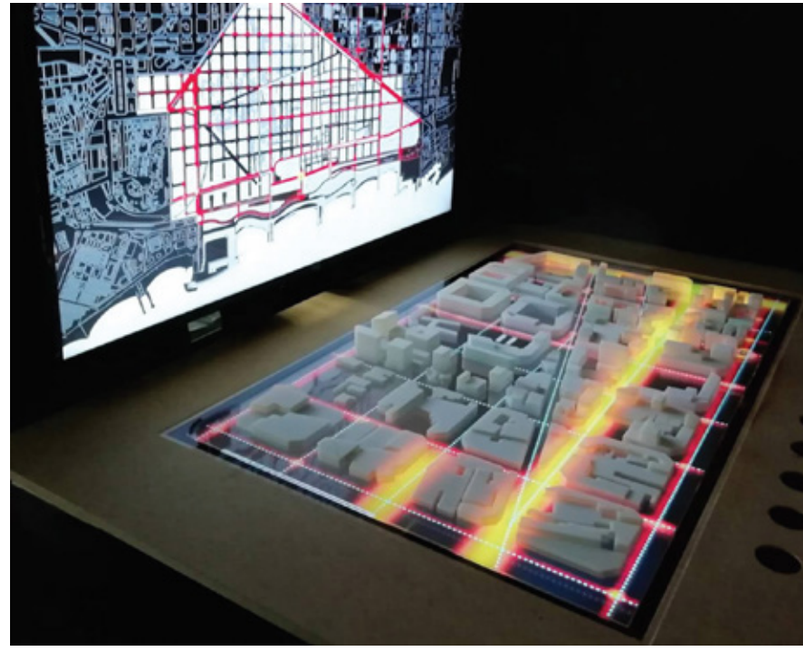
The master program features three topics: Internet of Cities, Internet of Buildings and Internet of People. Each term includes a practical design studio on the topic and theoretical seminars where students learn to understand how big data could be used to understand urban and territorial environments. They have courses related to mobility, big data strategies, computational design, urban optimization, future city challenges, blockchain and the circular economy, among others. Students are taught how to be theoretical, critical and practical thinkers, to turn their concepts into designs. By the end of the program, students learn how to quantify qualified data and take in citizen perspectives through participatory design and technology to democratize the connection between citizens and city decision makers to create a more informed city. Students always work with real case scenarios, through collaboration with city administrators, industry partners and other field experts. IAAC runs on the pedagogy of "learn by doing", so the master program places strong emphasis on prototyping models, learning in an interactive studio environment, engaging in round-table debates and exploring topics, together with the faculty, that are new and emerging in the field.

/ students

A significant percentage of the students in the program come from backgrounds in architecture and urban design. Another large portion come from economic-related disciplines. Additionally, some students enter the master program with experience and expertise in engineering, computer science, psychology, ecology and environmental-related fields. These diverse backgrounds are what cultivates the multidisciplinary environment of the program. After graduation, there are three common routes for students to take. Many students go into collaboration with city administrations, helping them navigate technological opportunities to create more ecological and circular cities. Some graduates go on to lead innovation initiatives in the field, either within companies or by creating their own practices and start-ups. And some students continue in academia either by teaching or pursuing further education with a PhD.



THE INTERNET
OF BUILDINGS
The Internet of Buildings is a project which aims to create new typologies of buildings. It redefines their role in the city as nodes in a network of communication for the exchange of data, energy, goods and resources. It combines 3D and physical modeling, data mapping, data visualization, physical computing and user interaction, to empower citizens to explore and evaluate new urban scenarios that have the potential to improve the performance of their urban environment. This is visualized in an interactive installation which is composed of a 3D printed model of a 28 block area of Barcelona, TV monitors and 8 interactive buttons. By interacting with it, users can visualize 5 different approaches to the Internet of Buildings by visualizing data that show the current condition of the area, the developed proposal and its impact.



Media Art Nexus
Nanyang Technological University Singapore

Interviewee Ina Conradi-Chavez, Associate Professor, School of Art, Design and Media; Creative Director of Media Art Nexus NTU Singapore Location Singapore Faculty School of Art, Design & Media Duration 14-week course Students 20 per course Active Since 2016
Website mediaartnexus.com

Curating and Promoting Media Art on Campus

/ vision

Media Art Nexus (MAN) is a platform at the Nanyang Technological University (NTU) Singapore that curates and promotes media art from students and artists from Singapore and around the world. It is part of the NTU Museum "Campus Art Trail" public art initiative, which has the goal to build a sense of community beyond physical space and use art to develop global awareness and cross-cultural audiovisual exchanges.
The MAN public art installation is a 15m by 2m LED media screen on campus, accessible to locals, visitors and university communities and attracts over 40,000 people daily. MAN has established itself as Singapore's only non-commercial urban media screen dedicated to consistently growing urban media art content.
The goal of MAN is to create and co-create content for this screen and connect with other similar screens and initiatives around the world.
The MAN installation utilizes a course taught in the School of Art, Design and Media. There, students work collaboratively to create experimental media artwork of their own for media screens in the public realm. MAN aims to integrate large-scale media displays for creative endeavors in pedagogical contexts through this hands-on learning approach, democratizing students' access to the technologies that the advertising industry dominates. MAN enriches local cultural scenes with original art content and provides a space for students to create art without commercial limitation.

/ competencies

Students who take this 14-week course develop theoretical and technical knowledge about creating media art for urban screens. The main goal of the course is to empower students to create art by giving them a public platform to display it. Granting students the opportunity to have their work viewed by thousands of diverse people is the core activity for them to learn from. Thus, they get to develop an understanding of how media art affects and transforms public spaces. Creating finalized media art pieces pushes students to learn and think about the impact of public art on audiences and social interactions.

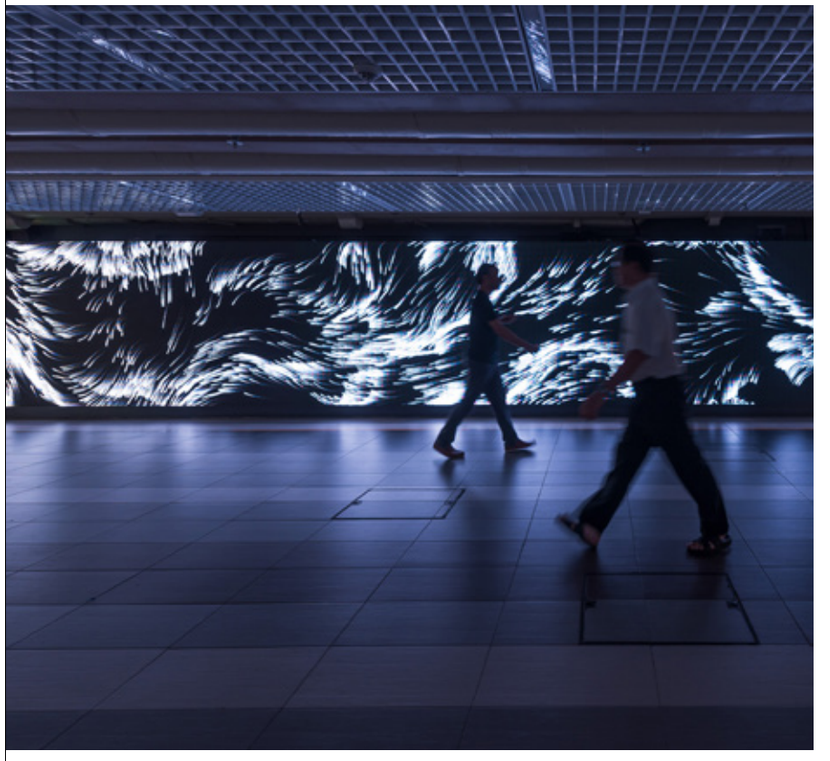
/ program content

They also learn skills in visual storytelling for transient viewing and gain knowledge about technical logistics such as the importance of aspect ratio and typology, speed of media, colour and adjusting to differences between their computer screen and the urban screen. To create their artwork, they build on their existing skills and collaborate with their peers as they explore different toolsets for authorship using industry-standard software such as Adobe After Effects, Maya, Cinema 4D and Unity. They are encouraged to think conceptually and make art that is meaningful to them and at the same time visually compelling, like a moving painting that draws the attention of passers-by. This initiative aims to provide students with a new mindset of urban screens for an artistic endeavor.

The MAN course is open as an elective to all students in the university as a one-time experience to collaboratively create public media art. Each term produces new works ranging from data visualization to generative works to animation and time-based media. During the first weeks of the course, students discover the field through lectures where they hear from artists and past students and analyze international case studies. They work individually or in multidisciplinary teams of two to three students with a mix of technical, artistic and conceptual skills. The students spend time diving deep into the conceptual phase of their process to identify what kind of meaningful story they want to tell. Historical and literary imaginaries along with scientific and environmental issues are only a few of the topics covered. Along the way, the students go through many critique sessions and give each other feedback on the work.
Once or twice a year, MAN collaborates with other universities worldwide to allow students to co-create work for different urban screens and facades. In these cases, they create and exchange content for each other's venues. Past collaborations include working with the Art & Design Department at the University of Applied Sciences Europe in Hamburg and the Elbphilharmonie Concert Hall Hamburg media wall, working with the School of Engineering and Digital Arts and the Gulbenkian Media Façade at University of Kent's Arts Centre UK, co-creating with animation students from the Ceruleum Ecole D'Arts Visuels in Lausanne, Switzerland, and co-creating with music students from the Conservatoire à Rayonnement Régional Music in Reims, France.

/ students

Being open to any student at NTU, the MAN course becomes a multidisciplinary classroom of students from film studies, animation, interactive media, visual communication, industrial design, photography, engineering and more. When the course is collaborating with other universities, this brings in even more varied backgrounds and nationalities. This course has a profound impact on some students' career paths. It gives them a unique addition to their portfolio, which is physical, realized and public. Sometimes, students will get offers to do similar work with media screens after having had this experience. Overall, it provides them with skills and knowledge that make them stand out.



MACROCOSMIC FLUX
Macrocosmic Flux uses the Singapore Land Transport Authority's DataMall API to obtain 'live' public transit data to map the current pressure on the network's bus and train lines, to paint a real-time picture of Singaporeans moving through the island – the macrocosmic state of its citizens constantly in flux.

Interviewee Dan O'Brien, Associate Professor, School of Public Policy and Urban Affairs; Director, Boston Area Research Initiative Location Boston, MA, USA Faculty School of Public Policy and Urban Affairs Duration 2 years Students 8 students per year Active Since 2015
Website northeastern.edu

MS in Urban Informatic
at Northeastern University

Leveraging Data to Best Serve Communities

/ vision

The Master of Science in Urban Informatics at Northeastern University is rooted in the belief that the city is a system of systems. Their goal is to train the next generation of experts who can leverage data and technology to best serve their communities. Teaching at the intersection of technology, analytics, theory and application, the program solidifies the idea that "urban" and "informatics" go together hand-in-hand and are incomplete without the other. Students are taught how to use critical thinking skills to tackle complex urban problems and use their rich toolbox of technical skills to solve real community needs.
Boston is used as a "living classroom" for students to experiment and learn in. The program is centered around enacting positive, productive change in the city. It is heavily influenced by the smart city agenda, though with a characteristic emphasis on equity and community needs, as students learn how to use technology to better understand urban environments. As a university, Northeastern has committed to making data science a priority on campus by encouraging all students from any department to take courses in statistics, visualization, databases, algorithms and machine learning. This demonstrates the highly interdisciplinary environment that the master program exists within.

/ competencies

Students in the program are taught technical, visualization, communication and critical thinking skills. On the technical side, the curriculum ensures that students are able to code in R and Python. By the end of the program, they are proficient in running statistical analysis and can represent data visually in an interesting and attractive way. Additionally, the program has a heavy emphasis on teaching students how to analyze spatial data using GIS.
To expand upon their technical skills, students learn how to effectively communicate their work to diverse audiences. This is important because the program is rooted in enacting real community change.
For example, they could be working on a data project about a disadvantaged neighborhood. The students then must learn how to make their work understandable and compelling to different communities that may not have their same background. To address these complex challenges, students are taught how to think critically and dissect the purpose of each challenge. They are taught to understand the larger impact of their work

/ program content

and make inter-connections within different fields, such as politics. At the end of the program, all students come out with a completed portfolio of the work they have done in the course. Students learn how to refine and iterate their designs, as inspired by a culture of continuous learning.
The Master program has a deep relationship with the Boston Area Research Initiative, an urban research lab at Northeastern University, which enables students to work on real projects within the city of Boston. Students get to learn new skills and see their impact directly, with many opportunities to work with external partners.
The program curates a large amount of data about Boston and its neighborhoods which is then intertwined into the curriculum, so students can practice learning with real scenarios. Students take courses covering topics such as big data, GIS, urban theory and science, environmental challenges and dynamic modeling, among others. In conjunction with learning data science tools and skills, this program teaches students about the history and theory of the discipline to encourage social scientific critical thinking.
In one of the introductory courses "Big Data for Cities", the curriculum combines social and technical aspects by allowing students to learn how to code in R using real Boston data and have conversations along the way with community stakeholders about the impact of their analysis. Classes are usually around 20 people and are a mix of lectures, workshops, co-creation sessions and other hands-on experimentation. The program is primarily project-based, following Northeastern's vision of experiential learning.

/ students

The Master program encourages applicants from varied, interdisciplinary backgrounds. Students coming from computer science and engineering are taught how to bring a social element into their professional development. And students with sociological, economic and political science backgrounds learn how to add technical skills and a data analysis element to their work. Often, incoming students have overlapping interests in public administration and data. The differing backgrounds and skills of the students allow the program to be truly interdisciplinary, which creates a collegial environment where students help each other with their complementary skills.

Most graduates go into the public sector to work on analytical projects in the civic sphere. Some graduates go into the private sector, as their skills in spatial data are highly sought after.
And a handful of graduates enter into the nonprofit sector to work on impactful data analytic projects in various fields to help the common good.

EFFECT OF PUBLIC TRANSPORT ON CRIME
Recent Urban Informatics graduate Bidisha Das studied crime rates around transit stops during her tenure at Northeastern. First, she constructed a theoretical framework to explore the effect of public transport stations and their impact on crime rates. Using the City of Boston as her research setting, Bidisha formulated two inquiries for her project:
+ To identify crime hotspots across transit stations in the City of Boston.
+ To analyze the trend of crime across transit stops in the City of Boston.

Bidisha then created visualizations illustrating her findings. She utilized Analyze Boston, Massachusetts GIS data, and the Boston Area Research Map for her research.

Master in Artificial Landscapes
Pontificia Universidad Javeriana

Interviewee Iliana Hernández García, Co-founder of Master Program
Location Bogota, Colombia Faculty Department of Aesthetics, Faculty of Architecture and Design Duration 2 years Students 8-15 students per year Active Since 2022
Website javeriana.edu.co

Studying the Borders between Natural and Artificial Landscapes

/ vision

The Master in Artificial Landscapes at Pontificia Universidad Javeriana is set to begin in January 2022. It was co-founded by Iliana Hernández García, Jaime Hernández-García and Raúl Niño Bernal. Through research and practice, the program aims to study the borders between "natural" and "artificial" landscapes that have been blurred by the evolution of science and technology. It will combine technology, science, sociology, art and architecture to produce transdisciplinary graduates that can tackle the changing landscape of Colombia. The curriculum will focus on three themes: virtual landscapes, informal landscapes and built landscapes.
Students will apply non-classical logics, evolutionary biology, quantum physics and other approaches to these three main themes. They will use technologies such as bio-technology and nano-technology to propose creative solutions for architecture and urbanism. Additionally, the program will be one of the first of its kind to offer a research track. The founders of this program in the Aesthetics, Technologies and Habitability Research Group at Pontificia Universidad Javeriana are creating this master to help contemporize architectural education and practice in Colombia. They saw a need to create more flexible and adaptive spaces through a transdisciplinary approach to account for the effects of science and technology on society.

/ competencies

In the program, students will develop an array of theoretical, methodological, practical and critical skills throughout their studies. They will learn to understand the complexities of artificial landscapes in relation to their interconnectivity with science and technology. Students in the program will experiment with diverse sciences such as aesthetics, complexity, non-classical logic, electronic arts, biocomputation and technological poetics, among others. With this knowledge, they will be able to analyze, interpret and produce innovative solutions for concrete problems in society. They will do this through learned theoretical and technological skills such as building algorithms and modeling virtual landscapes.
Through exploration of the "natural" and the "artificial",

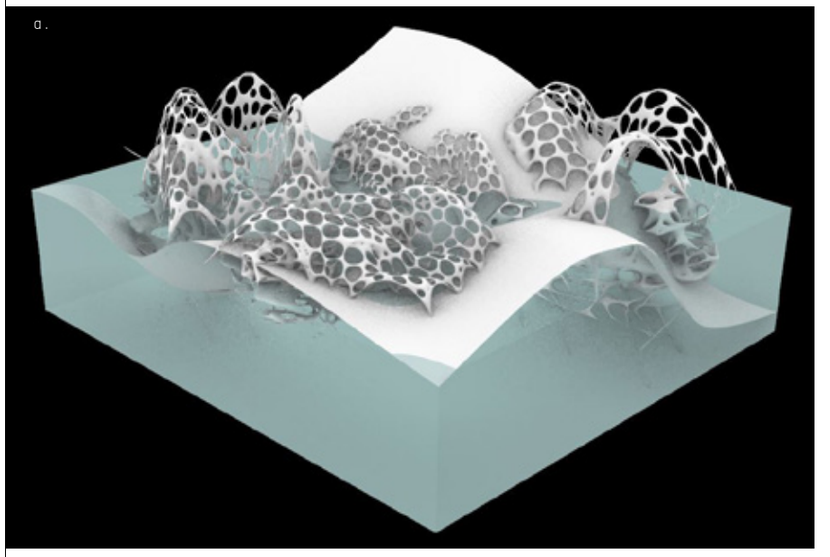
/ program content

the program will encourage students to find and articulate their critique of this space and its social effect. Graduates will be expected to be able to generate new knowledge in this field and take a creative stance to social innovation in their practice.

In the first year of the program, students will take courses in methodology, virtual landscapes, informal landscapes and built landscapes. The methodology curriculum will be presented first and will feature courses in non-classical logics and the relationship between social sciences and natural sciences. There, students will receive a solid foundation on which to further their studies. The virtual landscape courses will explore how to build architectural environments in digital spaces and the relationships between science, technology and society. The informal landscapes curriculum will give students the opportunity to approach the societal challenge of persons living in informal habitats. Students will do field research in these neighborhoods and learn about the kind of relationship these settlements have with technology. Lastly, in the built landscapes curriculum, students will explore how new materials, such as bio-nano-technologies, can be used to affect the health and life of people in urban environments. All of their courses are split between theoretical teaching and practical skill development. Students will also have the opportunity to take complementary electives from various faculties. In the second year, students will work on one year-long project, following either a practical track or a research track. At the end of the master program, students will present their projects and be evaluated on their innovation, implementation of technology and societal approach.

/ students

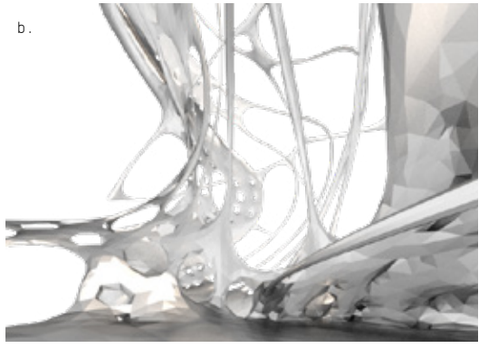
The program foresees most incoming students to be from the field of architecture. But, there will also be an opportunity to welcome in people with backgrounds in art, ecology, science, design, engineering and social sciences. All applicants must have an interest in the production and conceptualization of digital landscapes and the desire to be transdisciplinary between science, technology and society. The career path of graduates depends on whether they choose to follow the practical or research track in the second year. Students who complete the practical project are likely to take on careers as consultants, architects or designers within municipalities, housing corporations, technological collectives, cultural organizations or other. Students who take the research track are expected to further their career in universities or institutes, tackling complex urban challenges with algorithms, big data and computational heuristics through research. In all, the knowledge graduates will obtain can be beneficial to public organizations, private companies and NGOs to help them build technological plans for the future of urban environments.

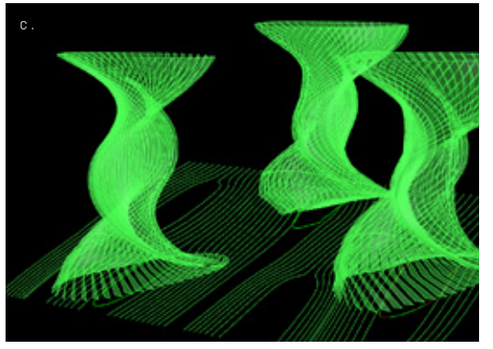


IMMERSIVE SPECIES a that proposes an inside view of an architectural building that simulates an artificial non-organic species.

PLASMA CELL SPECIES b that was designed in a specific material made of cells of plasma,which provides nutrients to the structure' s metabolism.

NANOTECHNOLOGY SPECIES c that is designed at the nano scale to use the advantages of flexibility and lightness of the quantum matter.





Urban Interfaces
Utrecht University

Interviewee Nanna Verhoeff, Professor of Screen Cultures & Society Location Utrecht, The Netherlands
Type Research Group Faculty Humanities; Department of Media and Culture Studies Active Since 2014
Website urbaninterfaces.sites.uu.nl

Understanding how Technology Shapes
Urban Life and the Human Experience

/ vision

The research group [urban interfaces] at Utrecht University, founded by Nanna Verhoeff, Sigrid Merx and Michiel de Lange explores the ways in which situated media, art and performances interact with urban spaces through research and teaching.
The group's research and teaching bring together insights from Media Studies and Performance Studies. Located within the Department of Media & Culture Studies at the Faculty of Humanities, their initiatives are grounded in theoretical and analytical approaches to urban interaction design. The goal of their teaching is to bring creative thinking and critical making into the academic setting of the university.
The [urban interfaces] research group approaches urban spaces as situated arenas for social interaction and reflects on the conditions for experiences, relations and actions within those spaces. In their teaching, they push students to think critically and creatively about the world around them. There is a strong emphasis on analyzing artistic and activist practices to locate tensions and urgent matters within the city. Together, researchers and students interrogate the mutual shaping of technology and society through an interdisciplinary approach where philosophical and theoretical thinking are mobilized as critical and creative thinking.

/ competencies

Students who take the courses taught by researchers of the [uban interfaces] research group develop skills in creative thinking and making beyond what is typically taught in the university curriculum. They learn how to activate academic critical thinking for contemporary situations relating to technology in the urban environment. Their courses aim to engage students with contemporary society, urban living and the world around them in an active way. Students from different study programs and various disciplines mix together in these courses, providing an experience for them to work in a new multidisciplinary and collaborative manner. Bringing diverse knowledge and expertise, they work together to develop a deep understanding of the ways in which technology shapes urban life and the human experience. The students present their learnings through writing, so analysis and argumentative skills are important. In all, the researchers want to open students' eyes to this field of study and push them to think in a new way.

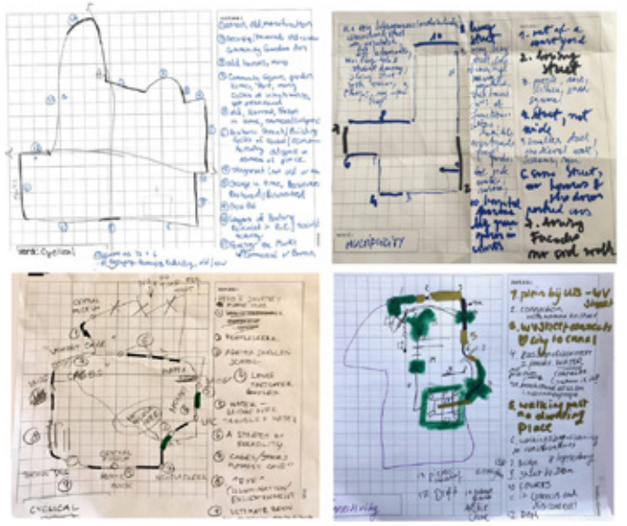
/ program content

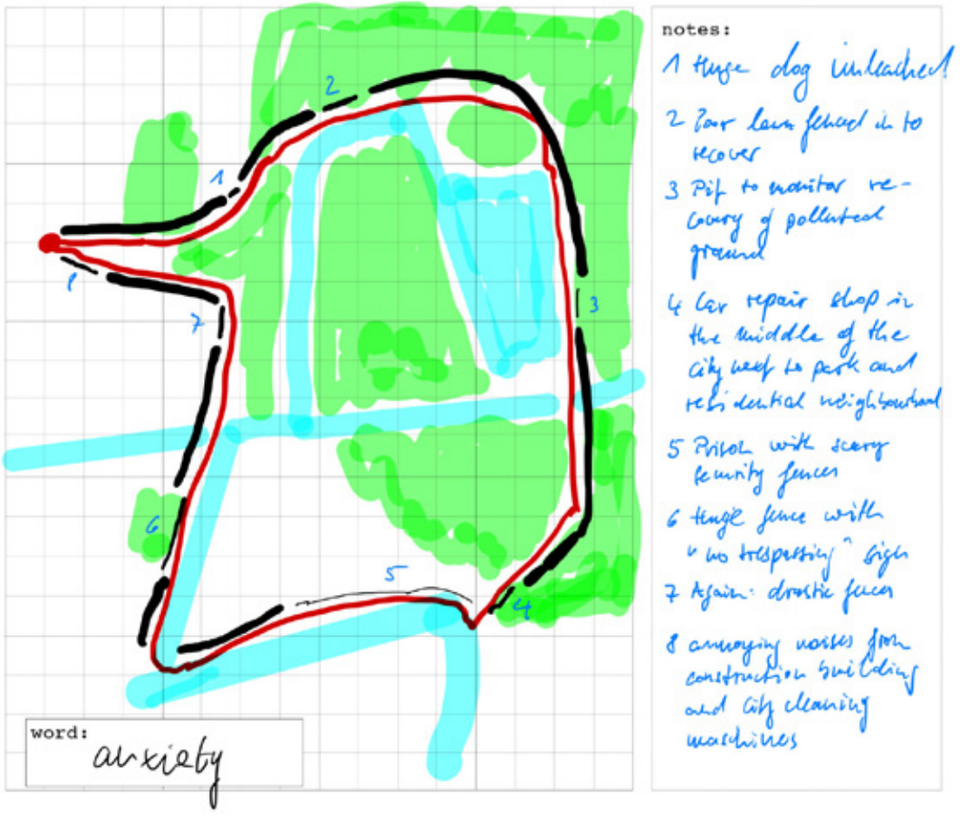
[urban interfaces] teaches bachelor- and master-level courses, and organizes a yearly graduate seminar open for interested students on BA, MA or PhD level. The bachelor course Creative Urban Technologies deals with the question of how technology shapes city life. It critically examines smart city agendas and rhetorics and investigates people-centric alternatives in close collaboration with cultural partners in the city of Utrecht and beyond. The bachelor course The City as Stage explores both theoretically and practically how artistic interventions in public space can intervene in social issues that play out in the city. The master course Urban Mobile Media explores how mobile and social media have become embedded in our everyday lives and how these media indeed constitute the present urban condition. The research master course Urban Interfaces focuses on developing research about urban transformations and includes a 2-day pressure cooker workshop where students are mixed with designers to create a public intervention.
All of the courses spend time looking at case studies of artistic and activist projects in urban space to use as "theoretical objects" on which to reflect upon through discussion and writing.
The yearly thematic seminars are open to participants from within and outside of Utrecht University. Past seminar topics include Urban Frictions, The Right to the City, Urban Ecologies and Interfacing the (In)formal City.

/ students

The courses taught by [urban interfaces] are open as an elective for students to choose. Anyone from within the Humanities Department can easily enroll and students from other faculties are welcome but must request permission in order to enroll.
The courses attract students from various disciplines, enriching the learning environment for everyone. The knowledge about urban interaction and design that these students gain, along with their developed critical, creative and academic skills may impact their future career choices down the road.

WALKING-THINKING
What is an open city? What makes a city open? When do we experience a city as open? With our walking-thinking method, we hope to offer a different perspective from which to explore the 'open city', taking an embodied, experiential lens to learn about our immediate environments.





Media Arts & Architecture Program
University at Buffalo

Interviewee Mark Shepard, Associate Professor of Architecture and Media Study
University University at Buffalo, State University of New York Location Buffalo, NY, USA
Faculty Architecture and Media Departments Duration 3 years Students 2-3 students per year
Active Since 2006 Website arts-sciences.buffalo.edu

Exploring the Space between Architecture and Computational Media

/ vision

Housed between two faculties, the Media Arts and Architecture Program (MAAP) at the University at Buffalo interrogates the space between architecture and computational media.
The mission of the program is to look at the intersections present between the two fields, both of which are increasingly computational in nature. MAAP began from the rise of the smart city, as the faculty saw it important to critically look at the promises and pitfalls of embedding technology into the city. They also found interest in the relationship between social media platforms and architectural space and knew that this new form of digital public space deserved a place in education.
This interdisciplinary program dives into how situated technologies and architecture converge, through looking at topics such as responsive environments, environmental sensing and urban surveillance. The program emphasizes its goal to be an experimental environment where students are able to develop their own practice and ideas. The students are encouraged to push assumptions and build their own definitions of what media architecture can be, which then in turn can add to the evolution of the field as a whole.

/ competencies

At its core, MAAP aims to provide students with a rich understanding of technology within social contexts that involve people, machines and space. The core competencies can be broken into three categories: technical skills, theoretical knowledge and design skills.
On the technical side, students learn how to write code and work with electronic circuits such as sensing devices. These skills are instrumental to their prototyping and building success. All of their work is built at a one-to-one scale, so ensuring technical proficiency is imperative. On the theory side, students develop deep knowledge of the critical history of media architecture and technology's evolution and impact on the built environment over time. And lastly, to be successful in developing concepts and prototypes, the students learn how to operate as designers, with skills drawn from interaction design applied at scale.
They develop skills such as design thinking, scenario planning and service design.

/ program content

Students in this program take courses from the Architecture and Media Study departments. In the Architecture faculty, they explore areas such as architectural design, coding, mapping and fabrication. In the Media Study department, students learn about computational media issues, creative coding and spatial phenomenons. Almost all of the students in the program are additionally affiliated with the Situated Technologies Research Group in the Architecture department.
The teaching is broken into three categories: studios, seminars and technical workshops. In the studios, students work on designing and building their one-to-one prototypes through a mix of independent and collaborative work. On average, there are around 15 people per studio, and each course is dedicated to a chosen context, such as exploring how digital devices could aid in social distancing during the Covid-19 pandemic. The seminars are held in separate classrooms that typically feature round table discussions about topics in the field. The technical workshops are held in the Extensible Media Lab where students have access to physical computing materials such as soldering stations, circuit board printers, 3D printers and a components library.

/ students

The majority of incoming students come from an architecture background, though some people do enter the program with experience in media. The student body is broadly international, attracting students from Asia, the Middle East, South America and Europe. As a state school in New York, there is also a significant draw of students from the New York City area into the program. Some of the students every year come from the International Media Architecture Masters Studies (IMAMS) program at Bauhaus-Universität in Weimar, Germany as part of the dual degree partnership between the two universities. Students on that course spend the first and last semesters at their home university and the middle two semesters at the partner university. This adds to the internationality of the program. In the end, graduates take on roles in teaching, research, exhibition design, smart product development and architecture.

SILICONE VALLEY (2018)
As pervasive computing infiltrates our everyday life, we often find ourselves entangled in multiple techno-spatial hybrids. Their often unmapped socio-cultural impact could be summarized in technology's enduring ability to construct how we relate to our context - our spaces, the city and each other. In particular, this work is concerned with the dynamic ways in which networked technologies reconfigure how we work, pay attention, navigate the city, socialize and get to know our own selves better. It imagines five speculative devices that break, or make, "techno-mediated habits" in an attempt to negotiate our established, technologically-curated relationships with the world.

Architectural Computation MSc/MRes
University College London

Interviewee Ava Fatah gen. Schieck, Associate Professor in Media Architecture and Urban Digital Interaction Location London, UK Faculty The Bartlett Faculty of the Built Environment Duration 1 year Students around 25 per year Active Since 2005 (original foundation 1996) Website ucl.ac.uk/bartlett

Exploring the Built Environment of Tomorrow

/ vision

The Architectural Computation Master and Research Master program at the University College London (UCL) is centered around exploring how tomorrow's built environment will be designed, manufactured, constructed and experienced.
With a focus on advanced digital design and computational methods and techniques, students learn from architects, artificial intelligence experts and human-computer interaction experts about how to create interactive, generative and responsive forms with real programming environments. The school is situated in the Knowledge Quarter in London where students learn alongside over 100 innovative academic, cultural, research, scientific and media organizations.
The main themes of the program are automation and robotics, geometry and fabrication, and interaction, including extended, mixed and augmented realities. These themes are supported through teaching on choreography and the human body, sensing and actuating, robotics simulation techniques, generative algorithms and machine learning. The program brings together diverse perspectives from the arts and humanities, sciences and the creative industries. At its core, the program utilizes a framework of research-based education, exposing students to cutting edge knowledge and thinking in the field.
It is situated in the B-Pro suite, which is a collection of graduate programs and research labs within The Bartlett School of Architecture that are dedicated to advanced digital design and computational experimentation in architecture and urban theory.

/ competencies

The program aims to give students solid theoretical and technical foundations for the use of computation as a means to realize architectural design. The curriculum is grounded in the social theory of architecture and pushes students to develop computational design skills to apply at the highest levels of architecture, design, research and industry. Students learn to use computational techniques in architecture, understand the built environment and predict the consequences of their design actions through computational processes, integrate their predictions into the design process and carry out self-sufficient research into new methods and processes.
The projects students work on explore topics such as computational methods for automated construction, augmented

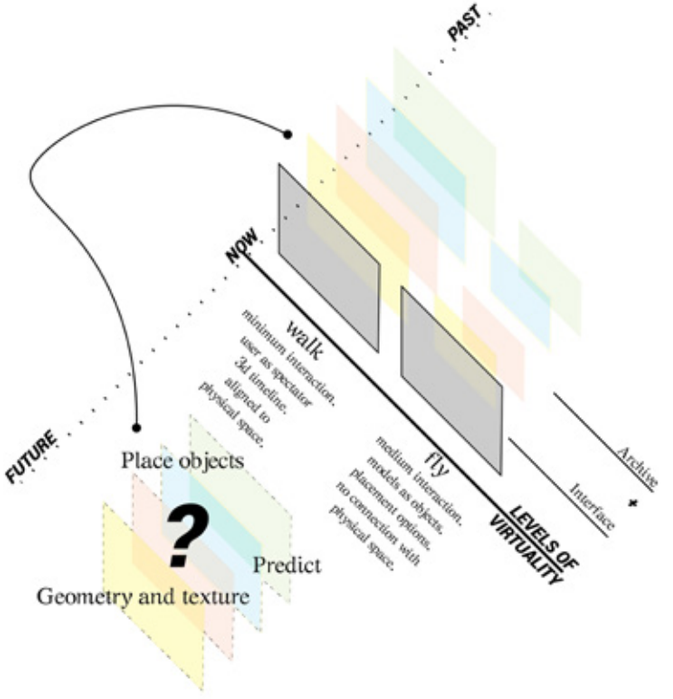
/ program content

and extended reality applications for the built environment and its optimization, collaborative human-robot interactions, the use of wearables to detect and raise awareness of air pollution, embodied interfaces for interaction with machines and the development of artificial intelligence to be used for spatial navigation and pattern generation. Throughout their research and work, students learn how to work interdisciplinarily to be able to change the way the built environment is designed, constructed and used in a collaborative way.

The learning of technical knowledge, such as computer coding, plays a strong role in the program. It is viewed as a skill and a framework of thought. The students' technical knowledge is supported by a broad theoretical understanding of the algorithms and philosophies of artificial intelligence and related domains, underpinned with unique collaborations with the Computer Science, Engineering and Creative Industries departments at UCL. The teaching is supported through studio modules, workshops and lectures and features three strands: theory, practice and skills. The theory modules teach the use of computation in the design process, ranging from analysis of space and structure, to using artificial intelligence techniques to learn about design performance and ultimately the role of computation in creativity. The practice modules are divided into studio-based clusters that allow students to develop their own interests within a large range of themes including interactive technologies, artificial intelligence and automation, cybernetics, physics simulations and robotic manufacturing. The skills modules teach research and programming skills from foundational to advanced levels, guiding students through the varied possibilities that computation offers design environments. Together, students explore emerging ideas with professors, researchers and peers.

/ students

The program attracts a diverse cohort of international students to London. Predominantly, the incoming students come from architectural backgrounds, but a few also come from engineering, mathematics and media art. Graduates from the program have gone on to work as architects and within R&D groups with renowned architectural practices and engineering firms such as Zaha Hadid Architects, Fosters + Partners and ARUP. Graduates have also joined interaction design studios such as United Visual Artists or creative innovation studios such as digital retail agency Holition. Some choose to go further into academia to continue a career in research.



THE ARCHIVE ACROSS SPACE AND TIME (2020)
Can we use the real-time depiction as a dynamic tool for recording spatial memory through media traditionally used to represent space? Cultures have always been connected to technical life as humans have been extending their capabilities through technology. However, in the information society, interfaces, which enmesh our work in so-called real time, are dominating our everyday lives, while at the same time our online activity is constantly being stored in a dynamic archive. This research project explores the connection of archive to time and spatial memory. It focuses on the context of contemporary technical apparatuses of recording through 3d scanning, an example of a spatial digital replication tool.

Lighting Design Training
University of Oulu and Savonia University of Applied Sciences

Interviewee Henrika Pihlajaniemi, University Teacher, Program Leader
Location Oulu, Finland; Kuopio, Finlan Type Continuing Education Program
Faculty Faculty of Technology, Oulu School of Architecture Duration 1 year
Students 25 in Oulu, 25 in Kuopio Active Since 2020 Website oulu.fi

/ vision

The Lighting Design continuing education program taught at both the University of Oulu and the Savonia University of Applied Sciences is the first of its kind in Finland. The program provides an interdisciplinary education about architectural and urban lighting to professionals working in related fields. The curriculum emphasizes how lighting design has significant and complex effects on human experience and well-being in interior and urban environments. Spurred by the evolution of adaptive, intelligent and interactive lighting technologies, this program aims to expand the role of lighting to become more communicative, participatory and artistic in relation to social contexts.
Through participatory scenario workshops and hands-on learning, students use the city as a living lab to realize their projects.
In Finland, lighting has extra importance since the country experiences such extremes of lightness and darkness throughout the year. The program aims to address these sensitivities and the importance of lighting through theoretical and practical teaching.

/ competencies

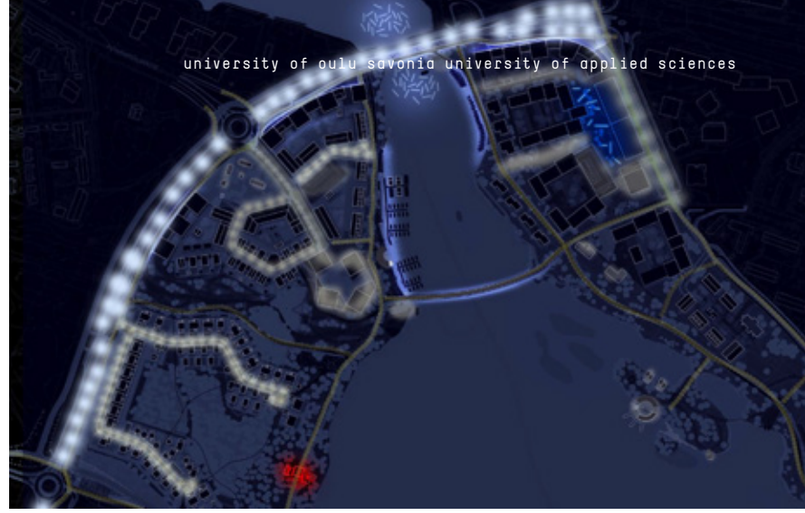
Students in the program develop strong theoretical knowledge about lighting design in which they then apply into practice. As a theoretical base, students explore the interconnections between light, humans and the environment. They develop an understanding of the different effects that light has on human experience, behavior, and physical and mental well-being. With this, they learn how to take the needs of people and the functions of the environment into consideration during their design process. Additionally, the program emphasizes the importance of understanding light and lighting as a means of communication and artistic expression. Planning and implementing lighting designs in urban and interior environments teaches students how to put this theory into practice. The students become familiar with visual presentation and modeling programs to visualize the effects of their designs. They also gain knowledge about the types of luminaires used in indoor and outdoor settings in addition to understanding their intelligent control methods and the properties of these light sources in relation to the final outcome. The students also become familiar with design guidelines and standards related to light in terms of variables such as light pollution, ecological and economic laws, energy consumption and electrical design.

/ program content

The program uses a blended learning method with a mix of on-campus and distant learning to create flexibility for working professionals to attend the course. The curriculum is divided into two categories: Urban Lighting and Architectural Lighting. In the Urban Lighting block, students create lighting installations in public space and take courses such as Light Creativity & Events, and Light, Environment & People, where the main design project is a lighting master plan for a city district. In the Architectural module, students create an interior lighting design project and take theoretical courses including Daylight & Building and Light & People. In this way, the hands-on learning is supported by lectures.
The program works in close collaboration with cities, companies and festivals to create real design challenges for the students. The students work in multidisciplinary teams made up of people with complementary skills and expertise from architecture, interior architecture, landscape architecture, media art and electrical engineering. For their design projects, the teams are urged to slow down their process and mediate in the concepting phase in order to reflect longer on their ideas. At the end of each module, the students create a portfolio including their project and newly learned theoretical knowledge.

/ students

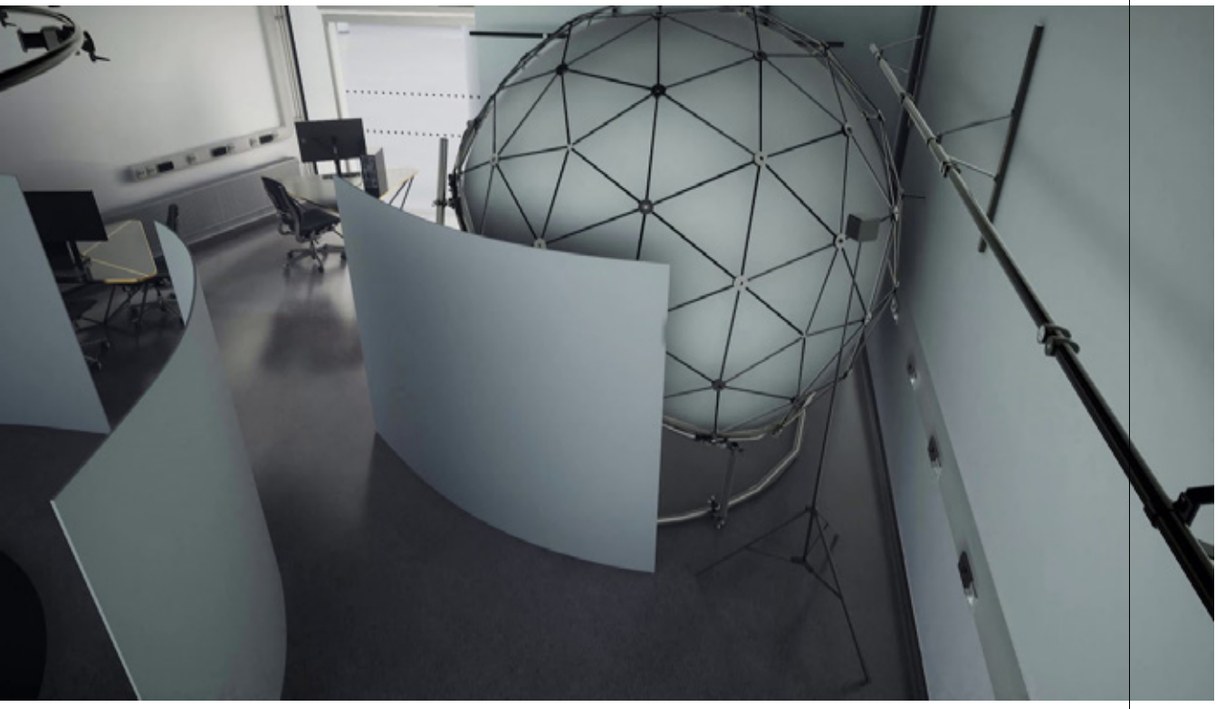
The Lighting Design continuing education course is open to anyone who has experience within the lighting field through previous studies or working experience. Students typically come from backgrounds in architecture, interior architecture, landscape architecture, design, interior design, landscape design, stage lighting design, electrical engineering and lighting technology. Students who work beside their studies have the option to complete the curriculum over two years instead of one. This continuing education program provides graduates with current experience and knowledge in the field of lighting design to further develop and enhance their career.



LIGHTING MASTERPLAN FOR HARTAANSELÄNRANTA, OULU
In the Urban Lighting course, students prepare a lighting master plan for a city district. In this project, the group Helios has envisioned an artistic lighting concept for Hartaanselänranta area in Oulu, where a housing fair will take place in 2025. The lighting master plan provides safe and atmospheric lighting conditions for the inhabitants and visitors of the area and communicates the local history - timber rafting and Oulu city fire - creating an experiential route around the water area surrounded by new housing.

MA Smart Urban Futures
University of Plymouth

Interviewee Professor Katharine Willis, Program Leader Location Plymouth, UK
Faculty Arts and Humanities Duration 1 year Students 5-10 Active Since 2019
Websit plymouth.ac.uk



Bringing Innovation and Entrepreneurship
to the Smart City Agenda

/ vision

The Master in Smart Urban Futures at the University of Plymouth focuses on bringing design, innovation and entrepreneurship to the smart city agenda. Born out of international research on smart city projects, this program aims to bring creative perspectives into the field. Students develop digital and spatial skills that allow them to tackle real-world urban design and planning challenges through a hands-on approach. The aim is for students to design integrated and embedded technological solutions for cities.
The program merges understandings of technology and the city, ensuring that students address design problems with a well-rounded approach, such as through activities like participatory design.
Social innovation is the key goal of this program; this is achieved by engaging with real publics through a socially responsible approach. Additionally, students are pushed to think and work entrepreneurially and develop a foundation of business skills. The program's unique entrepreneurship emphasis provides students with a path forward in this emerging field to realize their own projects and become specialists in the space.

/ competencies

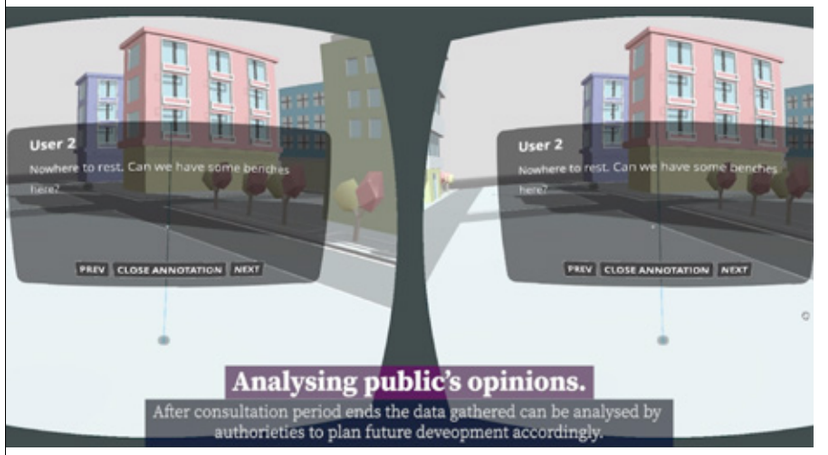
The core competence of this program is for students to gain a deep understanding of the opportunities that arise with the combination of urban design and digital technologies.
They achieve this goal by investigating creative approaches to new forms of interaction with data and technologies in urban space. Students are expected to understand and employ co-design and creative design thinking methods throughout their process as well as have rich validation of their concepts from research. Students build up their technical palette by learning how to develop prototypes incorporating AR, VR, IoT, 3D printing, AI and other digital technologies. In the end, students must be able to evaluate their designs for their problem-solving ability. Throughout, students are taught how to be entrepreneurs by becoming competent in communicating their ideas to stakeholders with methods such as the technology readiness levels.

/ program content

Students work together with industry and civic sector partners on one substantial project throughout the year. Together, they design challenges and propose smart solutions. The core teaching is delivered through the Design Lab Module where students tackle challenges in the spaces of digital living, transportation, health, mobility, governance and sustainability. Students are pushed to bring their ideas to life through creative research approaches and exploratory prototyping. In addition to their project, students also take courses to deepen their understanding of technological skills and urban design theory. In their Urban Dataplay course, students develop theoretical and practical skills in digital technologies and design through the teaching of softwares and hardwares such as Arduino, Unity3D, Processing, Lilypad, IoT sensors and more.
In the Futures Entrepreneurship course, students explore the innovative possibilities of their ideas and gain an understanding of how to take them to the real world through tools such as business plans, value propositions, technology readiness levels and IP.
The core design classes take place in a studio environment.
On campus, students have a hack lab and a digital fabrication and immersion lab to experiment in. Students also have frequent engagement with guest speakers and experts in the field.

/ students

The program does not assume any skill sets of students coming into the program. They receive applicants from varied fields including art, design, psychology, computing and sociology.
In the coming years, the program hopes to attract more architects and urban planners to provide them with digital technology and creative design thinking skills. Upon graduating, students are in a unique position to work in integrated design project teams or in postgraduate research. Throughout the program, they develop their real world design and entrepreneurial skills by working with industry partners. Students exit the program knowing how to navigate client relations, often leading them to start careers with their own studio or as a consultant. Some students decide to turn their year-long project into a start-up or continue working with their industry partners. So far, graduates have entered into the smart energy and IoT sectors and are doing work to design creative solutions for cities.



CROWDSOURCED URBAN PLANNING

Imagine a city in which the urban landscape is shaped by its citizens' needs. Decisions are made collaboratively. The top down approach is non-existent. Such a vision of the future can be achieved through the integration of AI and/or immersive technologies into urban planning processes. The aim is to create a process or tool that enables the public to participate in the urban planning process in a way that allows for opinion making about urban spaces. Such comments could then be forwarded to the city authorities for further analysis and planning future developments accordingly. The project is a mobile app which uses GPS coordinates to drop and read location based messages. The user is first greeted by a chatbot to learn more about the location. Next, a link to a mobile app is provided, which once installed starts an AR experience. The user, through the screen of the device, is able to see other people's comments magically suspended in the air. All the comments are geo-located and the user can leave their own comments regarding the area development enquiry. The augmented reality app uses Unity 3D game engine with ARCore toolkit for vision processing. It incorporates an AI chatbot developed in Google's Dialogflow software. 3D assets for the AR app were created in Blender.

Interviewee Dr. Luke Hespanhol, Program Director Location Sydney, Australia
Faculty School of Architecture, Design and Planning Duration 1.5 years
Students 200+ in total Active Since 2009 Website sydney.edu.au

Master Interaction Design & Electronic Arts
University of Sydney

Designing for an Ever-evolving World

/ vision

The Master of Interaction Design & Electronic Arts at the University of Sydney was the first of its kind in Australia. Inspired by the demands of students across the country, this program was a trailblazer in teaching how to use technology to create human-centered, interactive designs. The program encourages creative output from designers and challenges them to connect their designs to broader societal topics. With most of the Australian living in cities, students are inspired by designing for shared environments. They work with and learn about interactive design topics including responsive environments, interactive architecture, urban informatics, mobile applications and wearables. They are pushed to think about a broader definition of interaction by looking into the world around them and using design thinking methods to tackle complex issues. This study program has a strong emphasis on hands-on learning and is rooted in the belief that designing without making is not really complete.

/ competencies

The core trait that is taught in this program is adaptability. The curriculum teaches students how to design for an ever-evolving world, in terms of technological advancement and societal changes. Students must always know how to apply best design practices to different situations. The program teaches students how to contextualize problems through human-centered design thinking approaches. They are taught how to design for these contexts and build functional prototypes. Creating these designs requires some technical training and knowledge in making, creative coding and electronics. Students learn how to refine and iterate their designs, as inspired by a culture of continuous learning.

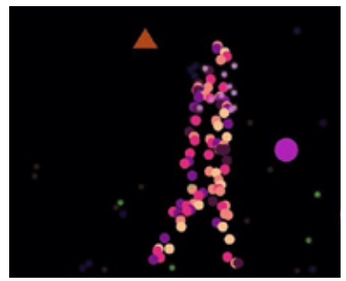
/ program content

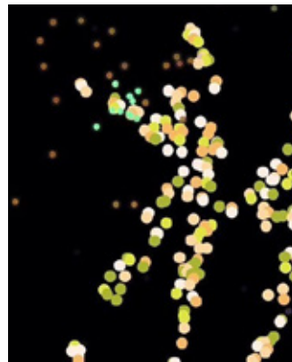
The curriculum is rooted in design thinking approaches and teaches students how to research through theory and practice with desk and field research methods. All courses have a hands-on making component where students prototype their designs. This provides them with a finished portfolio at the end of their degree. One formative experience for students is the opportunity in some courses to work on design briefs from real industry and research clients. In these courses, they get to follow a full design process from beginning to end.
Students are introduced to the field of media architecture in a studio course that encourages them to see the city as an interface for the first time. This expands their definitions of what designers can do and teaches them both theoretical and practical knowledge in urban interaction design, urban media art and digital placemaking. Additionally, at the end of the program, students can opt to take an additional semester in audio acoustics or illumination design to become a specialist in one of those areas.

/ students

Nearly 70% of students in the program are international, mostly coming from countries in Asia, primarily China. There are no prerequisites for entering this course, so everything is taught from scratch. This brings a wide diversity of students with people coming from backgrounds in design, health, marketing, business, engineering, architecture and other professions or academic histories. Some students enter the program as a path to change their career.
After graduating, many students go on to work in user experience roles at design studios or larger companies. Some graduates also go on to be consultants or work in product or service design, marketing or sales. A few students take more artistic routes and end up in stage lighting, media facades or audio acoustics. Additionally, some students go on to further their academic career with a PhD.

THEATER FOR YOU (2019)
Theatre For You is a concept for playful placemaking, implemented in 2019 at The Footbridge Gallery at The University of Sydney campus. It allowed staff and students to discover new and innovative ways to utilise urban spaces in a more meaningful, aesthetically pleasing, engaging and creative manner. The concept aimed to transform the pre-existing, static LED lighting system into a vivid, interactive, and engaging space where pedestrians could do more than simply walk by, and instead have a reason to stay and partake in shared, spontaneous play.
The project innovated by synchronising high and low resolutions (projections and LED pixels, respectively) to deliver a unified and coherent playful experience in a public space. Tracking of passers-by was achieved with a Microsoft Kinect camera, fed into a Processing sketch orchestrating the real-time communication between three computers via OSC.





Bachelor of Computational Design
UNSW Sydney

Interviewee Dr. Nicole Gardner, Senior Lecturer, Education Lead
Location Sydney, Australia Faculty Arts, Design and Architecture Duration 3 years
Students 50 students per year Active Since 2015 Website be.unsw.edu.au

Using Technology to Solve Problems
in the Built Environment

/ vision

The Bachelor of Computational Design at the University of New South Wales (UNSW) Sydney explores how emerging new technologies can innovate the built environment. By combining architecture, design, computer science and engineering, the program explores how to design and build more sustainable and smart urban spaces through viewing architecture and urban systems with a “whole of life” approach. Students follow a process-oriented approach to design innovation and explore technologies and techniques such as parametric modelling, digital fabrication, digital twins, data science, physical computing, sensing, actuating, visualizing and simulation.
The program is rooted in three core interconnected themes: constructing, contextualizing and calibrating. Constructing relates to computation software that might enhance the understanding of construction. Contextualizing is concerned with the urban environment as a whole and explores topics related to the smart city, responsive environments and human computer interaction. Calibrating refers to the optimization and decision support for workflows within architectural processes. Theory and practice within these themes are the core of the program.

/ competencies

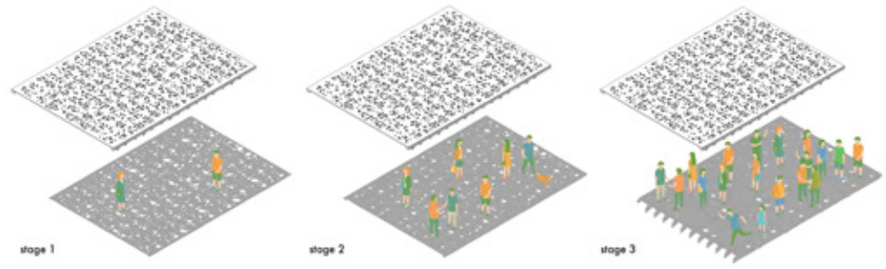
Students in this program learn where and how technologies could be implemented in the architectural design process.
The goal of this program is to create graduates who can use the power of computers and technology to create and present solutions to built environment challenges. As software is ever-changing, students learn to be adaptable by exploring different methods. They develop foundational skills in softwares for 3D modelling, laser cutting, 3D printing, algorithm visualization, digital fabrication, robotics, computer programming, data analysis, physical commuting, artificial intelligence, machine learning and more. In all, the program aims to teach students a full design process that involves conceptualization, prototyping and possibly construction. Additionally, students learn theory about urban interaction, digital architecture history, human computer interaction, biomimicry, mathematics, evolution and more in tandem with their learned technical skills. These skills and knowledge compliment each other when brought into practice.

/ program content

The first year of this program is focused on courses to build a core foundation in parametric design and digital fabrication. Their education is a mix of courses in technical skills and theory. Each year, there is a theory course on one of the three themes: constructing, contextualizing or calibrating. In these courses, they explore topics including urban interaction design, smart cities, social media data analysis, human computer interaction, digital architecture history, systems thinking, evolutionary algorithms, biomimetics, postphenomenology and mathematical concepts like hyperbolic paraboloids and Newtonian space. During their third year, students work on real-life projects proposed by leading industry partners. In these projects, they work with their clients to define a problem and work through an iterative design process to create a solution. Most of their projects come from the architecture, engineering and construction fields, but some students also work on design challenges within software companies and technology start-ups.

/ students

This bachelor program is made up of local and international students. To enter the program, applicants must be interested in design and creativity as well as emerging technologies and computing. Incoming students tend to be excited about the idea to use data to drive creativity in their studies. Some students in the program are there following the dual degree option, which allows them to earn a second degree by taking one year of the core Computational Design courses in addition to their other full degree within the School of Built Environment at UNSW. The program holds strong relationships with the architecture industry, so many students continue on into that industry after graduation. Some students are offered employment with the clients they worked with in their third year project.
The roles graduates go on to hold include digital optimization specialist, urban data analyst, building information model implementer, software solutions developer, gaming environment developer, smart cities consultant and urban design researcher, among others.



RUSTLING LEAVES URBAN INTERACTION DESIGN (2018)

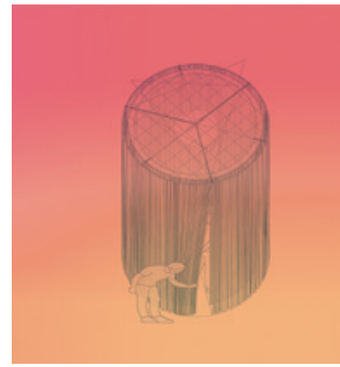
Rustling Leaves is a distinctive interactive canopy that provides shade and draws attention to the Quadrangle precinct on the UNSW campus. Located over the central pedestrian intersection of the Quadrangle lawn, that is an area of high activity, the canopy interacts with users who pass beneath through motion detecting sensors that in turn actuate the canopy 'leaves'. The degree of actuation of the canopy leaves is directed by the quantity of people within the space. This encourages others to come together and socially participate in the interaction. As the servo motor operates, it pushes a rod causing the horizontal supports to rotate and move. This agitates the hanging leaves, creating a gentle rustling sound and altering the reflected shadows on the footpath. By speeding up the servo motor in the case of more people in the space, the horizontal supports move rapidly, and the shadows begin to dance. In its idle state without movement detection, dynamic shadows are also cast onto the footpath as the sun moves throughout the day. The canopy collects pedestrian traffic data useful to campus operations, whilst also engaging the principles of sensing and actuating acting to create curiosity, acknowledge presence and revitalise the precinct.

Carlos García Fernández
MediaArchitecture Student at Bauhaus-Universität Weimar

Name **Carlos García Fernández** Degree **Master or Science** Program **MediaArchitecture M.Sc.**
School **Bauhaus-Universität Weimar** Location **Weimar, Germany** Graduation **2021**

Carlos García Fernández is nearly complete with the MediaArchitecture Master program at the Bauhaus-Universität Weimar. In his prior architectural education he was consistently drawn to the content about artistic interventions like installations and immersive experiences. And in his work experience as an architect working on office design projects, he felt like he was missing an element of creativity and interaction. That is what drew him back to study media architecture.
He is very appreciative for the broad freedom that students are given in this program. In addition to the required courses, he had ample flexibility to explore his interest in immersive experience design. Through access to state of the art technologies, workshops and literature, Fernández has been able to explore this at his own pace and take courses across multiple faculties, leading to a multidisciplinary education.
The most surprising course he took in the MediaArchitecture Master was Bio Art. He was inspired by the way the curriculum taught him how to join arts and sciences together. Merging the artistic and the technical opened up many opportunities in his mind.
He also greatly enjoyed his courses in interaction design, as this is directly related to his interest in immersive experiences. On a technical side, the program emphasizes the importance of building and prototyping with technologies. Because of this, he learned how to program with Arduino and Processing to achieve his project concepts.
The most influential course he took was the first project course where they were tasked with developing a playful and dynamic installation for the 100th anniversary of the Bauhaus. Having access to workshops for woodworking and computing helped him realize this project. Going forward, Fernández would like to work in an environment where he can develop as an architect and a media artist. He sees himself working at the intersection of the two fields in a space such as retail architecture or exhibition design. He has also entertained the idea of doing a PhD in the future to further explore immersive realities and adaptive architecture.
Overall, Fernández is very grateful to the university for giving him the opportunity to explore this field.

ATMOSPHERIC SPACES
How would it feel to experience distant and/or imaginary realities in physical space? Is it possible to experience locations that are somewhat unreachable or even non(yet)existent? How could these intangible locations be translated and re-built into atmospheric spaces, perceptible by the senses through immediate experience? This immersive experience brings remote whereabouts and yet-to-discover locations closer using light, sound and reflections to render ambiances in space. The user (or traveler) is able to directly feel and experience these phenomenal realities that used to remain in an intangible realm; they are now embodied in a multi-sensory environment.

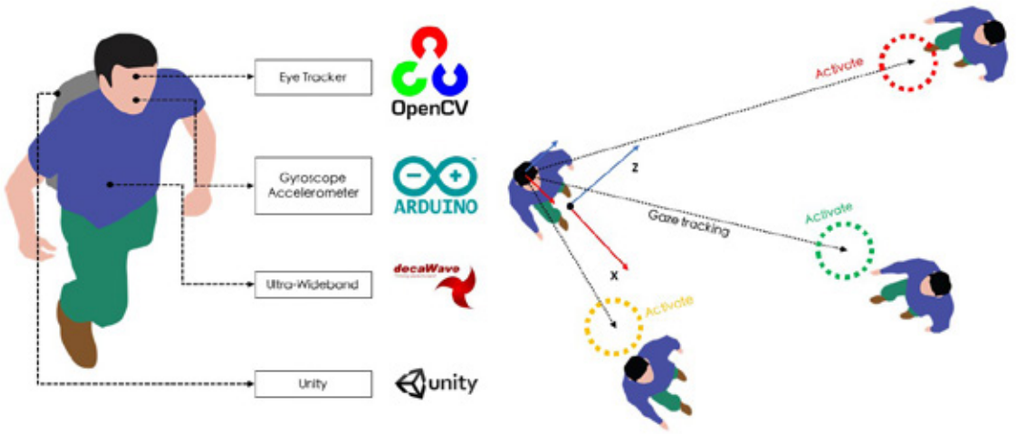


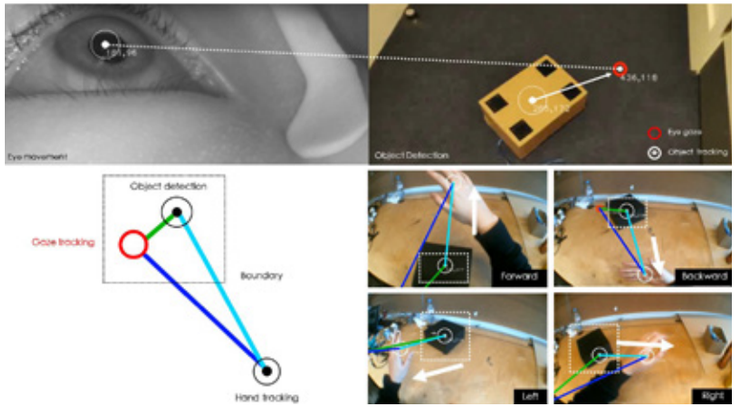
EXPLORING MEDIA ARCHITECTURE DESIGN IN VIRTUAL DESIGN ENVIRONMENTS
Here, a student uses a VR headset to explore a media architecture structure. Jenek´s case study research explores how immersive technologies can be employed to teach architecture students to capture the dynamics of media architecture.

Waldemar Jenek
PhD at Queensland University of Technology

Name **Waldemar Jenek** Degree **PhD** School **Queensland University of Technology (in aggregation with CSIRO´s Data61)** Location **Brisbane, Australia**
Graduation **Beginning of 2022**

Waldemar Jenek is a PhD student at Queensland University of Technology exploring how virtual design environment tools can be employed in the design process of media architecture within an educational context. Through his academic background in architecture and work experience in the software industry, Jenek noticed the underutilized potential for new digital tools to create media architecture. In his case studies, he worked with students and guided them through the process of designing media architecture structures using digital environment tools. When Jenek previously studied architecture, he noticed that architectural practitioners and educators primarily used traditional design tools such as sketching, 3D renderings and physical models. In his opinion, these methods are hardly capable of capturing and communicating the dynamics of media architecture. Jenek has dedicated his studies to exploring new opportunities with digital design tools to design media architecture. Digital design environment software allows students and practitioners to process the design of dynamic media architecture structures that would be hard to explore with static models – paper or physical. His exploration at QUT has been greatly benefited from his involvement in the Urban Informatics Lab, where he is able to make connections with external partners and learn from his peers who are researching in the same and related fields. His supervisors at QUT, Glenda Caldwell, Jared Donovan and Veronica Garcia Hansen, have been an inspiring force in connecting him with people and initiatives such as the Urban Art Projects in Brisbane and the Media Architecture Biennale Community. He is co-supervised by Matt Adcock and Mingze Xi from CSIROs Data61, who provide additional guidance and support his research impact. He has found that working across disciplines with diverse colleagues is essential to creating media architecture, as it is an amalgamation of many disciplines, including art, architecture, technology and sociology. Being adaptable and open-minded are vital components to successful work in this field. In the future, Jenek sees himself continuing this educational work at the intersection of architecture and technological tools.





FROM ANALYSING GAZE TO CREATING COMMUNICATION

Our eyes' movement has the potential to provide useful information for a variety of scene recognition and visual perception problems as visual perception has emerged as a critical part of research in human-computer interaction and spatial understanding. Moreover, eye movements are linked to cognitive processes of communication, such as engagement, attention and expression. This project seeks to extend the way we communicate with others or interact with devices. A wearable eye-tracking system was developed for tracking three-dimensional directions of eye gaze, capturing a wide range of hand gestures, recognising different objects with three cameras and localising people's movement in built environments simultaneously with the use of IMU and ultra-wideband tracking systems, which creates a novel way of utilising eye gaze to communicate and interact with people and devices.

Zehao Qin
UCL Architectural Computation Alumni

Name Zehao Qin Degree Master or Science Program MSc Architectural Computation
School Bartlett School of Architecture, UCL Location London, UK Graduation 2019

Zehao Qin is a recent graduate of the Architectural Computation Master program at the Bartlett School of Architecture at the University College London. He now works as a Design Systems Analyst at Foster + Partners. His journey into Architectural Computation began with his Bachelors in Fine Arts where he focused on public art and space design. From critiquing his own artwork in urban spaces, Qin became fascinated with the human experience in physical space. He looked for paths to explore this idea and found his way into computing as a tool to analyze this space. His goal, since then, has been to merge art and computation to explore human experiences in the built environment. He is fascinated with trying to understand the city through an artistic viewpoint.

In the master program, Qin participated in the Body as an Interface | City as an Interface studio.

There, he learned how to think about and develop prototypes relating to how humans move around their environment. He further developed his hard skills in coding, data analysis and machine learning, among others. These skills were imperative to his success, as they gave him the tools to achieve his interventions.

Qin noted that the most beneficial part of the program was the theoretical teaching. The Body as an Interface | City as an Interface studio pushed him to think creatively about what can be used as an input and what can be used as an interface. This allowed him to break beyond his original assumptions and explore the human experience in physical space from a broader, more artistic view. He noted that even just exploring the word "interface" in-depth had a profound effect on the way he viewed the world around him. He believes this prepared him well for the job market because he not only had advanced coding skills but could also understand user experience, which is not as common in the architectural field. He demonstrated his skills, knowledge and curiosity in his final thesis project which explored human navigation in the built environment. Throughout his process, he experimented with using eye tracking as an input in creative ways. His fascination with this technology and the topic of human experience led him to create an intervention on the UCL campus where he analyzed passersby's head movements to understand where their attention was drawn to in the space.

His experience in the Architectural Computation program gave him the opportunity to think critically about interaction and experience within the architectural world.

Ger Baron
CTO City of Amsterdam

Interviewee **Ger Bar** Title **Chief Technology Office** Company **City of Amsterdam**
Website **amsterdam.nl/en/policy/policy-innovation** Location **Amsterdam, NL**

Ger Baron is the Chief Technology Officer of the City of Amsterdam. The CTO Office works with all of the diverse offices within the municipality to foster innovation and aid in digital transformation. They help these departments reach their goals through the use of ethical technology in areas such as e-health, e-education, sustainability, smart mobility and the sharing economy, among others. These collaborations have resulted in projects around cyber security, fake news, Covid-19 measures, waste management programs and many more. The CTO Office also helps Amsterdam be proactive and prepare for upcoming digital transformations and their impact on how citizens live, work and play in the city. Additionally, the office defines a digital strategy for the municipality to insure its success as a 21st century government for the people. Baron emphasizes the importance of building a digital world that is inclusive for all citizens in order to protect their rights.

Their team of software engineers, design thinkers, philosophers and more all root their innovative choices in ethics and are pushed to confront, understand and remove their personal assumptions in order to think outside of the box. Baron believes it is imperative for people working in this field to truly understand the context of the problem before applying solutions. He says that a key element to achieving this mindset is to teach people how to listen. The CTO Office offers workshops in topics such as Socratic Design, agile working and philosophy to help employees further develop themselves and their curiosity about the world. Using these foundational soft skills, programming and data science can be used ethically to help people and build a more respectful and responsible city. Baron looks for new employees who both have the technical skills to understand and work with data and have a deep curiosity for the world around them.

ROBOAT
Roboat is a 5-year research project and collaboration between the Amsterdam Institute for Advanced Metropolitan Solutions and the Massachusetts Institute of Technology. In developing the world’s first fleet of autonomous floating vessels for the city of Amsterdam, it investigates the potential of self-driving technology to change our cities and their waterways.

ROBOAT
Roboat is a new kind of on-demand infrastructure: autonomous platforms will combine together to form floating bridges and stages, collect waste, deliver goods and transport people, all while collecting data about the city. How can we re-imagine urban infrastructures with cutting-edge technologies?

SHUTTERCAM PROJECT
The Shuttercam project investigates the effect of shutters, also called screening caps, placed over cameras. What if, as a passer-by, you can clearly see whether and when a camera is on or off? And what if you can turn off such a camera yourself, just like with a webcam? With the help of shutters, cameras are not switched on unnecessarily and Amsterdammers can feel safe and less spied on. The Shuttercam project is part of the Responsible Sensing Lab, a collaboration between AMS Institute and the City of Amsterdam.

SIMPLE SENSORS
Simple Sensors is a design system for sensors in public space. Values such as privacy and autonomy of the Amsterdammer are central to this innovative way of designing. Simple Sensors provide Amsterdam residents with insight into what and why something is being measured, how the sensor works and who uses this data. The Simple Sensors are visibly present in the public space and have playful elements that ensure that Amsterdam residents are invited to interact with them and check whether they are working as intended. The Simple Sensors are a collaboration between The Incredible Machine, AMS Institute & City of Amsterdam, and part of the Responsible Sensing Lab.

Jason Bruges Jason Bruges Studio

Interviewee **Jason Bruge** Title **Multidisciplinary Artist and Designer** Company **Jason Bruges Studio** Website **jasonbruges.com** Location **London, UK**

Jason Bruges is a multidisciplinary creator passionate about blending art, design, architecture and technology to create interactive experiences in physical space.
He often gives guest lectures on topics around art, architecture, design and engineering. His studio, Jason Bruges Studio, is known around the world for their innovative installations and interventions.
They create artworks and immersive experiences that are site-specific and architectural in nature.
Many of their works incorporate high-tech creative uses of light design. The studio team is made up of a wide range of specialists including architects, design engineers, structural engineers, interaction designers, computational designers, software developers, performers, artists and scientists. He emphasizes the importance of having both specialized and generalized skills in each team member. For example, he finds great value in designers who also have skills in production and project management or scientists who also have knowledge in computational design. This "T-shaped" skill set is what Bruges looks for in new team members, as it is beneficial when people can approach projects from multiple different perspectives at the same time. Additionally, Bruges noted that having experience creating artistic cultural works within the urban environment is a must; this hands-on experience of building and developing work is extremely valuable. He also looks for self-initiated projects outside of studying. Showing initiative and creativity outside of school demonstrates a curiosity about the world, which is attractive to this field of work. Bruges views technical skills as important for communicating ideas, but sees a deeper value in someone's critical and creative mindset.
He looks for new employees that question why they do what they do. His advice in developing this mindset in education is to always encourage students to place their work into the real world. This can be achieved by working on projects for clients. This pushes students to consider real-world logistics and methodologies and encourages them to talk to the people that their work would affect.

WHERE DO WE GO FROM HERE? (2018)
Described as a "cast" of robots, Where Do We Go From Here spans four different site-specific locations in the Old Town of Hull. Depending on the location, the six-meter-tall robots have been programmed to behave in different ways. Together, the installations act as "beacons" across the city, guiding visitors between locations.

VARIEGATION INDEX (2019)
A site-specific media artwork for British Land located in the reception area of 20 Triton Street at the Regents Place Campus. The artwork consists of 293 digital cells that cascade across the wall and expand the idea of plants giving feedback to their environment through photosynthesis. An array of plants, placed below the artwork, are discreetly being 'observed' via bespoke cameras which measure chlorophyll levels within the leaves then translate this into a real-time data visualisation.

"It's all about creating projects that could very easily end up in the real world."

A site-specific monochromatic media artwork focused on the eastern elevation of the Royal Route underpass. The shadows and silhouettes of the crowds passing through the space generate the resultant artwork. The canvas is light sensitive and with a multitude of shadows overlaying creates a palimpsest effect on the surface. The slotted metallic facade references the ebb and flow of the crowds entering and departing Wembley Park.

SEPTEMBER PLEIN
Refurbishment, Eindhoven, NL 2014-2020. UNStudio's refurbishment portrays a series of light-filled installations, which celebrate and complement the existing extruding windows on the north facade, whilst also serving to draw the gaze of passersby towards the building through interactivity.

Filippo Lodi
UNStudio

Interviewee **Filippo Lodi** Title **Associate Director, Senior Architect, Lead UNSx** Company **UNStudio** Website **unstudio.com** Location **Amsterdam, NL**

Filippo Lodi is the Head of Innovation and Knowledge Management at UNStudio, an architectural design firm with six locations worldwide. UNStudio's focus is on designing and building future-proof, user-centric, adaptive and resilient architecture, as well as generating knowledge around these topics in the built environment. Lodi has an educational background in architecture, engineering and business. He has experienced firsthand how the digitalization of the built environment has had an effect on how architects operate. For example, digital technologies have provided architects with a way to manage waste and materials, making for more sustainable designs. Additionally, digitalization has affected the way humans interact with the world around them; people expect to have seamless experiences everywhere they go, and architects must now consider this in their designs. Lodi sees it as imperative for education to begin teaching the digital and physical without differentiation. He notes that though both disciplines operate on systems thinking that the two use drastically different time scales; having cross-disciplinary people work together can help bridge this gap.

From his perspective, the most important skills for students in this field to learn are good communication and collective thinking. He pointed out the fact that many incoming architects have to be trained to think as a collective when they join the studio. As software and technical skills change overtime, the most important foundation for architects is to be able to work and make decisions in a team. When hiring at UNStudio, they look for people who have strong communication skills, can understand the built environment from diverse perspectives and have the technical skills to jump into the job.

"Education should be much more about working together to achieve objectives."

“We are at the cross link where the digital and physical will not be differentiated anymore.”

SOLISCAPE
Product designed by Ben Van Berkel, UNStudio for DeltaLight 2020. Soliscape is a toolbox of flexible components that can be used to create ‘lightscapes’ that respond to their user’s ever-changing needs and activities, through sensor-based technology.

RESET
Stress Reduction Pods, Milan, IT, 2017. Reset is a fully immersive, modular structure that features scientifically proven stress reduction methods in a playful and interactive way.

SAMSUNG GALAXY PAVILION
Pavilion, Rio de Janeiro, Brazil, 2016. UNStudio developed a series of interpretative experience designs that aligned with the brand’s vision. The mirrors “unpack” the colors of the Rio context and make the user the center of the experience.

STUDIO IMPRESSION

Digital Design at Aarhus University
Main Image: Photo from www.youtube.com/watch?v=TA65sZcyyv4
Project: Smart City in a Suitcase
Students: Magnus Johansen & Julie Neel
Photo by: Jonas Klitgaard

Metropolitan Analysis, Design and Engineering at AMS Institute
Main Image: Photo courtesy of Arjen Zegwaard
Project: Future Amsterdam Curbs
Students: Roberto Carlos Márquez Estrada, Neïla Ali-Chaouch, Gustaf Wuite & Titus Venverloo
Images courtesy of Titus Venverloo

Learning Community Urban Interaction Design at Amsterdam University of Applied Sciences
Main Image: Photo courtesy of Martijn de Waal
Project: 4D Citymaking
Students: Bianca Brandner, Claire Crawford, Martijn Fleurkens, Koorosh Gharehdaghi, Aljoscha Gleser, Jessica Livon & Lena Overkamp
Photos courtesy of Katy Barnard

Master MediaArchitecture at Bauhaus-Universität Weimar
Main Image: Photo by Tobias Adam
Project: Observatory Station (2020)
Students: Didem Zeynep Ödemis & Ksenija Tajsić
Supervisor team: Junior Professor Dr. Reinhard König, Dr. Sabine Zierold & Stefan Kraus
Photos by: Didem Zeynep ćdemis & Ksenija Tajsić

Master in City & Technology at the Institute for Advanced Architecture of Catalonia
Main Image: Photo courtesy of Alex Mademochoritis
Project: The Internet of Buildings
Students:
MaCTOl 2018/19: Natalie Adhiambo Ouma, Nathalie Barada, Sarine Bekarian, David Casanovas Tatxé, Raeshma Janardhanan Nair, Jarosćaw Kowalski, Luna Nagatomo, Mahsa Nikoufar, Polina Skorina, Maria Uporova, Wei Wei, Luyang Zhang, Xinyu Zhang, Haining Zhou
MaCTOl 2019/20: Kushal Saraiya, Elijah Munn, Andrew Saltzman, Alejandro Quinto Ferrández, Linara Salikhova, Rovianne Santiago, Jianne Libunao, Rashid Gilfanov, Jochen Morandell, Byron Esteban Cadena Campos, Akshay Marsute, Pawitra Bureerak, Michelle Carolina Rodriguez Ruiz, Aryo Dhaneswara.
Faculty: Areti Markopoulou & Alex Mademochoritis
Computational Design Assistant: Iacopo Neri
Physical Computing Assistant: Cristian Rizzuti
Digital Fabrication Assistant: Ricardo Mayor
Photos courtesy of Alex Mademochoritis

Media Art Nexus at Nanyang Technological University Singapore
Main Image: Photo courtesy of Ina Conradi-Chavez
Project: Macrocosmic Flux
Student: Kapilan Naidu
Photo by Quek Jia Liang Solomon

Master of Science in Urban Informatics at Northeastern University
Main Image: Photo courtesy of Jeanne Petrizzo
Project: Effect of Public Transport on Crime
Student: Bidisha Das
Image by Bidisha Das

Master in Artificial Landscapes at Pontificia Universidad Javeriana
Main Image: Photo by Jose Javier Alayon
Projects: Images by: Jorge Bohórquez, Carolina Andrade, Natalia Prada & Natalia Castro

Urban Interfaces at Utrecht University
Main Image: Photo courtesy of Nanna Verhoeff
Project: Walking-Thinking
Project Organizers: Jente Hoogeveen, Dr. Corelia Baibarac-Duignan, Dr. Sigrid Merx & Utrecht University
Photos from www.crum.sites.uu.nl/2021/03/26/walking-thinking/

Media Arts & Architecture Program at the University at Buffalo
Main Image: Photo courtesy of Mark Shepard
Project: SILICONE VALLEY (2018)
Student: Pinelopi Papadimitraki
Faculty: Mark Shepard (University at Buffalo), Bernd Rudolf (Bauhaus-Universität Weimar) & Jason Reizner (Bauhaus-Universität Weimar)
Photos courtesy of: Mark Shepard

Architectural Computation MSc/MRes at University College London
Main Image: Photo courtesy of Ava Fatah gen. Schieck
Project: Here but when: The archive across space and time (2020)
Students: Iliana Papadopoulou & Sathish Somasundaram
Supervisor: Ava Fatah gen Schieck, Associate Professor
Studio: Body as Interface| City as Interface

Lighting Design Training at the University of Oulu and Savonia University of Applied Sciences
Main Image: Photo courtesy of Henrika Pihlajaniemi
Project: Lighting Masterplan for Hartaanselänranta, Oulu
Students: Laura Ainali-Karjalainen, Matti Haikka, Jussi Hurskainen, Jaakko Peltonen
and Riikka Vuorenmaa
Lighting Master Plan: Photo by Jussi Hurskainen
Timber Rafting: Concept and visualization by Jussi Hurskainen; background images by Lars Ploug-Sørensen & maxpixel.net
Oulu City Fire: Photo by Jaakko Peltonen

MA Smart Urban Futures at the University of Plymouth
Main Image: Photo courtesy of Katharine Willis
Project: Crowdsourced Urban Planning
Student: Marcin Roszkowski
Images by Marcin Roszkowski

Master of Interaction Design & Electronic Arts at The University of Sydney
Main Image: Photo courtesy of Dr. Luke Hespanhol
Project: Theater For You (2019)
Students: Jiahao Chen, Jiaxin Li & Isaiah Hinkler
Photos courtesy of: Dr. Luke Hespanhol

Bachelor of Computational Design at UNSW Sydney
Main Image: Photo courtesy of Dr. Nicole Gardner
Project: Rustling Leaves Urban Interaction Design (2018)
Students: Jeremy Saguinsin & Kelly Ji
Images courtesy of Dr. Nicole Gardner

Carlos García Fernández - MediaArchitecture Student at Bauhaus-Universität Weimar
Project: Atmospheric Spaces
Photos courtesy of Carlos García Fernández

Waldemar Jenek - PhD Student at Queensland University of Technology
Project: Exploring Media Architecture Design in Virtual Design Environments
Photos courtesy of Waldemar Jenek

Zehao Qin - UCL Architectural Computation Alumni
Project: From Analysing Gaze to Creating Communication
Photos courtesy of Zehao Qin

Ger Baron - CTO City of Amsterdam
Project: Shuttercam Project
Credits: The Shuttercam project is an initiative of the Responsible Sensing Lab: a collaboration between AMS Institute and the City of Amsterdam. This project is being carried out by TAPP, Life Electronic and Marineterrein Amsterdam.
Photo courtesy of Tapp & Life Electronic_2021

Project: Simple Sensors
Credits: Simple Sensors is a sensor design system designed by The Incredible Machine, commissioned by the Responsible Sensing Lab.
Photo courtesy of The Incredible Machine

Project: Roboat
Credits: Amsterdam Institute for Advanced Metropolitan Solutions and the Massachusetts Institute of Technology.
Photo courtesy of MIT/AMS Institute

Jason Bruges - Jason Bruges Studio
Variegation Index (2019): Photo by James Medcraft
Shadow Wall (2019): Photo by James Medcraft
Where Do We Go From Here? (2018): Photo by: James Medcraft

Filippo Lodi - UNStudio Reset: Photo courtesy of Filippo Lodi
September Plein: Evabloem
Stress Reduction: oddproduzioni
Soliscape: Delta Light
Samsung Galaxy Pavilion: Joana França
Studio photo: Evabloem

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