
This is the **published version** of the bachelor thesis:

Aparicio Crespo, César. *Spaces for Experimentation and Innovation in Public Events : The Case of the UAB–Cruïlla Chair*. Treball de Final de Grau (Universitat Autònoma de Barcelona), 2026 (Gestió de Ciutats Intel·ligents i Sostenibles). 16 pàgines.

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Spaces for Experimentation and Innovation in Public Events

The Case of the UAB–Cruïlla Chair

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Abstract– This paper examines the potential of cultural and artistic events as infrastructures for experimentation and research, drawing on the case study of the UAB–Cruïlla Chair (2024–2026). The analysis compares two complementary environments: the university campus as a living lab and the Cruïlla Festival as an ephemeral city, exploring how each setting shapes processes of co-creation, technological validation, and the social perception of AI. Through a methodology grounded in direct observation and approaches akin to action research, the study identifies the social, creative, and organizational dynamics that emerge within these spaces, arguing that their combination constitutes a distinctive ecosystem for accelerating responsible innovation in the cultural and creative industries.

Keywords– artificial intelligence, living labs, ephemeral cities, cultural innovation, technology transfer

1 INTRODUCTION

The UAB-Cruïlla Chair is a public-private collaboration project for the 2024-2026 period, supported, on the one hand, by the Universitat Autònoma de Barcelona (UAB) and, on the other, by Barcelona Events Musicals, the company that organizes the Cruïlla Festival in Barcelona. Its main objective is to promote cutting-edge research in Artificial Intelligence (AI) within the context of Music and the Arts more broadly [16].

From this perspective, the Chair aims to foster knowledge generation, applied research, and technology transfer in AI, with particular attention to its role across three key dimensions: AI as a tool for artistic creation (*AI-CREATE*), as support for creative processes (*AI-SUPPORT*), and as a transformative element of user experience in cultural events (*AI-EXPERIENCE*). In particular, the Chair focuses its efforts on exploring the potential of AI for the development of cultural and creative industries, as well as its application in large-scale live events -ephemeral cities (subsubsection 2.2.1)- where attendees actively participate in the co-creation of AI-based solutions aligned with ethical values of sustainability and business development [16]. The Chair's activities are structured around four core pillars: basic, oriented, and applied research in AI; the promotion of talent and innovation within the industrial ecosystem; the development of citizen-centred innovation programmes; and capacity building, alongside the dissemination and

social impact of the results obtained (the focus of this work) [16].

The Chair's strategic partners include leading public research centres such as the Computer Vision Center (CVC) and the Institute for Research in Artificial Intelligence (IIIA-CSIC), as well as non-profit private entities linked to artistic and technological innovation, such as Barcelona Music Lab, Eurecat, and the Fundació Èpica Lab - La Fura dels Baus [16] (see section 5).

In terms of innovation, this project examines how to apply and test prototypes that are still in experimental stages within real-life environments such as festivals. In this regard, the UAB–Cruïlla Chair functions as a *TRL Elevator*, a space for the development of prototypes that transition from Technology Readiness Levels (TRLs) situated in laboratory or simulated environments to real-world settings, specifically reaching TRL 7 (see TRL level table in Appendix A).

Furthermore, the Chair is part of the ENIA Chairs Programme 2022, an initiative promoted by the Spanish Ministry of Economic Affairs and Digital Transformation through the Secretary of State for Digitalisation and Artificial Intelligence. This programme aims to strengthen the capacities of the university system in research, teaching, outreach, and innovation in AI, contributing to the creation of a critical mass of knowledge that enables the country to lead the development of this technology within an ethical, inclusive, and sustainable framework [28]. The National Artificial Intelligence Strategy (ENIA) is one of the key pillars of the España Digital 2026 agenda and the Recovery, Transformation and Resilience Plan. Its overarching objective is to promote the development, adoption, and responsible use of AI across all sectors of society, supporting scientific research, strengthening digital

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capacities, and fostering technology transfer to productive and social sectors [28].

The advancement of Artificial Intelligence research, and its widespread application as a tool for innovation across multiple fields, is transforming society at an accelerated pace. However, the potential impacts that AI may have on our models of cities and communities are not yet fully understood. Throughout the research process, the UAB-Cruïlla Chair has been present in a range of spaces with highly diverse urban and social contexts, allowing for a particularly clear observation of the role each can play in applied research processes. In conventional models of technological development, prototypes typically move from controlled testing environments to broader public spaces. However, in the case analysed -due to project management and availability constraints- the temporal sequence occurred in reverse: the only demonstrative prototype present in both environments was first introduced at the festival and later at the university campus. This study seeks to examine the importance of these two spaces within the context of research and knowledge transfer: *La Setmana de la Innovació* (Innovation Week) at the UAB, treated as a *Living Lab*, and the *Cruïlla Festival*, understood as an *Ephemeral City*.

2 OPEN EVENTS AS EXPERIMENTATION SPACES

2.1 Innovation Week

La Setmana de la Innovació (Innovation Week) at the Universitat Autònoma de Barcelona is an event through which the UAB showcases its innovation and entrepreneurship ecosystem, bringing the technologies and innovative knowledge generated on campus closer to society. In addition to making this ecosystem visible and connecting it with the business sector, networks of public and private investors, and knowledge centres, these annual sessions also aim to foster collaboration between researchers and entrepreneurs from diverse fields of expertise in order to enhance the competitiveness of their initiatives. All of this is pursued while promoting an innovative and entrepreneurial mindset, supporting female entrepreneurship, and, above all, with the objective of linking UAB research to the challenges of the B30 territory -a network of open innovation created to promote collaboration, economic development, and social cohesion in the area where the university is located, as well as among the numerous research centres situated on campus.

In this context, on October 22, the UAB-Cruïlla Chair organised the session *Arts, innovació i Intel·ligència Artificial* (Arts, Innovation and Artificial Intelligence), bringing together the worlds of art and cutting-edge technology. During the session, prototypes developed within the framework of the Chair were presented, alongside other performative prototypes that combined live performances, performing arts, and artificial intelligence (see subsection 6.1). The distribution of these activities across different campus spaces, together with their open and interactive nature, allowed attendees to experience and interpret the prototypes first-hand. In this way, the campus functioned as an experimental space structured around three

main settings: the UAB theatre, the *Plaça Cívica*, and the campus streets.

2.1.1 The Campus as a *Living Lab*

This logic of experimentation in a real-world environment aligns with the concept of *living labs*, understood as open innovation environments in which new products, services, or infrastructures are developed and tested in real-life contexts and in dialogue with societal needs [33]. This approach situates experimentation within everyday usage scenarios, enabling the observation of how users interact with innovations and how these are integrated into specific social dynamics.

Living Labs are a relatively recent concept, first coined in the 2000s [41], and have traditionally been configured as research environments. The concept is attributed to William J. Mitchell, who conducted one of the earliest experiences at the Massachusetts Institute of Technology (MIT) in 2003 [48]. The initial idea was to carry out R&D activities in real-life situations, allowing for the analysis of user responses to innovation [20].

Today, the *European Network of Living Labs* (ENoLL) defines them as “user-centred open innovation ecosystems based on a systematic approach in real-life communities and environments” [23]. This definition aligns with many others found in the literature. For instance, several authors [37, 33, 54, 49, 19] define *living labs* in a similar way, as physical regions or virtual realities where stakeholders form public-private-people partnerships—including firms, public agencies, universities, research institutes, and users—all collaborating in the co-creation, prototyping, validation, and testing of new technologies, services, products, and systems in real-world contexts. In this sense, *living labs* provide a platform for collective innovation and development, serving both as a source of information and as a testbed for novel products, services, systems, and solutions [1, 38].

Thus, the concept of the *living lab* entails several tensions and paradoxes: a central value proposition lies in its ability to conduct controlled experimentation (the “lab” dimension) while simultaneously enabling testing under real-life conditions (the “living” dimension) [49]. In such real-world environments, “messy” and uncontrolled co-creation is often a more accurate description of the activities that take place [18]. Yet, these co-creation processes are precisely at the core of the *living lab* concept: the convergence of diverse actors in a joint activity leading to mutually beneficial outcomes [51].

In line with this perspective, universities are increasingly collaborating with external actors to facilitate technology transfer and co-produce knowledge aimed at addressing complex and transdisciplinary societal challenges [27, 21, 11]. Whereas universities traditionally built dedicated laboratories to conduct experiments under controlled conditions, they are now transforming their own campuses into real *living labs*, using their buildings, streets, staff, and students as part of the experimental setting [49]. Universities are no longer spaces that **contain** laboratories; rather, they **are** laboratories themselves, embedded in co-creative relationships.

2.2 Cruïlla Festival

The second of the events analysed is the Cruïlla Festival. Originally founded in Mataró in 2005 under the name “Mataró, Cruïlla de cultures” [15], and renamed in 2010 following its relocation to Barcelona, the festival is characterised by its diversity and pluralism [8]. It aspires to function as a concert series encompassing multiple themes, marked by versatility and variety [32]. According to Jaume Collboni, Mayor of Barcelona, Cruïlla is distinguished by its “audience-friendly approach,” while “remaining highly aware of its impact on the city and its cultural ecosystem” [7].

Its very name, “Cruïlla” (crossroads in Catalan), refers to this meeting point of musical styles [8]: an eclectic mix of genres featuring both international and national artists of diverse scales and styles [55], while remaining a reflection of the city of Barcelona itself [32].

Beyond its artistic programming, and in light of global challenges related to environmental protection, festival culture has increasingly emphasised ecological considerations [47]. In this context, Cruïlla’s distinctly Barcelonian identity has positioned it as a festival committed to social and environmental values, integrating strategic partnerships into its organisational structure that reinforce this identity. Its collaboration with organisations such as Amnesty International -whose work attendees can support through donations when purchasing tickets- and Som Energia -a local cooperative that assesses the festival’s environmental impact and explores ways to reduce it- as well as its commitment to local suppliers and proximity-based products [34], reflect the festival’s innovative orientation. At the same time, the organisers acknowledge that “a music festival is one of the least ecological things there is” [32], and seek to address this through initiatives such as the Sustainable Festival Challenge: an innovation programme aimed at identifying startups working on environmental issues and supporting the festival in achieving new sustainability goals [34].

This commitment to innovation is also evident in the technological tools that have been implemented at Cruïlla over the years. One example is the management of audiences through proprietary Big Data and Business Intelligence systems, supported by artificial intelligence tools in their operational processes [14].

2.2.1 The festival as an ephemeral city

Cruïlla, like any festival, is above all an ephemeral artistic manifestation, conceived as a rupture from the city’s usual cultural activity in which it is embedded [29]. Since 1969, when the *Woodstock Music & Art Fair* took place in upstate New York, the number of music festivals and their societal impact has continued to grow. The following year, in 1970, a similar phenomenon occurred in Europe, when the *Isle of Wight Festival* in the United Kingdom surpassed Woodstock’s attendance, drawing more than 650,000 people [42]. This dynamic of growth -both in scale and impact- has persisted to the present day, where events, culture, and festivities have gained particular significance [31]. Festivals have become cyclical, short-term events that function as significant manifestations of temporary social communities and, when their scale and social impact are

sufficiently large, behave as structures akin to ephemeral cities [47].

The term **ephemeral city** refers to transient, fleeting, and temporary phenomena within an urban context [47], where the ephemeral becomes a “stage” that reinforces symbolic ties between inhabitants and their urban environment [52]. In the introduction to his book *Ephemeral Urbanism*, Rahul Mehrotra employs the concept of the *Kinetic City* to further illustrate this idea: a city in a constant state of change, where the uses of buildings shift relatively frequently [44]. The concept of the ephemeral city extends this perspective by focusing on even shorter-lived urban phenomena, intentionally designed from the outset as temporary installations and, therefore, conceived with a planned end from the very beginning [44]. These ephemeral cities reflect adaptability and often demonstrate how urban spaces can be rapidly configured and repurposed for specific purposes [6], offering opportunities for experimentation, innovation, and creative expression, as exemplified by the Cruïlla Festival.

Contemporary festivals, thus understood as ephemeral cities, can be seen as urban landscapes strategically planned for the production and consumption of experiences - what O’Dell and Billing termed “experiencescapes” [50]. According to Juncal [35], in the article *La festivalización de la experiencia*, festivals provide a means of creating flexible and adaptable settings capable of accommodating a variety of situations and programmes. These ephemeral events “transform urban space,” generating new functions and temporary uses [52], while also operating as complex social structures [47] that are subsequently dismantled with the same speed with which they were constructed. The introduction of temporary and flexible spatial concepts not only enables a more versatile use of urban spaces -producing their own places and creating their own references [59, 30]- but also highlights the need for greater citizen participation [47]. For this reason, music festivals can be considered incubation environments or laboratories of ideas that foster the development of innovative concepts in the field of urban planning [47]. However, their transformative potential extends far beyond this, significantly impacting social dynamics, cultural imaginaries, and the economic processes of the territory.

3 OBJECTIVES

The objectives of this study are framed within a threefold purpose:

- **To experience a living lab as a formative and methodological space**, fostering both the acquisition of practical skills and critical reflection on the process, as well as the understanding of key concepts and tools.
- **To analyse and document the approach to experimental spaces developed within the framework of the UAB-Cruïlla Chair**, so that it may serve as a reference and guideline for future projects.
- **To promote critical reflection on the social impacts of artificial intelligence**, with particular attention to the emerging European regulatory framework and the opportunity to transform legal requirements into instruments for learning.

4 METHODOLOGY

As noted in the introduction, the UAB-Cruïlla Chair has been developed through a series of prototypes and activities deployed in real contexts of interaction with different audiences. From a methodological perspective, the study of these processes has been approached through an empirical research strategy based on direct observation of the spaces where these experiences take place, with the aim of documenting the innovation process and analysing the social dynamics that emerge around it. This type of approach is particularly appropriate when the phenomenon under study cannot be separated from its social and cultural environment, as it allows it to be analysed “in depth and within its real-life context” [60].

The approach adopted is partially inspired by *action research*. As its name suggests, this concept places strong emphasis on “action” and was originally defined by Kurt Lewin as a process that combines analysis and action to better understand certain social practices, describing it as “a comparative research on the conditions and effects of various forms of social action” [39]. Subsequently, several authors have highlighted that this type of research involves studying social processes from within the contexts in which they occur, combining observation, reflection, and participation [36, 12]. However, the definition that most closely aligns with the methodology followed in this study is the one that describes it as a combination of diagnosis, action, and reflection [43], focusing on practical issues identified by participants that are both problematic and open to change [17], with the aim of achieving practical improvements, innovation, change, or the development of social practice, as well as a better understanding by practitioners of their own practices [61].

In general terms, the research has been based on three main types of data collection techniques: (1) observation of the activities and contexts in which the prototypes were developed, (2) the collection of testimonies from the actors involved in the project, and (3) the gathering of data derived from audience interaction with the proposed experiences. As highlighted by various authors in the field of social research, combining different sources of information allows for a more comprehensive understanding of the processes analysed, especially when studying complex phenomena developed in real-world contexts [13, 24].

However, the specific application of these techniques has been conditioned by the particular characteristics of the two research settings analysed. Although both are part of the same institutional framework, they present different social and organisational dynamics, requiring research strategies adapted to each empirical context. On the one hand, the *Setmana de la Innovació* (Innovation Week) takes place within the university campus environment and is primarily oriented towards the presentation and discussion of research projects, which has made it possible to observe knowledge transfer dynamics and the discourses that articulate the Chair’s innovation ecosystem. On the other hand, the Cruïlla Festival constitutes an open cultural environment in which prototypes engage with a general audience, making it possible to analyse participants’ experiences and their reception of the technologies presented.

The material generated through this fieldwork extends

far beyond the scope of the present report and can be accessed in this [GitHub repository](#) [5]. It includes the interviews conducted with the project’s main *stakeholders* — including artists, researchers, and representatives of the entities associated with the chair — the transcripts of the debates held during the *Setmana de la Innovació* (*Innovation Week*) (*Performaforums*), as well as a set of parallel analyses that have informed the insights and conclusions of this work but could not be included due to its length.

5 STAKEHOLDER MAPPING

Before explaining the prototypes and their experimentation across both events, it is necessary to understand which actors were involved in order to analyse how the UAB-Cruïlla Chair has been structured. These actors, ordered from most to least important, are the following:

- **Universitat Autònoma de Barcelona:** The UAB constitutes one of the main actors of the Chair, representing the academic dimension of the project and contributing 75% of the total funding (€600,000). In terms of the Chair’s content, its students contributed a large proportion of the analysed prototypes.
- **Cruïlla Festival:** The second main actor, described in [subsection 2.2](#), provided the contextual dimension during its 15th anniversary. Its main objective, as explained by its CTO David Rocasalvas, was to bring AI closer to the public and demonstrate its potential positive impact for users [4].
- **Computer Vision Center (CVC):** The CVC is a non-profit research centre with the mission of conducting cutting-edge research in the field of computer vision, promoting knowledge transfer to industry and society, and serving as a reference centre in knowledge creation [9]. Through its innovation unit, it has supported the development of two demos included in the Chair: *Visual narratives with generative AI* (briefly explained in the [GitHub repository](#)) and another that transforms the audience into festival stars ([subsubsection 6.2.1](#)).
- **Artificia:** As a platform for the promotion and dissemination of AI applied to the arts, Artificia acts as a meeting point for artists, researchers, and institutions working with AI in their creations, with the aim of ensuring that “academic talent becomes artistic talent capable of reaching a wider public, collaborating in the promotion, production, and distribution of projects emerging from academia” [4]. Although not one of the main partners, Artificia has been a key contributor through its support in setting up the *buzz* at the Cruïlla Festival and its management of the *Demo Day* events during the *Setmana de la Innovació*.
- **Barcelona Music Lab:** This private foundation places particular emphasis on technological innovation and on fostering connections among different stakeholders in a highly fragmented sector. Its ambition is to identify challenges, accelerate projects, and facilitate their growth [4]. Although its role within the Chair has been relatively limited, its main interest, according to its Director of

Strategic Projects, Doris Overmair, was “to understand what is being researched at the university level in order to connect research and innovation with the market” [4].

- **Fundació Èpica – La Fura dels Baus:** This centre for creation and research in advanced arts promotes horizontal collaboration between the humanities, science, technology, and society [25]. Its role in the Chair is linked to its interest in participatory and reflective knowledge dissemination and transfer, bringing significant value in both artistic and scenographic expertise.
- **Institute for Research in Artificial Intelligence (IIA-CSIC):** The IIA, part of the Spanish National Research Council (CSIC), was established with the aim of advancing scientific research in the field of artificial intelligence. It is currently an internationally recognised reference centre with expertise across multiple areas of AI, and participates in numerous technology transfer projects, particularly within the Catalan ecosystem [56]. Its involvement in the Chair reflects this trajectory, contributing extensive expertise and acting as a key link with other actors such as *Artificia* or *Barcelona Music Lab*.
- **Eurecat:** As the main technological centre of Catalonia and one of the largest private research organisations in Southern Europe, Eurecat works to be a benchmark in public-private cooperation in research and innovation, promoting technological and sectoral initiatives [22]. Within this context, Eurecat represents a key actor for the Chair in terms of expertise in technological innovation.
- **LAINAPP:** Emerging from participation in the *IA4ALL* programme, this *startup* offers a digital solution designed for large-scale events with the aim of optimising attendee itineraries [4]. Its main contribution has been to support the integration of the *Cruïlla* app with the project (*Cruïlla(AI)*), creating a link between the CVC and UAB students [4].

6 ACTIVATIONS IN THE REAL-LIFE SETTINGS

All the activities framed within the context of the Chair and described in this section are also contextualised on the UAB–Cruïlla Chair website [16].

6.1 Participation in the *Setmana de la Innovació - UAB*

The events and activities of the Chair were distributed across three distinct spaces, reflecting their differing nature. First, the presentation of the performative prototypes took place at the UAB Theatre, as part of four concerts/performances held throughout the day: *Historical Scores and AI*, *Candela*, *Harmon.IA*, and *Beyond Collapse*. Second, the Chair’s stand was located at the UAB *Plaça Cívica*, where 10 technological demonstrators were exhibited. Finally, within the *UAB Campus Circuit* - comprising three different locations across the campus- the CVC’s autonomous vehicle carried out eight demonstration runs in the photorealistic virtual environment *Town-UAB*.



Fig. 1: Concert of *Partitures Històriques*.
Source: own elaboration.

For this study, the analysis focuses on the first group of prototypes: the performative ones. This choice is guided by the overarching aim of analysing artistic events as spaces for transfer and innovation. The following section describes the four concerts that took place at the UAB Theatre on 22 October (see Appendix C for the programme).

6.1.1 Concert: Historical Scores and AI

The concert *Historical Scores and AI* constituted an applied demonstration of musical heritage recovery through computer vision systems, presenting previously unpublished scores by Catalan composers from the 18th, 19th, and 20th centuries. The performance was led by Francesc Garrigosa, conducting the ensemble *De Canedi Elegàntia*, featuring an extensive vocal and instrumental cast. The programme included four works: *Salve Regina* (Francesc Andreu), *Lamentation for Maundy Thursday* (Ramon Carnicer), *Salve Regina* (Josep Masvidal), and *O Sacrum Convivium* (Francesc Valls), as an initial sample of an expanding corpus.

The curatorial approach did not follow a strictly chronological order but rather a progressive construction of soundscapes. The selection responded to three criteria defined by Carles Badal: technical requirements to ensure a varied “raw material,” musicological criteria linked to the recovery of Catalan heritage (supported by IFMuC), and a broad chronological framework centred on modern Western notation [2].

Beyond the repertoire performed, the core research component of the prototype lies in the process of converting historical scores -often handwritten and featuring complex notation- into interpretable material. As stated by Dr Alicia Fornés, this project “is the result of nearly a year and a half of work by many people” and therefore does not correspond to a one-off production, but rather to a sustained and collective effort “by more than 10 people, not including the musicians” [2]. The institutional framework of this phase is linked to a national research project, DOLORES, developed within the Department of Computer Science and responsible for the transcription work, incorporating profiles beyond strictly computational fields, such as musicologists.

The approach is situated within the field of “document intelligence,” focused on automated reading in contexts

of limited data availability. The objective is not only to digitise, but to learn how to read complex typologies where current systems present limitations [2]. AI is conceived as a support tool for expert work, separating automated reading from editorial decisions: “what matters [...] is that it recognises the scores as they are written” [2], generating literal transcriptions as a basis for subsequent correction.

Technically, the system is based on Optical Music Recognition (OMR), addressing the complexity of musical scores as non-linear structures. Training requires extensive generation of *ground truth*, involving “hours and hours spent labelling more than 1,500 historical pages” [2].

The potential impact lies in the field of heritage preservation. According to Alan Capellades, representative of the *Xarxa d'Arxius Comarcals de la Generalitat de Catalunya* (Network of County Archives of the Government of Catalonia), musical heritage remains “an outstanding issue” in historical archives, with only 1,200-1,500 digitised scores out of a total of 64,000 [2]. The prototype could significantly reduce the mechanical work of transcription, as “there are not enough archivists in the world to undertake this task” [2]. Furthermore, Garrigosa highlighted the value of generating preliminary audible representations to support interpretative decision-making [2].

6.1.2 Performance: Candela

The performance *Candela*, conceived and performed by Maria Badji, was presented as an immersive audiovisual proposal combining flamenco-inspired soundscapes, proprietary technological development, and improvisation. The work was structured into four scenes conceived as progressive demonstrators of a single artistic-technological ecosystem, integrating body, sound, and lighting within an interactive environment. The staging, symbolic and dreamlike in nature, was constructed through reddish lighting, smoke, and circular projections, with a central figure articulating the whole through voice and movement.

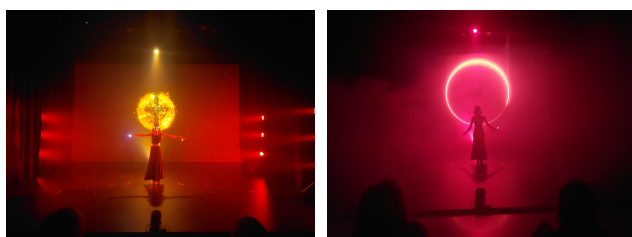


Fig. 2: Concert *Candela*
Source: own elaboration

Beyond serving as an aesthetic reference, flamenco functions as a control interface, “thanks to being a highly improvisational and arm-driven dance” [2]. Its gestural language adapts naturally to computer vision systems, transforming dance into “a tool for creating not only movement, but also sound” [2], where the body operates simultaneously as an expressive medium and a technological interface.

The project emerges from the intention to integrate the entire audiovisual ecosystem into a single environment. According to Badji, *Candela* is “an application [...]

that allows performing artists to create their own shows [...] without requiring technical knowledge” [3]. This simplification is embodied in the SILVA device, fully designed by the artist, which combines custom hardware, software, and computer vision.

On stage, a camera continuously analyses the performer’s body: “an AI that is watching me [...] and that I have programmed to perform certain actions when I move” [3], interacting in real time. Improvisation is central to the system’s logic, combining “pre-programmed elements” with others generated live according to movement, thereby expanding the scope of artistic decision-making [2].

The scenes display increasing levels of complexity: from an initial configuration based on voice and SILVA, to sound control through movement, and finally to the incorporation of reactive lighting in the third scene. The final scene returns to a more essential configuration. “Each of the scenes is a demonstrator of the potential [...] of *Candela*” [2].

From a performative perspective, the proposal highlights the potential of AI as an integrated control system for the stage environment. The combination of sound, light, and projection, together with body tracking, enables a single performer to modulate the entire space. AI does not operate as an autonomous generator, but rather as a reactive infrastructure that enhances artistic self-sufficiency, where the body activates and configures the stage environment itself.

6.1.3 Performance: Harmon.IA

Under the title *Harmon.IA*, two performances were presented: *Ghost Drums*, featuring Carles Marigó, and *ImprovIA*, featuring Ignasi Terraza. Both explored how AI can intervene in real-time musical improvisation as an active agent capable of proposing, responding, and shaping the artistic discourse.

In *Ghost Drums*, the focus was placed on the rhythmic dimension. The piano engaged in dialogue with an acoustic drum set activated by AI, generating shifting and unpredictable patterns that required constant reaction from the pianist. Marigó described the performance as “100% improvised, pure interaction” [2]. The conceptual inversion—an acoustic drum set “played by an electronic element” [2]—introduced a significant aesthetic shift: the AI did not imitate human patterns, but instead generated its own rhythms, diverging from traditional interpretative habits.

From a technical perspective, however, the system was trained on prior recordings, specifically from an album by Marigó himself with a drummer, in order to maintain a shared rhythmic language. Human mediation was described as that of “a stage manager or conductor rather than a musician” [2], regulating the system’s behaviour in real time. In this sense, the digital instrument was understood as “another musician on stage,” where the interest lay in “the human communication” generated around this new sonic agent [2], configuring an improvisation based on interaction rather than substitution.

A similar approach was adopted in the second performance, *ImprovIA*, where the focus shifted towards the harmonic and timbral dimensions. The piano was

expanded through sound layers generated in real time by a system that analysed the performance via a microphone. The improvisation was total—there was “nothing fixed,” although “the type of interaction” was defined [2]—and was structured through programmes that generated different types of responses, ranging from “synthesised sounds” to melodic proposals [2].



Fig. 3: Concert of *Improvia*.
Source: own elaboration.

These systems did not merely accompany the performer, but introduced directive material, adapting to changes in key or tempo and generating “surprising proposals” that “led you to places you would not have entered otherwise” [2]. Creativity thus emerged from the tension between human control and algorithmic suggestion.

This approach was defined as an “extended instrument,” whereby the system “generates other sounds related to what the performer is doing” [2], expanding its possibilities. From a research perspective, it is conceptualised as a “hyperinstrument” [2], extending the capabilities of the traditional instrument.

Overall, the project raises new questions regarding agency in improvisation, highlighting “the communicative dimension of these AI agents with the musician” and opening a debate on leadership within these hybrid processes [2].

6.1.4 Electronic Music: Beyond Collapse

The day concluded with *Beyond Collapse*, a performative electronic music show by David Hernández and DJ Huex (*DJ Ciborgs*), structured into several chapters that explored the relationship between humanity, technology, and the future. The proposal combined electronic music, live instruments, AI-generated visuals, and audience participation, creating an immersive experience whose narrative evolved throughout the performance.

From the outset, the show established a futuristic and dystopian aesthetic through the use of cyborg masks, distorted voices, and a stage atmosphere characterised by smoke, low lighting, and projections of fragmented urban landscapes. As the chapters progressed, the performance incorporated rhythmic variations and new elements on stage -percussion, bass, saxophone, and guitar- alternating moments of high electronic intensity with more melodic or reflective passages, linked to themes such as memory,

nature, science, or love.



Fig. 4: Concert of *Beyond Collapse*.
Source: own elaboration.

One of the most relevant aspects was the integration of the audience into the development of the performance. Through QR codes, attendees were able to participate in various decisions that directly affected the show, such as generating a poem using ChatGPT based on words proposed by the audience, choosing the language of a song, or selecting the theme of one of the chapters. These interventions introduced a variable dimension into the development of the performance, incorporating a logic of real-time co-creation.

In parallel, artificial intelligence played a central role in the visual construction. The projections combined predefined images with live captures from the stage itself, which were transformed in real time through algorithms until they became almost unrecognisable. This visual layer, managed in real time, accompanied the musical changes and reinforced the hybrid nature of the proposal.

Throughout the performance, AI was thus integrated at multiple levels -visual, participatory, and narrative- in constant dialogue with live music, performers, and the audience, generating a dynamic stage environment in which the different elements mutually influenced one another.

6.2 Participation in the Cruïlla Festival

Months before the *Setmana de la Innovació* at the UAB, the Chair was presented at the Cruïlla Festival through two of its demonstrative prototypes, located in the UAB *buzz* (Figure 5).

These two proposals were developed by the Computer Vision Center (CVC) and the Universitat Autònoma de Barcelona.

6.2.1 CVC Prototype

The first prototype presented at the Cruïlla Festival was led by the Computer Vision Center (CVC), with the main objective of transforming participants into the festival’s stars [4] through the generation of a personalised image. This image portrayed users as Cruïlla headliners, adopting the festival’s visual identity (graffiti style) and a selected pose (in this case, the options were DJ, guitarist, or singer). To ensure colour consistency across the generated images,



Fig. 5: The Chair's *buzz* at the Cruïlla Festival.
Source: own elaboration.

another prototype from the Chair was integrated into the process. This made it possible to guarantee consistent output quality regardless of lighting conditions or other external factors.

Figure 6 shows some examples of the images generated by this prototype.



Fig. 6: Images generated by the CVC prototype
Source: own elaboration

6.2.2 AI Students Prototype

The second prototype, developed by a group of students from the Bachelor's Degree in Artificial Intelligence at the UAB, also resulted in the generation of an artistic image of the participant. In this case, the image consisted of two elements: an avatar and a mascot, both linked to the user based on their personal preferences.

The process was structured in two phases. First, participants completed a survey about their musical preferences and some of the activities available at the festival. Based on these responses, the system generated a base mascot that was then customised through different visual elements, such as clothing, according to the user's profile. In the second phase, the avatar was created from a photograph of the participant. This image was processed using the same previously collected preferences, transforming the user into a stylised representation consistent with their tastes [4].

From a technical perspective, the generation of the mascot was based on vector comparison between the survey responses and the attributes of its different visual

elements (head, face, and body). An algorithm developed by the students selected the closest vectors, enabling the personalisation of appearance according to the user profile. For the avatar, *Stable Diffusion XL* was used in two stages: first, combining the participant's photograph with a *prompt* designed by the students [4] to extract relevant features; and second, using a fine-tuned model with reference images to reduce bias, which generated the final representation. Finally, the system assigned visual traits and elements, such as clothing, based on the most weighted preferences in the survey [4].

Figure 7 shows some examples of the images generated by this prototype.



Fig. 7: Images generated by the UAB prototype
Source: own elaboration

7 DISCUSSION

As a complement to the present discussion, all the materials that have served as the basis for the analysis—including interviews, transcripts, survey results, and visual documentation—are available in the project's [GitHub repository](#) [5].

The analysis of the case studies shows that cultural events do not function solely as spaces for technological exhibition, but rather as environments in which prototypes are tested through direct interaction with the public, generating research dynamics in non-controlled contexts. This experimental dimension manifests differently depending on the type of event, making it possible to identify distinct forms of knowledge production, in this case, around artificial intelligence.

In the case of the *Setmana de la Innovació*, experimentation is primarily structured around the initial testing of prototypes and the subsequent reflection on their performance. Many of them were presented for the first time in a public setting, placing the emphasis not so much on the final outcome as on the technical process itself. As Maria Badji highlighted, this context allowed her to present her project from this exploratory perspective: “Here, what matters is that people understand that this is

a prototype. It is not about everything working perfectly, but about showing research that is just beginning and considering what it could become” [2].

In this context, the audience mainly assumed an observational role, witnessing the development of proposals still in an open phase. However, the research value was not limited to this initial interaction, but extended to subsequent discussion spaces -the *performaforums*- where artists and researchers analysed the performative outcomes and explored future directions. In this way, the event generated knowledge not only through the execution of the prototypes, but also through critical reflection on that execution and its communication to the public.

Moreover, the academic and technological context of the Chair fostered a particular mode of reception. Questions and post-performance discussions frequently focused on technical aspects, system functioning, or the design decisions underlying the prototypes. The event thus became a space in which research was collectively discussed and interpreted, reinforcing the role of the campus as an environment for transfer between research, artistic practice, and the cultural industry.

By contrast, the Cruïlla Festival introduced a different logic, in which experimentation shifted towards observing the social impact of technologies under much more open conditions of use. Interaction with attendees -often without an explicit awareness of participating in a research process- favoured more spontaneous and less mediated responses. This characteristic is particularly relevant, as it enables access to forms of perception of artificial intelligence that are unlikely to emerge in controlled environments. Furthermore, the greater heterogeneity and scale of the audience amplified this dimension, configuring a context in which validation occurs less in technical terms and more in terms of social reception.

One of the most significant aspects emerging from this process is the capacity of these environments to reveal effects that were not anticipated during the development of the prototypes. As discussed in Appendix B, interaction with the public brought to light phenomena such as the hypersexualisation of women and the reproduction of racial stereotypes. This demonstrates that the behaviour of artificial intelligence systems acquires new dimensions when exposed to real-world contexts and larger, more diverse samples. These findings reinforce the need to incorporate open experimental spaces into technological development phases, particularly when applications have a direct impact on users.

Likewise, the observation of processes across both events suggests that these environments facilitate learning and iterative dynamics that are difficult to reproduce in laboratory settings. In some cases, developers attempted to introduce modifications to the prototypes based on initial reactions observed, indicating that experimentation extends beyond mere validation.

However, the research potential of these spaces is conditioned by several limitations. The absence of systematic measurement mechanisms makes it difficult to obtain structured data, limiting the ability to compare results or draw generalisable conclusions. These limitations do not invalidate the value of these environments as spaces for experimentation, but they do highlight the need to

develop specific methodological tools to better harness their potential.

In this regard, future research should focus on designing methodologies adapted to these contexts, capable of combining the qualitative richness of observation with more structured data collection tools. It would also be relevant to analyse the evolution of prototypes after their deployment in these events, in order to assess the real impact of this experimentation on their subsequent development. Similarly, further exploration of the social perception of artificial intelligence in cultural contexts would contribute to a better understanding of how factors such as the type of event, the audience profile, or the degree of participation influence its acceptance. Finally, extending this model to other urban and cultural contexts would help evaluate its applicability as a research strategy in broader domains.

8 CONCLUSIONS

This work is grounded in a hypothesis that, throughout the analysis, has been clearly supported: artistic spaces and cultural events can be transformed into effective environments for joint research and experimentation. Through the study of the UAB-Cruïlla Chair, it has been shown that artistic creation, artificial intelligence, and social interaction can not only coexist, but can also be integrated into a single process of knowledge production. In this sense, the results go beyond the description of a specific case, enabling the formulation of a set of conclusions that point towards a paradigm shift in the way research is understood in urban and cultural contexts.

- **Cultural spaces as real research infrastructures:**

The main conclusion of this study is that artistic spaces should not be understood merely as places of exhibition or dissemination, but as infrastructures capable of generating knowledge under real conditions. Both the university campus and the festival have demonstrated their capacity to function as environments where technological experimentation takes place in direct contact with users, integrating social, cultural, and contextual variables that cannot be reproduced in a traditional laboratory. This ability to operate under real conditions makes these spaces particularly relevant for contemporary research, where value lies not only in experimental control, but in engagement with the complexity of the environment.

- **The need to combine Living Labs and ephemeral cities as an operational model:**

The comparative analysis between the *Setmana de la Innovació* and the Cruïlla Festival makes it possible to identify a research structure based on the complementarity of two types of spaces. The university campus, as a *Living Lab*, fosters observation, technical mediation, and critical discussion within a relatively controlled environment. In contrast, the festival, understood as an ephemeral city, introduces a larger scale in terms of diversity and public exposure. Together, these environments form a continuous system in which prototypes evolve, are validated, and are confronted with different levels of complexity.

- **Artificial intelligence as a system of augmentation, not substitution:**

The analysed experiences clearly

challenge narratives that position artificial intelligence as a substitute for the artist. In all observed cases, AI functions as a system that extends human capabilities, whether as a tool, an interface, or a generative agent. Creativity emerges from the interaction between performer and technology, rather than from system autonomy. These events also enable the transfer of such insights, contributing to a more effective integration and public understanding of artificial intelligence.

- **The transformation of the performative space into a visible research device:** The performances analysed do not present finished outcomes, but processes in development. This implies a transformation in the status of the artistic work itself, which shifts from being a final product to becoming a medium through which research is made visible. In this context, the audience is no longer a passive spectator, but actively participates in the interpretation, validation, and reformulation of the prototypes. Knowledge transfer thus becomes a shared practice, rather than a unidirectional process.
- **The methodological value of experimentation in real-world contexts:** From a methodological perspective, this study confirms the relevance of conducting research in real-world environments, particularly in the case of emerging technologies such as artificial intelligence. Direct interaction with users makes it possible to incorporate variables such as perception, appropriation, or rejection, which are difficult to simulate. These elements are part of the phenomenon under study and are essential for understanding the social impact of technology in non-controlled contexts.

Taken together, these conclusions support the view that contemporary cultural events should be considered legitimate spaces for knowledge production. Far from merely applying technologies developed elsewhere, these environments generate their own forms of research through the interaction between technology, art, and society. The UAB-Cruïlla Chair exemplifies this potential and, at the same time, anticipates a model in which the city -even in its most ephemeral dimension- becomes a laboratory: an open, dynamic, and unstable laboratory where research is not shielded from reality, but is instead constructed in direct engagement with it.

STATEMENT ON THE USE OF AI TOOLS

During the preparation of this work, OpenAI's ChatGPT-5.5 was used as a support tool for the initial search for specialized literature, the improvement of synthesis, and the translation or reformulation of some passages. All generated or suggested content was reviewed, verified, and critically edited by the author, who assumes full responsibility for the final text.

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APPENDICES

A NIVELES TRL

TRL 9 System proven in an operational environment	Real-world environment
TRL 8 System complete and qualified through testing and demonstration	
TRL 7 System prototype demonstration in an operational environment	
TRL 6 System/subsystem model or prototype demonstration in a relevant environment	Simulation environment
TRL 5 Component and/or breadboard validation in a relevant environment	
TRL 4 Component and/or breadboard validation in a laboratory environment	Laboratory environment
TRL 3 Analytical and experimental critical function and/or proof of concept	
TRL 2 Technology concept and/or application formulated	
TRL 1 Basic principles observed and reported	

TABLE 1: Technology Readiness Levels (TRL) and validation environments.

Source: *Revista Economía Industrial* [45]

B IMPACTS BY GENERATIVE AI IN THE CRUÏLLA FESTIVAL

Advances in artificial intelligence have led to its widespread and democratised use in everyday contexts, both professional and recreational, reaching a heterogeneous population with diverse sensitivities. However, despite this evolution, AI remains far from perfect, and in its ongoing development, its lack of robustness in certain cases can give rise to conflicts in emerging human-AI interaction (HAI).

The advent of technologies such as generative AI has introduced a wide range of ethical challenges. First, these systems often rely on simplified reasoning when faced with highly complex realities; second, they learn from data derived from past situations, leading them to produce statistical inferences [46]. Addressing the risks and harms that may result is essential, not only because they have already had some impact and are likely to persist, but also because they may intensify and accumulate over time [40].

Throughout the development of this study, and as a result of the deployment of prototypes in the context of the Cruïlla Festival, several examples of *representational harms* - those in which systems reinforce stereotypes or render certain groups invisible [57], among other impacts- have been observed and analysed. These have been classified into four subgroups according to their area of impact: hypersexualisation of women, “adultification” of minors, racial stereotyping and ethnic distortion, and alteration of gender identity. Through their observation and analysis, this study aims to explain the challenges posed by the emergence of this technology, what should be considered when using it, and how it may be improved.

B.1 Hypersexualisation of Women

The hypersexualisation of women was one of the most evident and impactful issues observed during the research

conducted at the festival. This phenomenon, identified exclusively in female participants and in the images generated by the CVC prototype, involved both the amplification of certain body features and the removal of clothing, as noted by Coen Antens, a member of the CVC technical team. Despite the clear presence of these alterations, many participants themselves did not perceive the physical changes applied to their bodies. Age appeared to play a significant role in this perception: older participants experienced the impact more quickly and more negatively, whereas younger participants, in most cases, did not express dissatisfaction with the generated images (Figure 8).

The analysed results therefore indicate a very high level of risk in the evolution and democratisation of artificial intelligence, due to users’ inability to detect inaccuracies in representations of their own image. When transferred to human bodies, this may lead to discrimination, self-rejection, or the invisibilisation of any form that deviates from the aesthetic norms reproduced by AI.

B.2 “Adultification” of Minors

When focusing on younger participants, one of the harms produced by both prototypes becomes evident (although the CVC prototype remains the most pronounced). In this case, an “adultification” of all child participants was observed, with generative AI representing them in the same way as adults. This not only implied the aforementioned adultification, but also the hypersexualisation of girls, mirroring the treatment applied to adult women.

As Coen Antens acknowledged, the models were not designed to handle younger profiles. Despite this, these impacts were not perceived either by the minor participants themselves or by their accompanying adults, who in some cases, even when previously warned of this risk, downplayed it as something “fun and curious”.



Fig. 8: Perceived fidelity of the prototype outputs in the case of women, in relation to the presence of visual biases, disaggregated by age.

Source: own elaboration based on user survey data.

As evidenced by the responses collected in interviews conducted during the festival, this social group perceived the final images as accurate representations, without identifying any form of bias.

Once again, these findings regarding the inaccurate representation of younger participants highlight a significant risk for late childhood and preadolescent age groups. Self-perception is shaped during these developmental stages, and representations such as those analysed -affected by these types of biases- may negatively influence self-image. Not only do they “adultify,” but they also impose a homogenised standard of beauty across all body types, distorting the heterogeneous reality perceived by individuals and ultimately producing a dangerously uniform output.

B.3 Racial Stereotyping and Ethnic Distortion

When discussing racial biases in generative AI, reference is often made to cases in which artificial intelligence prioritises certain ethnic groups over others, favouring

representations of the Western white male [26] or reinforcing racial and gender stereotypes in professional representations [10, 58, 53].

In this case, racial stereotyping manifested through the exaggeration of traits -facial features, clothing, or stylistic elements- that stereotyped the ethnicity attributed to the participant. This impact was generated by the prototype developed by UAB students, which, upon detecting certain physical features or preferences indicated in the prior survey, assigned a set of “typical” characteristics associated with a specific ethnicity. Although present, this form of racial stereotyping was not among the most significant impacts produced by the prototypes, neither in frequency nor intensity, as reflected in participants’ responses regarding the perceived fidelity of the generated images, where no bias was generally identified (Figure 9).

In addition to this impact of racial stereotyping, the prototype also exhibited a certain degree of ethnic distortion, particularly in its initial stages. In this case, the bias mainly consisted of changes in skin tone or facial features, resulting in an entirely inaccurate ethnic representation. However, during the first day of the

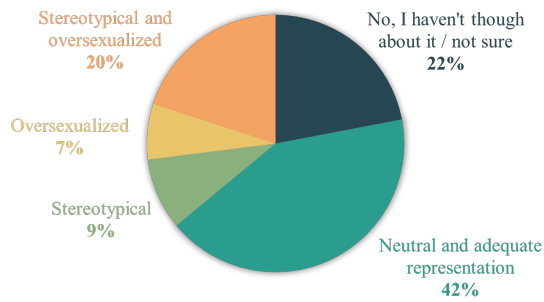


Fig. 9: Perceived fidelity of the prototype outputs in relation to the presence of visual biases.

Source: own elaboration based on participant survey data.

festival, the technical team identified that the issue could be attributed to human error, specifically the incorrect calibration of lighting conditions during image capture. This factor led to an excessively dark estimation of skin tone, often transforming participants into representations associated with African American ethnicity. Another element detected during the festival that contributed to this same distortion was dark, curly hair, which the AI system also associated with this group. Adjustments to lighting conditions significantly improved the results, although they did not eliminate distortions affecting other groups, such as Asian representations, which in some cases caused discomfort among participants.

B.4 Alteration of Gender Identity

The final impact identified during the festival was the alteration of gender identity, again produced by the UAB prototype. Although this form of representational harm was the least frequent, it was arguably the most impactful for those affected. As with hypersexualisation, this issue was observed exclusively among female participants. The most evident alteration was the introduction of facial hair (such as a moustache or beard), often accompanied by a masculinisation of facial features.

C PROGRAMME OF THE PERFORMATIVE PROTOTYPES AT THE INNOVATION WEEK - UAB



Setmana de la
Innovació de la UAB

PRESENTACIÓ DE PROTOTIPS PERFORMATIUS

Intel·ligència Artificial, arts i innovació

22 d'octubre
10:00 - 17:30h
Teatre de la UAB

09:40h - Obertura de portes de la Sala Teatre

10:00 | Benvinguda institucional

Benvinguda institucional i presentació de la jornada

- **Rosa Maria Sebastián**, Vicerectora d'Innovació, Transferència i Emprenedoria de la UAB
- **Fernando Vilarinho**, Director de la Càtedra UAB-Cruïlla
- **Jordi Herreuela**, Director del Festival Cruïlla
- **Javier Lafuente**, Rector Magnífic de la UAB

10:20 | Presentació Town-UAB

Presentació de l'entorn digital Town-UAB inspirat en el Campus de la UAB per l'entrenament del vehicle autònom

10:20h - Presentació del conveni UAB-CVC.

Fernando Vilarinho, Director de la Càtedra UAB-Cruïlla

10:25h - Presentació del Town-UAB.

Antonio López, Catedràtic i professor ICREA Acadèmia a la UAB i investigador CVC

10:45 | Concert: Partitures històriques i IA

Concert de partitures històriques inèdites de compositors catalans dels segles XVIII, XIX i XX, recuperades gràcies a un projecte que combina sistemes de visió per ordinador i musicologia.

10:45h - Presentació.

Fernando Vilarinho, director de la Càtedra UAB-Cruïlla

10:50h - Concert amb *De Canendi Elegancia*

- Ensemble vocal "De Canendi Elegancia"
- Director: **Francesc Garrigosa**

11:15h - Performafòrum 1

- **Alan Capellades**, Xarxa d'Arxius Comarcals, Generalitat de Catalunya
- **Carles Badal**, Departament de Musicologia, UAB
- **Alicia Fornés**, Centre de Visió per Ordinador, UAB.
- **Francesc Garrigosa**, Director de l'ensamble musical De Canendi Elegancia

12:00 | Pausa cafè

12:15 | Performance: Candela

Performance audiovisual immersiva que fusiona flamenc, tecnologia i improvisació.

12:15h - Presentació.

Fernando Vilarinho, Director de la Càtedra UAB-Cruïlla

12:20h - Prototip performatiu Candela.

Maria Badji, Ballaora experimental i enginyera de multimèdia i arts

12:40h - Performafòrum 2

- **Maria Badji**, Departament de Ciències de la Computació UAB
- **Fran Iglesias**, Fundació Èpica
- **Fernando Vilarinho**, Director de la Càtedra UAB-Cruïlla

13:20 | Dinar Networking

Posteriorment, visita guiada als prototips a la Plaça Cívica i viatges en el cotxe autònom.

15:00 | Performance: Harmon.IA

Interacció entre artistes i IA mitjançant dues propostes d'improvisació musical en temps real: Ghost Drum i ImprovIA.

15:00h - Presentació.

Fernando Vilarinho, Director de la Càtedra UAB-Cruïlla

15:05h - Concert Harmon.IA

- **Carles Marigó** i **Alex Tentor**: "Ghost Drum"
- **Ignasi Terraza** i **Philippe Salembier**: "ImprovIA"

15:45h - Performafòrum 3

- **Ignasi Terraza**, Músic
- **Carles Marigó**, Músic
- **Marco Schorlemmer**, IIIA-CSIC
- **Lisette Lemus**, IIIA-CSIC, Artificia
- **David Rocasalbas**, CTO del Festival Cruïlla

16:15 | Pausa cafè

16:30 | Música electrònica: Beyond Collapse

Final de festa amb DJ's ciborgs que fusionen habilitat humana i IA en un espectacle electrònic immersiu exploratiu de la relació entre humans i tecnologia.

16:30h - Presentació i breu introducció del procés.

Fernando Vilarinho, Director de la Càtedra UAB-Cruïlla i **David Hernández**, co-creador de Beyond Collapse

16:45h - Concert Beyond Collapse.

- **David Hernández**
- **DJ Huex**

17:30 | Fi de l'acte



10:45h | Concert: Partitures històriques i IA

Concert de partitures històriques inèdites de compositors catalans dels segles XVIII, XIX i XX, recuperades gràcies a un projecte multidisciplinari que combina visió per ordinador i musicologia.



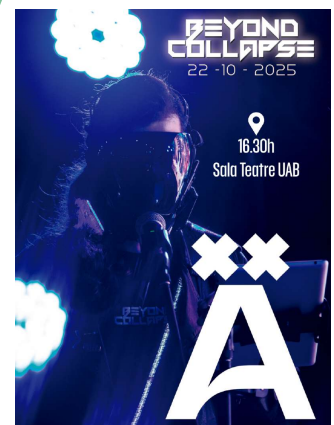
12:15h | Performance: Candela

Performance audiovisual immersiva que fusiona flamenc, tecnologia i improvisació.



15:00h | Performance: Harmon.IA

Interacció entre artistes i IA mitjançant dues propostes d'improvisació musical en temps real: ImprovIA i Ghost Drum.



16:30h | Música electrònica: Beyond Collapse

Final de festa amb DJ's ciborgs que fusionen habilitat humana i IA en un espectacle electrònic immersiu exploratiu de la relació entre humans i tecnologia.

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