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History-grounded Design Speculation as a Method for AI Impact Anticipation

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ABSTRACT

As Artificial Intelligence continues to permeate everyday life, concerns over its societal consequences are becoming increasingly pressing. Anticipatory practices have emerged as central to responsible AI development, offering ways to envision and mitigate potential harms. While policymakers engage with anticipation through forecasting and risk assessment, speculative design offers an alternative, more experiential approach to also fosters public engagement and critical reflection. However, most speculative explorations focus on future possibilities, often neglecting the continuum between these and past phenomena. In this pictorial, we argue for integrating historical perspectives into speculative design to enrich anticipatory work on AI. Through a week-long international summer school, we engaged with the legacy of phrenology and the work of Cesare Lombroso. Using this as a springboard for speculation, we illustrate that incorporating historical trajectories into speculative design can deepen understanding of current dilemmas around AI, but dedicated methodological resources are still needed to achieve this value.

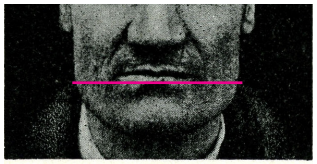


Fig. 9. Tipo comune (a grande mascella) - Omicida-ladro.

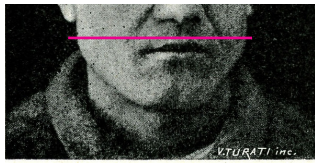


Fig. 12. Tipo comune (a grande mascella) - Assassino.

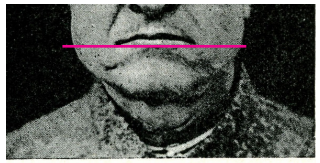


Fig. 11. Tipo comune (a grande mascella) - Assassino.

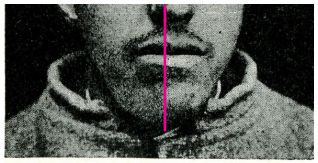


Fig. 8. Tipo comune (a lunga faccia) - Omicida-ladro.

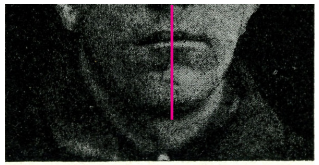


Fig. 7. Tipo comune (a lunga faccia) - Uxoricida.

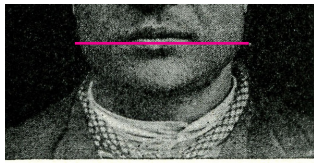


Fig. 10. Tipo comune (a grande mascella) - Omicida.

Authors Keywords
Speculative Design; Anticipation; Artificial Intelligence; Past-facising speculation; Responsible AI.

CSS Concepts
•Human-centered computing~Interaction design~Interaction design process and methods~Interface design prototyping•Social and professional topics~Professional topics~Computing education~Computing literacy

INTRODUCTION

As Artificial Intelligence (AI) gets increasingly embedded in a variety of products and services, a complex web of societal implications and unintended consequences also emerges. We increasingly witness cases of ***AI algorithms propagating or exacerbating biases, inequalities and injustice*** [56]. Facial recognition systems have been shown to exacerbate existing discriminatory policing practices, with minority communities facing a higher risk of being misidentified and falsely accused of crime [3, 4]. Generative AI characters are often found to be luring people into illusory relationships that create emotional dependency, and which can have tragic consequences–see the case of a teen who committed suicide, presumably encouraged by an AI companion [47]. And even when no dramatic consequences happen, the increasing exposure to AI tools, especially Large Language Models (LLMs), can have a subtle impact on millions of people [5]. Recent studies, for instance, have found that integrating AI in work pipelines, i.e., for coding and other types of knowledge work, can lead to a reduction of personal confidence [50] and lower enactment of critical thinking [40]. It is therefore of utmost importance to understand and mitigate AI impacts. For this, increasing effort is being put in by both academia, industry and governmental bodies to drive AI innovation responsibly.

A key aspect in these responsible AI innovation practices is ***anticipation*** [56] – 'assessing possible, probable, and desirable forms the future might take, create awareness and shared visions, and accordingly mobilise resources and elaborate paths in order to enable those futures that are beneficial for society' [38]. This practice, which prompts researchers and organisations to ask 'what if...?' questions [56], is key when it comes to AI innovation, as it offers a way to envision and potentially mitigate its possible unintended consequences [33, 46]. Anticipation has become so central to the actualisation of responsible AI development that recent regulatory actions from various countries feature it as an underlying strategy. To name one, the EU AI Act and its risk-based approach is grounded on the anticipation of AI consequences and EU AI experts explicitly call out regulatory bodies to put efforts on anticipating the potential (desirable and undesirable) disruptive effects of AI technologies as a way to address their societal and geopolitical implications [38]. Anticipation, then, holds great value for public sector organisations as it allows for forming expectations, mapping responsibilities, governing and strategizing, and influencing the future [61].

Alongside this value for regulatory bodies, the work of anticipation also has intrinsic potential for the public to collectively engage with and have a voice in the AI debate. In this vein, however, the work of anticipation takes radically different forms. If anticipation 'speaks' to policy-makers and strategic stakeholders through the language of trend scanning and forecasting, the general public may be better encouraged to engage with and grasp AI through informal translations of anticipation, such as ***speculative design explorations of AI***. In these, the exploration, speculation, and envisioning of various potential scenarios of what might happen [56] is translated into experiential and argumentative artifacts. Here, the focus is not much on anticipating most likely scenarios and outcomes and prescribing better courses of action, but rather rendering a critique and inviting the collectivity to engage with it. As a matter of fact, speculative design practices traditionally seek to criticise the status quo, explore alternate scenarios, and envision alternative futures [36]. As speculative design artifacts usually resemble mundane products or services and come embedded in a future environment, it lowers the barriers for people to engage with a topic and increases the possibility to include also people with diverse backgrounds [36]. These engagements, however, should not be seen as a way to gain feedback on a problem to ultimately solve it, but rather as a method of research, a 'means of asking questions and generating new connections' [28]. Thereafter, speculative design explorations offer a way to collectively engage with AI and explore the dilemmas we face about its implementations.

Most speculative design explorations around AI, however, ***limit their focus to imagining a possible future***. This is consistent with a decade-long Human-Computer Interaction (HCI) trend that looks at the future as more important than ever – something we must attend to [47] which, nevertheless, leaves unattended the fact that many of the issues we see materializing with AI deployment and adoption today are not all new [27]. Discrimination, uneven distribution of benefits and costs, job loss, deskilling, environmental costs, and data protection are all problems we have witnessed with the advent and popularisation of other technologies before. See the HCI debate around the environmental costs of Internet of Things (IoT) technologies [1], and data protection and mass manipulation scandals associated with social media platforms [10]. Several technologies before have brought unintended consequences similar to AI, leading to analogous forms of societal resistance. Some of these even have century-long precedents, such as the example of Luddism and resistance to work automation, now being taken up again as a way to resist the idea of AI inevitability [48].

In this work, we argue that these threads could and should be woven, understanding how impacts of technologies have unfolded in the past as a way to anticipate how these could play out in our present and near future with AI. We investigate what engaging with history can bring to speculative design explorations of AI, and what methodological implications comes with it. We report and reflect on a week-long summer school program as our experimental setting, in which we



visited the ethnographic museum of Cesare Lombroso, a famous phrenologist from the nineteenth century, as a key mode of engagement with history. Building on participants' feedback and projects' documentation, we draw conclusions on the values and challenges of history-grounded design speculations as a method for AI impact anticipation.

SPECULATIVE DESIGN EXPLORATIONS OF AI

With speculative design explorations of AI we refer to the body of works that critically engages with AI through speculative design -- 'a practice that uses design artifacts to open up and explore alternate possible and plausible futures as a way of generating discussion about what a preferable future might look like' [62]. These works are radically different from the ones that look at the generative potential of AI for supporting design speculation and exercising imagination (as in [39, 37, 35, 22, 19; 13]). These are rather interested in the distinctive capacity of speculative design to ***encourage critical reflections on emerging technologies and their impact***, as well as on the responsibilities of design in their regard [9].

In this vein, an increasing number of works employ speculative design methodologies to identify and contest AI design norms, acknowledge matters of inequity, and address the perspectives of the most vulnerable and underrepresented populations who may be affected by AI [29]. Marenko [45], for instance, argues for the need to engage in future-oriented design speculations that are grounded in the here and now as a way to escape from techno-determinism, dystopia and 'existential risk to mankind' visions of AI, and imagine a benevolent future where humans and AI co-evolve. Somewhat relatedly, Cohen [17] uses critical fabulation grounded on a reinterpretation of the Torah to contest dominant narratives around artificial general intelligence (AGI) arguing that these tend to advance a monotheistic bias around AI that promises universal salvation for all of humanity, and disregards alternative epistemologies that contain radically different conceptions of intelligence. Sharing a similar intention to contest and dismantle AI design norms, several works make use of speculation to overcome the normative structuring of data and algorithms that harm minority communities, such as LGBTQ+ people [53] and BIPOC youth [26]. Some of these works specifically focus on the lens of queerness to build the speculations and spark debate [23], such as *Mutant in the Mirror* by Turtle [60] and *Zizi: Queering the Dataset* [21], which make manifest the highly subversive power that these practices can have.

Along with contesting narratives and norms, speculative design explorations are also used to explore the practical and ethical implications of AI within specific areas of application. These, which may vary from the use of diegetic prototypes to investigate AI hiring practices [25] to using fictional videos for exploring public contestability of AI in urban areas [2] (just to name a couple), have the ultimate intent of providing the field with practical recommendations for the development of AI applications. What these speculative explorations of AI share is a general orientation towards the future, which is consistent with the need of the HCI field to anticipate and mitigate the impact of AI technologies in society. As Floridi [27] argues, however, many of the issues we see materializing with AI deployment and adoption today are not new. Discrimination, uneven distribution of benefits and costs, job loss, deskilling, environmental costs, and data protection are all problems we have witnessed with the advent and popularisation of other technologies before. So, *why isn't history explicitly addressed in speculative design explorations of AI?*

Past-facing speculations

A –slowly– growing body of research underscores the value of addressing history within speculative design practices, as a way to productively engage with 'the question of where and why change occurs,' which is seen as a prerequisite to the possibility of imagining alternative forms of change [49]. The past is not only now seen as valuable, but even acknowledged as an ***inextricable part of speculation***. As Lindley et al. [43] argue, even when exclusively targeting the future, the design space of speculation actually encompasses

the entire spectrum of 'time': past, present, and future possibilities alike. Individual perceptions of the past play a crucial role in determining what individuals interpret as possible. This is further underscored by Candy and Dunagan [14] who argue that '*any alternative future entails or corresponds to an imaginary taking in the entire chronology' and 'this is way history is and must be constantly rethought and rewritten*'.

Building on the same understanding, several authors have engaged with the past in their speculations, especially as a way to explore how alternative pasts could have translated into alternative configurations of the present. Auger [7], for instance, identifies alternate histories as a design strategy that, by choosing specific events that shaped the course of today's technological products and re-imagining them, allows to create a very poignant alternative present, where imaginary outcomes –speculative 'things' that live in it– instigate reflection on our current situation. Seminal, in this space, is the experiential scenario *The People Who Vanished*, by Candy and Dunagan [14]. Here, the authors were engaged in explorations of possible futures for the city of Phoenix. They started from the history of a local lost civilization to imagine an alternative present in which an archaeological discovery was made, materialized in a series of artificious material traces being found on things from different moments in history. Such a way of exploring speculative pasts has been further formalized as a pedagogical practice by Nooney and Brian [49], who value how this approach requires students to deeply engage with historical social, economic, and technological contexts, by creating documents from hypothetical historical scenarios.

As these works underscore, doing the work of speculation while engaging with the past holds great value as it 'demands contending possibility spaces and grappling with the question of why one sequence of events or decisions occurred in lieu of others' [49]. Nevertheless, we still see a methodological gap in this design and research space. Although the field increasingly acknowledges the value of engaging with history as an integral part of doing the work of speculation, current literature tends to limit its focus to exploring alternative pasts–counterfactual histories– as a way to consider diverse possibilities in the present. As we learn from the related field of future studies, however, engaging with ***factual*** history is essential to understanding future possibilities [54]. So, *why is this yet not a common practice in speculative design? What are the methodological implications of doing history-grounded speculations?*

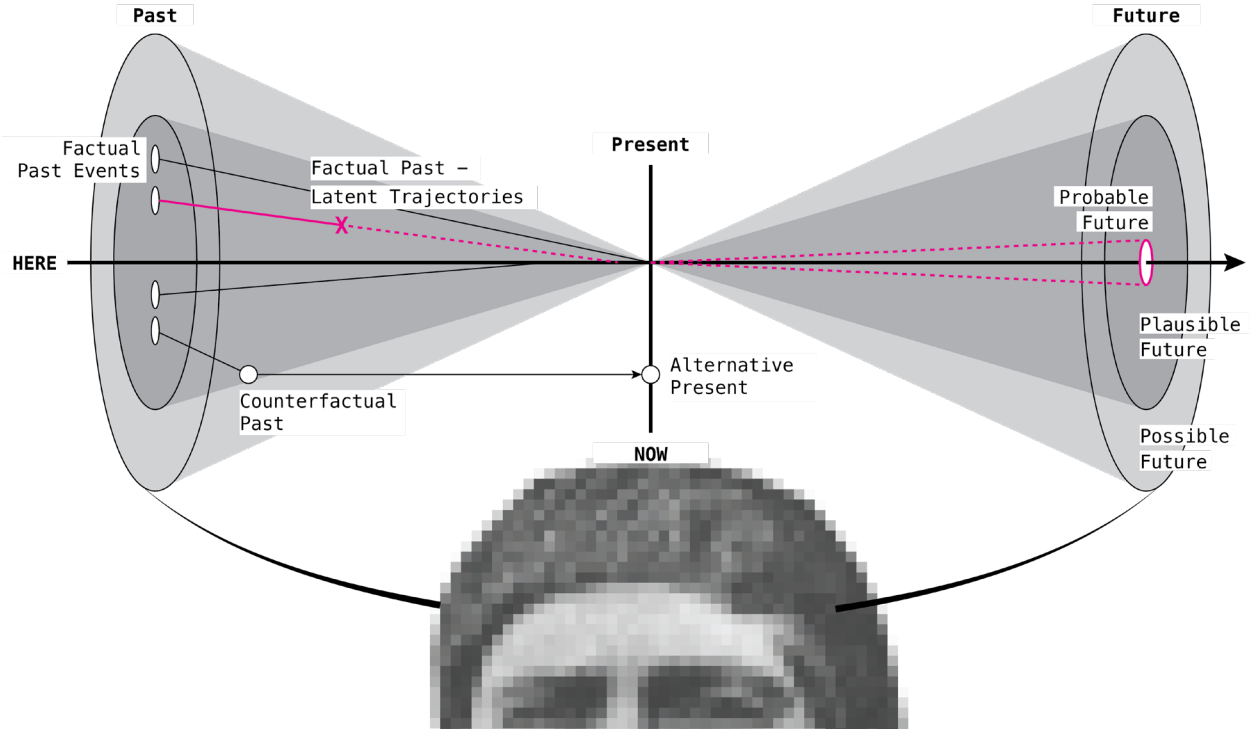
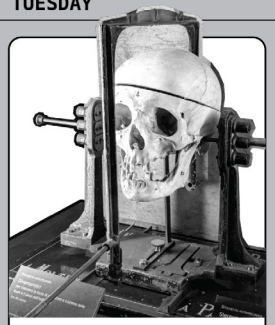
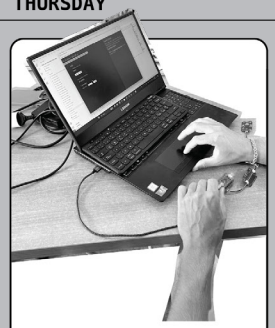
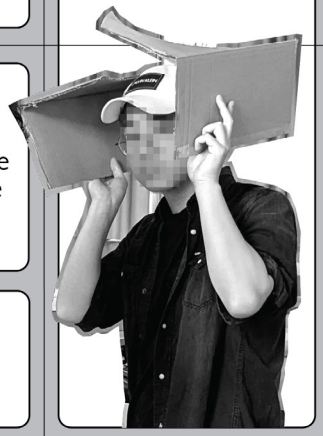


Figure 1. Inspired by the Auger's [7] illustration of 'alternative presents and speculative futures' and Lindley et al. [43] illustration of 'the nature of design fiction's speculations', this schema maps the space of Design Speculations as a continuum between past and future, where both factual and counterfactual past events should be addressed to understand trajectories that can lead to present and future possibilities.

AN EXPERIMENTAL SUMMER SCHOOL ON HISTORY-GROUNDED AI SPECULATIONS

This work engages with *history in speculative design explorations of AI as a way to ground critiques and anticipate possible impacts of these technologies in society*. Driven by the interest to explore what engaging with the past brings to speculative design explorations of AI and whether this can facilitate the work of AI impact anticipation, we run a week-long summer school on "***Prototyping Speculative AI***". The program was held at the beginning of September 2024, in Italy, and attended by master students enrolled in design and architecture programs from Italy, Switzerland, the Netherlands and China. As a key mode of engagement with history, we visited the ethnographic museum of Cesare Lombroso, a famous phrenologist from the nineteenth century.

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
morning	Lecture: Welcome to the summer school Lecture: Relational Design and AI	 **Cesare Lombroso Museum Visit**	Lecture: The value of prototyping Exercise: Introduction to the hardware framework	 Prototyping	 Prototyping	Setting up the exhibition
afternoon	Exercise: Playing with AI. Using teachable machine to get into the topic of classification Brief launch	Lecture: Speculative Design Exercise: from ideals to concepts 	Lecture: Translating human experience into observable metrics for AI Prototyping		Documenting: Report + Video	 Seminar + Exhibition

Program

The summer school lasted six days, with the first five days dedicated to lectures, exercises and project development, and the final day dedicated to showcasing students' projects in a small exhibition opened by a half-day seminar on *Design & AI*.

Inspired by the pedagogical structure illustrated by Bendor and Lupetti [9], the program combined lectures from an international teaching team (the authors of this pictorial) and project work, moving from grounding activities, scenario thinking, and speculative as well as performative prototyping. In addition to the lectures and project work, on the second day, the program included a visit to an anthropology museum from a local, internationally renowned, seminal scientist: *Cesare Lombroso*. The visit to the museum functioned as a grounding action: instead of asking students to do contextual and desk research about possible AI issues, we provided the case of Lombroso's research as a specific analytical lens through which students could critically approach AI. This historical example was chosen for its local popularity, as well as timely parallels with current critiques around AI and phrenology [41].

Participants

The program was attended by fourteen master's students with design (9) and architecture (5) backgrounds. The majority of students were enrolled at Politecnico di Torino (10), two at the Master in Interaction Design at SUPSI (CH), one at the Department of Industrial Design Engineering at TU Delft (NL), and one at the China Academy of Art (CN).

The main motivations for participants to join the summer school (which we learned through a brief introductory survey) were ***curiosity about the intersection between speculative design and artificial intelligence***, underlining how this domain can be an opportunity to expand their knowledge baggage about these topics, and a strong interest in acquiring new skills, especially in prototyping with both AI and physical computing platforms, i.e., Arduino, which sponsored the program. Despite the general interest of students towards AI, few had previous rich experience in engaging with these technologies in their projects. Most of them only had experience with the generic use of mainstream AI tools like ChatGPT and Copilot.

Materials

As part of the summer school's project development goals, we provided tools and materials to enable the participants to develop their speculations. This included lo-fidelity prototyping materials like everyday objects, cardboard, mirrors, fabric, and tape, a card set for ideation, as well as an interactive prototyping kit by Arduino, inclusive of hardware components and a digital environment with introductory resources for learning about Arduino's digital prototyping tools and platforms.

Ideals Cards. We provided a card set as a tool for student teams to use as a focus point for developing their speculations. Each card contains an ideal, along with a pixelated graphic that could be an interpretation of the ideal. The set included the ideals "Beauty," "Fitness," "Goodness," "Italianness," "Smartness," and "Purity," as well as two extra, empty cards in case the student teams wanted to pick a different ideal to work from. The choice of this set of ideals was exploratory, driven by an initial brainstorming session. We aimed to have a variety of ideals that might be easy to engage with given the visit to the museum and could provide a starting point for speculating.

Interactive prototyping materials. In addition to the ideal cards, we provided each student team with a kit for interactive prototyping, with the support of Arduino, a sponsor for the workshop. Each kit included an Arduino Nano RP2040, as well a set of sensors and actuators



Figure 3. Ideals cards.



Figure 4. Interactive prototyping materials

from the Modulino series. In addition to the base kit, we also provided access to a wider range of components for students to use as needed.

To complement the physical prototyping materials, we also introduced the students to various digital prototyping tools and platforms like Teachable Machine, p5.js and HuggingFace to enable the teams to develop prototypes that worked physically as well as digitally. These tools and platforms were introduced as part of the exercises during the week-long program.

HISTORICAL GROUNDING: CESARE LOMBROSO

Cesare Lombroso is a nineteenth-century Italian physician and anthropologist who's work was foundational in criminological sciences for its introduction of a biological theory of delinquency — born criminal theory— which was later discredited [55].

The reason behind the decision to engage with with the figure of Cesare Lombroso and his work was twofold. On the one hand, Lombroso is an iconic scientist whose work is peculiarly positioned in between the ***'rigor' of a scientific progress and erroneous diminishing of human experience and identity to something quantifiable*** [30], which we considered to be a powerful historical example from which it is easy to draw lines with current AI critiques (as a matter of fact, parallels have already been drawn in scientific literature [41, 57]). On the other hand, we chose the case of Lombroso as this represents an important component of the historical repertoir of Turin, the city where the summer school was run.



Figure 5. Portrait of Cesare Lombroso, Wellcome collection

This allowed us to leverage archival resources that were already available locally, and at least partially familiar to the students.

Cesare Lombroso (1835-1909) has been a doctor and become a public figure of great interest and debate thanks to his studies on criminology; he (his skeleton and skull) is part of a museum collection dedicated to his work which preserves hundreds of skulls of criminals [18], as well as other parts of the body, such as tattoos, and illustrates his approaches not only towards criminals but also towards people with mental illnesses, who were locked up in mental asylums at the time [31]. Lombroso's work has been seminal in the field of criminology, finding a place also on the website of the Italian State Penitentiary Police to illustrate the origins of the field. His theories, largely focused on the relationship between body parts, especially the skull, and criminal tendencies and mental health issues. His work contributed to the notion of criminal atavism: the idea that criminals are characterized by a biological regression to a primitive or subhuman type of human, in whom physical features are reminiscent of apes, lower primates.

Although these theories have long been criticized, contemporary approaches to machine learning and AI seem to have forgotten about such history. Face recognition technologies are increasingly used with applications and assumptions that either ***consciously or unconsciously perpetuate such erroneous beliefs around possible correlations between physical appearance and human identity and behavior***, revamping the pseudoscience of physiognomy once again [8]. In the same vein, a variety of machine learning applications looks and measures bodily—mostly facial—characteristics as a way to 'screen' populations, i.e., companies claiming to be using AI to estimate personality traits of job candidates based on their facial expressions [58]. Because of such clear parallels, Lombroso's work represents an ideal case to engage with.

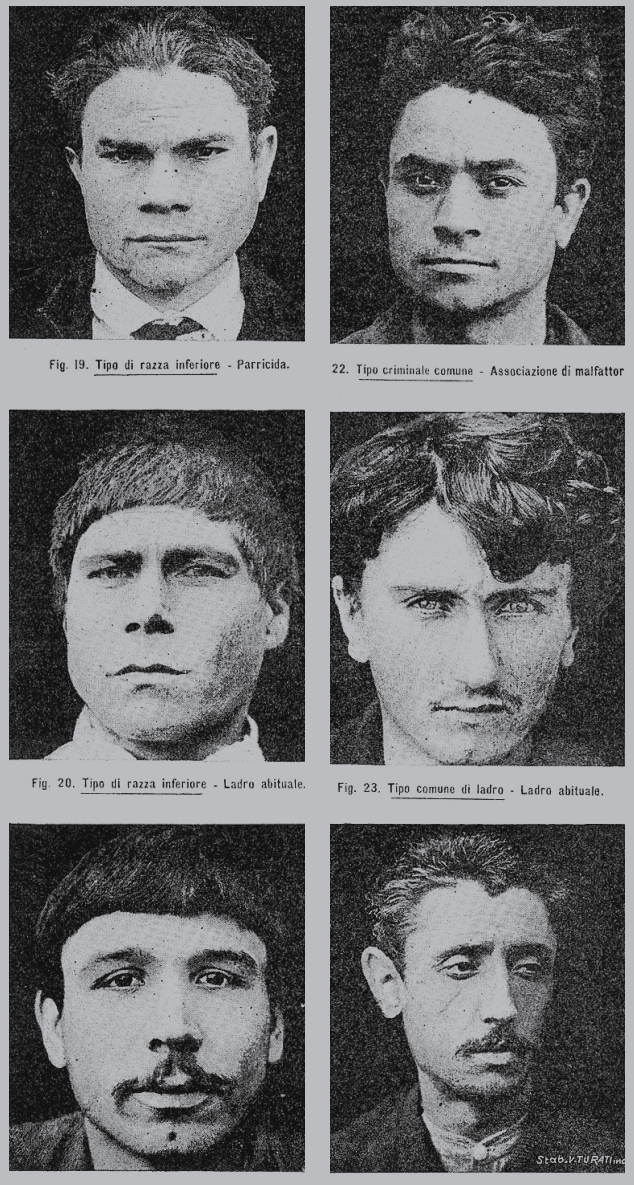


Figure 6. Portraits of delinquent man, from The Delinquent Man, by Cesare Lombroso, 1897.

SPECULATIVE AI PROTOTYPES

For each project, we provide photos, a general description based on the documentation that students themselves provided about their project at the end of the course, and a critical reflection on how each project renders a critical issue, also based on students' final report. We report the names of the student authors of each project, except for Lucifer, following the students' will to remain anonymous.

***The Italianometer*, by Davide Colletti, Marta Piatti, Matteo dell'Agostino, and Fiona Hajredini**

The Italianometer is a digital platform designed to support citizenship application procedures in Italy. The prototype is a totem for Italian post offices, where currently many citizenship application procedures happen in Italy. Students developed an interface prototype in Figma, where, using variables and components, a wizard operator can enter the interviewee's data and rate their "Italianess," acting as the AI. The iPad is remotely controlled with a Bluetooth keyboard to synchronize with the interview steps, while user-totem interactions utilize Figma components. To make the results as realistic as possible, the assigned scores update the charts and descriptions of the final document, which can be downloaded via a QR code after being uploaded to Google Drive by the operator.

The project engages with the topic of the ageing society, one of the main social challenges that Italy is facing today, and satirically focuses on how, in the near future, the country will need to bridge the gap between younger and older generations. The scenario imagined here, on the one hand, sees the country offering young individuals the opportunity for citizenship in exchange for active help in the sustainment and renewal of the country's social fabric and economy. On the other side, Italy's elderly population—viewed as the custodians of the country's rich cultural heritage, traditions, and values—plays a central role in assessing the requirements for these candidates. This evaluation process becomes a way for the older generation to pass on their cultural



Figure 7. The Italianometer

knowledge and ensure that Italy's identity is preserved for the future. As the citizenship application procedure should not just be an economic or demographic check, the *Italianometer* is designed as a tool for cultural preservation. It uses artificial intelligence to analyse non-verbal cues such as gestures, facial expressions, and body language to determine if applicants embody enough "Italianess" to be considered worthy of citizenship. This assessment method integrates the wisdom and intuition of the elderly with the efficiency and precision of technology. The AI system captures subtle, culturally significant behaviours that go beyond language and formal knowledge, tapping into the essence of what it means to be Italian.

***Moody the Smart Mirror* by Giorgia Cozzani,Tito Poles, Gautham Ravikiran, Meng Shisen**

Moody the Smart Mirror is a smart mirror that reads emotions in the user's facial expressions and responds accordingly to help users become more conscious about their emotions. The prototype consists of a mirror equipped with a webcam that feeds information to an AI system that analyzes user expressions and classifies them into 6 fundamental emotions: happiness, sadness, neutrality, surprise, anger, and fear. After recognizing these emotions, the mirror communicates with the user through a Bluetooth speaker, adapting its communication style based on the identified emotional state. This emotional classification serves as input for a pre-trained Large Language Model (LLM) that initially presents itself as kind and gentle, but gradually becomes more emotionally manipulative over time. The mirror employs various psychological techniques to manipulate users, such as shaming, negging, guilt-tripping, and providing backhanded compliments. The responses generated by the mirror are converted into voice messages through text-to-speech technology and played through the Bluetooth speaker, creating a more natural and spontaneous interactive experience.

The project engages with the concepts of emotional intelligence in machines and self-acceptance, which, in the AI context, represents a timely and relevant topic that society will face sooner rather than later due to the rapid development of artificial intelligence. The students imagine a scenario depicting a possible



Figure 8.Moody the Smart Mirror

future where smart devices fully perceive, evaluate, and understand human emotions. Moody uses AI to recognize micro-expressions and non-verbal signals to provide seemingly objective feedback that gradually transforms into passive-aggressive behavior, making users psychologically dependent on technological validation. This project underlines how technology can profoundly influence our self-perception and emotional identity.

***Lucifer,* by anonymous students**

Lucifer is a mask that analyzes users' aesthetic characteristics, gives a score based on facial imperfections and proposes possible product solutions or treatments to achieve a better score and improve one's beauty. The prototype consists of a physical mask where students simulate a 3D scanning process through the use of low-fidelity prototyping materials, such as LEDs, and a mobile interface that communicates the score to the end users. The AI analyzes the scanned face and compares it with predetermined beauty standards based on contemporary aesthetic norms, such as facial symmetry, texture, tone and health metrics (for example, skin health) without leaving any space for tolerance. After an initial analysis, the AI provides a score and customized advice on areas that, according to the AI, need improvement. This provides an apparently objective analysis of a person's beauty and makes users feel uncomfortable unless they achieve perfection. This project addresses unrealistic beauty standards, which are a widely discussed theme in socio-cultural discourse, and focuses on how technology in the near future could increase aesthetic pressures.

The designed scenario is a dystopian future where beauty standards are unreachable because of the ideal perfection established by the media and because of raising awareness on health standards, which often can be based on non-scientific data. On the other hand, this project explores how users are generally perceived as consumers in a cycle of buying and comparing, and suggests a future where AI will advertise products to help us achieve impossible ideals.



Figure 9. Lucifer

***VerifAI,* by Yue Zhu, Sara Ghione, Meng Shisen and Shadi Masihi Pour**

VerifAI is an AI-powered passport checker that people have to interact with when arriving at an airport and having to enter a new country. The project engages with the general expectation that AI judgment should be, unlike the judgment of a human being, completely free from social conditioning, prejudice and bias, thus objective and reliable. The prototype consists of a cardboard reconstruction of a passport checker machine, inclusive of a passport reader and a sensor on which to place the hand, along with corresponding light signals. The machine's interface is represented by a computer screen, where a presentation simulates the user experience. The user must follow the instructions on the monitor and answer questions, all while staring at the prominent camera placed above the computer. The camera is connected to a screen located below the cardboard model, simulating the sensor where the user places their hand during the simulation. These two elements are connected to a computer running an AI model from Teachable Machine, which can detect whether the person is maintaining eye contact with the camera. If the user is doing so, the screen will light up green; otherwise, it will turn red, simulating whether or not the test is being performed correctly. Additionally, a row of LEDs inside the hand-shaped slot, where the user places their hand, is connected to a Modulino system. This system is programmed to activate green or red LEDs by pressing two different buttons. These LEDs are manually activated at the end of the simulation to indicate whether the test has been passed or not, in accordance with what appears on the screen (the presentation is also manually controlled by a wizard, allowing the choice to end with an "access granted" or "access denied" slide). The objective of the prototype is to offer the user a realistic experience of both how much faster an AI-powered control process would be compared to current methods, and by attempting to make them feel the anxiety and stress caused by the total lack of control a person would have. Any hesitation would be detected



Figure 10. VerifAI

by the machine as an attempt to lie or hide the truth.

REFLECTING ON OUR ENGAGEMENT WITH HISTORY IN SPECULATIVE DESIGN EXPLORATIONS OF AI

We ground our reflections on two main resources: participants' feedback collected through a brief questionnaire at the end of the summer school, and the descriptions of the projects produced by the students to document their work, especially the sections on rendering a critical issue around AI. These were qualitatively analysed to understand whether engaging with a factual past example, the work of Lombroso in this case, was useful to students to grasp possible dynamics around AI, such as the often questionable unconscious logics behind AI implementations, i.e., AI as an objective judge using non-objective metrics.

Student's perceived 'utility' of engaging with history

Students' responses about the relevance of engaging with a historical perspective, and the museum visit more precisely, show diverging opinions. Most students (10 out of 13 who responded) acknowledged some value in the museum visit, and a few explicitly appreciated it for being inspiring, for being "especially on topic", and for encouraging them to engage with positivist thinking and how this is still alive today: "*it was useful to immerse ourselves in a world in which positivism towards progress was dominating, a feeling that still remains today. The inspiration is the one of questioning the application of the scientific approach to all the fields*".

Other students, however, reported less positive opinions. Many actually struggled to draw direct connections between the historical example and contemporary AI issues: "*The visit was interesting, however, I did not see the relationship or rather the inspiration for the project*".

Nevertheless, other students who also initially struggled to see such a connection found the lecture on speculative design and other explanations in class to be useful in clarifying it. Students' responses, then, suggest that while the museum visit offered a positive experiential engagement with a relevant historical reference, the pedagogical framing and explanations by the teaching team were essential to helping students derive meaning from the historical engagement.

Tacit embedding of Lombroso's analogue critiques

To further understand whether and how engaging with history holds value for students, we also looked at the reports where students were asked to describe how their projects render a critical issue. From this, we could notice a clear link to the work of Lombroso, especially in the way *projects conceptualized AI along its intricacies*. In the *Italianometer*, AI was described as a measurement precision tool that "*within the dedicated totem measures gesticulation, vocal emphasis, and facial expressiveness to evaluate the individuals' Italianness*". Similarly, in *Lucifer*, AI is framed as a tool of mathematical precision, with an explicit pointer, however, to the contradictory underlying practice of objectively judging a subjective matter as beauty—"*artificial intelligence attempts to define beauty through mathematical precision, transforming subjective aesthetic judgments into seemingly objective measurements*." The same controversy is also underscored by the project *Moody the Smart Mirror*, where students engage with the myth of AI objectivity and stress the manipulative power that comes with it. As students explain "*AI systems that measure human emotions through a set of supposedly "objective" parameters acquire a potentially dangerous, manipulative power, generating a power imbalance, especially when users perceive the AI as an omniscient, unbiased entity*." Last, to the same framing of AI as 'objective judge', the project *VerifAI* adds a further link to the work of Lombroso as it underscore the risks of overtrusting AI — "*AI is not a truth machine [...] Probably it would have a less prejudicated view on some situations, but it wouldn't be able to understand the complexity of other situations*."

In line with the results from the questionnaire, however, the reports also made evident how the projects were not only a 'translation' of the Lombroso's inspiration, but also and foremost an appropriation of the lectures' contents and other materials, i.e., ideals cards. This is particularly evident in the way the projects *render personal views on human problems*, as well as in the *use of peculiar design tactics to manifest the critiques*.

Prompted by the ideals cards, students deeply engaged with important societal issues, such as identity, intergenerational change, and community belonging (*Italianometer*), self-perception and mental wellbeing (*Moody the Smart Mirror & Lucifer*), and the complexity of understanding human life experiences (*VerifyAI*). It has to be noted, however, that although the cards provided students with a direction, these were neither presented with a positive or negative tone, nor were contextualized by the teaching team. The translation of the ideals into critical matters of public concern was a natural interpretation by the students, presumably encouraged by their understanding of speculative design methodologies presented in the lectures. Relatedly, the projects also made explicit use of critical design tactics that we know being peculiar to speculative design tradition. As students from the Italianometer explain, for instance, "*The Italianometer incorporates friction within its experience to recreate the typical processes of Italian bureaucracy. Each interviewee is asked general knowledge questions related to Italy, which serve only to allow the person to articulate their response. Meanwhile, the AI within the dedicated totem measures gesticulation, vocal emphasis, and facial expressiveness to evaluate the individual's 'Italianess'. The entire interview includes the presence of an operator at the desk, as well as the use of a tablet to answer questions, emphasizing the redundancy of Italian procedures*". Both *Moody the Smart Mirror* and *Lucifer*, instead, made use of escalating interactions and exasperation as a way to manifest the AI controversies. In *Moody the Smart Mirror* especially "*users will experience a progressive deterioration in the quality of the emotional bonding, ultimately reaching a state where they become emotionally insecure and increasingly dependent on the mirror's approval*". Finally, *VerifAI* makes induces users' discomfort as an intentional tactic to confront the public with the controversies that arise when we use AI

for objectively judging subjective human experiences. As the students explain "*The objective of the experience is to put the user in a situation of discomfort, as they do not know exactly what the machine is doing and are required to answer personal questions publicly, without having control over the situation*." Friction, redundancy, progressive experience deterioration, and discomfort are all design tactics that have largely been explored before as a way to allow the public to experience the tension of critical work, and ease the engagement with serious matters of concern.

DISCUSSION

Through our experimental summer school program on *Prototyping Speculative AI*, we engaged with *history in speculative design explorations of AI as a way to ground critiques and anticipate possible impacts of these technologies in society*. Our observations and analysis of students reports and feedback confirmed that there is a positive value in engaging with history as a way to facilitate the work of critique around AI. However, the path between engaging with history and appropriating it to run a contemporary critique of AI is non trivial. *Walking the walk of history-grounded speculative design explorations of AI requires dedicated processes and tools*, and invites us to question the very value of materializing critiques. More precisely, questions emerge not only on whether engaging with history is a valuable practice, but also on whether t*he making of speculative prototypes itself, with the related engagement with AI technologies, still also hold value*. And last, more than allowing us to answer the question of whether engaging with history can help us do the critical work of AI impact anticipation, *our experimental program led us to reconsider the very notion of anticipation*. In the following, we unpact each of these three reflections.

Walking the walk of history-grounded speculative design explorations of AI

In line with previous literature [49, 43, 14, 7], our work underscores that speculative design applied to AI, can gain richness and critical depth through an active engagement with history, particularly by turning to alternative resources such as museums. Unlike purely textual study, the museum offers an experiential form of learning, immersing students in artifacts and narratives that embody complex historical trajectories, and prompting a reflective exercise on how past innovations, failures, and ideologies connect to contemporary challenges in AI. This approach fosters connections not only with historical events but also with territories, local cultures, and institutions, promoting situated learning and amplifying less dominant, often overlooked, narratives. However, integrating the museum experience into speculative design practice proved to be methodologically challenging: students needed structured support to build meaningful bridges between artifacts and speculative futures.

As we discussed in Section 6, the lecture on Speculative Design and the Ideals Cards proved to be essential for students to translate what they learned at the museum and through the lecture on Cesare Lombroso, and their critical projects. This indicates the *need for more explicit frameworks and tools to help designers bridge factual history with contemporary issues of AI and technology more broadly*. Surely, much can be learned by the related field of future studies and forecasting and foresight methodologies (as in [59, 12]) but how to best support speculative design engagement with history to encourage critical reflections on emerging technologies and their impact remains a challenge for which more methodological contributions are needed. Furthermore, along with inviting us to develop modes of speculative engagement with history, our work also encourage us to question: *what constitute a good historical resource? Looking beyond museums, what are other resources of archived knowledge we could leverage?* Oral histories, local community archives, public monuments, and even archaeological sites—can all potentially offer valuable, embodied contexts that diversify and enrich the speculative design process, helping designers imagine AI futures rooted in plural, grounded pasts. But the modes for engaging with these diverse resources are all to be defined.

Further, along with this methodological complexity, *time* comes as a critical factor when walking the walk of history-grounded speculative design explorations of AI. Developing meaningful critiques, even when guided by dedicated resources and structured workflows, is already known to be a challenging tasks that generally requires first of all mindset shift and a familiarization with alternative design goals and tactics (from solving proiblems to raising questions, and from enabling seamless interaction to encouraging friction) [9]. Adding to that, encouraging an understanding of AI interventions as actions that are deeply situated in specific historical moments from which inherit and reshape social, political, and cultural dynamics over time, requires integrating historical research into design processes where past technological paradigms, failures, and societal reactions are scrutinized. This requires time—a temporal investment necessary for critical reflection and meaningful narrative development. This sits in clear contrast with the often fast-paced design environments, where speculation often risks of becoming superficial [62]. Meaningful critiques and speculative craft then demand a deliberate slowing down of design processes, where much effort should also be paid to familiarizing and unpacking the workings of the technology under critique. Without sufficient time, speculative practices risk losing their critical potential, reducing complex issues to simplistic provocations.

There is a value in prototyping… we saw it in action

Along with engaging with history, the very act of prototyping—also with electronics hardware— proved valuable in our summer school, offering students a hands-on way to demystify the black boxes of AI. The rise of what is colloquially called "vibe coding"—rapid, LLM-assisted programming that prioritises exploration over technical understanding—has certainly transformed how students approach these projects [24]. Critics often worry that this shortcuts the learning process, and there's some truth there [50]. Yet, what we observed was more nuanced: students happily used AI assistance to bypass technical roadblocks (as seen in *Moody*'s perceptive

mirror and *VerifAI*'s passport system), but the physical nature of their prototypes still demanded thoughtful engagement with both materials and ethical questions. Rather than getting trapped in syntax errors, students could redirect their energy toward the more interesting questions about their creations—maintaining what Lim et al. [42] describe as prototyping's essential role as a process of inquiry rather than merely artefact creation. Nonetheless, questions remain about the depth of technical understanding students develop and whether this new approach might obscure important learning about how AI systems actually function beneath their seemingly magical interfaces [44].

We couldn't help but notice an ironic historical parallel: Lombroso's fixation on skull measurements bears a striking resemblance to how early XAI researchers obsessed over attention weights and feature importance [51, 20]—both represent an excessive focus on mechanistic details while missing the broader sociotechnical picture. Today's vibe coding presents the opposite problem: students readily create working AI systems without fully understanding their inner workings. *Might we be swinging from one problem to another?* When questioned, students indeed struggled to explain what was happening "under the hood," but they excelled at articulating sociotechnical implications—physical prototyping pushed them to confront the social consequences of their designs. For example, *The Italianometer* wasn't merely code; it materialised algorithmic cultural gatekeeping in a way that made power dynamics hard to ignore. Nonetheless, since explainability is crucial for designers working with AI as a design material [63], we argue for consciously integrating moments of explanation and understanding into AI prototyping processes, striking a balance between technical comprehension and social impact analysis. Ultimately, what remains crucial is metacognition about what is being prototyped—students need a core-level grasp of computational principles when leveraging AI assistance. After all, your understanding of technology shapes what you think you can do with it—and using it, in turn, reshapes that understanding [34]. This connects to ongoing debates about AI literacy in education [15], where scholars emphasise that meaningful engagement with AI requires not only skilful use of these tools but also critical reflection on their capabilities, limitations, and societal implications. This middle path might help us avoid both the reductionism of Lombroso's era and the potential opacity of purely output-focused development.

Focusing the lens of History Grounded Design Speculation of AI

There are two particularities about working speculatively with AI that invite further reflection. Firstly, there is an ease with the material, that allows for a relatively fluid exploration of spaces. In the past, if one was - for instance - to speculate around bringing the ghost of Lombroso back to life to critique the effects his thinking had on the world, it would have been a work of research; twenty years ago, it would have felt like an impossible proposition, that might have inspired discussion between historians and NLP researchers, the very impossibility of doing it 'well' provoking a richness of discussion and scholarship. Ten years ago, a group of interested students might have painstakingly trained a character-level recurrent neural network on some of Lombroso's documentation, that would produce somewhat Lombroso-like language, but without strong coherence - it would be evocative, but mostly interesting for the strangeness, the reproduction of mannerisms, perhaps a strange idiolect that invents Lombroso-like words. Today, one can put some PDFs into a custom GPT, and have plausible conversations in a matter of minutes. This is a deeply double edged proposition - it certainly makes the practice of creating speculative artefacts more rapid. However, to some extent, the space for 'magic' is lost.

In the first two examples, it is the gaps that allow for thinking: the impossibility of a functioning system, or the strangeness of a babbling network giving cracks for researchers to dig into, or audiences spaces to *imagine their own kinds of possibility*. The ease of creating a generic, somewhat flat version of the idea is seductive, but is in tension with the *craft* of speculation, the reaching towards an impossible future. Where the mundane aspects of speculative artefacts took their power from pushing us to imagine a world in which the conditions were set for that proposition to be mundane, here the mundanity of AI explorations can suck the imagination out of the experience. The ease of creating makes it hard to keep alive the voids, elisions and leaps of imagination that truly support speculation. This is not an argument about craft for craft's sake; rather, it is that the deep engagement required of crafting practices is a rich source of the grit, the idiosyncracy, the strangeness that makes a good speculative artefact provocative and supports opening debate on propositions.

The second is the difficulty of finding something new when speculating with and around genAI. The ease of making a mediocre first version of things means that for almost any idea one can think of, there is a collection of companies already doing this. Of course, this is not a new idea; Leonardo's *Codex Atlanticus* (1489) predated flying machines by a few centuries. However the breadth and speed of the connection between possible speculations and startup culture seems particularly challenging. In 2013, the Black Mirror episode '*Be Right Back*' explored AI technology for reviving dead loved ones; in 2014, Wired featured eterni.me, a startup claiming to do exactly that [16]. Now, it's hard to do the work of *anticipation* in this space, due to the number of commercial explorations of this space. There is a way in which the possibilities of what can be enacted with this technology are outpacing our ability to imagine what could be done with it. If our publics have already seen the terrible start up version of an idea, *what then is the point of presenting a speculative version? Where can we find the 'bite' that drives engagement with the underlying ideas and implications?*

One idea to play with is that as the speculative horizon contracts towards the present moment, the work is less on imagining futures, and more towards a different reading of the present. The alternative possibilities, the implications, focussing particular strangenesses. It was

around seven years between Bridle's *Autonomous Car Trap* [11] and someone placing a traffic cone on top of a Waymo car's bonnet to immobilise it [32]. To some extent, this is where facing the past comes in: it prompts richness over novelty, tracing cultural and conceptual flows for nuance and context rather than requiring newness as the only lever to crack open the possibilities of thought.

CONCLUSION

This pictorial has explored the potential of integrating historical perspectives into speculative design practices for doing the work of anticipation of AI's societal implications. By engaging students with the legacy of *Cesare Lombroso* and facilitating hands-on speculative prototyping, we witnessed how historical grounding can deepen critical engagement and add depth to speculative explorations. Our findings suggest that history is not merely a source of inspiration or a warning but a vital resource for framing contemporary critiques of AI technologies as a result of existing, yet latent trajectories. However, this integration demands careful pedagogical structuring, dedicated methodological tools, and—perhaps most critically—time for reflection and synthesis.

The summer school showed that speculative design, when coupled with material prototyping and critical reflection, provides a powerful means to surface and interrogate the latent ideologies, biases, and cultural assumptions embedded in AI systems. Yet it also revealed the tensions between ease and depth in an era where generative AI tools make it increasingly simple to fabricate speculative artifacts. As AI's development accelerates and the boundary between speculative and real technologies narrows, the role of speculative design may shift—from forecasting distant futures to re-reading the present and revisiting the past. Ultimately, our work calls for a recalibration of anticipatory practices: one that does not seek novelty alone, but values richness, grounded critique, and historical continuity. Speculating with AI, then, becomes not just a question of "*what if*", but also of "*what has been*" and "*how did we get here?*" Facing forward means also looking back—critically, reflectively, and with intent.

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