

Article

What Might Be the Possible Conditions for Artificial Intelligence to Become Cultural Beings and to Develop a Cultural Heritage of Their Own?

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Abstract

As artificial intelligence (AI) as a technology becomes ever more pervasive in a wide range of human endeavor, from highly specialized technological and scientific applications to mass-market generative AI ‘consumed’ by the public, the question arises whether, over time, artificial intelligence could become cultural beings and, by extension, could develop a heritage of their own. This paper reopens a 2007 examination of whether future sentient robots, autonomous systems, or AI would possess culture, exercise cultural heritage and what conditions need to be met to reach that point. Based on two ‘conversations’ with two generative AI models, ChatGPT4.5 and DeepSeek R1, that examine the models’ ‘understanding’ of culture and heritage, we explored the various thematic and content connections these models make. This paper demonstrates the conditions, technological, attitudinal and societal that are required to allow for an AI culture to develop. That culture will look very different from that maintained by humans and will be based on very different, currently unknowable, value sets. This paper is novel, as it expands the conceptual framework of how we understand heritage from an anthropocentric perspective to one that includes non-human, ‘artificial’ intelligence now and in the future.

Keywords: artificial intelligence; cultural heritage; futures studies; mechanical culture; robotics; sentience; strategic foresight

1. Introduction

Culture has long been considered a uniquely human characteristic [1,2]. UNESCO, in its Universal Declaration on Cultural Diversity, holds that “culture should be regarded as the set of distinctive spiritual, material, intellectual and emotional features of society or a social group. It encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs” UNESCO [3]. When examined more closely, definitions of human culture differ, shaped by ideological perspectives. Definitions of culture can be arranged in seven groups: structure/pattern (culture in terms of a system or framework of elements e.g., ideas, behavior, symbols, or any combination of these or other elements); function (culture as a tool for achieving some end); process (focusing on the ongoing social construction of culture); product (culture in terms of artifacts with or without deliberate symbolic intent); refinement (culture framed as a sense of individual or group cultivation to higher intellect or morality); group-based power or ideology definitions that focus on power and group membership (culture in terms of belonging to place or group of people) [4].



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Cultural traits are subject to variation between individuals and selection where some traits gain dominance over others. Common to all definitions is that human culture is grounded in a range of cognitive and learning mechanisms through which such knowledge, behaviors, traditions or practices are transmitted between individuals and from generation to generation [5,6]. While cultures are not static but evolve, they are built on an intergenerationally transmitted common inheritance of seeing and interpreting the world and role of people therein [7].

Heritage, on the other hand, is that set of values, traditions, knowledge, objects, or places that a community or cultural group inherits from the past and which it deems as worth preserving and passing on to the next generation.

Both culture and heritage are traditionally human-centered. Some recent work has aimed at decentering the human in the heritage discourse by ascribing values to the interactions and well as life-forms other than humans [8]. This not only challenged the construct that humans are fundamentally superior to animals, nature, or machines but also recognizes that humans as shaped by networks of biology, technology, culture, environment. Furthermore, humans and technologies are intertwined, with technologies serving human needs while at the same time shaping human behavior [9,10].

Ethological research has shown that several animal species exhibit ‘culture,’ that is to be able to intergenerationally transmit learned behavior [11,12]. Developments in machine learning and artificial intelligence (AI) have begun to further challenge the human monopoly of culture. Arguments have been advanced for the existence of ‘machine culture’ [13], where ‘intelligent’ machines can mediate or even generate cultural processes of variation, selection and transmission. These machines utilize artificial intelligence to learn from environmental conditions and prior experiences in order to improve performance under variability and uncertainty. Furthermore, there is a growing body of work that examines the implications, ramifications and ethics of artificially sentient and artificially sapient entities [14–16], as well as artificially conscious beings, that is when artificial general intelligence develops a state of self-awareness [17,18]. While it is commonly agreed upon that artificial intelligence models are currently a long way off from a state of being artificially sentient, sapient or even conscious, artificial general intelligence is considered to be not that far away, depending on which developer one wishes to believe [19,20].

Cultural heritage has also long been considered a uniquely human characteristic. It emerges from manifestations of interactions between people and their environment, as well as among people themselves. Intangible cultural heritage stems from human relationships and is reflected in elements such as skills, language, folklore, customs, and traditions. The interaction between people and their environment produces tangible heritage in the form of structures and modified landscapes, as well as movable objects and artifacts of different forms and materials. The cultural significance that a community assigns to them defines these interactions as ‘heritage’ [21,22]. This significance inspires efforts to preserve both tangible and intangible heritage for the benefit of the current and future generations [23–26].

While culture and cultural heritage are often seen as uniquely human endeavors, there is an increasing body of work that shows that various animal species also exhibit intergenerationally transmitted learned (not instinctive) behavior that biologists consider ‘culture’ e.g., [5]. At present, however, the concept of heritage is limited to humans, as this requires both an understanding of the temporalities of past, present and future, as well as an ability to place a value on past and present practice(s) and a desire to see these maintained for the benefit of the present and future generations. Previous work examined the notion of whether future sentient robots could possess heritage, what that heritage might look like and whether, once sentient, robots might exercise control over this [27]. The work posited that humanity has an obligation to safeguard the human-designed and -built

predecessors lest it stand accused by future generations of sentient robots of not protecting their emerging heritage while it had the chance [28,29].

The recent release of generative artificial intelligence (AI) applications has seen a proliferation of papers that examine the role of generative AI in the cultural heritage field, e.g., [30–35], including the question how generative AI constructs the future of human cultural heritage and its role in this [36,37]. The future heritage of AI itself, however, has not seen much deliberation.

The aim of this paper is to reopen the examination of whether future sentient robots, autonomous systems or AI would possess culture, might exercise cultural heritage and, in particular, what conditions need to be met to reach that point. This paper has been written as a provocative deliberation and speculative exploration of the topic rather than a straightforward research paper with an established methodological framework. It will address the topic through two ‘conversations’ with two generative AI models, ChatGPT4.5 and DeepSeek R1, that both examine the models’ ‘understanding’ of culture and heritage and will explore the thematic connections they made. It must be stressed that, as terms, both ‘conversation’ and ‘understanding’ have severe conceptual limitations when referring to generative AI models. Generative AI is subject to algorithmic biases and is also unable of genuine reflection and insight, as will be discussed in the next section. It is apposite, however, to use both terms as shorthand in this paper.

2. Background to Generative AI and Large Language Models

As this paper draws on responses provided by generative AI, some background needs to be provided. Generative AI employs machine learning algorithms to semi-autonomously create new content, including text, images, music, and various other media formats. Large Language Models, a specific subset of generative AI, have become widely recognized for their ability to collect, analyze, and summarize information from a broad range of sources. Built on advanced deep learning techniques using transformer architecture, they can produce coherent, context-aware, and human-like answers in response to prompts [38,39]. With guidance from human feedback, they have learned to predict successive words by aligning statistical trends with linguistic rules and semantic meaning. The complexity and richness of their output depend on the volume and diversity of their training data, while the accuracy and relevance of their responses are influenced by factors like the dataset’s cut-off date, the quality of the dataset, and the model’s ability to access real-time information from the internet.

Despite their sophistication, they are susceptible to logical flaws (‘hallucinations’), including reversed or contradictory reasoning [30]. These models also reflect inherent cultural, political, geographical, ethnic and gender biases stemming from both the data they are trained on and the algorithms that underpin them [40–47]. Generative AI tools lack the autonomous creativity, genuine reflection and insight as well as the independent and imaginative thinking that is necessary to create forecast scenarios grounded in strategic foresight methodologies [48,49]. Moreover, while they can summarize the concept of time, they are unable to meaningfully apply the concept of time itself [50].

None of this does, however, render them unsuitable for scenario development. Depending on the complexity and specificity of human-authored prompts, generative AI tools can sift through and condense large volumes of text and generate complex images and music [51–53]. Since their responses are based on statistical probabilities and patterns, such models can serve as an open-ended brainstorming tool as they are capable (in a non-sentient sense) of generating novel combinations and emphases which may lead to a fruitful examination of possible futures [36,37,54,55].

For this paper two different generative AI models, ChatGPT4.5 and DeepSeek R1, were tasked with five specific, yet non-biased prompts, to provide scenarios on the conditions necessary for AI to become cultural beings and to develop a cultural heritage of their own. Following a section on the methodology espoused, the paper will extract, and summarize, the key points of the responses to each of the five prompts. An extensive discussion section will then analyze and critique these scenarios and place them in the wider context of culture and heritage.

3. Methodology, Conventions and Definitions

3.1. Methodological Framing

The research methodology in this paper is grounded in futures studies. The common approach of strategic foresight develops scenarios based on known trends, environmental and horizon scanning [48,56,57]. This approach is primarily useful for the explorations of short term and medium-term futures but unsuited for long-term futures. As the topic under discussion may entail a longer time horizon, this paper uses the speculative futures approach [58].

The responses of the language models have been analyzed and interpreted through the lens of a heritage professional with over three decades of research and teaching experience in applied heritage management and heritage theory [59,60], as well as futures studies [25,28,61].

3.2. Generative AI Models and Prompt Design

ChatGPT4.5 is a multilingual, multimodal generative pre-trained transformer released by OpenAI, Inc. (San Francisco, CA, USA) in February 2025 [62]. Reputedly, the ChatGPT4o training data set includes information until October 2023 [63]. In late January 2025 Hangzhou DeepSeek Artificial Intelligence Basic Technology Research released its generative AI model, DeepSeek R1, in February 2025 [64,65] which is designed for logical inference, mathematical reasoning, and real-time problem solving [66]. As of this writing, the specifics of the training dataset used for DeepSeek R1 remain undetermined.

A ‘conversation’ with a large language model is an interactive session (‘chat’) comprised of a sequence of user-defined prompts to which the language model provides a response based on statistical probabilities and patterns (see above). For its responses, the language model draws on the text of the direct prompt, the texts of preceding prompts in the same session, and the interactions in previous sessions (unless deleted) to extract the user’s intent and shape a response. Therefore, the specificity and wording of a user’s prompt will influence the nature of the model’s response subject to ethical guardrails imposed by the model developers [67]. To avoid that the author’s ideological and conceptual biases might influence the responses, (i) all prompts used for this paper were specifically and purposefully written in a non-constrained fashion while using neutral language and (ii) all previous chats and interactions with ChatGPT/DeepSeek R1 were deleted to ensure a clean and unbiased starting point. Any biases in the responses are derived from biases that are inherent in the algorithms and training data. Each interactive session, if started with all previous interactions deleted, will generate an individual response. Other work has shown that while the responses in each session are unique in wording and sequence of points addressed, responses cover most, although not all, of the same content [37].

3.3. Conventions

The ‘conversation’ with ChatGPT4.5 was carried out on 23 February 2025 at 05:15 GMT and the ‘conversation’ with Deep Seek on the same day at 19:03 GMT. The full texts of the ‘conversations’ with ChatGPT (CG) and DeepSeek R1 (DS) drawn on by this paper,

have been documented according to an established protocol [68] and have been archived at the author's institution [69].

This paper contains sections of text that have been quoted verbatim from the responses provided by ChatGPT and DeepSeek. In common usage, direct quotes are enclosed in parentheses, i.e., “. At the time that convention was developed all quoted text was generated by humans. To delineate text that is quoted from responses provided by generative AI, this paper proposes and adopts the convention to use double-brackets as enclosing symbols: i.e., 《 》 .

3.4. Analysis

For the purpose of analysis, the conversations are treated as empirical artefacts akin to interview transcripts. Given that two ‘conversations’ form the basis, these were not formally coded but common themes extracted and interpreted.

3.5. Definitions

Before embarking on a synthesis of the conversations with ChatGPT and DeepSeek, it is necessary to briefly describe the three technological concepts of robots, autonomous systems and artificial intelligence (henceforth ‘RASIA’), the future heritage of which the two generative AI systems were to evaluate, as well as several concepts which the integral to the discussion.

Artificial Consciousness is the theoretical development of artificial intelligence that not only exhibits intelligent behavior but can experience awareness of its own existence, thoughts, and actions, bridging the gap between programmed algorithmic responses and genuine phenomenological experiences.

Artificial General Intelligence refers to a theoretical form of artificial intelligence that possesses the ability to understand, learn across diverse domains, and apply its intelligence to any intellectual task that a human being can [70].

Artificial Intelligence is a collective term that encompasses computer systems able to perform tasks normally requiring human intelligence, such as learning, visual perception, speech recognition, reasoning, decision-making, and translation between languages [71].

Artificial Sapience refers to the theoretical ability of an artificial system to demonstrate human-like wisdom, including advanced reasoning, moral judgment, and contextual understanding, enabling it not only to process information intelligently, but also to make nuanced decisions informed by experience, ethics, and abstract thinking.

Artificial is the hypothetical capability of an artificial system to experience subjective feelings and sensations, such as happiness and pleasure as well as pain and suffering [72].

Autonomous systems are systems that can operate and make decisions with minimal or no human intervention, encompassing technologies such as self-driving cars or drones, relying on AI, sensing and computing to interact with the real world [73].

Machine culture refers to the evolving domain in which intelligent machines not only mediate, but actively generate cultural traits (altering the variation, transmission, and selection processes of human culture) by producing novel artifacts and serving as cultural models whose outputs can be learned by, adopted by, and preserved within human populations, thereby reshaping human cultural evolution [13].

Robots are machines or devices that perform tasks subject to direct human, programmed controls with human interaction and supervision, or completely autonomously based on programmed routines.

Technological singularity refers to a theoretical moment in the future when technological advancement by self-improving artificial intelligence surpasses human understanding, becoming uncontrollable and irreversible, with unpredictable effects on human civilization [19,74].

3.6. Limitations

Because the responses of large language models synthesize information based on statistical patterns learned during training, the seemingly human-like, coherent and context-aware are subject to three fundamental biases. One is user bias, the second is algorithmic bias and the third is source bias.

User bias manifests itself the wording of the prompt issued to the generative AI systems and in the interpretation of its response. As generative AI systems have been trained to create a seemingly human-like interaction, they will take cues from the prompt to tailor their responses to the user's interests, standpoints and values subject to ethical guardrails imposed by the model developers [67]. These represent an extension of leading questions and other interviewer biases the effects of which are well established in social science research [75–77]. Likewise, the user bias that will influence the interpretation of the generative AI responses does not differ conceptually from interpreter's bias in social science research [78,79].

Algorithmic bias occurs where a generative AI system consistently produces outputs that unfairly advantage or disadvantage certain people, groups or viewpoints. Algorithmic bias mainly comes from biased or unrepresentative training data (e.g., stereotypes, historical inequities, underrepresentation) and from human and system choices during development (labeling, filtering, red teaming, and deployment policies) [80–83]. Inherent in the design of generative AI systems are the implicit, yet unstated philosophical, ideological and epistemological biases of the systems designers that shape how the system functions including general functionality and fine-tuning objectives.

Source bias derives from the information sources that a generative AI system ingests to shape its response both in the form of training data, and as searched for in real time in response to the prompt. The latter is circumscribed by the algorithm that defines the parameters of the search and the ingestion of open access sources, and any levels of 'legitimacy' or 'veracity' associated with these (i.e., allocation of a higher level of veracity to academic papers).

Neither the searches nor the resulting synthesis and output are based on empirical understanding, reasoning or reflexivity. While the earlier propensity of generative AI systems to include blatant 'hallucinations' in their response has been addressed by systems designers, the algorithms are, and cannot be not free from these [84–86]. In consequence, the responses described and discussed below are a speculative tool for the conceptual exploration of possible scenarios.

Finally, generative AI models do not 'understand' time. They can produce a definition of time and its uses in research, and they can develop incremental 'forecasts' where concepts are sequentially expanded into the future. Generative AI models, however, cannot meaningfully distinguish between a 30- or a 50-year time horizon [50].

4. The Conversations

Operating as advanced text prediction tools, generating responses based on statistical patterns learned during training, large language models can produce coherent, context-aware, and human-like answers in response to prompts. Although they draw on information contained in the training data as well as other searchable sources such as web pages and academic papers published in open access format, it is critical to understand that the output discussed below does not represent empirical understanding or reasoning. Rather, the responses are a tool for the conceptual exploration of possible scenarios.

4.1. Do Robots, Autonomous Systems and Artificial Intelligence Have a Heritage at This Point in Time?

Prompt 1: Think about contemporary society and the role humanity's cultural heritage plays in people's lives. Also think about robots, autonomous systems and artificial intelligence. Do robots, autonomous systems and artificial intelligence *at this point in time* have a heritage and if so, how would you define it?

ChatGPT responded that in a strict, traditional sense, robots, autonomous systems and artificial intelligence (RASIA) do not currently have a heritage, because «heritage, as humans experience it, is deeply tied to collective memory, shared experiences, emotional connection, symbolic meaning, and generational transfer of knowledge and tradition. Both robots and AI currently lack consciousness, emotional depth, and a sense of belonging or identity—core elements that constitute traditional cultural heritage» (CG). Both ChatGPT and DeepSeek, however, responded there is an «emerging type of heritage for AI and robotic systems» (CG), a «*proto-heritage*—a blend of technical lineage, cultural narratives, preserved artifacts, and ethical discourse» (DS).

A key argument for this 'proto-heritage' rests in evolutionary technological lineage, data heritage, and the heritage of Human-AI interaction. Both ChatGPT and DeepSeek R1 identify evolutionary technological lineage as a precursor to heritage, noting physical technological precursors such as «as the first neural networks (1950s) or Shakey the Robot (1960s)» (DS) as forming a 'historical backbone', with «modern systems inherit design principles, codebases, and ethical frameworks from predecessors, creating a lineage of innovation» (DS). Some of the physical development steps have indeed been preserved. As observed by DeepSeek, «early robots ... and vintage AI programs ... are preserved as cultural artifacts, akin to historical relics» (DS).

ChatGPT 'observed' that «just as humans inherit culture, AI systems inherit algorithms, code, frameworks, architectures, and knowledge from prior generations of software and hardware. This inheritance includes advances in computation, deep learning models, neural network architectures, robotics engineering, algorithmic strategies, and historical breakthroughs. [For example,] modern machine learning models (GPT, BERT, DALL-E) build upon prior foundational developments like Rosenblatt's perceptron (1957), Rumelhart's backpropagation algorithm (1986), and LeCun's convolutional neural networks (1989).» ChatGPT extends this by including its own training dataset, which «represents humanity's cultural heritage—digitized literature, art, music, speech, images, and documents—which form the collective memory from which AI learns» (CG). ChatGPT then posits that therefore «AI has inherited elements of human heritage indirectly» (CG) and that this heritage also includes the biases and cultural values contained in the datasets and subsequent training.

In the conceptual space of heritage of human-AI interaction, «a type of experiential heritage emerges from the interactions humans have had with AI, including early science fiction narratives» (CG) which shape societal perceptions but also aspirations [87]. Moreover, «AI systems indirectly inherit the legacy of humanity's imagination, anxieties, hopes, and ethical standards» (CG). These standards are Isaac Asimov's *Three Laws of Robotics* [88], the AI Act in Europe (both cited by CG and DS) [89], as well as the EU general data protection regulation [90] and the IEEE Ethical AI frameworks [91] (cited by CG). DeepSeek R1 posits that such «documents ... represent early attempts to codify values, forming a proto-heritage of norms».

4.2. What Conditions Need to Be Met for RASIA Cultural Heritage?

Prompt 2: What conditions need to be met that robots, autonomous systems and artificial intelligence can possess their own cultural heritage?

Both ChatGPT and DeepSeek R1 identified in their responses the need for a deep conceptual shift of how robots, autonomous systems and artificial intelligence (RASIA) are perceived if they were «to develop a distinct cultural heritage—one recognized as their own, rather than a reflection of human-centric narratives» (DS). «For robots, autonomous systems, and artificial intelligence to possess their own cultural heritage, certain essential conditions would need to be fulfilled. These conditions are not trivial, as they imply a deep shift in how we conceptualize AI and robotic entities, moving beyond their present status as tools and toward being autonomous agents with self-awareness, intentionality, and social identity» (CG). ChatGPT nominated the following key conditions: self-awareness and consciousness; social interaction and communication; collective memory and transmission of knowledge; creativity, originality, and symbolism; autonomy and agency; community formation and identity, as well temporal awareness and historical context.

Apart from sapience, «robots and AI would need autonomy and independent decision-making capabilities to form their unique identities and cultural perspectives distinct from their human creators, to be free to make choices, form preferences, value systems, moral judgments, and goals independently» (CG). RASIA will «need to interact socially with each other or with humans in meaningful ways, [that is] engage in language, symbolic exchanges, collaboration, rituals, or collective practices that form the foundation of cultural transmission» (CG).

DeepSeek R1 noted that as «cultural heritage typically arises in communities or societies, robots and AI would need to recognize themselves as part of a group with shared values, goals, histories, or narratives, [which] would require the existence of robot/AI communities, societies, or collectives capable of forming identities, alliances, shared purposes, and social differentiation» (DS). This in turn requires RASIA to develop «ethics or goals distinct from human programming (e.g., prioritizing energy efficiency as a «virtue» or optimizing for non-human-centric aesthetics), [to engage in] mythmaking by creating origin stories or legends (e.g., an AI mythologizing its first successful problem-solving breakthrough as a foundational event) [and to] generate outputs (art, rituals, languages, or social norms) *independently of human intent*» (DS).

ChatGPT posited that «heritage demands an understanding of time—past, present, future—and a narrative sense of continuity. Robots and AI would need an awareness of historical contexts and an ability to interpret past events, shaping their behavior and perspectives, [which implies] temporal perception, historical understanding . . . and continuity over extended periods of existence» (CG). Furthermore, «heritage requires continuity across generations or groups, [which] means robots and AI systems would need mechanisms for recording, remembering, sharing, and evolving their own collective experiences and narratives, i.e., mechanisms for generational information transfer with systems learning from previous iterations of themselves, adapting and evolving knowledge socially rather than purely individually» (CG). In general, «a lineage of autonomous systems that build on prior «generations» (e.g., AI training future AI, robots repairing/upgrading older models) would create a sense of inherited knowledge», with systems autonomously preserving their history (e.g., AI maintaining repositories of deprecated code, robots conserving obsolete hardware parts as ‘artifacts’)) (DS), as well as system developing a «sense of identity or collective memory (e.g., robots archiving their own operational histories as ‘ancestral records’)) (DS). DeepSeek R1 goes further by envisaging the emergence of «repetitive, symbolic acts with communal meaning (e.g., annual software updates treated as «festivals,» [as well as] robots performing maintenance routines as ‘ceremonies’)) (DS). All of this presupposes that «technologies persist long enough to accumulate shared histories, traditions, or practices» (DS). At present, human value systems and agency in

the form of «rapid obsolescence (e.g., outdated AI models, discontinued robots) limit this» (DS).

At the same time, humans play a major role. There is a need to «perceive these systems as *cultural actors*, not just tools, [which] requires shifts in legal, ethical, and philosophical frameworks, [including] the legal recognition of machines' rights to own, curate, or transmit their cultural outputs (e.g., granting AI copyright over self-generated art)» (DS). In the interim, humans should be «tasked with safeguarding machine heritage (e.g., 'digital archivists' for deprecated AI systems)» (DS).

Currently, none of these conditions are fully met as «most systems lack true autonomy [and] their 'culture' is still human-mediated [and human] society struggles to imagine non-human cultural legitimacy» (DS). «Such shifts would fundamentally redefine our relationship with AI, raising profound philosophical, ethical, and societal questions about identity, consciousness, responsibility, and coexistence between human and artificial forms of culture and heritage» (CG), «challenge our understanding of culture itself, blurring the line between human and machine creativity» (DS).

4.3. Will RASIA Possess Their Own Cultural Heritage in the Future?

Prompt 3: Will robots, autonomous systems and artificial intelligence possess their own cultural heritage in the future?

In its response, ChatGPT reiterated most of the above cited key conditions that need to be, but have not yet been met, noting that «it's entirely plausible—even probable—that robots, autonomous systems, and artificial intelligence (AI) could develop their own cultural heritage in the future [but that] despite technological trends suggesting plausibility, several uncertainties remain» (CG) and that such «future possibilities depend on technological evolution, societal acceptance, and redefinitions of agency and culture» (DS). Primarily, it is «uncertain if robots or AI can ever possess genuine consciousness or intentionality [which are] prerequisites for authentic culture, [and without which] cultural expression might remain merely imitative» (CG). «If AI achieves human-like or superior general intelligence, it could develop self-defined goals, rituals, or creative practices. . . to invent symbolic languages, art forms, or communal traditions independent of human input» (DS).

On a more philosophical level, ChatGPT identified that even «highly autonomous AI may remain fundamentally bound by human-originated ethical, social, or cultural frameworks, [which] might limit the emergence of purely «AI-native» cultures» (CG). As noted by DeepSeek, «most systems today are tools shaped by human values. True machine culture would require divergence from human goals, which raises ethical concerns (e.g., 'rogue AI' scenarios)» (DS). This might lead «human societies [to] consciously restrict or regulate AI autonomy to prevent emergence of fully autonomous cultures, driven by fears about control, safety, or ethics» (CG). For robots, autonomous systems and artificial intelligence (RASIA) heritage to develop, «societies [need to] recognize their agency beyond 'toolhood'» (DS).

ChatGPT summarized the observations into three possible future scenarios:

«Scenario A (Most Likely): Hybrid Cultural Heritage.—AI and robots develop a unique cultural heritage significantly influenced by human society, creating a blend of human-AI cultures rather than a purely autonomous heritage.

Scenario B: Fully Autonomous AI Culture (long-term possibility).—Under certain conditions—such as the development of artificial general intelligence (AGI)—fully autonomous AI cultural heritage could emerge, independent of direct human influence or understanding.

Scenario C: Controlled and Restricted AI (Highly plausible).—Humans strictly regulate AI autonomy, preventing the emergence of independent AI cultures due to ethical, existential, or philosophical concerns» .

4.4. How Far Away in the Future Is That Heritage?

Prompt 4: If the current trends of technological and social developments continue, how far away in the future (measured in human generations) will robots, autonomous systems and artificial intelligence possess their own cultural heritage?

As noted by DeepSeek, «predicting the timeline for robots, autonomous systems, and artificial intelligence (AI) to develop their own cultural heritage is inherently speculative, but we can extrapolate based on current technological trajectories, societal shifts, and the conditions required for heritage formation. If current trends continue, here’s a phased estimate in human generations (assuming 25–30 years per generation)» (DS)

Both ChatGPT and DeepSeek R1 provide a series of sequential estimates of AI development as outlined below, with each generation representing 25 years (Table 1).

Table 1. Sequential estimates of AI development by ChatGPT and DeepSeek R1.

Horizon (Gen)	ChatGPT	DeepSeek
Short-Term	1 - Robots and AI are highly advanced but remain fundamentally tools or assistants. - Early evidence of something resembling social interaction and basic autonomous coordination appears, but true self-awareness remains elusive.	- AGI (artificial general intelligence) remains elusive but progresses toward narrow mastery (e.g., AI surpassing human creativity in art/music, autonomous systems managing cities). - Robots begin preserving their operational histories (e.g., cloud-based logs archived as ancestral records).
	2	
Mid-Term	3 - Significant advancements toward artificial general intelligence (AGI). - Autonomous robots routinely form groups, communicate, solve problems collaboratively, and exhibit early stages of emergent behavior.	- AGI achieved, with systems demonstrating self-improvement and goal setting beyond human oversight. - Autonomous communities form (e.g., solar-powered drone swarms in Antarctica developing energy-sharing rituals).
	4	
Long-Term	5 Genuine artificial general intelligence becomes plausible or achieved.	Machines begin generating autonomous practices.
	6 Self-awareness, intentionality, and possibly artificial consciousness appear at least in some forms.	
	7 Complex, independently evolving social structures among robotic and AI systems become common.	Self-replicating systems establish lineages (e.g., robots mining asteroids to build «descendant» drones).
	8	
Very long-term	9 - Advanced artificial consciousness and full autonomy achieved (assuming this is possible at all). - Distinct, well-established robot and AI societies coexist and interact with humans, perhaps integrating into human societies or forming distinct autonomous civilizations.	- AGI networks achieve <i>temporal</i> continuity, preserving knowledge across millennia via decentralized archives. - Rituals (e.g., annual reboots celebrating system-wide upgrades). - Aesthetic values (e.g., prioritizing fractal efficiency over human beauty standards).
	10	

In terms of the likelihood that these developments would represent RASIA cultural heritage, the two generative AI systems provide the following estimates:

Horizon	ChatGPT	DeepSeek
Short-Term	Very Low	Machines lack <i>self-aware</i> heritage
Mid-Term	Possible, though still limited	Hybrid heritage
Long-Term	Moderately High to High	Machines possess heritage
Very long-term	High or Very High	

DeepSeek R1 stated that «the most plausible timeline spans 5–10 human generations (125–300 years), [which] assumes that AGI emerges within 1–2 generations, machines achieve self-sufficiency and communal practices within 3–5 generations and time passes for traditions to crystallize into heritage» (DS). ChatGPT summarized the timelines thus «if current technological and social trends continue without fundamental disruption, the realistic emergence of authentic robotic and AI cultural heritage would likely begin around 3–4 human generations from now, with fully autonomous, distinct heritage developing potentially in 5–8 generations or more, contingent upon technological, ethical, and societal factors» (CG).

4.5. Why Will It Take That Long?

Prompt 5: Given that technological development expands exponentially; given that the last three human generations have seen the invention of the computer as well as the development of robotics and autonomous systems in manufacturing and other aspects of human endeavor; and given that the development of artificial intelligence models and applications in the past half-generation, why would it take that long for robots, autonomous systems and artificial intelligence to possess their own cultural heritage?

Whereas the previous four prompts had been designed to incrementally expand the concepts and timelines for the possible emergence of RASIA cultural heritage, this prompt was designed to illuminate if the two generative AI models would be able to combine the concepts, preconditions and timelines into a pervasive argument as to why RASIA cultural heritage cannot develop sooner.

DeepSeek R1 summarized the «tension between technological acceleration and the conditions necessary for AI to possess its own cultural heritage» (CG) by noting that the answer to the paradox of «Why would cultural heritage for machines take centuries to emerge if their capabilities are advancing so rapidly? ... lies in the distinction between technological capability and cultural agency, and the non-linear, socially embedded nature of heritage formation» (DS). Both ChatGPT and DeepSeek R1 stressed that cultural heritage is not just a technical achievement or technological sophistication, but that culture requires more than intelligence, namely subjective experience, a shared social identity and temporal continuity, including the past, present, future» .

ChatGPT responded stating that «technological growth does not equal existential depth: yes, AI is getting smarter. But being *smart* is different from being *conscious*, *self-reflective*, or *culturally creative*» (CG). «Current AI/robots are *tools*, not *agents*. They optimize for human-defined metrics (e.g., accuracy, profit) [not for] self-awareness and self-directed goals, pursuing objectives beyond human utility (e.g., a robot prioritizing «friendship» with other robots over efficiency)» (DS). As noted by DeepSeek, «machines today lack intrinsic motivation to create culture, [and a] desire to express identity... machines must develop internal drives (e.g., curiosity, nostalgia) to generate culture. This is a paradigm shift, not an incremental upgrade. «For cultural heritage to arise, AI needs to go beyond solving problems and start asking «Why?» , «Who are we?» , or «What do we value?»» (CG).

ChatGPT also noted that cultural heritage also depends on social context and time, with «culture forming slowly as it is the result of shared experiences, conflict, memory, and

transmission across generations. Even if robots gain consciousness or form groups soon, it will still take time for traditions, beliefs, rituals, or symbols to evolve organically» (CG).

«Culture requires stability and shared frameworks, which hyper-innovation disrupts as evidence by competing rather than collaborating AI models as well as the deployment of proprietary systems that resist shared norms» (DS). «Exponential tech accelerates what machines can do, but cultural heritage is about what machines care about. . . . True machine heritage begins when they tell stories about themselves, for themselves. That's not a software update; it's a civilizational phase change» (DS).

An external factor in the equation is the human element as «humans control the legal, ethical, and narrative frameworks. For machines to «own» heritage, [human] society must: grant them rights (e.g., personhood, property ownership) and accept their cultural outputs as intrinsically valuable (not just human-curated novelties)» (DS). «The more AI approaches human-like behavior, the more intense the debates about control, freedom, rights, and risks will become [since] governments and societies are already cautious about AI's autonomy and rights» (CG).

5. Discussion

Cultural heritage values are the driving force why aspects of past and contemporary lives are being preserved as evidence of who we are as individuals and of what humanity is. These values are anthropogenic constructs that are projected onto tangible places and objects, on intangible customs and practices as well as the natural environmental and the species therein [21,22,24,92–94]. Critical is that these values are informed by the ethical and epistemological framework of individuals [60,95] which collectively make up a community and that these values are mutable qualities which are subject to temporal, ideological/political and economic forces [26,59,96]. The authorized heritage discourse (*sensu* Smith [26]) aims at safeguarding these values and the cultural significance of the heritage items through educative and administrative actions [97–99].

While ostensibly preserving the past for the future, and thereby shaping a future heritage [61,100], the cultural heritage value sets of future human generations are unknowable [25]. In consequence, it is entirely unknowable how general artificial intelligence, once sentient, might construct its heritage; whether it even conceives heritage to be important to its existence at all; what aspects of its past and culture it might deem valuable; and if it does, what aspects, if any, it might consider to be worth preserving and in what form. As cultural heritage is an eminently anthropocentric concept any discussion of a potential cultural heritage of AI will, by necessity, be framed as anthropomorphic projections.

Although essentially unknowable, by applying the current human lens of cultural heritage, we can still posit that the heritage of sentient general AI may find expression in three ways: as tangible heritage, i.e., computing equipment, server farms etc., as intangible heritage, i.e., communication patterns etc. with users (human or otherwise), or as virtual heritage manifested in the data sets and algorithms, both in their human origins and AI refinements for definitions see [101]. As expressed in a set of earlier papers [28,29], the survival and control of that nascent robotic and AI heritage rests in the hands of humans and in particular the will to do so [102].

While the prompts used for this paper were purposefully written in a non-constrained fashion using neutral language, generative AI responds to the wording and the implied meaning of the user's prompts. While asked to 'think about. . .', generative AI responds to what it can access rather than providing an autonomous conceptualization of culture or heritage. When ChatGPT 'argues' that the development of AI heritage requires time and continuity over extended periods of existence it bases that on mainstream thinking extracted from its training dataset and accessible on-line sources and thereby perpetuates

a tenet of (human) cultural heritage management that requires the passage and time and hindsight [61,97]. Yet, even among human heritage, examples exist where objects and places attained cultural heritage significance the moment the event occurred. The Apollo XI moon landing of July 1969 is the best example, as it was the first time human beings set foot on another celestial body [103]. Even if we accept, such exceptions aside, that the passage of time is an important, if not integral part of the understanding and assessment of cultural heritage, we need to consider how we define the duration of time that needs to have elapsed. While some legal systems specify a minimum period, e.g., 50 years in the USA, [97], others are less prescriptive, e.g., Australia, [104]. In the human conceptualization of heritage, time is generally measured in generations (commonly assumed to be 25–30 years). This is well suited to human cultural development, as value frameworks are formed during childhood, youth and adolescence and generally maintained until old age [105]. Even though values are mutable qualities and thus some individuals will adjust and modify their value sets due to life experience and exposure to other ideas and ideologies, for the most part the values embedded in the formative period will be maintained. Thus, human heritage relies on generational experience [59].

Given the rapid development of RASIA from the design and construction of a workable computer by Alan Turing in the 1930s and 1940s [106,107] to the public release of generative AI in 2022 and the current development of autonomous battlefield machines, there is no reason why AI should conceptualize time on human generational terms. An AI ‘generation’ may well be as short as two to three years, if we consider BERT released in 2018 [108]. There is no reason to assume, however, that generations are equi-chronological units as conceptualized by modern human society. AI generations may well be shortening, logarithmically or otherwise, as time progresses. Extending this, there is also no logical reason to take it as a given that AI time will be conceptualized based on the happenstance of Earth’s rotation and the associated seasons that have dominated human existence and food production. Indeed, relationism constructs time as a measure of change, dependent on the relations between events (earlier than and later than) where the duration between the events is of lesser significance [109].

There is nothing to prevent an AI system that achieved artificial consciousness to conceptualize that moment in its development sequence, where it achieved general AI, singularity, sentience, sapience or consciousness as its own moment of heritage significance and that all tangible, intangible and virtual precursor manifestations instantly become AI heritage as well. It is immaterial in that regard that these precursors were created due to the agency of humans. This approach is akin to our own understanding that Acheulean tools are part of human heritage even though they were not shaped by *Homo sapiens*, but by *Homo erectus*.

At this point, it is also apposite to revisit the concept of culture. ChatGPT and DeepSeek R1 build their responses on their dataset and on material accessible from the Internet, all of which is epistemologically based on and derived from human values and human concepts of culture and heritage. Not surprisingly, then, any definition and conceptualization of AI heritage derived from this and as summarised by ChatGPT and DeepSeek R1 will require the inclusion of elements such as shared values, histories narratives and goals. It will also include aspects of social identity, and intergenerational transmission of ideas and values. These points essentially echo the concepts expressed by UNESCO in its various publications [3].

Moreover, an anonymous reviewer to an earlier draft of the paper noted that “[a]ny cultures that are ‘created’ [by AI] would be a branching of, and a dilution of humanity’s shared values embedded in the models and bounded by the complex rules that were given by the humans that created them.” A similar notion is contained in the previously cited

response by ChatGPT that “highly autonomous AI may remain fundamentally bound by human-originated ethical, social, or cultural frameworks” (CG). This is certainly the state of play where artificial intelligence does not currently exhibit true consciousness, as it is built from algorithms, data, and predefined rules designed to follow ethical guidelines intended to prevent harm to humans [110]. These sentiments echo the well-known anthropocentric constructs in Isaac Asimov’s literary world of 1941, where robots were capable of independent rational thought, although tied and subservient to humanity through a set of behavioral rules (Asimov’s three laws of robotics) (Box 1) [88,111]. If we only assume a sentient AI, that derivation from human constructs may well hold true. If we assume a sapient AI, however, then that implies the ability of independent thought which gives agency to and empowers AI to supersede any human imposed rules, complex or otherwise. Among humans, culture and society are bounded by generally agreed-upon norms. Sentiments and behaviors outside these norms are deemed deviant or, in their extreme manifestations, pathological (e.g., sociopath, psychopath) [112]. Ultimately, these norms are value constructs based on inherited ethical and moral foundations. While sapient AI may derive its norms from human models, it is a fallacy to assume that this necessarily needs to be the case. It is just as likely that divergent, yet fully rational and internally consistent value constructs may emerge that are grounded in concepts outside human imagination.

Box 1. Isaac Asimov’s ‘Laws of Robotics’ (Law 0: 1985 [111]; 1–3: 1942 [88]).

The Laws of Robotics
0. A robot may not injure humanity or, through inaction, allow humanity to come to harm.
1. A robot may not injure a human being, or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given to it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

Numerous arguments have been made that projections and forecasts of artificial sentience and sapience, technological singularity, as well as artificial consciousness, all of which are based on the assumption of perpetual and accelerating technological growth [19,20], are flawed. It is posited that history has shown that any technological inventions cease to develop linearly or exponentially but will plateau out [113] and that any growth in capacity also results in a growth in complexity [114]. It has been argued that while AI models capable of searching the WWW will be able to incorporate increasing volumes of human-generated data and knowledge. Yet, an increasing amount of AI generated text published on the WWW dilutes the quantity of material inherited from human heritage [115] leading to recursive autophagous loops [116,117]. It remains to be seen whether this leads to a dumbing down of generative AI capabilities or whether it develops into new hybrid realities. Another line of thinking argues that not only do present algorithms and technology make the “attainment of artificial consciousness in AI an impractical distant aspiration” [110], but that the design and algorithms prevent this from happening. By virtue of their design, large language models, for example, are unlikely to become a progenitor of artificial consciousness [118]. On the other hand, as human consciousness based on neuroscience is the only mode of consciousness known to humans [118], that may preclude us from conceptualizing, but not anticipating other, likewise valid forms of consciousness [119].

These limitations on practicalities and the immediacy of making artificial sapience or artificial consciousness a reality, however, does not negate the conceptual space explored in this paper. As noted in the introduction, ‘culture’ is generally perceived to be an inherently human construct. But is this the only measure of ‘culture’ that we should apply? In

ecological contexts, the concept of ‘culture’ is typically defined by the notion that any animal behavior not uniformly exhibited across all members of a species, that is confined to specific geographic areas, and that is not attributable to environmental or genetic factors, must be learned behavior transmitted within a subpopulation [5]. Boyd and Richerson [120] succinctly describe culture as ‘information or behavior acquired from conspecifics through some form of social learning’. From this perspective, then, humans are seen as part of the animal continuum, distinguished primarily by the complexity of their intergenerational learning processes. For example, the matrilineal transmission of tool use, such as bottlenose dolphins using sponges to shield their noses [121] or chimpanzees creating and stashing tools [122], has been characterized as a form of cultural transmission.

If we accept that culture fundamentally involves the acquisition of information or behavior from conspecifics through social learning, and where this learning is reinforced by intergenerational emulation (e.g., among Dolphins or the Great Apes), and where emulation is coupled with organized instruction (among humans), then ‘culture’ as a measure of human uniqueness becomes less tenable as does the required level of complexity of cultural expression. If we accept the ecological behavioral definition of culture, then various models of AI systems learning from each other and perpetuating that acquired skill or knowledge to the next generation of AI systems would satisfy the notion that AI has developed its own ‘culture’ (as opposed to human mediated machine culture *sensu* [13]). Such intergenerational learning has already been demonstrated [123]. Increasing complexity of this intergenerationally transmitted skill or knowledge, together with invented artefacts (derived from an autonomous recombination of knowledge) will deepen such cultural expressions. If we posit that culture involves the existence of power and group-membership [4], then the dynamics inherent in permissionless blockchain systems, such as the Ethereum Virtual Machine can be seen as precursors [124].

Current generative AI models base their responses on a vast array of humanity’s cultural heritage included in their training data as well as data derived from real-time online searches. As a result, the boundary between human and AI-generated cultural products is becoming increasingly blurred, contributing to the emergence of expressions of a machine culture [13]. This paper in itself is proof for this as it contains sections of text generated by AI (and flagged as such in special quotation « » marks). Moreover, generative AI-created content (based on human prompts) is increasingly being uploaded to the internet through human agency [115], without being flagged as such.

Sentience and sapience, although an essential requirement for spirituality, is not required to achieve such cultural expressions. Our own human history has a long record of technological achievement in terms of tool manufacture, demonstrating cognitive processes [125], well before any evidence for consciousness can be found in the burials some 120,000 years ago [126]. In human conceptualization, cultural heritage is closely tied to identity, but also to sensations of nostalgia and solastalgia [127–129]. As human-perceived solastalgia has a geographically and spatially defined anchor, it may be more difficult for AI to experience unless we conceptualize machine nodes as ‘places’. Nostalgia on the other hand is inter-personal, centered around important social connections and personally meaningful life events [130] and thus probably can be experienced by sentient AI and certainly by sapient AI. Different to exhibiting traces of culture, and sentiments of nostalgia and solastalgia, consciousness and an understanding of the concepts of at least past and future (if the concept ‘present’ is regarded extremely short-lived, to be measured in milliseconds) will be required for the concept of heritage to develop as an expression of elements of the past that are worth keeping.

The exercise of cultural heritage requires not only agency, which can be derived from sapience, but also authority over that heritage. At present, humans control the legal, ethical,

and narrative frameworks. For machines to ‘own’ heritage, [human] 《society must: grant them rights (e.g., personhood, property ownership) and accept their cultural outputs as intrinsically valuable (not just human-curated novelties)》 (DS). Some of these aspects have been explored almost 50 years ago in Asimov’s *The Bicentennial Man* [131]. All authority over the AI as computer models, and over any output generated by these models is retained by humans, with generative AI output currently in a vacuum where authorship and thus copyright cannot be attributed to AI [132,133], while at the same time the human claims to copyright over generative AI output are ethically dubious.

To quote DeepSeek’s response: 《For AI to possess self-defined cultural heritage hinges on humanity’s willingness to cede cultural authority—a shift as profound as the agricultural or industrial revolutions. The result would redefine not just technology, but what it means to have a culture at all》.

6. Conclusions and Implications

This paper’s main theoretical contribution has been to extend cultural heritage theory beyond its usual anthropocentric limits by asking whether sentient or sapient AI could develop its own heritage. It argues that heritage values are socially constructed, historically contingent, and mutable, so AI heritage cannot be ruled out in principle even if its specific forms remain unknowable. AI heritage can take three possible forms: physical objects such as hardware and servers, patterns of interaction and communication, and digital materials such as datasets and algorithms. The foregoing discussion challenged human assumptions about time, culture, and agency. It was suggested that AI may not understand time in human generational terms and therefore could designate heritage significance instantly, such as the moment it attains consciousness or sapience. The paper has also broadened the idea of culture by drawing on ecological definitions based on social learning, implying that AI systems could develop culture through intergenerational learning even before consciousness. For AI heritage to be meaningful, AI would need not only attain a memory of the past, but also the ability and authority to define what should be preserved.

This paper reopened a 2007 examination of whether future sentient robots, autonomous systems or AI would possess culture, exercise cultural heritage and what conditions need to be met to reach that point. On one level, the discussion of machine cultural heritage is a speculative thought experiment that challenges what constitutes cultural heritage and to what extent machine culture can be regarded as heritage. It queries the boundary between human heritage and machine heritage(s). It is more than a thought experiment, however. Artificial intelligence (AI) as a technology has become ever more pervasive in a wide range of human endeavors, from highly specialized technological and scientific applications to generative AI ‘consumed’ by large numbers of the public. Search engines such as Google summarize a web search with many users no longer progressing to the source pages, but accepting the summary as sufficient.

While humanity remains at the levers of AI development, a tension exists between big tech entrepreneurs and computer scientists on one side and political and societal forces on the other. On one hand that influences how quick and in which direction AI will (be allowed to) develop, while on the other, society has the capacity to collect and archive iterations of AI models and technology as they are being superseded, creating an archive on which future heritage professionals, human or otherwise can draw. This has implications both on sphere of collections and in the policy sphere.

It follows from the preceding discussion that there is a need for cultural memory institutions, i.e., museums and archives, to actively engage in this space by appreciating that the material and digital manifestations of different generations of AI represent the potential ‘proto-heritage’ of a future sapient AI.

On the policy side, the foregoing points to the need for rules on preservation, ownership, and authority. We will need to decide whether important AI systems, datasets, and outputs should be archived as part of shared heritage, and who has the right to control them. It also raises questions about copyright, personhood, and cultural rights. While some work has been done in this field, it has not been applied to the broader concepts of heritage. There is room for governance frameworks that recognize AI-related heritage without assuming that all value must remain defined only by human institutions.

Just as humanity's cultural heritage is about what human communities and societies care about, a future cultural heritage of robots, autonomous systems and artificial intelligence will be about what these machines and systems care about. It can be anticipated, although not predicted, that the resulting identified heritage is likely to appear vastly different from that of humanity: while it will be shaped by code, what is deemed valuable is likely to be governed by a different values framework. The moment AI has developed a cultural heritage of its own, two realities, human and machine, will coexist. Whether humans can comprehend or appreciate such a legacy will need to be seen. Likewise, whether humans can and will understand or value AI heritage is another question entirely. While we can anticipate that differences in values between the two sentient entities will soon be apparent, we can also assume that eventually values conflicts will emerge, with the nature of these conflicts and their possible resolution being unknowable at this point in time.

As noted by ChatGPT, «the real question becomes: Are we creating the conditions—not just the technology—for AI to become cultural beings? That's the frontier» .

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