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To Have Done with The Metaphor of Summers and Winters: Can AI And Internet History Cure Hype?

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Abstract

This paper presents the intertwined history of artificial intelligence (AI) and the internet, positing that narratives and lexicons treating them as separate entities often overlook how their co-evolution shapes understandings of both domains. Three significant conceptual shifts are examined, where developments in one field have been crucial to progress in the other. Firstly, the role of networking in DARPA's Strategic Computing initiative is examined, rooted in packet switching from the 1970s in parallel with advances in machine learning, particularly with artificial neural networks (ANNs) and convolutional neural networks (CNNs) in the 1980s - now central to AI applications. Secondly, the emergence of ImageNet in the latter 2000s is analysed as pivotal for machine learning in visual object recognition, leading to the revitalisation of neural network research. The discussion focuses on how ImageNet drew from a networked earlier semantic database, WordNet, and how terms shifted from internet lexicon to machine learning vernacular in academic literature, resulting in today's dominant perception of AI as a machine learning-centric technology. Lastly, the paper

discusses the recent application of large language models in transforming search engines, indicating a merging of AI techniques with online platforms. These shifts highlight connections between AI development and internet-based applications, urging a reconsideration of how these technologies' histories are narrated, enabling us to think beyond AI/internet or winter/summer dichotomies.

Keywords: AI Winters, Artificial Intelligence, History, Internet, Linguistic Socialisation, World Wide Web

1 Introduction, Rationale and Scope

> "*History in this town […] is no more worthy of respect than the average movie script, and it comes about in the same way – soon as there's one version of story, suddenly it's anybody's pigeon. Parties you never heard of get to come in and change it. Characters and deeds get shifted around, heartfelt language gets pounded flat when it isn't just removed forever.*"
>
> Sasha Gates, in *Vineland* by Thomas Pynchon (Pynchon, 1990, p. 81)

Reflecting on the intertwined development of the internet and artificial intelligence (AI), this paper traces their symbiotic history despite periods termed as "AI winters," which falsely suggested technological dormancy. Scholars highlight the misleading effects of hype surrounding AI, fuelled by terminologies linked to commercial, research, military, or journalistic interests. A critical examination of the interplay between AI and internet technologies is warranted, particularly to avoid the "novelty traps" (Rayner, 2004) where innovation is mistakenly perceived through language choices rather than substantive breakthroughs.

This study scrutinises three historical shifts in technical conceptualizations shared by both AI and internet technologies, that have been overshadowed by domain-specific vocabulary. First, the paper outlines the 1970s development of packet switching, foundational

for later advances in machine learning, particularly neural networks. It analyses the perceptron controversy's role in diverging ANNs from predominant AI/internet trajectories, as well as DARPA's ARPANET and the Strategic Computing initiative.

Secondly, the analysis progresses to the 2000s, highlighting ImageNet, a project vital to machine learning-based visual object recognition, and the ImageNet Large Scale Visual Recognition Challenge. This paved the way for major developments like AlexNet in 2012, which marked a significant turn in AI research. The study delves into ImageNet's roots in the semantic database WordNet, uncovering a terminological shift from internet-oriented Web 2.0 to machine learning discourse, illustrating hype and the historical rebranding of AI as "machine learning technology" while underplaying symbolic AI.

In discussing these shifts, the paper emphasises the recent transformation of conversational agents into commercial search engines, signifying the AI and internet applications' deep linkage. A concluding table provides a visual representation of the argument, advocating for a longitudinal perspective on technological and terminological evolution. As I am generally suggesting thinking critically about the adoption and abandonment of existing technical vocabularies, I am introducing two new words in the concluding section that are apt to conceptualise the extreme and complex rhythms of AI/internet history as mediated through hype, these being "hypernetics" and "eggspoontations."

Targeting policymakers, industry experts, scholars, and the public, this study seeks to instigate critical reflection on hyped AI terminologies and reassess debates surrounding a new potential "AI winter." Essentially, any field that has found itself historically being about to be "impacted" or "transformed" by either AI or internet technologies, will benefit by this analysis in order to exercise sobriety in its self-assessment and foresight. The paper aims to

cultivate necessary scepticism towards hyped terminologies and through a historical lens, question the current debates around a potential new "AI winter," suggesting that it may be more of a rhetorical device than a reflection of technological stagnation – indeed, acting as a reorientation of interconnected technological goal-setting in new guises. The paper, thus, contributes to ongoing discourses on the "AI effect" - a folk theory reflecting the tendency to redefine AI once its goals are achieved (AI Effect, 2023) and proposes that as AI faces challenges and potentially falls short of inflated expectations, it does not so much fail as it evolves, often through new terminologies and domains. Focusing predominantly on the US, with UK and European perspectives as well, the paper acknowledges that while this analysis stems from Western events and conceptualisations, their impact extends globally (Kim, 2005). The work encourages sectors anticipating transformation through AI or internet technologies to apply this analytical lens for a more grounded understanding and foresight.

2 Theory and Selected Relevant Literature: AI and the Internet as Linguistic Socialisations in the Closed World

The narratives of "AI winters" and their supposed correlation with Human-Computer Interaction (HCI) "winters," posited by Grudin, serve as a point of departure. Grudin's observation of interchangeable rounds of concurrent "winters" in AI and “summers” in HCI serves as a historical pattern highlighting the mutual feedback loop between the two fields (Grudin, 2009). These seasonal metaphors encapsulate the tides of investment, interest, and perceived progress. However, Grudin's model may overlook the gradual, less visible development and the sociotechnical dynamics that permeate both AI and HCI and that often much of the “shift” may be linguistic – under certain instances AI can be seen as HCI, and vice versa. By considering internet technologies as advanced forms of HCI, this paper posits that close scrutiny of AI/internet coevolution reveals a rich tapestry of social nuances that circumvents stark seasonality. During the early establishment of the internet, Dutton has

written of “continuities and discontinuities,” returns “to earlier visions,” in the case of networked “information superhighways” as a revival of futuristic visions about single, multimedia devices for a “wired nation” are at play in the case of AI revivals (Dutton, 1995, p. 81). For Dutton, visions of technological convergence always act as drivers in processes of technological adoption and policy. Here, I suggest that there is a linguistic convergence assisting (or otherwise influencing) the strategic assessment of technology.

This paper's underpinning principles are further informed by Thomas Kuhn's notions of linguistic socialisation and paradigm shifts as interpreted in scientific and technological domains. The adoption of, and disagreement over, particular terminologies emerges not only as a reflection of scientific consensus or controversy, but also as an influence on the trajectory of, and through, technological policy and development. Kuhn’s recently published last book’s draft provides a lens to examine the interplay of focus on various instances of internet and AI technologies showing how language and terminology not only follow but also help shape technoscientific evolution. Kuhn suggests that “linguistic communities share a structured kind set […] which is largely acquired through learning […], encod[ing] the ontology of a community and greatly restrict[ing] what community members’ beliefs can be” (Kuhn, 2022, p. 93). In a lecture preceding the intended forthcoming book, Kuhn explains that linguistic socialisation is not to be studied only as posing regional or spatial obstacles in scientific commensurability, but also historical and temporal: “Transmitted from generation to generation as part of the process of linguistic socialization, these ever-developing differences limit the extent of communication possible between members of groups with different lexicons. The same differences restrict communication with the past” (1987 lecture script, in Kuhn, 2022, p.57). As shown in this latter work, Kuhn wants to emphasise how the adoption of new terminologies is associated to his earlier work on paradigm shifts (Kuhn, 1962).

There are further theoretical strands that have shaped this paper's approach. Through the emphasis on language in the examination of the AI-internet seasonal change, I extend the work of Suchman who investigated "human-machine reconfigurations" in AI and HCI (Suchman, 2007). Suchman depicted how the negotiation of the human-artefact boundary is a social (and therefore, historical, political, and linguistic) process, involving depicting and designing AI/robots as assistants (or servants), or the cyberspace/virtual reality as environments at different historical moments and regional contexts. Suchman is pointing towards this via Bødker's work on interface, noting "the shifting movement of the interface from object to connective medium," observing "than when unfamiliar, or at times of trouble, the interface itself becomes the work's object" (Bødker 1990 as interpreted in Suchman, 2009, p. 279). While Bødker/Suchman refer to a *psychological* process of "trouble," I refer to a similar, yet, *historical* one. To paraphrase: when disillusioned, or at times of less hype, AI becomes the internet, and vice versa. Placing these boundaries and arguing in favour of one or the other type of computing as more important at different spatiotemporal contexts has significant social, economic, and psychological impact, from the financial investment of countries partaking in the "AI race" (Ding and Dafoe, 2021) or the "information superhighway" (Emmott, 1995) to the emotional investment of a young student who decides to study AI because of a hype that have ended by the time the student earns a degree.

This historical-linguistic process of terminological attention shift is often strategic and political, akin to what Latour defines as the reshuffling of interests and goals (Latour, 1987, p. 113). For Latour, this is a tactical process, in that it follows five "tactics": displacement of goals, invention of goals, invention of new groups, rendering invisible of the detour, and a final step of "winning trials of attribution" (Latour 1987: 113-9). While I abstain from pointing towards individual agency about these steps in the case of AI/internet (at least in the context of this paper), what I show below suggests that the steps have been followed with

precision, twice: the goal of creating artificial companions/assistants/robots has been displaced by the one of connectivity and a global network. Goals about global connectivity give space to goals about an AI race. Groups interested with cybernetic production of automata have been replaced by groups interested in connecting communities. Through slow processes of overlapping vocabularies between AI and networks, hype has rendered policy and funding transitions invisible, and this historical erasure enabled the identification of new players are attributable for success – always serving the demands of media hype that is in search of short-term archetypes[1].

3 Method

Methodologically, I employed a qualitative review of secondary literature concentrating on the historical paths of AI and the internet that confer attention to lateral technological themes. A diverse and interdisciplinary range of sources are considered, ranging from personal inquiry and semi-biographical or investigative journalistic works such as those by Feigenbaum and McCorduck (1983) or Metz (2021), to more technologically-focused histories or critical historical sociologies and oral histories like Crevier's (1993), Anderson and Rosenfeld's (2000), Roland and Shiman's (2002), Kim's (2005), Flichy's (2007), Nilsson's (2010), or Driscoll's (2022).

This work is thus fairly exploratory in nature, constructing a meta-narrative based on existing literature. Nevertheless, the primary sources used also help defining the problem: the many historiographies focusing on one aspect of either AI or the internet, perform a history in which one technological domain has primacy over another. The cumulative effect of a reader's effort to engage with the history of one domain, paired to the publisher's pressure

[1] Or, "archehypes," to introduce a pun of the type that computers still cannot make.

towards the author to generate an attractive argument about the domain's primacy crystallises division between disciplinary domains and belief in seasonal summer/winter metaphors. Given the present theoretical proposal, however, I envision more critical comparative histories of digital technologies' intersections, sensitised by the influence of language and hype in historical assessment of technology.

4.1 1970s-1980s: From DARPA to Hedonism

Starting in the late 1960s and early 1970s, the seeds of what would become the internet were sown. One of the pivotal advancements was packet switching, a method for effectively transmitting electronic data in networks by breaking the informational message into pieces and sending across various nodes of the network instead of following a single line (Leiner et al, 2009). "A packet was viewed as an elemental container for carrying data in a distributed network," consisting "of a finite set of bits with a known, but relatively small limit (such as 1,000 bits)" (Lyons and Kahn, 2018, p. 175). Packet, instead of circuit, switching would become the basis for network communications and lead to the development of protocols such as Transmission Control Protocol/Internet Protocol (TCP/IP) introduced by Cerf and Kahn in 1974 (Leiner et al, 2009). The need for time-sharing quick turnaround of information is captured in a 1961 MIT report conducted by a committee involving, among others, Minsky and McCarthy (the two key players in coining the term AI), forecasting the need "for extreme capacities in the way of memory sizes and operating speeds" towards heuristic and translational AI applications (Arden et al, 1961, cited in Edwards, 1996, p. 258). Setting up an agenda for time-sharing, McCarthy and Minsky influenced what was effectuated by Kahn through packet switching. In turn, achieving sophisticated information retrieval across expanding digital repositories would eventually enable the contemporary machine learning applications success. This period witnessed notable acceleration in AI research within defense and academic institutions that was not always called "AI." The role of the Defense

Advanced Research Projects Agency (DARPA) in the United States is substantial in understanding this progress.

An underappreciated moment in time is one of the first non-military and education-oriented uses of DARPA's ARPANET by Conway, one of the initiators of the Very Large Systems Integration (VLSI) computing architecture that DARPA would use later in its AI project. AI specialist Feigenbaum and AI historical McCorduck offer a summary of the role of network design thinking Conway proposed by using the APRANET as a collaboration with other universities to exchange feedback: "Intelligence in the network adventure is human, not artificial. But we offer it to illustrate the difference that the computer can make, speeding up by orders of magnitude the exchange and evaluation of information over ordinary means. The network proved once more that enough quantitative difference makes a qualitative difference" (Feigenbaum and McCorduck, 1983, p. 76). Proto-internet technologies enabled communication across AI researchers in the programme analysed below.

It is important to add some further emphasis on Kahn's role as Director of DARPA's Information Processing Techniques Office (IPTO) and key planner of the Strategic Computing initiative, the United States 10-year $1 billion AI programme (1983-1993) that promised the creation of a general purpose, human-level AI system, through parallel development and eventual connection of several component technologies. According to Kahn's diagrammatic plan for DARPA, networks, research machines (such as today's search engines), rapid machine prototyping (a practice performed today with generative AI), design tools, interoperability protocols, and implementation systems and foundries were at the infrastructural basis of the SC's goal setting which involved, among others, many "intelligent functional capabilities" applications that we recognise as very relevant in today's general purpose AI systems goals, natural language navigation (that relates to language models),

vision and speech expert systems, while even higher in the hierarchy, one finds "military applications" including "autonomous systems" (Nilsson 2010: 287).

While SC is considered to be a failure in terms of delivery of promises, its separate findings can seen as important contributions to AI in the 1980s and the role of network technologies in this, through Kahn's influence, cannot be disregarded: "Networking was clearly infrastructure of the kind envisioned in the SC plan. Indeed, it was in some ways the paradigmatic infrastructure. It connected this technology in the most fundamental way" (Roland and Shiman 2002: 110). The two historians of the SC programme, recommend viewing the "AI winter" level of SC promises from at least two perspectives, one based on the fulfilment of specific promises about connecting many applications towards a general-purpose AI system, and one based on successful component applications that are still used: "At the coarse-grained level, AI fell into another AI winter. […] On the fine-grained level, AI, including many developments from the SC program, is ubiquitous in modern life. It inhabits everything from automobiles and consumer electronics to medical devices and instruments of the fine arts" (Roland and Shiman 2002: 328). It is at this point when the transition to internet technologies is important. In 1989, a proposal for a 1990-1995 continuation of the SC programme known as "SC2" suggested continuation of its basic goals, but redefined the nomenclature by: (a) incorporating networking as means towards parallel computation, in light of ARPANET's dissolution to the dawn of the World Wide Web, and (b) a "major shift of emphasis" in the removal of "machine intelligence" from SC's goal pyramid to be replaced by "software" – as Roland and Shiman suggest, "[t]his seemingly minor shift in nomenclature signalled a profound reconceptualization of AI, both within DARPA and throughout much of the computer community. The effervescent optimism of the early 1980s gave way to more sober appraisal" (Roland and Shiman 2002, p. 282). Without

any formal explanation to Congress, SC2 was never released and many of the component projects were reoriented as separate practical applications projects.

Tracing the history of artificial neural networks (ANNs) from the cybernetic work of McCulloch and Pitts in the 1940s through the 1980s, the evolution of these systems paralleled AI development but remained distinct. Rosenblatt's Mark I perceptron (1958) and the pioneering yet unsuccessful attempts by Werbos (1969) to apply Freudian theory to algorithms laid early groundwork (Anderson and Rosenfeldc, 2000, p. 338). Nonetheless, it was the 1980s introduction of the error-correcting backpropagation algorithm that consolidated ANN's prospective value, largely attributable to Rumelhart, Hinton, and Williams (1986). Despite backpropagation's centrality to modern AI, Olazaran (1996) exposed an extensive field controversy that prompted ANN specialists to eschew the AI label. This disposition also extended to convolutional neural networks (CNNs), pioneered by LeCun and Bengio (LeCun et al, 1989; LeCun and Bengio, 1994). Concurrently, the Strategic Computing (SC) plan did not incorporate connectionist models into its framework, although DARPA recognized ANNs' potential apart from mainstream AI[2], considering them distinctive in their 1988 report. Claims about ANN capabilities often veered into hype territory, necessitating a linguistic separation from symbolic AI (DARPA, 1988).

Key figures like Minsky from symbolic AI and SC program representatives attended workshops that acknowledged crossover interests, including Sutton and Barto who developed "reinforcement" learning—once termed "hedonistic"—now a practice embedded in social media engagement such as “likes” or “dislikes” (Sutton and Barto, 2015, p. viii). This period solidified the divide between ANN research and conventional AI, with linguistic

[2] Consider the following introductory remark by project lead Jasper Lupo: “After participating in this Study, my personal view is that neural networks will provide the next major advance in computing technology. Over the history of computing science, two advances have matured: highspeed numerical processing and knowledge processing (artificial intelligence). Neural networks seem to offer the next necessary ingredient for intelligent machines - namely, knowledge formation and organization” (DARPA, 1988, p. iii)

differentiation shaping both the perception and the development of each field. But this had little to do with nomenclature. The most complete historical account of AI until 1993 stated the following:

> "Rather than a specialty of AI, many connectionists consider their field a new science of its own, Indeed, connectionists meet in different conventions, express themselves in different journals, and speak a technical dialect different from that of AI researchers. Yet, there are signs that the two fields may be converging: […] AI now recongises the need for extensive parallel computation, and new AI theories postulate the existence of large numbers of cooperating 'agents' within a mind: intelligence would then be the result of a 'network' of interacting entities" Crevier, 1993, p. 215-6).

Hinton began his PhD in AI at Edinburgh University in 1972, exactly on the year that the Lighthill investigation led to what is considered the first large-scale AI winter was commissioned. He was awarded the title in the aftermath of the report, thus, remaining jobless, working on a connectionist model which was considered to be doomed to fail amid AI communities, and at a time of the AI winter. Before moving to Canada, in an attempt to avoid the Ronald Reagan's regime and that DARPA was the only source of research money, he found shelter at Carnegie Melon, under Alan Newell's hospice, (Metz, 2021, p. 34-45). From a linguistic socialisation perspective, this is interesting as Newell was one of the participants at the 1956 Dartmouth summer school that gave birth to the term AI, but opposed the term as "too flashy," preferring "complex information processing" instead (BBC TV, 1973, 00:44:37-00:46:45). The Rumelhart, Hinton, and Williams (1986) paper also makes no reference to the term "AI," although papers about perceptron by either Minsky or Rosenblatt are acknowledged, evidencing the technological continuity from 1957 perceptrons and Minsky's appreciation of connectionism (as noted by Olazaran, 1996).

Amidst the 1980s AI development, Cyc emerged as a knowledge infrastructure project led by Douglas Lenat, bridging AI's early focus on knowledge systems with later internet applications. Cyc's extensive knowledge base, incorporating a wealth of facts and theories via an upper ontology (Lenat et al., 1985), evolved through the internet era (Lenat, 1995) and remains pertinent within generative AI discourse (Lenat and Marcus, 2022). It demonstrates how internet-derived knowledge enriches digital interaction by infusing semantic search and content creation with nuanced understanding and reasoning, rooted in the AI advancements of the 1980s.

Past the terminological alienation instead of synergy between specialised technical fields and their lexicons such as ANNs and CNNs, backpropagation, hedonistic reinforcement learning, networking infrastructure, VLSI, and semantic databases would need to wait until increased computational needs of AI, particularly in training large neural networks, would only happen with the infrastructural exigencies of an increasing internet user base.

4.2 1990s-2000s: Of Singularities, Folksonomies, and New Neural Nets

Since the establishment of the World Wide Web in the early 1990s, in the early 21st century, the domains AI and the internet continued to evolve hand-in-hand. The mid- to late 2000s marked a period of developments within AI that were deeply interwoven with the maturation of the internet as space for cultural expression. This era saw the transition from static web pages to dynamic user-generated content platforms, a hallmark of Web 2.0, and the concomitant rise of machine learning as the powerhouse of AI, supported by increasingly available large datasets and computational resources.

Driscoll, in his historical work about early UseNet fora, points out that in that period, “vernacular use of ‘internet’ reflects a transformation in meaning from the technical to the

social, from programs and protocols to people and practices" (Driscoll, 2022, p. 5). Driscoll's suggestion to look for myths about the origins of the internet beyond ARPANET is useful here. As Driscoll rightly points out, "the standard history of the internet jumps from ARPANET to the web, skipping right past the mess of the modem world," a world with emphasis on "the role of popular innovation and amateur invention" very similar to "today's social media ecosystem" as "an archipelago of proprietary platforms, imperfectly connected at their boarders" (Driscoll, 2022, p. 194-5). Or, to extend Jurgenson's points about the social nature of online photography, living online was predominantly a social endeavour, serving personal desires but within the formation of a social whole, from selfies to food images (Jurgenson, 2021).

Web 2.0, envisioned as a democratic shift from early internet monopolies, harnessed user-generated content through bottom-up "folksonomies" (instead of top-down taxonomies) for knowledge sharing, exemplified by platforms like Wikipedia and Flickr (O'Reilly, 2005). This period saw a utopian fantasy of immaculate user-driven metadata (data about data) for content description, a notion that, despite its allure, remained unrealised and perhaps unattainable (Doctorow, 2001). The backdrop of this technological optimism was "the Californian Ideology" (Barbrook and Cameron, 1996), where Silicon Valley's network innovations merged with 1960s counterculture and a neoliberal stance, epitomising the era's socio-political context, largely understood now through the massive influence exerted by Silicon Valley companies.

This aspect of social innovation online mutually dependent with techno-deterministic visions took place in parallel with the preservation of AI visions stemming from intellectuals and science fiction writers. Flichy captures this sentiment when he discusses "robots and thinking networks" in his book *The Internet Imaginaire*. It was during the establishment of the internet and its popularisation through the World Wide Web that grand speculations about

the singularity became more prominent – that being the possibility of AI exceeding in intellectual power that of humans, according to Vinge, a prolific science fiction author who popularised the term at an symposium about cyberspace visions hosted by NASA (Vinge, 1993, Eden et al, 2012). Vinge, being a regular contributor to the *Wired* magazine, suggested in January 2000 that "[t]he largest control systems are being *grown* and *trained*, rather than written […] Cyberspace begins to leak into the real world […] Even when that is not explicit, there is growing use of synthetic intuition" (Vinge, in Flichy 2008: 144). This is co-orchestrated by a number of similar influential statements about a "global artificial intelligence" such as roboticist Hans Moravec's prediction that "robots capable of learning and adapting will appear in around 2020" (Flichy 2008: ibid), suggesting a divergence of disciplines (cyberspace and robotics) that partake in the same narrative currency for attention, that of the surpassing of human intelligence by machines. In an interesting moment of terminological interchangeability between AI and robotics, roboticist Moravec suggests robots' "success or failure will be defined by separate programs that will monitor the robot's actions and generate internal punishment and reward signals," also on a *Wired* article (Moravec, 1995, in Flichy 2008: 144-5), a tacit hint to reinforcement learning. For the media, this could sound as a commercially-oriented story. For internet, AI and robotics specialists, this might sound like a motivation to continue work in hedonistic backpropagation.

A key step was meant to be found in the work of Fei-Fei Li and her team in creating ImageNet, an extensive visual database designed for use in object recognition software. Li, along with her collaborators Jia Deng, Kai Li, and An Li at Princeton University, sought to provide a resource that could serve as the scaffolding for developing advanced machine learning algorithms capable of parsing and interpreting visual information, a particularly challenging aspect of AI research as understood in the 1980s. ImageNet was introduced in a paper published in 2009, yet despite its direct implications for AI, the team's discourse

avoided the mention of "AI," focusing instead on the burgeoning Web 2.0 framework. The continuity of AI-and-internet technologies can become more strongly evident if ImageNet is considered in relation to its nominal predecessor, WordNet. ImageNet drew its philosophical and operational inspiration from Princeton's WordNet, a semantic database for the English language created in the 1980s by George Miller and others. WordNet organised words into sets of cognitive synonyms (synsets), providing an extensive lexical framework that contributed significantly to advancements in natural language processing. Li and colleagues' ImageNet, extending Li's earlier (2004) works on generative models in machine vision is situated within the data and metadata literature. From the original ImageNet article abstract:

> "The explosion of image data on the Internet has the potential to foster more sophisticated and robust models and algorithms to index, retrieve, organize and interact with images and multimedia data. […] ImageNet aims to populate the majority of the 80,000 synsets of WordNet with an average of 500-1000 clean and full resolution images" (Deng et al, 2009).

In the context of the AI-internet continuum, besides the ImageNet project harnessing the power of the internet web search infrastructure to gather images, it also employed crowdsourcing platforms like Amazon Mechanical Turk to label and categorise over 14 million images of images into a structured dataset. ImageNet was made publicly available through the project's website, emphasising collaboration and an open-source mentality. This meant that researchers from all over the world could access and download the dataset in the aforementioned spirit of community sharing that is paired to neoliberal values of free market competition (Russakowski et al, 2015).

The introduction of the ImageNet Large Scale Visual Recognition Challenge (ILSVRC) in 2010 by Li's team was pivotal. It set a benchmark for AI systems in image recognition and

catalysed competition and innovation in the field. Participants from around the world were invited to develop algorithms that could achieve the highest accuracy on tasks such as object detection and image classification (Russakowski et al, 2015). This contest laid the foundation for a significant moment in AI: the resurgence of Hinton and his protégés Krizhevsky and Sutskever with their deep CNN – AlexNet, deriving from Krizhevsky first name. In 2012, their participation in ILSVRC led to a monumental victory that crushed the competition, achieving a top-5 error rate of 15.3%, more than 10 percentage points better than the runner-up (Krizhevsky, Sutskever and Hinton, 2012). Hinton and colleagues brought neural networks back into the spotlight.

Krizhevsky, Sutskever, and Hinton's work exemplified a paradigmatic shift from an internet-oriented focus on Web 2.0 technologies to an explicit harnessing of machine learning power – AI, as a term, was again out of the map. These breakthroughs were dependent on and fed back to the evolution of the internet, with advancements in distributed computing and data sharing platforms enabling such neural networks to be trained over extensive datasets like ImageNet.

5 Towards Discussion: Generative AI as Search Engine

The latest paradigm in AI was enabled by work on generative adversarial networks (GANs, the rather violent acronym now mostly referred to as “generative AI”), the initial domain Li and her colleagues have been working on before ImageNet. Following Hinton, Krizhevsky and Sutskever’s success with pattern recognition in large visual datasets, Goodfellow et al (2014) employed some of these techniques showing how a computational training process of a model for a given image dataset, can produce variations of the same image according to prescribed parameters (currently known as “prompts”). This methodology’s realistic output is offering alternate versions of digital content (visual, audio, text) paired to its increasing

efficiency (as recently outlined by Goodfellow et al 2020; in collaboration with Bengio, who had refined CNNs chiefly in the 1990s). Currently, generative AI models and applications such as generative pretrained transformers (GPTs), image generators such as DALL-E or Midjourney, or music and video generators, become increasingly more commercialised and embedded in multiple other applications. On March 27 2019, the three connectionist researchers Hinton, Bengio, and LeCun, whose work in the 1980s and 1990s that was distant from AI discourses nominally, became the pillar for contemporary AI applications received collectively the Association for Computing Machinery (ACM) A. M. Turing Award for their contributions to AI. Press coverage (*The Telegraph*, *The Verge*, *TechRegister*, *TechTimes*, and *Forbes*) pronounced the them as "godfathers of AI," with Minsky, McCarthy, and other supporters of the logicist AI paradigm being unavailable to exert any disagreement over the new paradigm. Early AI, which concentrated on symbolic logic and rule-based systems, eventually gave way to subsymbolic, data-driven approaches encapsulated by neural networks and statistical learning methods. This transition is not simply a change in preference or technology but a fundamental paradigmatic shift signifying a deep reconceptualisation of machine "learning" and "thinking," challenging both the mimicry of human cognition by machines and the applicability of connectionist theory to human thought processes. For the purpose of this discussion, let's examine how the history of AI adds nuance to Kuhnian paradigm shift theory through an experimental commentary on the last paragraph of Kuhn's chapter *The Resolution of Revolutions* (Kuhn, 1962, p. 159 – brackets indicate my own additions based on the AI-internet case study):

> "At the start a new candidate for paradigm may have few supporters, and on occasions the supporters' motives may be suspect. [That's precisely what happened with connectionism in the 1970s and 1980s] Nevertheless, if they are competent, they will improve it, explore its possibilities, and show what it would be like to belong to the

> community guided by it. [The first part matches history indeed – models were improved. The difference is that the community was detached and reattached only later] And as that goes on, if the paradigm is one destined to win its fight, the number and strength of the persuasive arguments in its favor with increase. More scientists will then be converted, and the exploration of the new paradigm will go on. Gradually the number of experiments, instruments, articles, and books based upon the paradigm will multiply. [Again, a fair assessment of the neural network paradigm overtaking symbolic logic AI. What Kuhn does not mention that is crucial in the present case study is the availability of infrastructural externalities as allies: neural networks' results would not be enabled without the internet infrastructure. It takes an established network of networks to enable applications of neural networks] Still more men [*sic*], convinced of the new view's fruitfulness, will adopt the new mode of practicing normal science, until at last only a few elderly hold-outs remain […who eventually die, and in the case of AI, let the power of the Press, as another externality, pass them on the sceptre of scientific godfathership constructing a near erasure of the field's historical background]".

That is where Kuhn's last writings (2022) become more relevant. Indeed, it would seem paradoxical for most people to always refer to geocentrists as pioneers of astronomy after Copernicus's dramatic (in every sense of the term) success. It might make sense to refer to ancient heliocentrists as theoretician who coined hypotheses but never tested them empirically, but geocentrism would not be given linguistic accreditation despite its dominance and political/infrastructural importance. Likewise, it is interesting to see that one of the most recent historical accounts of AI, conducted by Metz (2021), locates the birth of AI chronologically in 1958, with the publication of Rosenblatt's work on perceptrons – Minsky and McCarthy are scarcely mentioned in the book and AI now means neural networks and neural networks are synonymous with the progress of internet platforms such as

Facebook and Google, according to the book's subheading ("*The Mavericks Who Brought AI to Google, Facebook and the World*"). A potential commentary by latter Kuhn on early Kuhn, after AI: the paradigm shift is completed through linguistic socialisation, as well as through Latourian "winning trials of attribution" after a number of decades-long displacement and invention of goals (connect everyone, mimic intelligence…), new groups (cybercultures, AI leaders), all through relatively invisible detours by the most paradoxical tactic: the employment of hype as attention grabber that renders changes invisible by making static aspects overly visible.

Sutskever, one of Hinton's co-authors of the 2012 ImageNet paper, who worked at Google Brain between 2013 and 2015, "envisioned a lab that was entirely free of corporate pressures, a not-for-profit that would give away all its research, so that anyone could compete with the Googles and the Facebooks" – this thought resulted into the company OpenAI which received the financial backing of Elon Musk amounting to more than a billion US dollars (Metz 2021: 163-165). Since the public release of OpenAI's ChatGPT, the first publicly available generative AI application that has admittedly been adopted at a rate faster than any other online platform, the landscape of AI has been inextricably altered, revealing a multitude of applications that intertwine AI advancements with the development of the internet. ChatGPT, released in November 2022, is a variation of the Generative Pre-trained Transformer models, building upon OpenAI's GPT-3 architecture. It employs deep learning techniques to produce human-like text, demonstrating remarkable capability in conversation, composition, and comprehension across various domains. The ripple effects of generative language models on various sectors have reinforced the idea that the evolution of the internet is inherently connected to progresses in AI. The detour from internet cultures to AI cultures is now erasing the historical connection to social network and Web 2.0 technologies.

While writing these lines, the first technical, legal, and ethical assessments of the employment of generative AI as search engines (after already serving as search engine result optimisers for a number of years now) are published while such applications, textual or visual, can now be embedded as browser search plug-ins (to enable information summation), word processors (for grammar check, summaries, or template text generation), or chat environments (to generate unique icons) (Arcila, 2023, Kelly et al, 2023, Lindemann, 2023). As an extension of mobile internet use and frontline interface, it is very unlikely that generative AI will be used offline as, indeed, much of its imaginary charm derives from its power to update its database live. Is that generative AI an internet application? Or is the internet an extension of AI research that began in the 1950s? In the case of AI and the internet, we might speak about a paradigm shift by way of technological and terminological convergence.

6 Concluding Hypernetic Eggspoontations: Hibernation or Hyper Nation?

I visualise technological history mediated through technological hype as a very slow egg-and-spoon race, surrounded by massive display screens projecting rapidly interchangeable flashing images of future technological progress and science fiction scenes. The rapidly changing surrounding standing for human desire's velocity is contrasted by the immensely slow rhythm of material infrastructure aligned with sociotechnical convergence between invention and adoption – I describe the synthesis of extremely fast and extremely slow experience of digital technological duration in one word: eggspoontations. The intricate relationship between the historical progressions of artificial intelligence (AI) and the internet is characterised by a symbiotic narrative and myriad of technical components, terminological variations, cultural discourses, and motivations for adopting either narratives or terminologies. Throughout their evolution, both domains have influenced and catalysed

advances in the other. This assessment, grounded in the theoretical framework of interface and historical continuity and discontinuity shaped by linguistic socialisation established earlier, explores these connections, recontextualising the conceptual seasons of “winters” and “summers,” assessing linguistic shifts, and appreciating the material backdrop of innovation. The following table acts as synopsis of the above critical synthesis of historical literature on AI and the internet. The tremendous growth of the internet paired to an imaginary about preserving every aspect of life online catalysed the generation and flow of digital data, which, in turn, became the raw material for machine learning. Abundant data, improved algorithms, and more powerful computational hardware have collectively allowed AI systems to achieve performance that was once unattainable.

Moving beyond seasonal metaphors (indeed, not so relevant during climate change), the term "AI winter" suggests stark periods of stagnation, a conceptualization at odds with ongoing incremental innovation. The historical landscape of AI reveals that during these purported winters, researchers and engineers continued their work without calling it AI, sometimes inventing entire disciplines, often contributing fundamental research whose impacts would only be recognised later.

This paradigm shift was, in part, instigated and perpetuated by changing terminologies. The repositioning of neural networks from a peripheral to a central focus in AI reflects the potent role of language and strategic hype as an indicator of scientific priority. From a materialist perspective, the rhetoric idealism of linguistic socialisation may pose harmful attentional shifts away from the material networks that are common in both neural and social networks – those of undersea cables, satellites, data centres, and circuit boards form the substrata upon which digital applications are built. These infrastructures, less heralded than the algorithms they support, are vital in the historical progression of both AI and the internet, and more histories based on them should be written, paired to more

empirical work around the social groups who shaped and continue shaping their construction, often overshadowed by the spectacular light of heroic AI and internet Freudian gods-fathers.

1970s-1980s: DARPA's Strategic Computing, expert systems period: computers are assistants	**1990s-2000s: World Wide Web, Californian ideology, Web 2.0 period: computers are connective environments**	**2010s-2020s: Machine learning, generative AI period: connectivity and assistance merge with termoil of focus**
Artificial/convolutional neural networks, Backpropagation algorithm	Unsupervised deep learning	Increased computational speed, customised/personalised generative AI training through semi-supervised learning
Hedonistic reinforcement machine learning	Internet-as-culture, online fora, social media, demand for social media reactions (e.g. likes or dislikes) for customised content	
Networking-as-infrastructure, ARPANET, VLSI		Targeted advertising, customisable content, platform culture
Semantic databases for information retrieval (Cyc, WordNet)	Web 2.0 contributions to the web, big databases, building up of first large models, ImageNet	Generative AI based on large models employed as search engine for "one-shot" information search
Natural language navigation, vision and speech expert systems	Natural language processing, visual object recognition	Large language and image models
Rule-based intelligence leading speculation about superintelligence	Cyberspace narratives enabling speculation about connected intelligences and the singularity	Language model communication suggesting emergence of conscious entities

Table 1: Technical contributions associated with reshuffling of interests and goals and continuous development irrespective of perceived AI winters (1973-, 1991-). Variations of dominant lexicons generate perceptions of "winter."

In conclusion, AI and the internet have shared a mutual history of growth and advancement, led by multiples conjoined or convoluted narratives, filled with reciprocal influences and complex hype systems – a "hypernetics" of sorts, for lack of a better term, that triggers AI/internet reconfigurations by negotiating paradigmatic boundaries, simultaneously obscuring and serving national agendas of geopolitical significance (Kissinger, Schmidt and Huttenlocher, 2021) by focusing on the fear of a hypothetical hibernation during a presumed AI winter – the desire towards a hyper-nation[3] may be lurking behind the fear of AI hibernation. More empirical research should examine the political motives behind AI and internet actors/stakeholders: sponsors, scientists, workers, entrepreneurs. Ending with an optimistically bleak quote by novelist Yukio Mishima: "Whether in success or in failure, sooner or later time must lead to disillusionment; and if foresight of this disillusionment

[3] This paper is written in the aftermath of European, British, Chinese, American, Indian, and Russian (among others) establishment of national agendas concerned with AI between May and November 2023.

remains only that, it is mere pessimism. The important thing is to act on this foresight even by dying" (Mishima, 1970, p. 78). The present exploration of AI and internet history has shown that disillusionment is a feature of *technology as language* and *language as technology*. Nothing, besides language, guarantees the persistence of hyperbolic excitement. Language's linear structure points towards an end, successful or not, but always by placing attention towards something. The excitement must be prepared to give place to the abandonment of vocabularies and the invention of novel ones in order to respond to contemporary crises that may as well not just go beyond winter/summer and internet/AI binaries, but also beyond the very necessity, or even "right to" or "lack of" internet/AI access.

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