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Artificial intelligence as primitive accumulation: enclosure, extraction, exploitation

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Abstract

AI systems are imposing escalating calls on the key resources of energy, water, land and minerals and on the hidden labour, often located 'offshore', required to build and service them. These demands are the latest episodes in the long history of capitalist accumulation and exploitation organised around enclosure and extraction. This paper suggests that we can usefully begin tracing continuities by revisiting Marx's analysis of primitive accumulation and David Harvey's notion of accumulation by dispossession. Marx identified the enclosure of the English commons and the labour and resources delivered by colonial exploitation as the essential foundations of Britain's leading role in establishing industrial capitalism. The same basic processes have fuelled the unprecedented concentration of control over digital media and AI now exercised in the West by a handful of US corporations. The neoliberal pursuit of marketisation has transferred public resources to private ownership, weakened public interest regulation, and opened new global labour markets for exploitation. The paper reviews these processes, explores their historical roots taking the electric telegraph as a case study and points to the social and environmental harms they cause. It concludes by asking what implications restoring these issues to a central place in analysis has for public policies towards AI.

Keywords: Artificial intelligence, Marx, Enclosure, Extraction, Accumulation by dispossession, Colonialism, Slow violence, Sacrifice zones

On November 30th 2022 a then relatively unknown artificial intelligence start up, Open AI, launched ChatGPT. Trained on vast troves of data harvested from the public internet, programmed to identify patterns and structures, and employing everyday conversation (chat) in interactions with users, it generated mostly plausible answers to users' queries, translated between languages, and produced new texts in a variety of forms and genres. It was joined by systems generating images and video.

Their release marked a watershed moment in efforts to build machines matching human cognitive and creative capacities and possibly surpassing them. Companies developing AI point to its positive applications in medicine and other areas of public benefit. Emerging systems promise "truly human-centred AI" that can "navigate ordinary

homes and look after old people", provide "a tireless set of extra hands for a surgeon", or be employed in "training and education" (Li, 2024). Critics are unconvinced. Dark warnings of existential threats to social and political order as machines pursue their own agendas jostle with mounting concerns over more immediate impacts on the future of work and employment, surveillance and privacy, and the integrity of public debate and democratic processes.

The sweeping transformative potential of AI has fed into wider debates on the impact of digital technologies on the organisation of capitalism. Marxists have been forced to ask whether Marx's original analysis, developed to identify the underlying dynamics of nineteenth century industrial capitalism, is still the essential starting point for a critical understanding of contemporary conditions. A full review of available answers would take us well beyond the bounds of this paper. The focus here is on Marx's analysis of relations between capital, labour and automation.

There is a rapidly a growing literature in this area (see for example Dyer-Witherford et al. 2019; Healy, 2020; Steinhoff, 2021; Buttolo and Nuss 2022). The handful of pages, "The Fragment on Machines", included in Marx's notebook, the *Grundrisse* (groundwork), complied in 1857 in preparation for drafting Capital, are particularly relevant to the argument I want to make here.

Marx and machinery revisited

Current discussions around AI are the latest contributions to long-standing debates on the consequences of mechanising human skills and knowledge. Debate begins in earnest in the 1830s with the first factories built to house self-acting machines for cotton manufacture. As Andrew Ure argued in his influential book of 1835, *The Philosophy of Manufactures*, the factory system shifted production decisively from hand crafted work conducted in domestic dwellings and small workshops to a "vast automaton, composed of various mechanical and intellectual organs, acting in uninterrupted concert (driven by) the moving force" provided by steam power fuelled by coal (Ure, 1835: 13–14).

Ure was an unashamed enthusiast. He saw factories laying the basis for "the most perfect manufacture" dispensing "entirely with manual labour" (Ure, 1835: 1) and relegating workers to caretakers, ensuring the machines operated at maximum capacity. Far from "lending itself to the rich capitalists as an instrument for harassing the poor, and exacting from the operative an accelerated rate of work" as its critics claimed Ure saw automation improving working conditions by eliminating strains on physical health and leaving "the attendant nearly nothing at all to do" (Ure, 1835: 7). Marx, for whom systematic exploitation at the site production is central to the generation of surplus value, is scathing. In Volume One of *Capital* he lampoons Ure as an unashamed apologist for "his dear machinery exploiting manufacturers" (Marx and Engels 2010b: 390) singing their praises as "the Pindar (Roman lyric poet) of the automatic factory" (Marx and Engels 2010b: 421). For Marx, Ure's relentlessly positive depiction of automated labour "perfectly captures the spirit of the factory not only in its undisguised cynicism, but also by the naivete with which it blurts out the stupid contradictions of the capitalist brain" (Marx and Engels 2010b: 439).

An alternative survey of mechanisation was provided Ure's contemporary, the eminent mathematician, Charles Babbage. His book, *On the Economy of Machinery and*

Manufactures appeared three years before Ure's, in 1832. Babbage's account set out "to trace the causes and consequences of applying machinery to supercede the skill and power of the human arm" (Babbage 2009[1832]: 1). It gained a wide readership, including Marx, but Babbage was better known in his lifetime for efforts to build machines that replicated mental processes.

In 1822 he announced his Difference Engine designed to calculate navigational and astronomical tables. Awarding the invention its Gold Medal in 1824, the president of the Astronomical Society of London noted that while previous "mechanical devices have substituted for simpler tools or for bodily labour [this] invention substitutes mechanical performance for an intellectual process" promising a general automation of intelligence (quoted in Schaffer, 1994: 203). The prospect of producing navigational charts rapidly and cheaply attracted significant government funding but following the resignation of Babbage's chief engineer, Joseph Clement, the project floundered and was eventually abandoned in 1842.

By then Babbage had turned his attention to his Analytical Engine, a more advanced and versatile machine incorporating an integrated memory and other core features of a computer. Following the system developed by the French textile entrepreneur Joseph Jacquard, instructions were fed in using punched cards. To demonstrate its versatility in 1839 Jacquard printed a limited edition of portraits of himself on silk with definition close to etching. Babbage purchased a copy as a reminder that even creativity might be automated. The Analytical Engine was formally announced in 1843. Entirely sound conceptually it was over taken by cost overruns and technical problems and a full scale version was never built in Babbage's lifetime. He died in 1871.

Babbage is not mentioned by name in "The Fragment on Machines" but given Marx's close interest in developments in science and mathematics and the publicity surrounding the Analytical Engine he would almost certainly have known about it. His account of fully automated production was a projection of possible futures not a description of existing conditions. It has proved remarkably prescient raising fundamental issues for both his own theory of capitalist accumulation and contemporary debates around AI.

Building on Ure's earlier description of the automated factory and borrowing some of his phrases, Marx pictures capitalist production increasingly organised around "an automatic system" made up of "a large number of mechanical *and intellectual organs*…set in motion by a self-moved motive power" fed by a continuous supply of energy [italics added] (Marx and Engels 2010a: 82). Operating this system requires the wholesale appropriation and exploitation of gains from "general scientific work" and "the technological application of the natural sciences" (Marx and Engels 2010a: 84). These intellectual resources could be made openly available as public goods, shared, and employed for a range of socially determined purposes. Instead they are privatised and enclosed, "absorbed in capital as opposed to labour" (Marx and Engels 2010a: 82) protected from unauthorised use by legally enforceable patents and intellectual property provisions. As Marx notes, this intellectual enclosure increasingly forces "All the sciences into the service of capital…invention becomes a business, and the application of science to immediate production" becomes a major factor in determining which areas of science will be prioritised and funded (Marx and Engels 2010a: 90).

Automation also trades on the information and know-how acquired through everyday work and living. Early moves replicated workers' bodily movements. The more comprehensive version Marx imagines encloses the vernacular knowledge produced by the general "social mind"(Marx and Engels 2010a: 83) which, because it circulates freely in society appears, Marx notes, "as natural gifts of social labour" available to be "appropriated gratis by capital" (Marx and Engels 2010a:84).

In an ideological sleight of hand however "capital works to dissolve itself as the form which dominates production" (Marx and Engels 2010a: 86) shifting the locus of control to the machine which is presented as having "a soul of its own in the laws of mechanics which determine its operations" (Marx and Engels 2010a: 82). The knowledge base of the system is permanently locked in a "black box". It "does not exist in the worker's consciousness, but acts upon him through the machine…as a force of the machine itself" (Marx and Engels 2010a: 83).

Despite being written well before the appearance of the first fully working computer, Marx's notes raise issues that remain centrally relevant to current debates around AI.

He sees the automation of mental as well as manual labour making most workers redundant confining those that remain to subordinate roles employed to "watch over " the system "and guard against obstructions" (Marx and Engels 2010a: 82). At the same time, he speculates that reducing labour to a minimum could free up time for everyone to explore artistic, educational and other resources for self-development (Marx and Engels 2010a: 91). The spectre of AI causing mass redundancies has revivified this argument, but as in Marx's time, how far increased non-work time will expand opportunities will depend on a radical redirection of income and assets from the top to the bottom of the scales. At present movement is entirely in the opposite direction.

Marx's imagined networked of connected machines has been realised in the structure of the internet and the now massive assembles of computers in the data centres storing and handling the information feeding AI systems. He anticipates the increasingly central role that command over strategic information and knowledge will play in the organisation of advanced capitalism and the production of value noting that "Immediate labour disappears as the determining principle of production, of the creation of use value [and] becomes a subaltern moment in comparison to the" application of science (Marx and Engels 2010a: 86). This argument comprehensively under cuts the labour theory of value at the heart of his analysis and he never returns it in his later writings.

Of particular relevance to the present argument is his insistence that capital's capture of strategic knowledge represents a comprehensive enclosure movement transferring core resources from the public domain to private ownership.

Marx also points to the fundamental role played by extraction. He notes that maintaining the "continuous self-motion" of an automated system requires it "to consume coal, oil etc. as the worker consumes foodstuffs" (Marx and Engels 2010a: 82), but he doesn't elaborate on the organisation of labour and exploitation that securing these resources entails. AI systems are increasingly reliant on "mass extraction, mass flows of matter and mass dissipation of waste" (Pineault, 2023: 11). A proliferating array of infrastructures and devices is making increasing demands on land, metals, energy, and water imposing escalating global social and ecological costs, mostly borne by marginalised communities. We can usefully begin unpacking these processes by revisiting Marx's analysis of

Primitive Accumulation in Volume One of *Capital* where he presents extraction alongside enclosure as the core drivers of capitalist accumulation.

Accumulation and dispossession

As Kate Crawford has argued a full analysis of AI needs "a theory…that accounts for the states and corporations that drive and dominate it, the extractive industries that leave an imprint on the planet, the mass capture of data,and the profoundly unequal and increasingly exploitative labour practices that sustain it" (Crawford, 2021: 11).

A growing body of critical commentary and research has begun to address these issues (see Brevini, 2021; Crawford, 2021; Muldoon, Graham and Cant 2024), but it has tended to focus on immediate problems rather than locating them in the long history of capitalist accumulation. David Harvey's recasting of Marx's analysis of "primitive" or initial accumulation in Volume One of *Capita*l (Harvey, 2003) provides a productive place to start.

Setting out to explain how Britain became the first, and for a time, the dominant industrial capitalist power Marx identifies two key factors: the completion of domestic land enclosure and the resources extracted by colonial adventurism and labour exploitation. Following David Harvey's (2003) revisionist account, I will argue that the consolidation of digital capitalism in the United States has been propelled by the same basic processes. Neoliberal privatisations and deregulation at home and abroad have fuelled both a new enclosure movement, concentrating command over digital activity in the hands of mega corporations, and the continuing exploitation of "offshore" material resources and labour. These developments coincide with steadily worsening climate and environmental emergencies and deepening global inequalities creating a radically unequal distribution of ecological and social costs.

Marx presents his account of Primitive Accumulation as a "pre-history of capital" (Marx 1967[1867]: 875). Enclosures cleared the way for industrial capitalism by dismantling feudal economic relations. Profits from the slave trade and the Caribbean sugar plantations provided a pool of investment. Later writers have challenged this "one time, one place" conception. They view the processes Marx identifies as "inherent and continuous" features of capitalism with a range of action that "extends to the entire world" (De Angelis 2001: 3). The last four decades of neo-liberal global reconstruction support this view, reaffirming the extent to which capitalist accumulation continues to rely on multiple forms and sites of dispossession.

As Harvey points out, "a closer look at Marx's description of primitive accumulation reveals a wide range of processes" converting collective resources into exclusive private property rights. Since these are still active he argues, it is unhelpful to continue describing them as "primitive" or "original" (Harvey, 2003: 74). He nominates "accumulation by dispossession" as a more useful concept for capturing the range and geographical reach of the "the on-going predatory practices occurring under the guise of privatisation, market reforms…and neo liberalisation" that have transformed the world economy since the late 1970s" (Harvey, 2006: 158).

For Raju Das and other critics, this expanded definition breaks with Marx's original analysis. Das concedes that "a worker's job or their house is their means of subsistence" but argues that since being laid off when a factory closes or having a house repossessed

are "a direct outcome of economic processes where capitalism has already come into being [they] cannot be conflated with peasants forcibly expelled from their land at the origin of capitalism" (Das, 2017: 598). This argument ignores the fundamental redefinition of entitlements based on the rights secured by popular struggles and political reforms since Marx wrote.

In the years following World War II, across liberal democracies, hard-won portfolios of expanded rights were institutionalised in newly negotiated social contracts between governments and citizens and capital and labour. Corporate power was subject to regulatory limits. Labour rights were guaranteed. Public investment delivered material rights to affordable housing and sufficient income to live with dignity. Cultural rights guaranteed information and communicative resources supporting full and informed participation in social life. Ronald Regan's election as US President in 1980 saw these settlements abandoned. Economic policy in the world's leading capitalist nation was increasing organised around a neoliberal platform of marketisation based on an aggressive reassertion of **capital**'s right to pursue accumulation with minimum intervention from government and minimal requirement to contribute to the public purse.

The regulatory regimes and public investment that had supported cultural rights were jettisoned or drastically scaled back. Citizens were urged to see themselves as consumers, rather than citizens and workers, "free" to meet their needs through market choices. Versions of marketisation were adopted in emerging economies, creating new zones of "offshore" labour. These are the essential contexts for analysing the control over digital innovations and applications now exercised by the leading US based corporations and the social and environmental costs they impose.

The nineteenth century enclosures of land and natural resources Marx witnessed were secured by new laws privatising collective resources. His designation of these interventions as "parliamentary robbery" retains its full force under contemporary conditions. we need to return to his original analysis to retrieve these continuities.

Marx on enclosure as legalised theft

Across Europe feudal economic relations granted peasants the right to graze cattle and sheep on common land and forage in woods and forests for fallen timber, natural foods, and herbs for traditional medicines. Access to these resources supported a degree of self-sufficiency and independence from the vagaries and exploitations of market transactions. Capitalism's expansion required this space of relative autonomy to be closed. This was achieved by a fundamental "redefinition of property forms" that abolished customary rights. In the opening decades of the nineteenth century timber was still the main source of energy and building materials making forests and woodlands major sites of struggle (Fressoz & Locher, 2024: 179).

In 1842, Karl Marx, fresh from completing his doctorate in philosophy but barred from pursuing an academic career by his declared atheism, joined the journalism staff of the newly launched regional newspaper, the *Rheinische Zeitung* (Rhineland News). One of his assignments was reporting on debates in the Provincial Assembly on a new law cancelling customary rights to gather fallen wood in the forest commons and criminalising unauthorised access. Marx had strong personal ties to both the place

and the issue. He had grown up in Trier on the Moselle and roamed the surrounding forests. His father, a prominent local lawyer, was defending the rights of the local peasants in court.

Marx dramatizes the irreconcilable conflict at the heart of the debate by recounting an exchange between two delegates. The first strongly opposes criminalising children gathering bilberries and cranberries "to earn a trifling sum for their parents" on the grounds that it is a "customary right since time immemorial". He is roundly dismissed by a deputy celebrating the opportunities for entrepreneurship opened up by enclosure, boasting that "in his area these berries have already become articles of commerce and are dispatched to Holland by the barrel" (Marx 1975: 234–235). Marx studied law at university before turning to philosophy and saw very clearly that the emerging framework of property law was being deployed to translate the "customary rights of the poor…into a monopoly of the rich" (Marx 1975: 235). The piece is entitled "The Theft of Wood". For Marx, the real thieves are not the peasants defending their historic way of life but the new capitalist owners allowed to commandeer communal resources by governments promoting private ownership.

Taking England as a case study, Marx revisits the enclosure movement in his discussion of primitive accumulation the first volume of *Capital* assigning it a central role in his analysis of capitalist accumulation.

By the nineteenth century, appropriations of English common land and resources were accomplished by legislation rather than force. Returning to his earlier argument Marx identifies the Enclosure Acts as a "parliamentary form of robbery" (Marx 1976[1867]: 885) clearing the way for the consolidation of industrial capitalism in a double movement.

Firstly, as he had noted earlier, reporting on the Rhineland debates, transferring communal resources to private ownership opened new avenues for capitalist accumulation. Secondly, enclosure compelled peasants to be become proletarians. "Robbed of all their own means of production, and all the guarantees of existence afforded by the old feudal arrangements" (Marx 1976[1867]: 875) Marx pictures "the peasant, cast adrift" with no choice but to "obtain the value of the means of subsistence from his [sic] new lord, the industrial capitalist, in the form wages" (Marx 1976[1867]: 909).

This double movement has been repeated under digitalised capitalism. Strategic resources have been progressively concentrated in the hands of small number of major corporations and mobilised in the service of accumulation. Land enclosures cancelled peasants' rights to self-sufficiency. Privatising and commercialising publicly owned and administered resources has undermined "social self-provisioning" transferring control and access to corporations (Perelman, 2007: 59) and compelling citizens to depend on market provision to meet their communicative needs. Digital services have moved into this space, becoming central organising nodes for everyday living preparing the way for AI's insertion into every corner of personal and institutional life.

After a brief moment of disruption, AI has been assimilated into the prevailing structure of hyper concentrated ownership and control over digital innovation and applications. Retracing how we reached this point is essential to a full analysis of enclosure under contemporary conditions.

Grand theft digital: the corporate enclosure of the digital commons

Grand Theft Auto is among the most successful video game series ever released. By February 2024 Grand Theft Auto V, based in the state of San Andreas, a fictionalized southern California, had sold over 195 million copies worldwide, making it one of the best-selling titles of all time (Clement, 2024). Players move around a series of cities attempting audacious and lucrative thefts. One of the imagined locations, San Fierro, is modelled on San Francisco, the metropolitan centre for Silicon Valley, home to a number of the most influential digital corporations outside China. Over the last three decades they have pursued their own version of grand theft to position themselves as central organising institutions in modern capitalism.

Their enclosure of the digital commons has been enabled by neoliberalism's promotion of privatisation and retreat from public interest regulation. The privatisation of the internet marked a key turning point.

ARPANET, the original foundation for what later became the Internet was developed under the auspices of the US Defence Advanced Research Projects Agency (DARPA). It was publicly funded and directed to conduct basic research. Commercial applications were prohibited. In the late 1980s it linked to NSFNET, the public network developed by the National Science Foundation, connecting research and educational centres. In 1992, Congress passed the Science and Advanced Technology Act allowing connections to commercial networks. In 1995, public funding for NSFNET ended, opening the way for commercial internet service providers to commandeer the systems' major applications. They were aided and abetted by failures to fully implement anti-trust laws.

In 1990, Tim Berners Lee, working at CERN the publicly funded research facility, devised a solution to the problem of accessing files held on databases on geographically dispersed computers. The system, dubbed the World Wide Web, was made publicly available at no charge. 1993 saw the launch of Mosaic, the first simple point-and-click browser based on research conducted in the publicly funded National Centre for Supercomputing Applications at the University of Illinois. By enabling anyone to navigate their way around the proliferating range of web sites, it laid the basis for mass use and participation, transforming the internet from a specialised research and educational network into a general utility.

Mosaic rapidly lost market share to Netscape Navigator, co-devised by a former National Centre employees and made available free for non-commercial uses in March 1995.

In 1995, Bill Gates, Microsoft's co-founder and CEO, released Microsoft Internet Explorer, a direct rival to Netscape based on the same Mosaic code. Bundling it in with his Windows operating system and making it difficult to uninstall or switch to rival browsers, prompted the US government to bring an action alleging unlawful monopolisation under the Sherman Act, the anti-trust legislation introduced in 1890 to curb the monopolies in oil, railways and banking formed in the first phase of corporate consolidation. The case was initially upheld but partially overturned on appeal, prompting the Department of Justice to abandoned its original plan of breaking up the company. The final settlement required Microsoft to open its application programming interfaces to third parties but did not prohibit tying future programs into Windows.

Microsoft's expansion received a further boost when US regulators failed to challenge the tie-up between Windows and Intel, the leading manufacturer of microprocessors. This imposed "relatively strict conditions on the hardware manufacturers: no smooth running operating system without an installed Intel chip, no Intel chips without Windows compatibility" (Staab, 2024:12). The alliance, dubbed "Wintel", dominated the personal computer market until desk top machines were over taken by smart phones and tablets.

Europe presented stronger opposition. In March 2004, following a five year investigation, the European Commission ordered Microsoft to stop automatically bundling Windows Media Player in with its Windows operating system and to pay a 497 million euro fine. Allowing Microsoft to use Windows' market dominance to lock out rival media players would have cemented the company's control over proprietary standards for the player market. In 2007, Microsoft's appeal was rejected and the fine paid in full. In 2008, an additional fine of 899 million euros was levied for non-compliance with the 2004 anti-trust ruling, reduced to 860 million euros in 2012.

In the meantime, Microsoft pursued aggressive strategies of acquisition and diversification. Forethought, purchased in July 1987 provided the basis for Microsoft PowerPoint. Buying Hotmail in December 1997 added web mail. In 2011, Microsoft moved into social media acquiring the video platform, Skype, followed in 2016 by the professional networking site Linkedin. A second major diversification centred on the video games market. In a classic instance of vertical integration, the company acquired a succession of game producers, Mojang (2014), ZeniMax Media (2020) and Activation Blizzard (2014), to support its Xbox consoles.

The other major digital platforms have employed the same basic strategies of integration and diversification to consolidate and expand their portfolios. Facebook has successively acquired potential challenges to its social media dominance, purchasing the photo and video sharing site Instagram in 2012 and the instant messenger service Whatsapp in 2014. At the same time, it has invested in areas that go beyond the internet, establishing an artificial intelligence research laboratory in 2013 and buying the leading augmented reality company, Oculus VR in 2014. None of these acquisitions have been subjected to regulatory restraint.

Google has enjoyed the same free regulatory ride, systematically building on its search engine dominance to expand the services it offers and integrate users more securely into its network. In 2004, it introduced an email service (gmail) and acquired three companies (Where 2 Technology, Keyhole and Zipdash) that formed the building blocks for google maps, launched in 2005. In 2006, it diversified into social media acquiring the video platform You Tube. In September 2008, it launched a commercial version of the Android operating system for mobile devices with its associated app store, creating a proprietary market for services offered by third parties.

The relaxation of controls over corporate acquisitions and expansion was underpinned by a major shift in regulatory philosophy. The original anti-monopoly legislation introduced in the Sherman Act of 1890 assumed that "big is bad" because it reduced competition and squeezed out smaller, localised, concerns. In his influential 1978 book, *The AntiTrust Paradox* (Bork, 1978), the conservative legal scholar Robert Bork argued that corporate consolidation was only harmful if it resulted in consumers paying more for a

product or service or restricted output. This Consumer Welfare Standard informed the revised 1982 merger guidelines issued by the Reagan administration and became the de facto basis for regulatory intervention. Since access to the major platforms was free and users were offered an expanding range of services the leading digital companies easily qualified.

Popular access to the internet and app stores was boosted by two innovations: Wi Fi and smart phones. The introduction of the 802.11 protocol for wireless networking in 1997 laid the basis for always on, always there, mobile connectivity. Apple's integration of computer power into its iPhone, launched in 2007, delivered portable access to the full range of internet services capitalising on the state investment in risky, capital intensive "blue skies" inquiry that developed the key building blocks. As Mariana Mazzucato points out the iPhone and other Apple products have all "been designed and engineered utilizing innovative technologies…developed largely through federal funding and research" (Mazzucato, 2018: 187). In a classic enclosure movement, companies have incorporated these technologies into mass market commodities protected by patents that prevent their wider adoption. As a result, digital corporations have "made a 'killing' far out of proportion to their contribution" (Mazzucato, 2018: 182), taking advantage of liberal tax regimes to minimise payments to the public purse.

The foundation for the mega profits flowing to the major social media platforms were laid by another instance of legislative permissiveness. In 1996, Sect. 230 of the U.S Communications Decency Act ruled that:

> "No provider or user of an interactive computer service shall be treated as the publisher or speaker of any information provided by another information content provider."

Released from the editorial obligations placed on newspapers and broadcasting, digital platforms developed a business model trading free access in return for monopoly rights to harvest user data for sale to advertisers and third parties. There was no effective regulation of what data was collected or what it was used for. As an exhaustive 20,024 Federal Trade Commission report notes, by granting companies "nearly free rein in how much they can collect from users" and allowing them to "track what we do on *and off* their platforms, often combing their own information with enormous data sets purchased through the largely unregulated consumer data market…America's hands-off approach has produced an enormous ecosystem of data extraction and targeting" (Federal Trade Commission, 2024: 1–2 [italics in the original]). This wholesale enclosure of social data pre-empts its use for public social provisioning. Information that could provide a valuable evidential base for democratic deliberation on priorities for health and other core foundations of collective well-being is commodified and commercialised.

Computing has seen a succession of devices developed for storing and transporting data independently of machine hard drives. External drives for reading material printed on floppy discs arrived in 1976 only to be largely superseded by the erasable and reuseable flash drives inserted in USB ports introduced in 1987. As corporations amassed steadily rising volumes of data, these devices increasingly appeared inadequate and insecure, opening the way for storage be outsourced. It moved increasingly to dedicated sites capable of storing and processing colossal amount of data. The very

real, and very extensive, material base of these huge complexes of warehouse sized buildings was concealed by their popular designation as "the cloud".

Amazon launched its cloud computing operation AWS in 2006 followed by Google's Cloud platform in 2008 and Microsoft's Azure division in 2010. These three companies taken together currently account for 67% of global cloud services (Richter, 2024).

As Table 1 shows, by 2024 five companies dominated every major area of digital enterprise in varying combinations.

In January 2025, all five featured among the top ten global corporations ranked by market capitalisation. Apple was ranked number one, followed by Microsoft (3rd), Alphabet (4th), Amazon (5th) and Meta Platforms (7th). The list also included two major providers of chips and software. Nvidia, the leading manufacturer of the graphic processing units essential for training AI systems, was ranked second with Broadcom, a major supplier of semiconductors and infrastructure software, ranked ninth (Trading View, 2025).

AI: from disruption to incorporation

Leading digital companies had established AI research facilities well before ChatGPT was released. Meta opened its Facebook Artificial Intelligence Research laboratory in 2013 and Google purchased the British based AI start-up Deep Mind in 2014.

Deep Mind's original co-founders set out to combine projects with immediate profit potential with work on fundamental problems with possible applications to public issues. Following Google's acquisition they proposed a dual structure. Google would own the intellectual property rights to innovations directly related to their business while "a large portion of [Deep Mind's] profits" would be invested in "work on public service technologies that might only be valuable years down the line". Some major breakthroughs would be made open source "much like an academic lab". As cofounder, Mustafa Suleyman has admitted, this proposal "was just too much for Google" and Deep Mind continued as an ordinary profit-seeking subsidiary (Suleyman, 2024: 256).

Table 1 Digital services: global market shares of the leading U.S digital corporations (August 2024)[a]

	Alphabet	Amazon	Apple	Meta	Microsoft
Search	90.5				3.9
Social Media[b]	9.4			72.1	0.64
Digital Advertising	39	7		18	
Browsers					
All Platforms	65.2		18.5		5.3
Mobile	66.2		23.3		
Operating Systems					
All Platforms[c]	45.4		23.9		25.5
Mobile	70.7		28.5		
Cloud services	11	31			25

[a] Figures for search, social media, browsers, and operating systems, are from Statcounter Global Stats for August 2024. Available at https://gs.statcounter.com/. Figures for cloud services are for May 2024 from Richter (2024). Figures for digital advertising are for 2023 from http://www.statista.com/statistics/290629/digital-ad-revenue-share-ofmajor-ad-selling-companies-worldwide/

[b] Figures for Meta include both Facebook and Instagram

[c] Figures for Apple include both IOS and OSX

In the event, it was the launch of the immediately accessible ChatGPT chatbot, from Open AI, an independent start-up, that confirmed the technology's wide application and commercial potential. Initial competition came from the Claude suite of AI programs launched in March 2023 by another start-up, Anthropic, founded in 2021 by former senior Open AI employees. This initial moment of disruption to the digital majors' centrality was short lived.

Training and operating generative artificial intelligence systems requires storage and processing capacities able to handle huge amounts of data. This placed the leading cloud computing service operators in a strong position to broker deals. At the same time, the major providers of digital consumer equipment saw an opportunity to boost sales and replacement cycles by integrating AI capacities into their products, promising something distinctly new, different and indispensable.

The most extensive tie-up to date is between Open AI and Microsoft with Microsoft investing $13 billion. In a reciprocal arrangement, Microsoft's Azure is Open AI's sole cloud provider and versions of ChatGPT are incorporated into a range of Microsoft's consumer services.

Open AI's assimilation into the prevailing corporate structure has been reinforced by proposed changes to its internal organisation. It was originally launched in 2015 as non-profit entity with a stated goal of "advancing digital intelligence in a way most likely to benefit humanity as a whole, unconstrained by the need to generate financial returns" (Open AI 2024). The for-profit division, in which Microsoft holds its stake, was added in 2019 but the distribution of profits is capped by the non-profit board. Relaunching Open AI as a for-profit benefit company would end this control and allow investors to own shares in the company, significantly increasing its attractiveness. In October 2024, it raised US$6.6 billion in new funding from investors including the major chip maker, Nvidia.

The other two major cloud service providers have turned to Anthropic. Amazon has invested $4 billion in the company. Anthropic is using AWS's cloud services and Amazon is incorporating Claude into its digital consumer devices. These arrangements are not excusive. Amazon is also using Meta's Llama programs and Anthropic is using the cloud services provided by Alphabet's subsidiary, Google Cloud.

Alphabet has invested $2 billion in Anthropic but is continuing to develop its Gemini chatbot, a direct rival to Claude. Meta is developing its own suite of AI programs and integrating them into its consumer services.

The development of AI has followed the familiar path of digital enclosure. Its models are trained by appropriating the contents of the public internet without their originators' knowledge or consent, but data sets, and the source codes directing applications remain hidden from view, locked in a secure black box, protected by legally enforceable commercial privilege.

In September 2004, Open AI released its "Strawberry" model allowing the system to follow trains of though before replying to user queries. Incorporating reasoning ability has potentially far-reaching consequences that require sustained public discussion, but the company announced that "we have decided not to show the raw chains of thought to users" (quoted in Targett, 2024). Questions of design and application will be settled behind closed corporate doors.

Since its major income stream does not depend on selling access to its AI systems, Meta has opted to break with closure and develop a more general open-source strategy. In July 2024, it made the latest version of its powerful Llama model freely available for use. Citing the precedent of Unix, the open-source operating system that became the industry standard, Meta CEO Mark Zuckerberg envisions Llama supporting an extensive ecosystem of users introducing modifications and new applications that benefit Meta. As he notes:

"to ensure that we have access to the best technology…Llama needs to develop into a full ecosystem of tools, efficiency improvements, silicon optimizations, and other integrations. If we were the only company using Llama, this ecosystem wouldn't develop" (Zuckerberg, 2024).

Access remains conditional however, with the data base used to build the system remaining off limits to external users.

Control over the direction of AI's development and applications is still in flux but it is already clear that without significant governmental intervention, the future of this fundamental technology will be determined by decisions taken by the handful of established and emerging digital corporations that have already enclosed the major arenas of digitalised capitalism.

So far, we have focussed on dispossessions in the heartlands of advanced capitalism but as Marx reminds us, accumulation is a global process. The current development of AI marks the latest stage in a continuous world-wide process of annexing strategic material resources, exploiting "offshore" labour, and inflicting social and environmental harms. We can begin unpacking its initial formation by revisiting the telegraph network, the first communication system to achieve global reach in real time. Its development was intimately bound up with the expansion of nineteenth century U.S and British colonialism but its legacies are still active in the present.

Colonial dispossessions: the telegraph

Marx identifies colonialism as the second major source of the "primitive accumulation" of the resources essential for the development of industrial capitalism. Annexing overseas territories delivered access to raw materials and cheap labour enabling "the treasures captured outside Europe" to flow "back to the mother country" and be "turned into capital there" (Marx 1976 [1867]: 918).

Over his working life, Marx witnessed the construction of a telegraph system crossing continents and later oceans, connecting key industrial and imperial nodes. In the decade, he spent as European correspondent for the *New York Daily Tribune,* between 1852 and 1861, he relied on telegraphic dispatches to cover events on the Continent and beyond but he never interrogated its modes of extraction and exploitation or its environmental impacts. Since these processes remain central to contemporary global circuits of digital capitalism, retrieving their history is essential to a comprehensive analysis.

Industrial capitalism's constantly expanding global reach required quicker and more efficient means of transportation to move raw materials from source to factories and finished goods from factories to final destinations, together with more effective communication networks to monitor and coordinate complex production chains. Railways and

steamships powered by coal revolutionised transportation, the electric telegraph, using Samuel Morse's digital code of dots and dashes, transformed communication.

For many of Morse's contemporaries, the telegraph appeared as the perfect embodiment of Marx and Engel's famous assertion in the *Communist Manifesto* that under capitalism's creative destruction of the old order "all that is solid melts into air". Translated into code and converted into electrical impulses, the materiality of written messages dissolved as they travelled over the wires re-materialising only when the telegraph operator in the receiving station converted the code back into script. William Grove's 1842 celebration of the new technology as "an invisible, intangible, imponderable, agent…able… in the communication of ideas, almost to annihilate time and space" was widely shared (quoted in Morus, 2000: 463).

This appearance of immateriality, later repeated with broadcasting over the radio spectrum and the mobile internet, has directed attention away from the social and environmental harms generated by the material organisation of resource extraction and labour.

Cost overruns and defective wiring forced Morse to abandon his original plan to demonstrate his telegraph system by laying an underground cable between the US Capitol Building in Washington DC and a railway station in Baltimore. He fell back on stringing overhead wires between wooden poles and on May 24th 1844 successfully sent a message over the forty mile network. The combination of wires and poles was widely and rapidly adopted and became the standard infrastructure for land-based transmission. By 1860, the United States had 12,000 miles of telegraph wires (Standage, 1998: 58). 1861 saw the completion of a transcontinental network linking both coasts. By then lines of poles were common sights across Europe and the British colonies. Constructing and maintaining these systems imposed escalating environmental and social costs.

Most poles were cut from pine, cedar and chestnut trees. Widespread failure to use preservatives accelerated the need for replacements. This, combined with exploding demand led to "massive deforestation and habitat destruction" creating an ecological impact that remained "largely invisible to people who used the technology" (Social Science Matrix, 2022: 9). Stripped of bark and cut to standardised dimensions poles lost their "treeness" but not their vulnerability. As native American Indian raiding parties opposing the westwards march of European settlement on the Great Plains demonstrated, the simple tactic of "cutting telegraph wires and burning telegraph poles" disrupted "communication with the West and its market moving gold and silver mines" very effectively (Schiller, 2023: 39).

The telegraph system's dependence on the material world was reinforced by its reliance on coal burning railways and steamships to transport bulky poles from felling sites to pole yards for processing and onwards to construction sites. These multiple journeys generated substantial but mostly unremarked carbon dioxide emissions accelerating global warming. Emissions were further boosted by the transportation needed to move materials needed for trans-continental connection: gutta percha and copper.

In 1866, Brunel's iron hulled steamship, the *Great Eastern,* successfully laid a durable cable across the Atlantic, sparking a race to connect major resource and production centres. Undersea cabling imposed additional social and environmental costs. Copper wires on the ocean floor needed to be protected from salt-water corrosion. The most effective insulating material was gutta percha, a natural latex, found only in trees growing on the

Malay peninsula, Sumatra, Java and Borneo. This relative scarcity was compounded by the fact that sap could only be collected once a tree was thirty years old and attempts to cultivate them all failed. Locating trees was a problem. They were scatted across forests in isolated places. Finding them required "intimate familiarity with local terrain and ecological literacy" (Sanzo, 2023: 9) forcing British entrepreneurs to rely "on Indigenous tools and knowledge for the duration of the nineteenth-century telegraph boom" (Sanzo, 2023: 2). Pressing local expertise, governed by collective procedures and spiritual beliefs, into the service of capital accumulation offers another instance of enclosure. The gains from the additional income flowing to indigenous communities came at the cost of the wholesale destruction of an otherwise renewable resource.

Harvesting required trees to be felled and gutta-percha extracted from incisions made along the trunk. Because the latex rapidly congealed and each tree yielded only relatively small amounts rising demand led to mass deforestation. Between 1854 and 1875, three million trees were estimated to have been lost in one region of Sarawak alone (Tully, 2009: 573–574). In 1877, British gutta-percha imports required the destruction of around four million trees. The crazily high prices that the material commanded on the world market (drove) collection further into the forests until entire regions were cleared of the species (Newland, 2022: 83), disrupting historic ecologies and eroding diversity. By "the early twentieth century roughly 370,000 km of cables criss-crossed the ocean floors, made up of the sap of 88 million trees" (Jung, 2023: 5).

Telegraph wires and cables were made of copper chosen for its superior properties as a conductor of the electric signals carrying messages, but not all deposits met the conditions for "conductivity copper". The British firm of Bolton & Sons, the leading manufacturer of high-quality copper for the telegraph industry, sourced the bulk of their raw material from the Chilean company, Urmeneta y Errazuriz, based in Guayacan. "The quality of the Chilean ores (was) an irresistible prize, sending both mines and armies marching ever deeper into native lands", dispossessing the indigenous Mapuche peoples and subjecting them "to pillage, smallpox and war" (Newland, 2022: 81). In just a few years, their numbers almost halved, from the 40,000 recorded in the 1875 census to 25,000 (Newland, 2022: 83).

Digitalised colonialisms

In an influential intervention, Couldry and Meijias have proposed framing digital accumulation under contemporary capitalism as digital colonialism using the term:

"not as a mere metaphor, nor as an echo or simple continuation of historic forms of territorial colonialism, but to refer to a new form of colonialism distinctive to the twenty-first century" (Couldry & Mejias, 2018:1).

Where historical colonialism appropriated "natural" resources and cheap labour they see digital colonialism, organised around platform captures of user data, pursuing "the colonial appropriation of life in general and its annexation to capital" (Couldry & Mejias, 2018: 4), treating "social life all over the globe (as) an 'open' resource for extraction" (Couldry & Mejias, 2018: 2).

As they note, this assumption, that data is somehow "just there" for capital just waiting to be monetized, reproduces one of the central legitimations of territorial colonialism. Its deployment in Australia, a white settler colony with one of the world's leading

extractive economies based on coal and metals, has had devastating consequences for indigenous communities.

A law enacted in 1835 eradicated thousands of years of aboriginal occupation at a stroke, designating the continent as *terra nullius*, empty land belonging to no-one. Since the indigenous peoples appeared to live by hunting and gathering and had not worked the land or mined its natural resources industrious settlers claimed to be free to exploit them. As the *Sydney Herald* newspaper confidently declared, because aboriginal peoples regarded Australia only as "a common" and "bestowed no labour upon the land—their ownership, their right, was nothing more than that of the Emu or the Kangaroo" (Sydney Herald, 1838). This openly racist relegation of the continent's original inhabitants to the status of wildlife ignored the extensive writings and drawing of early explorers recording well developed systems of aboriginal agriculture and land management (Pascoe 2018).

Fifty four percent "of the world's global reserves and resources of transition minerals" essential to emerging digital technologies "are located on, or nearby, Indigenous peoples' lands" (Burton, Kemp, Barnes and Paramenter 2024: 1). Conflicts over access and use are one front in a wider war being fought over data centre capture of three other foundational resources: land, water and energy. These engagements belong to the long history of battles waged by First Nation peoples and marginalised groups to defend historic livelihoods and cultures against commercial annexation under colonialism. This history, together with the exploited labour involved in policing the social media posts that reach the public domain, is missing from Couldry and Meijas's framing. Restoring it suggests another way to think about digital colonialism.

Recent analysis confirms that the native tribes of the United States have lost 98.9%, of the territory they historically occupied (Farrell et al. 2021: 1). Not infrequently expulsions were secured by violence. In 1848, gold was discovered in California, recently wrested from Mexico. In 1850, the state's first governor, intent on securing white settler control of deposits, introduced a law stripping the tribes of their lands and eradicating their languages and culture. Public money was diverted to arming local militias. Supported by the US Cavalry, they launched concerted massacres against the indigenous population. "An estimated 100,000 Native Americans died during the first two years of the Gold Rush [and] by 1873 only 30,000 remained of around 150,000" (Blakemore, 2023: 3). The Ohlone people, occupying the San Francisco Bay area and what is now Silicon Valley, home to leading US based digital corporations, including Alphabet and Meta, were almost completely eradicated.

In June 2019, the Governor of California issued a formal apology for historic crimes committed against the states' native peoples but as the spokeswoman for the Ohlone noted "the only compensation for land is land" (quoted in Levin, 2019). Some of the data centres supplying the computing capacity servicing AI systems occupy land stained with native Indian blood but there are no moves to make reparations.

Memories of the colonial violence continue to animate disputes over contemporary mineral extraction. In September 1865, U.S cavalry massacred fifty members of the Numu at Thackery Pass in Nevada. The land, sacred to the indigenous community, holds the largest US deposits of lithium, essential to building the batteries powering the green energy revolution. Plans for a mine have met with vociferous local opposition from critics claiming "irrevocable environmental and historical destruction" (Sainato, 2023).

One of the world's largest sources of lithium is found in Chile under the salt flats on South America's Atacama Plateau. It is mined by pumping brine into huge ponds where it eventually evaporates leaving a lithium residue behind. The neoliberal economic experiment conducted by the Pinochet dictatorship privatised Chile's minerals and water granting companies ownership and prioritizing their interests. Local populations were not asked for their prior and informed consent. They have received little benefit from mining operations but have born substantial social and ecological costs. Mining is depleting already scarce water resources, rivers are drying up, damaging natural habitats and undercutting established culture and traditions based on agriculture and pastoralism (Blair, Blacazar, Barandiara and Maxell 2022).

Tin offers another example of the radically unequal distribution of benefits and penalties from mining critical metals. Connections in electronic devices, from smart phones to super computers, rely on solder made from tin. The electronic industry currently consumes half of the world's supplies with a third coming from the islands of Bangka and Belitung off the coast of Sumatra. Current labour processes continue the practices originally introduced by Dutch colonists to industrialise extraction. "Labour intensive and dangerous mining has destroyed the coastal ecosystem, which provided a livelihood for local fishers, (and) created stagnant pools of water which are breeding grounds for dengue and malaria" (Jung, 2023: 7).

Colonialised labour is also reproduced in data processing. The digital platforms' open house policy on user posts ran into problems from the outset. To head off demands for statutory regulation corporations introduced internal content moderation procedures to screen out the worst of the violent, obscene and political incendiary material being uploaded. These systems have consistently failed. Since value is generated by maximising attention and engagement the platforms' algorithmic recommendations are expressly designed to direct users to more extreme content. As the well-attested role played by Facebook's algorithms in fuelling the atrocities perpetrated by the Myanmar military against the minority Rohingya people in 2017 demonstrates, digital colonialism is not simply a matter of data appropriation. It can reaffirm the violent legacies of territorial colonial oppression (Amnesty International, 2022).

As Rob Nixon has argued however, the violence inflicted on subjugated and marginalized groups is not confined to immediate acts of physical dispossession. There is also the "slow violence" "that is incremental and accretive, its calamitous repercussions playing out across a range of temporal scales" (Nixon, 2011: 2). Under neoliberal globalisation, much content moderation designed to remove toxic content has been outsourced to low income countries where workers are repeatedly exposed to images of extreme violence and racist and misogynist posts that may impugn their identities.

They are in the same position as communication workers under territorial colonialism. Work in the Indo-European Telegraph Department based in India, the most extensive of Britain's imperial territories, was typical in being strictly divided been mental and manual labour, colonisers and colonised. Only European operatives could send trans-continental telegrams. The often hazardous work of maintaining and repairing the physical telegraph network was assigned to "locals" (Rose, 2024).

Building AI systems requires the vast range of material scraped from the internet, including social media, to be assigned relevant tags so it can be read by computer

algorithms. The annotators doing this work, many located in former colonial territories, are subjected to continual monitoring of their performance using techniques dating back to the colonial sugar plantations of the Caribbean (Muldoon, Graham and Cant 2024: 28–29). Intrusive surveillance is accompanied by high levels of stress from confronting between 500 and 1000 graphic images and video a day with no time "to process what they are witnessing" (Muldoon, Graham and Cant 2024: 2). This "slow violence" has devastating consequences, inflicting psychological damage and incidents of Post Traumatic Stress Disorder associated with war zones. In 2016, content moderators in the U.S successfully sued Facebook for failing to provide a safe working environment and were awarded £42 million in compensation (BBC 2020). This costly option is not open to workers in low- income countries.

Resource wars and sacrifice zones

"Tagging" content is essential to training AI systems but, as noted earlier, running and applying them requires the storage and computer capacity commanded by data centres. Accommodating the demands imposed by AI's rapid expansion exerts pressures on three core resources, land, energy and water. Increasingly, AI's demands conflict with public needs and environmental integrity.

Many data centres are sited urban areas to be close to customers commandeering land and resources that could be used for social purposes. As a recent report notes, in three densely populated suburbs in West London "recent DC builds have left no electricity capacity for new housing developments (or) other new significant developments until 2035" (KPMG, 2022: 7).

Living in close proximity to data centres is hazardous. Their operating processes emit considerable amounts of "acoustic waste", ranging from dull booms to mechanical whines and monotonous drones, causing often severe damage to residents' health (Monserrate, 2022).

AI systems use increasing amounts of energy. Processing a user request on ChatGPT consumes ten times as much electricity as a Google search "and with 100 million users of ChatGPT every week, the extra energy demand starts to add up. And that's just users on one platform…Overall, the computational power needed for sustaining AI's growth is doubling roughly every 100 days" (Kemene, Valkhof and Tladi 2024). Interviewed at the 2024 World Economic Forum, Open AI's Chief Executive Officer Sam Altman conceded that "It's totally fair to say that AI is going to need a lot more energy" but admitted that he didnot know how much more (Stone and Saul 2024). Nor can we fully calibrate the environmental impact of this escalating demand using available public data.

The prevailing practice for recording greenhouse gas emissions generated by a company's energy use bundles all its activities together masking the specific contribution made by data centres. Recent research using location based calculations however estimates that between 2020 and 2022 emissions from data centres operated by Google, Microsoft, Meta and Apple were 7.62 times higher than officially recorded, confirming AI's substantial environmental impact (O'Brien, 2024).

Projections of US centres' future calls on energy vary considerably. Rene Haas, the chief executive of Arm, a leading manufacturer of computer processors, estimates that given the continuing growth in AI capacities and applications data centres could

consume up to a quarter of America's electricity, compared to less than four per cent in 2024 (quoted in Schumpeter, 2024). Even if demand is considerably lower, increasing pressure on ageing electricity grid structures and available energy supplies will inevitably result in restrictions and outages.

As the agency responsible for monitoring electricity supply reliability in the US has noted, with studied understatement, the inability of predicted supplies over the next decade to "meet rising demand forecasts" is cause for "growing resource adequacy concerns" (NAERC, 2023). In small countries with large numbers of data centre the situation is already reaching crisis point.

Ireland has made concerted efforts to persuade the leading digital corporations to establish their headquarters there, offering low corporate taxes and easy access to the European Union. In 2023, Ireland's data centres were already consuming more electricity than all the country's homes in towns and cities, 21 per cent as against 18 per cent, with government estimates projecting a rise to 31 per cent within three years (Ambrose, 2024). This places domestic and public institutions at a double disadvantage. Firstly, they are caught in an escalating competition for secure access to an essential resource. Secondly, since Ireland still generates more than 50 per cent of its electricity from fossil fuels over the time takes to move to clean energy, rising data centre will add to greenhouse gas emissions compounding the climate crisis.

Major data centre operators are responding to electricity shortfalls by developing their own sources of supply. Nuclear power is a particular focus. In March 2024, Amazon purchased a nuclear-powered data centre from Talen Energy. In September 2004, Microsoft arranged to acquire energy from the reactivated Three Mile Island nuclear facility in Pennsylvania, site of the worst nuclear meltdown in US history in 1979. In October, Google ordered six small nuclear reactors (SNR's) from Kairos Power, hailing the agreement as helping to accelerate "a new technology to meet energy needs cleanly and reliably, and unlock the full potential of AI for everyone" (quoted in Lawson, 2024). This claim is open to question. Firstly, SNR technologies are new and the real-world risks from operational faults and contaminated waste unknown. Secondly, privatising decisions over which energy sources to prioritise and where to site installations pre-empts public debate on available pathways to green electrification and transfers control from "everyone" to corporations.

Moves to assert control over energy supplies are underpinned by a wider corporate claim that social and environmental risks should not stand in the way of developing AI's full potential and profitability. At an AI summit in Washington in October 2024, Eric Schmidt, former Google CEO, was asked if current efforts to curb AI emissions were sufficient to meet targets for mitigating climate change. His answer was unambiguous:

"[Targets] will be swamped by the enormous needs of this new technology because it is a universal technology. We're not going to hit the climate goals anyway because we're not organised to do it. Yes, the needs in this area [AI] will be a problem, but I'd rather bet on AI solving the problem than constraining it and having the problem" (quoted in Niemeyer and Lakshimi 2024). In this corporate hall of mirrors current efforts to keep emissions below the internationally agreed 1.5-degree threshold of warming have already failed, so "constraining" AI's energy demands is redundant and will reduce the chances of developing more effective, but as yet unknown, responses at some unspecified time in

the future. In the meantime, accumulation should proceed unimpeded regardless of the lived realities of climate breakdown in vulnerable regions and communities.

Generating the electricity needed to power and cool data centre servers also requires huge volumes of water. "A medium sized data centre uses as much water as three average sized hospitals" (Mytton, 2021). The hyper scale installations operated by the three leading companies use much more.

Research estimates that training Open AI's GPT-3 large language model in a U.S based Microsoft data centre used a total of 3.5 million litres. Training it in one of Microsoft's Asian data centres requires 4.9 L (Li, Yang, Islam and Ren 2023: 3). After a prolonged legal fight to keep its water usage private, Google eventually conceded that its data centres in Dalles Oregon were using a quarter of the city's water (Osaka, 2023). These levels of demand place escalating pressure on already stressed water systems with two thirds of the global population currently affected by severe water scarcity for at least one month each year (United Nations, 2024).

Google calculates that its total global greenhouse gas emissions for 2023 were 13 per cent higher than the year before. This was partly due to increased data centre energy demand but was also the product of continuing reliance on fossil fuels in the Asa Pacific and other "hard to decarbonise regions" along its supply chain (Google 2004: 3).

This admission reaffirms the importance of locating AI within global chains and interrogating the unequal geography of damage and harm. Dispossession, social dislocation, exploitative labour, and environmental degradation are concentrated in places where key resources are extracted, data centres are sited, and electronic waste is dumped. These areas are "sacrifice zones" (Lerner, 2010) bearing more than their fair share of the human and ecological costs of digital innovation "so that other places might experience full, sustainable life" (Juskus 2003: 3) or, at the very least minimise their exposure to risk and damage. Recognising this has major implications for public policy.

Public interests, common futures

Recent years have seen increasing governmental challenges to the unprecedented concentration of corporate control over digital innovation. In 2023, the UK Competition and Markets Authority interrupted Meta's relentless expansion through acquisition forcing it to sell Giphy, the gif search engine acquired in 2021, at a $260million loss.

During the Biden US Presidencies regulatory intervention has increasingly broken with the permissive Consumer Welfare Standard and moved back to the "big is bad" assumption underpinning the original anti-monopoly legislation. Its continuing relevance in an economic order increasingly organised around the digital majors was forcefully argued by Lina Khan in her influential essay "Amazon's Antitrust Paradox". She pointed out that focusing solely on consumer welfare "disregards the host of other ways that excessive concentration can harm us-enabling firms the squeeze suppliers and producers…allowing companies to become too big to fail, or undermining media diversity" (Khan, 2017: 743). In June 2021, she was appointed Chair of the Federal Trade Commission. In September 2023, the FTC brought a case against Amazon alleging that it "is a monopolist [that] exploits its monopolies in ways that enrich Amazon but harm its customers: both the tens of millions of American households who regularly shop on Amazon's online superstore and the hundreds of thousands of businesses who rely on

Amazon to reach them" (United States District Court Western District of Washington, 2023: 5).

In May 2024, the US District Court in Columbia ruled that by paying carriers, developers and equipment manufacturers to install Google as their default search engine Alphabet had created an illegal monopoly "and acted to maintain" it in violation of Sect. 2 of the Sherman anti-trust Act (United States District Court of Columbia 2024a: 4). This landmark ruling opened the door for moves to break up Alphabet.

In August 2004, the US Department of Justice brought a case for "restoring competition', condemning Google's market manipulation in the strongest possible terms, arguing that:

"Google's anticompetitive conduct resulted in interlocking and pernicious harms…in evolving markets [that] are indispensable to the lives of all Americans…and the importance of unfettering these markets cannot be overstated" (United States District Court of Columbia 2024b: 1).

In August 2024, a US Third Circuit court ruled on a case brought by the mother of a ten year old child who accidently hung herself after watching a video posted on her uniquely curated Tik Tok 'For You Page' encouraging users to record themselves engaging in acts of self -asphyxiation. The court ruled that:

"TikTok's algorithm, which curates and recommends videos, constitutes TikTok's own expressive activity, or first-party speech. Section 230 only provides immunity for third-party content, it does not protect TikTok from liability for its own recommendations" (Justia 2024).

The court's argument that algorithmic recommendations are editorial judgements presents a fundamental challenge to the platforms' assumed immunity from responsibility for posted content provided by Sect. 230 of the Communication Decency Act. As we noted earlier, this is the foundation of their advertising-based business model.

Insisting that the algorithms directing AI applications are published and open to public scrutiny before being released is also currently under discussion.

At the time of writing, these cases are still pending. How far they will be pursued to a conclusion with Donald Trump's re-election as President committed to a radical reassertion of deregulation remains an open question. The future of public finance for alternatives is also at serious risk.

Reasserting public interest regulation of corporate abuses is necessary but not sufficient. A concerted challenge to digital enclosure requires the reconstruction of a digital communicative commons. This entails interventions on four fronts. Firstly, reclaiming the internet as a public resource and experimenting with platform cooperatives and other new forms of democratic accountability. Secondly, socialising data and constructing a public repository as a comprehensive evidential base for public deliberation and action on issues of common concern. Thirdly, dismantling exploitative extractive and labour practices, as well as the colonial logics that continue to underpin them, while ensuring that indigenous and local communities have a guaranteed voice in discussions about future developments. Fourthly, abolishing sacrifice zones and ensuring that the costs and benefits of digital innovation are equitably shared.

This ambitious agenda can all too easily dismissed by apologists for business as usual as hopelessly utopian. They fail to mention that digital capitalism, as currently organised, is

fuelling deepening social and ecological crises with radically unequal impacts. As an International Monetary Fund Report noted "global inequalities are in bad shape and mostly do not appear to be getting better [with] disparities today about the same as they were in the early twentieth century" (Stanely 2022). In 2022, the poorest half of the world's population earned 8.5 per cent of global income while 52 per cent went to the richest 10 percent. Wealth was even more unevenly distributed with the top 10 per cent holding 190 times more than the bottom 50 per cent (Stanley, 2022). By 2024, with variable national rates of recovery from the Covid-19 pandemic, global inequality was widening for the first time in twenty-five years with 4.8 billion people poorer than in 2019. In stark contrast, the richest 1 per cent held 43 per cent of global financial assets while emitting as much carbon as the poorest two thirds of humanity (Riddell et al. 2024: 9).

These figures raise a fundamental question about the future of AI. Will it continue to be developed in ways that reinforce the present radically unequal distribution of social and environmental costs or can it support interventions that address current crises on a basis of social justice and mutual care? Developing AI on a business as usual basis is fundamentally unsustainable both socially and ecologically. Deconstructing the corporate power behind its present organisation and applications is an essential first step to finding an alternative.

Authors' contributions
Graham Murdock is the sole author of this paper. The author read and approved the final manuscript.

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