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ARTICLE

Artificial Intelligence in Iran: National Narratives and Material Realities

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Abstract

This article challenges the dominant narrative of AI in Iran as a symbol of national success and technological sovereignty by examining its materiality. The Iranian government often underscores AI's role in countering sanctions and securing national interests. However, this national narrative overlooks the complex realities of AI's implementation. By examining the material endpoints of AI – such as data centers, supercomputers, and digital labor – this article reveals a fragmented vision of AI, one that is entangled with global neoliberal practices. The analysis uncovers the sociopolitical and economic forces shaping AI in Iran, arguing that it reflects both the nation's ambitions and its vulnerabilities, offering a nuanced perspective on AI and its role in contemporary Iranian society.

Keywords: artificial intelligence; Iran; labor; materlaity; Snapp

Although rarely in the headlines for its technological prowess, Iran is a global leader in the development of artificial intelligence (AI). A recent index compiled by *Nature* ranks Iran as the thirteenth strongest AI-producing country in the world, placing it above larger, richer countries such as Brazil and Russia.[1] Although already punching above its weight, the Iranian government aspires to more. In 2022, the state-affiliated ICT Research Institute proposed an expansive strategy to position Iran in the top ten of AI-producing countries within ten years. The proposal even includes a massive $8 billion investment on the part of the government. The ICT Research Institute's goals match those of the country's Supreme Leader, Ayatollah Khamenei, who has also publicly stated that "Iran must become part of the top ten countries in the world in AI."[2]

At the heart of Iran's AI ambitions lies a carefully crafted narrative that frames AI as both a marker of technological progress and a symbol of national resilience. This narrative is deeply intertwined with the country's broader geopolitical strategy, in which AI is seen as a tool for counteracting economic sanctions and asserting technological sovereignty. However, this official discourse, which portrays AI as a vehicle for national empowerment, often overlooks the complex and less triumphant realities of AI's implementation within

[1] "Top 25 Countries/Territories in Artificial Intelligence (Dimensions Data)," Nature Index 2020 Artificial Intelligence, https://www.nature.com/nature-index/supplements/nature-index-2020-ai/tables/dimensions-countries.

[2] AL Mahdi, "Iran bāyad joz'-e dah keshvar-e avval-e donyā dar hush-e masnuʿi beshavad," *Aparat*, November 17, 2021, video, https://www.aparat.com/v/EvzhD.

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the country. Indeed, AI does not just describe patents, intellectual property, and abstract computing processes but also the material world that takes shape around and through software – from digital devices giving ordinary users access to algorithmic recommendations to the mammoth data centers performing complicated computations to the human labor training data sets. Beneath the surface of the state-driven narrative, the materialization of AI in Iran tells a different story, one marked by contradictions, labor exploitation, and the pervasive influence of global neoliberalism.

In this article, I argue that the material endpoints of AI in Iran, such as data centers, supercomputers, and labor practices, allow us as critical scholars to reassess the dominant narratives around AI in Iran. Rather than being a cohesive discourse of national success, AI in Iran is actually a composite of competing factions, desires, and material realities, thus reflecting both the country's ambitions and its entanglements with global economic forces. The material realities of AI – from its infrastructure to the labor it involves to the sociopolitical conditions it interacts with – reveal a vision of AI that is far from the sovereign and powerful image projected by the state. Instead, this vision is one in which AI is deeply embedded in and shaped by the dynamics of global neoliberalism, with significant implications for an already precarious workforce.

This article situates Iran's AI development within the context of the country's hybrid neoliberalism, a form of economic restructuring that combines elements of state capitalism with neoliberal market-driven reforms.[3] Since the end of the Iran-Iraq War in 1988, Iran has undergone significant neoliberal transformations, influenced both by internal class struggles and external pressures from the global economy. As Kayhan Valadbaygi has detailed, Iran's interactions with neoliberal globalization have revealed two competing factions within the state. The first faction, which he calls the "military-bonyad complex," has emphasized a more insular approach to the economy valuing self-sufficiency and resistance to Western influences.[4] Meanwhile, the "internationally-oriented capital faction…views integration into global value chains of Western capital, particularly European capital, as a guarantor of its long-term existence."[5] Valadbaygi is careful to note that both factions favor the "expansion of surplus by exploiting the working class," but view the ends and means of accumulation differently.[6] As the sections below detail, the development of AI mirrors this dual capitalist model, highlighting the tension between economic self-sufficiency and dependance on global capital. This tension has shaped how AI and digital platforms are developed and deployed in Iran in both the public and private sectors, reflecting the state's fraught navigation between global capitalist structures and nationalistic ambitions.

By studying the social, political, and economic forces shaping the development of technology in Iran, this article intervenes in the field of Iranian studies. Despite Iran's successes and ambitions in the realm of artificial intelligence, Iranian studies as a field has not yet grappled with AI from a humanistic or critical perspective. Indeed, one of this article's main goals is to introduce key debates in technology studies to the particularities of the Iranian context. By drawing on new materialist approaches and scholarship on algorithms and digital labor, the article explores how AI-driven platforms such as Snapp, which is the leading ride-sharing app in Iran, reflect and reinforce neoliberal economic practices. In doing so, the article situates Iran within global trends in the gig economy, highlighting how AI is not just a tool of national sovereignty but also a mechanism of labor exploitation. Furthermore, the article draws on scholarship on digital infrastructures to show that Iran's data centers and supercomputers, often positioned as symbols of national strength,

[3] Kayhan Valadbaygi, "Hybrid Neoliberalism: Capitalist Development in Contemporary Iran," *New Political Economy* 26, no. 3 (2021): 313–327.

[4] Kayhan Valadbaygi, "Neoliberalism and State Formation in Iran," *Globalizations*, epub ahead of print (January 2022), accessed September 1, 2024: https://doi.org/10.1080/14747731.2021.2024391, 7.

[5] Valadbaygi, "Neoliberalism and State Formation in Iran," 7.

[6] Valadbaygi, "Neoliberalism and State Formation in Iran," 7.

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are in fact fraught with contradictions and vulnerabilities, particularly in the context of international sanctions.

My argument in this article unfolds in four parts. First, a theoretical section introduces new materialism and sociotechnical systems theory to set the stage for a critical examination of AI as a material and sociopolitical phenomenon, challenging dominant narratives that portray AI as an abstract, disembodied force. Second, the article turns to the national narratives around AI in Iran, critiquing the state's rhetoric of technological sovereignty through an analysis of the material infrastructures that support AI development, such as the Martyr Haj Qasem Soleimani Data Center and the Simorgh Supercomputer. Third, the article explores digital labor, using the case of Snapp to illustrate how AI-driven platforms perpetuate labor precarity and align with global neoliberal trends. Finally, the article's fourth main section – which is based on interviews – challenges the misconception that AI-driven labor is purely immaterial by revealing how the work of Snapp drivers is intertwined with physical objects. By grounding digital labor in these material realities, the section underscores the article's central argument: that the Iranian state's portrayal of AI as a tool of national sovereignty and technological autonomy is misleading. Instead, the material dependencies and constraints experienced by workers expose the gap between the state's narrative of AI as a force of empowerment and the on-the-ground realities, where global neoliberal practices and economic vulnerabilities prevail.

A new materialist approach to AI in Iran

The term "artificial intelligence" (*hush-e masnuʿi* in Persian) has become ubiquitous over the last several years, especially with the advent of popular generative technologies and large language models such as ChatGPT. In the process, it has also become somewhat ambiguous, describing everything and nothing at once. The term is now deployed to describe both a vast, diverse range of data-intensive computing systems and also some phantasmic, far-off vision of technology in which robots have achieved human consciousness. The term has mostly fallen out of favor among computer scientists – who now prefer the term "machine learning" – and so, as Meredith Whittaker has explained, these days AI is primarily a "marketing hook."[7] Kate Crawford pushes this idea further, claiming that "the nomenclature of AI is often embraced during funding application season, when venture capitalists come bearing checkbooks, or when researchers are seeking press attention for a new scientific result."[8] Thus, as the term AI has been transported from strict scientific use to the more nebulous realm of public discourse, it has come to signify not so much a toolkit of data-intensive technologies as a heterogeneous set of ideas, values, and beliefs.[9]

Studying an unwieldy subject like AI, therefore, requires a theoretical framework that can account for its multiplicity of meanings, while also grounding it in concrete objects, physical environments, and material conditions. To that end, my analysis in this article advocates for a new materialist approach to AI in Iran. New materialism as theoretical orientation reframes our understanding of matter and materiality. New materialists do not view matter as passive or inert, arguing instead that it has an active role to play in the creation of social worlds. Such a vantage point is important to any analysis of AI, which is often viewed as an abstract, immaterial entity operating independently from the material world. In contrast, this article argues that the meanings of AI are embedded in material infrastructures, human labor, and sociopolitical contexts, making a new materialist approach particularly valuable.

[7] Meredith Whittaker, "The Steep Cost of Capture," *Interactions* 28, no. 6 (2021): 51–55, https://doi.org/10.1145/3488666.

[8] Kate Crawford, *Atlas of AI* (New Haven, CT: Yale University Press, 2021), 9.

[9] Crawford, *Atlas of AI*, 7.

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Central to new materialism is a belief in "the vitality of matter and the lively powers of material formations."[10] Such a belief is captured in Karen Barad's theory of *agential realism*, which posits that reality is not composed of independent objects with fixed properties but rather constituted through *intra-actions*, or the mutual, co-constitutive processes that bring entities into being. Materiality, in this context, is not a static backdrop to human action but instead active and dynamic, participating in the ongoing processes of materialization.[11] On this note, Barad writes that matter "is substance in its intra-active becoming—not a thing but a doing, a congealing of agency."[12] Through their theory of agential realism, Barad collapses the distinction between materiality and discourse, between matter and meaning, writing that discursive practices are "specific material (re)configurings of the world through which local determinations of boundaries, properties and meanings are differentially enacted."[13] Thus, Barad's ideas about agential realism clear the way for my analysis of AI in Iran, as it is co-constituted through intra-actions with various material, social, and political forces.

Media scholars, in particular, have been receptive to new materialist approaches. An important branch of scholarship has decentered the perception of digital media as immaterial by foregrounding the material infrastructures required to sustain digital technologies and culture. Here, the emphasis has been on data centers, cables, antennas, towers, and computer chips.[14] As James Allen-Robertson explains, "Our metaphors have not been drawn from the right places, focusing instead on ideals of clean, faultless networks, immaterial free floating information, and freedom from the material structures of power that operated through old, physical media forms."[15] By examining materiality, scholars of digital media have opened up issues of scale, relationality, unevenness, maintenance, and resource extraction.[16] In other words, a focus on the material dimensions of digital technologies has allowed for new questions of politics, agency, and power. My analysis in this article extends these questions to the context of Iran, where a growing body of scholarship has grappled with the social, cultural, and political implications of materiality.[17]

[10] Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham, NC: Duke University Press, 2010), vii.

[11] Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham, NC: Duke University Press, 2007), 218.

[12] Karen Barad, "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter," *Signs* 23, no. 3 (2003): 828.

[13] Barad, "Posthumanist Performativity," 828.

[14] See, for example, Mel Hogan, "Data Flows and Water Woes: The Utah Data Center," *Big Data & Society* 2, no. 2 (2015): 1–12; Lisa Nakamura, "Indigenous Circuits: Navajo Women and the Racialization of Early Electronic Manufacture," *American Quarterly* 66, no. 4 (2014): 919–941; Lisa Parks, "Stuff You Can Kick: Towards a Theory of Media Infrastructures," in *Between Humanities and the Digital*, eds. Patrik Svensson and David Theo Goldberg (Cambridge, MA: MIT Press, 2015), 355–373; Nicole Starosielski, *The Undersea Network* (Durham, NC: Duke Univeristy Press, 2015); Jonathan Sterne, *MP3: The Meaning of a Form* (Durham, NC: Duke University Press, 2012); Helga Tawil-Souri, "Cellular Borders: Dis/Connecting Phones Calls in Israel-Palestine," in *Signal Traffic: Critical Studies of Media Infrastructures*, eds. Lisa Parks and Nicole Starosielski (Urbana, IL: University of Illinois Press, 2015), 157–180; and Julia Velkova and Jean-Christophe Plantin, "Data Centers and the Infrastructural Temporality of Digital Media," *New Media & Society* 25, no. 2 (2023): 273–286.

[15] James Allen-Robertson, "The Materiality of Digital Media: The Hard Disk Drive, Phonograph, Magnetic Tape and Optical Media in Technical Close-Up," *New Media & Society* 19, no. 3 (2017): 468.

[16] These questions are central to the theory of media infrastructure developed by Parks and Starosielski *Signal Traffic*, 7–14.

[17] See, for example, Satoshi Abe, "Iranian Environmentalism: Nationhood, Alternative Natures, and the Materiality of Objects," *Nature and Culture* 7, no. 3 (2012): 259–284, https://doi.org/10.3167/nc.2012.070302; Blake Atwood, *Underground: The Secret Life of Videocassettes in Iran* (Cambridge, MA: MIT Press, 2021); Mikiya Koyagi, *Iran in Motion: Mobility, Space, and the Trans-Iranian Railway* (Palo Alto, CA: Stanford University Press, 2021); and Kusha Sefat, *Revolution of Things: The Islamism and Post-Islamism of Objects in Tehran* (Princeton, NJ: Princeton University Press, 2023).

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By activating a new materialist approach that emphasizes entanglements between material and social worlds, this article is in conversation with a growing body of scholarship studying the social implications of AI. As Crawford succinctly argues, "AI systems both reflect and produce social relations and understandings of the world."[18] Scholars such as Arshin Adib-Moghaddam, Ruha Benjamin, Virginia Eubanks, Safiya Umoja Noble, and others have been especially attentive to how AI perpetuates social inequalities, especially those related to race, gender, and class.[19] Their work accords with research on digital labor, which has shown how the discourse of technology's objectivity and efficiency hides exploitative labor practices and precarious work conditions.[20] Thus, the new materialist approach in this article achieves two goals. First, and more generally, it brings critical approaches to AI to the field of Iranian studies. Second, it weaves together two strands of inquiry – social studies of AI and research about digital labor – to understand AI in Iran as a material-discursive phenomenon, one in which the laboring body is a material endpoint, important to its co-constitution.

National narratives of AI

The development, training, and maintenance of AI systems require mass amounts of data, which must be collected, stored, and computed. Much of these processes take place in data centers –mammoth industrial facilities with computer servers that power the digital infrastructure sustaining internet networks. In recent years, data centers have become curious objects of study for critical Big Data scholars. They have upended the idea that digital media are immaterial forms, showing instead that digital interactions are always grounded in the very architecture of data centers.[21] As Mel Hogan has argued, the data center is not neutral in its materiality; it "has politics."[22] Building on that idea, in this section I examine the politics of the recently opened Martyr Haj Qasem Soleimani Data Center (MHQSDC) outside of Tehran, as well as the development of Simorgh Supercomputer. I show that the data center, and other computing infrastructures in Iran, consolidate not only the processes of a national AI project but also ideas of what AI is and whom it should serve. I argue that infrastructures are not merely triumphs of Iranian innovation, they are also entangled with economic sanctions and reliance on smuggled technologies. This contradiction underscores the precariousness of the Iranian state's AI ambitions, as the very infrastructures meant to

[18] Crawford, *Atlas of AI*, 8.

[19] Arshin Adib-Moghaddam, *Is Artificial Intelligence Racist? The Ethics of AI and the Future of Humanity* (London: Bloomsbury, 2023); Ruha Benjamin, *Race After Technology* (London: Polity, 2019); David Beer, "The Social Power of Algorithms," *Information, Communication, and Society* 20, no. 1 (2017): 1–13; Virginia Eubanks, *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor* (New York, NY: St. Martin's Press, 2018); Rob Kitchen, "Thinking Critically about and Researching Algorithms," *Information, Communication, and Society* 20, no. 1 (2017): 14–29;

[20] Phil Jones, *Work without the Worker: Labour in the Age of Platform Capitalism* (London: Verso, 2021); Ursula Huws, Neil H. Spencer, and Dag S. Syrdal, "Online, On Call: The Spread of Digitally Organised Just-in-Time Working and Its Implications for Standard Employment Models," *New Technology, Work and Employment* 33, no. 2 (2018): 113–129; Alex Rosenblat and Luke Stark, "Algorithmic Labor and Information Asymmetries: A Case Study of Uber's Drivers," *International Journal of Communication* 10 (2016): 3758–3784.

[21] See, for example, Julia Velkova and Jean-Christophe Plantin, "Data Centers and the Infrastructural Temporalities of Digital Media: An Introduction," *New Media & Society* 25, no. 2 (2023): 273–286; Alix Johnson, "Data Centers as Infrastructural In-Betweens: Expanding Connections and Enduring Marginalities in Iceland," *American Ethologist* 46, no. 1 (2019): 75–88; Mel Hogan, "Facebook Data Storage Centers as the Archive's Underbelly," *Big Data & Society* 16, no. 1 (2015): 3–18; Tung Hui Hu, *A Prehistory of the Cloud* (Cambridge, MA: MIT Press, 2015); and Anne Pasek, "Managing Carbon and Data Flows: Fungible Forms of Mediation in the Cloud," *Culture Machine* 18 (2019): 1–15, http://doi.org/10.17613/cw2d-jz18.

[22] Mel Hogan, "The Data Center Industrial Complex," in *Saturation: An Elemental Politics*, eds. Melody Jue and Rafico Ruiz (Durham, NC: Duke University Press, 2021), 284.

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symbolize independence and resilience are, in fact, products of and vulnerable to the global neoliberal systems they seek to resist.

Despite only recently joining the data center game, Iran has achieved remarkable success in just a few short years, culminating in the inauguration of the MHQSDC in 2020. Iran launched its first large-scale cloud data center in August 2016. Although owned by the private company Afranet, the government also granted a five-million-USD subsidy for the data center's construction. During the opening ceremony, Mahmoud Vaezi, the then minister of communication and information technology, lamented: "In Iran, we have fallen behind in the realm of data centers." The solution, he claimed, was a "small capital investment" on the part of the government. Indeed, throughout his speech, Vaezi connected national success to the proliferation of home-grown data centers in Iran.[23] In doing so, he reinforced the long-standing belief that a country's national growth is tied to its technological innovation. David Edgerton refers to this belief as "techno-nationalism," and it has been central to Islamic Republic's telecommunication strategy, including the launch of several more data centers since 2016.[24]

These nationalist projects came to a head in 2020, when Iran launched the MHQSDC. Also known as the National Internet Network Mother Data Center, the MHQSDC is a massive facility aimed at supporting the National Internet Network (NIN) or *shabakeh-ye melli-ye ettelāʿāt* in Persian. The NIN, which was proposed in 2005 by President Mahmoud Ahmadinejad, aims to develop a national intranet that will serve as a replacement for the global internet that Iranians currently access. The Iranian government, seeking inspiration from Russia and North Korea, has justified the project in a number of ways, all of which revolve around the internet as a nation-building project. Politicians have emphasized protecting national security, developing a "clean" internet aligned with the Islamic Republic's values, and encouraging e-commerce, especially given the economic sanctions on the country.[25] In contrast, human rights organizations have cautioned that disconnecting Iranians from the global internet and plugging them into a state-controlled version will further isolate the country and make it easier for the government to crack down on discontent.[26] Both sides see the NIN as hardening the country's national borders and consolidating the government's control over social, political, and economic life.

The MHQSDC, as the "mother" of the NIN, embodies these efforts to fortify state power. At a ceremony inaugurating the MHQSDC, Mohammad Javad Azari Jahromi, Vaezi's successor as minister of communication and information technology, explained that the new data center would support local services as part of the NIN, including email, messaging, and AI-powered search engines. He also emphasized that the MHQSDC, which improves Iran's digital capabilities by "three or four times," is an essential building block in the country's growing culture of startup companies and entrepreneurialism. During the same ceremony, Jahromi's deputy, Hamid Fattah, celebrated the development and construction of the MHQSDC despite "harsh sanctions from the United States."[27] Both speeches emphasized the MHQSDC as a uniquely national project, one that supports

[23] "Iftetah-e daytāsenter-e telekulād-e afrānet tavvasot-e vazir" [The Opening of the Afranet Telacolad Data Center by the Minister], *Aparat* (2018), accessed June 6, 2023, https://www.aparat.com/v/rkRAt.

[24] David Edgerton, *The Shock of the Old: Technology and Global History since 1900* (Oxford: Oxford University Press, 2007), 106–113.

[25] "Negāhi beh ravand-e takmil-e shabakeh-ye melli-ye ettelāʿāt" [A Look at the Process of Completing the National Internet Network], *ISNA*, March 22, 2023, https://www.isna.ir/news/1402010601938/.

[26] See, for example, "UN Human Rights Experts Urge Iran to Abandon Restrictive Internet Bill," United Nations Human Rights, Office of the High Commissioner, March 1, 2022, https://www.ohchr.org/en/press-releases/2022/03/un-human-rights-experts-urge-iran-abandon-restrictive-internet-bill.

[27] "Markez-e dadeh-ye madar-e shabakeh-ye melli-ye ettelāʿāt emruz eftetāh shod" [The National Internet Network Mother Data Center Openned Today], *Aparāt*, September 7, 2020, https://www.aparat.com/v/dzotc.

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local services, protects the country's economic wellbeing, and is resilient to outside threats.

The nationalist narrative built around the MHQSDC is also hardwired into its name. The center's namesake, Qasem Soleimani – a commander in the Islamic Revolutionary Guard Corps (IRGC) – was assassinated by the US military near the Baghdad airport in January 2020. His assassination was a huge blow to Iran's ruling class. By many accounts, Soleimani was second-in-command in the country, just below Supreme Leader Ayatollah Ali Khamenei.[28] Soleimani's assassination shook not only the Iranian government but also the international community, as it "was the first targeted drone killing of a senior foreign government official on the territory of a third country."[29] Over the last decade, public discourse has often understood drones as harbingers of automated warfare.[30] In such imaginations, drones will, in the near future, rely entirely on artificial intelligence, thus "embedding decisions to kill in networks that span the world."[31] The Iranian state has been particularly enthralled by the narrative of automated warfare, going so far as to claim that top officials have been assassinated by weapons powered by artificial intelligence.[32] It is not a coincidence, therefore, that Iranian officials named the MHQSDC after a popular figure murdered by American drone technology. By evoking the name of Qasem Soleimani and referring to him as a martyr, the MHQSDC stitches itself to ideals of national technological sovereignty and state power.

The issue of Iran's technological sovereignty is almost always tied to US-imposed economic sanctions on the country. This pattern is materially evident in the Simorgh supercomputer, a government-funded project housed at Amirkabir University of Technology (AUT). When it was launched in 2021, Simorgh made headlines as the country's most powerful supercomputer. According to reports, it is 100 times more powerful than previous supercomputers developed in Iran and, therefore, expected to contribute significantly to the development of AI in the country. As Jahromi explained to a crowd at the computer's inauguration ceremony, AI researchers had previously needed to send data outside the country for massive computing tasks, which is difficult given the sanctions.[33] Nevertheless, he emphasized, "Artificial intelligence is a driving force in the future of the economy in Iran and the world."[34] Thus, according to the government's official rhetoric, the Simorgh supercomputer accelerates AI development in Iran despite the sanctions slowing it down – and this is to the benefit of Iran's economy.

But beneath this rhetoric of national sovereignty lies a more complicated reality. The MHQSDC and Simorgh supercomputer rely on hardware and technologies that must often be smuggled into the country due to sanctions. Reports suggest that American-made chips

[28] For more on Soleimani, see Arash Azizi, *The Shadow Commander: Soleimani, the U.S. and Iran's Global Ambitions* (London: Oneworld, 2020).

[29] Nick Cumming-Bruce, "The Killing of Qassim Suleimani Was Unlawful, Says U.N. Expert," *New York Times*, July 9, 2020, https://www.nytimes.com/2020/07/09/world/middleeast/qassim-suleimani-killing-unlawful.html.

[30] See, for example, Peter Finn, "A Future for Drones: Automated Killing," *Washington Post*, September 19, 2011; Michael T. Klare, "The Coming of Automated Warfare," *Current History* 119, no. 813 (2020): 9–14.

[31] Hugh Gusterson, *Drone: Remote Control Warfare* (Cambridge, MA: MIT Press, 2016), 29.

[32] "Iran Says 'Smart Satellite-Controlled Machine Gun' Killed Top Nuclear Scientist," *Reuters*, December 7, 2020. https://www.reuters.com/article/idUSKBN28H13E/; Ronen Bergman and Farnaz Fassihi, "The Scientist and the A.I.-Assisted, Remote-Control Killing Machine," *New York Times*, October 6, 2021, https://www.nytimes.com/2021/09/18/world/middleeast/iran-nuclear-fakhrizadeh-assassination-israel.html.

[33] "Marāsem-e eftetāh va runamāii az abr rāyāneh-ye simorgh" [The Opening Ceremony and Unveiling of the Simorgh Supercomputer], Amir Kabir University, May 16, 2021, https://aut.ac.ir/content/7819/.

[34] "Azari Johrami az abr rāyāneh-ye irāni-ye simorgh runamāii kard" [Azari Johrami unveils the Iranian Simorgh Supercomputer], *Sedā-ye Iran*, May 16, 2021, https://sedayiran.com/fa/news/261681.

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are embedded in the very fabric of Simorgh, leading some to dub it a "black market supercomputer."[35] The tension between Simorgh as a nationalist project and its reliance on smuggled parts is evident in much of the journalistic reporting on the supercomputer. In such reports, statements extoling Simorgh as "wholly designed and built by a team of Iranian engineers" are tempered with reminders that "some of its hardware has been imported."[36] The contradictions between Iran's AI ambitions and its material dependencies highlight a fragile sovereignty. While the government positions AI as a tool for overcoming sanctions and asserting national strength, the development of this infrastructure reveals that the country's technological progress is contingent on global supply chains and illicit markets. Far from being a purely national project, Iran's AI efforts are deeply entangled with the global systems of capital and technology they claim to resist.

Thus, the material infrastructures of AI in Iran, exemplified in the MHQSDC and Simorgh supercomputer, reveal the paradoxes at the heart of the country's AI ambitions. Ultimately, these infrastructures, more than just mere technical achievements, are political sites where national ambitions and global forces collide. Although projects like the MHQSDC and Simorgh supercomputer are framed within a nationalist narrative that emphasizes sovereignty, independence, and resilience in the face of sanctions, they are also enmeshed in global supply chains, illicit markets, and foreign technologies. This fragility underscores a broader tension between the desire for technological autonomy and the material realities of dependence on external systems. This observation expands the critical scholarship on data centers, which typically locates the politics of data centers in western liberalism – in the transfer of public data to privately owned servers and the profiteering of Big Tech companies.[37] Instead, the MHQSDC and Simorgh supercomputer embody a unique form of hybrid capitalism in Iran – one that contains desires for both self-sufficiency and engagement with global markets.

The limits of innovation culture

In contrast to the grand national narrative of AI as a symbol of technological sovereignty, the everyday realities of digital labor in Iran expose a different, less triumphant story, one deeply entangled with global neoliberal practices. While state rhetoric frames AI as a tool for overcoming economic sanctions and asserting national resilience, the material endpoints of AI, such as algorithmically managed labor platforms, reveal the ways in which *innovation culture* perpetuates socioeconomic inequalities rather than solving them. Snapp, Iran's leading ride-sharing app, epitomizes this dynamic, positioning itself as a hallmark of Iranian technological progress while concealing the exploitative labor conditions that underpin its success. This section examines how the rise of AI-driven platforms, such as Snapp, reflects not just the state's capital accumulation strategies but also its precarious relationship with global capital. By situating digital labor within the broader material infrastructures and sociopolitical forces shaping AI in Iran, we can see how innovation culture reinforces, rather than disrupts, the inequalities embedded in both global and local economic systems.

The materiality of digital labor, particularly on platforms like Snapp, is rooted in the concrete, physical conditions that make this work possible. Unlike abstract discussions of

[35] Sebastian Moss, "Iran Launches Its Most Powerful Supercomputer, Built with Black Market Tech," *Data Center Dynamics*, May 17, 2021, https://www.datacenterdynamics.com/en/news/iran-launches-its-most-powerful-supercomputer-built-with-black-market-tech/.

[36] Maziar Motamedi, "Iran Unveils Its Strongest Domestic Supercomputer," *Al Jazeera,* May 16, 2021, https://www.aljazeera.com/news/2021/5/16/iran-unveils-supercomputer-starts-development-on-a-stronger-one.

[37] Jennifer Holt and Patrick Vonderau, "'Where the Internet Lives': Data Centers as Cloud Infrastructure," in *Signal Traffic: Critical Studies of Media Infrastructures,* eds. Lisa Parks and Nicole Starosielski (Urbana, IL: University of Illinois Press, 2015), 71–93.

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innovation and technological progress, digital labor relies on the tangible realities of human bodies, tools, and infrastructures. Workers on these platforms experience the physical strain of long hours, the maintenance and wear of their vehicles, and the spatial navigation of cities under the direction of algorithmic systems. Their labor is not only mediated by technology but also shaped by the physical environments they move through and the tools they rely on, including smartphones, street systems, and vehicles. This mode of labor management, which favors flexibility for the platform at the expense of worker security, is deeply connected to the material realities of life in a globalized, neoliberal economy. These realities manifest in the constant demands on workers' time, degradation of their physical tools (such as cars or motorcycles), and dependence on digital infrastructures to earn a livelihood.[38]

In contrast, innovation culture abstracts these material dimensions by emphasizing technological "solutions" and creative disruption. Since 2010, the Iranian government has invested heavily in its innovation ecosystem and promoted policies to encourage solutions coming out of that sector. Some of those investments involve building up the country's digital infrastructure, as discussed above. According to a report by the United Nations Development Programme (UNDP), they also include the proliferation of startup incubators, coworking spaces, mentorship programs, and venture capital funds. As a result, the digital economy more than doubled between 2012 and 2020.[39] Indeed, innovation culture links digital technologies to the economy through the unbending belief that economic development will lead to social development. As the UNDP report concludes of Iran, a thriving innovation ecosystem "will not only allow for startups and businesses to truly succeed in the country but will also result in job generation and future economic growth and [will] raise the visibility of Iran in a positive way globally."[40] However, these optimistic accounts of innovation are not the only narratives we have, and others have voiced serious criticism of the role of innovation in social development.

Indeed, the global obsession with innovation has also become a cause for concern, especially among a growing number of critical scholars. As Lilly Irani, in her groundbreaking study of innovation in India, argued: "These practices bend away from the slow, threatening work of building social movements; rather, people articulate desires to work for change as demos and deliverables."[41] In Iran, as elsewhere in the world, the burden of solving social problems is being increasingly outsourced to so-called entrepreneurs, who seek innovative solutions and raise capital to develop and pilot technologically driven products and services. This pattern – modeled after Silicon Valley – advances a wider neoliberal agenda by selling off public problems to the private sector and treating every beneficiary as a potential customer. While startup initiatives do sometimes become profitable companies, the wealth they accumulate is never redistributed to fix the social problems they address. Instead, innovation culture typically does more to reinforce rather than address social and economic

[38] My understanding of digital labor here is very much shaped by Jeremias Adams-Prassl, *Humans as a Service: The Promise and Perils of Work in the Gig Economy* (Oxford: Oxford University Press, 2018); Lilly Irani, "The Cultural Work of Microwork," *New Media & Society* 17, no. 5 (2015): 720–739; and Kylie Jarrett, *Digital Labor* (Cambridge, UK: Polity, 2022).

[39] Golnaz Shanehband, "Mapping of the Existing Innovation Ecosystem in the I.R. of Iran," United Nations Development Programme (2022), 1–17.

[40] Shanehband, "Mapping of the Existing Innovation Ecosystem in the I.R. of Iran," 6.

[41] Lilly Irani, *Chasing Innovation: Making Entrepreneurial Citizens in Modern India* (Princeton, NJ: Princeton University Press, 2019), 2.

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inequalities. Iran's significant investment in this culture over the last decade reveals its neoliberal orientation.[42]

Snapp embodies Iran's innovation culture. The app is celebrated as an innovative victory. For example, the UNDP report on Iran's innovation ecosystem heralds Snapp as a successful replacement for ridesharing apps like Uber and Lyft, which cannot operate in Iran because of sanctions. Snapp became Iran's first unicorn startup, i.e., a startup whose value exceeds one billion USD.[43] Like most startups, Snapp positions itself not in terms of profit but rather as a disruptor for the social good. According to a recent Snapp profile:

> We have redefined the transportation ecosystem of Iran since 2014. Every day, we work hard to build our ideal city, where air quality indicators are always green; traffic jams are an old nightmare; and parking lots have turned into parks, schools, and entertainment centers.[44]

This description exemplifies the ethos of innovation, which posits private companies and high-tech products and services as the answers to social and environmental ills.

Snapp's success is emblematic of Iran's hybrid economy, in which state capitalism coexists with neoliberal market reforms. While the Iranian government retains control over strategic sectors, such as oil, it has also fostered a liberalized startup ecosystem that encourages private entrepreneurship and foreign investment. This dual approach has allowed companies like Snapp to thrive, particularly through international funding. Despite the country's official stance of economic self-sufficiency, Snapp relies heavily on foreign capital, which shows Iran's dependency on global markets to sustain its innovation culture. Indeed, although Snapp is positioned as a uniquely Iranian company, it is actually the brainchild of two German venture capitalists: Eyad Alkassar and Mahmoud Fouz. Looking to capitalize on the untapped Iranian digital market, with funding from MTN, a South African telecommunications company controlling much of the mobile network in Iran, Alkassar and Fouz founded Snapp in 2014 and debuted the app in 2015. At the time of its launch, Snapp was the first and only ride-sharing app in Iran. Since then, it has undergone tremendous growth and continues to far outperform competitors that subsequently entered the market.[45]

This success is due, in part, to state support for startups and international funding. As Alkassar said,

> The Iranian government really wanted to diversify away from oil and encourage startups, so it facilitated foreign investment and allowed 100% ownership. I found it was one of the easiest places in emerging markets to start a business as a foreign investor.[46]

Journalists and academics often describe the Iranian government in terms of its restrictive social policies – and for good reason, given its rigid attempts to control people's

[42] This observation is consistent with Valadbaygi's argument that the Iranian state, since the 1990s, has been increasingly oriented towards capital accumulation, even developing an institutional framework to encourage accumulation strategies. For more, see Valadbaygi, "Neoliberalism and State Formation in Iran."

[43] "Iran May be a Heartbeat Away from First Unicorn," *bne Intellinews*, May 24, 2022, https://www.intellinews.com/iran-may-be-heartbeat-away-from-first-unicorn-245326/.

[44] "Snapp!" *Apollo.io,* accessed August 14, 2023, https://www.apollo.io/companies/Snapp-/556d9f6273696411ec674d01.

[45] Meg Rithmire and Gamze Yucaoglu, "Snapp: Scaling under Sanctions in Iran (A)," Harvard Business School Case no. 721-020 (Boston: Harvard Business School Publishing, 2020).

[46] Rithmire and Yucaoglu, "Snapp: Scaling Under Sanctions in Iran," 5.

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private lives. However, the founding of Snapp reveals Iran's liberal economic policies and dependence on global markets to sustain innovation culture.

These liberal economic policies serve not only the accumulation of wealth but also the reconfiguration of labor. By promoting fragmented and precarious labor, the state not only maximizes profit for private companies like Snapp but also strategically weakens the potential for collective labor movements. This decentralization of workforces makes it harder for workers to organize or resist, ensuring that economic grievances do not escalate into political threats. As a result, the government benefits both economically and politically from platforms that alienate workers from one another and from traditional forms of labor solidarity.

Curiously, Snapp's own statements about its social impact do not mention labor, even though one of its biggest "disruptions" has been to the labor market. According to recent figures, more than 3.7 million people use Snapp as drivers, providing taxi and food-delivery services.[47] As a point of comparison, there are nearly the same number of Uber drivers in the US (3.5 million), even though the US has a population nearly four times the size of Iran. Thus, a considerable portion of the Iranian population (approximately 4%) works on a single platform. These high numbers seem to align with the government's goals. As Jafar Qadri, a member of the parliament's budget committee, publicly announced in May 2023: "With the presence of Snapp…someone can no longer say that they are unemployed. Anyone can work with a car!"[48] Rising unemployment is a serious concern in Iran, with rates reaching upwards of 11%. Qadri's statement brings focus to the work of innovation culture, which defers social problems to private investors and their apps.

In this case, innovation culture is not just a matter of offloading the unemployment problem, it is also about the labor experiments it encourages. Despite modest tweaks to its algorithm, Snapp is representative of digital labor platforms globally, especially with respect to its problematic mediation of labor. Certainly, in some ways, Snapp needed to be tailored to the Iranian context. For example, the original code, based on a similar app in Brazil, was reworked by engineers to accommodate Iranian taxi practices, such as negotiating the price of the ride before it begins.[49] However, by and large, Snapp's basic function of connecting freelance drivers with customers is the same as ride-sharing and delivery apps around the world. It has, therefore, inherited not just the basic code from other apps but also the injustices designed into them. In particular, Snapp is typical in its exploitation of workers. As Niels van Doorn has argued, the so-called "gig economy" is nothing new. Instead, new technologies like AI deployed in platforms such as Snapp advance an old project of breaking apart the workforce through contingent labor practices. He writes, "These businesses do not only offer their software as a service to participants in the multi-sided markets they orchestrate, but also use it to manage and conceal a contingent workforce."[50] When viewed in this way, Snapp does not offer innovative solutions to the crisis-ridden labor market in Iran; it instead exacerbates the unemployment problem by devaluing and making invisible its workforce.

Like all neoliberal states, Iran benefits from the workforce fragmentation enabled by AI-driven platforms. Organized workers represent a threat to capitalist systems and political power. Snapp drivers, who are flexible freelance workers, are alienated from their labor and, importantly, from one another. This atomization of labor is a key feature of the state's

[47] "Snapp! *Apollo.io,* accessed August 14, 2023, https://www.apollo.io/companies/Snapp-/556d9f6273696411ec674d01.

[48] "Har kasi bikār ast, beravad dar esnapp va tapsi kār konad" [Whoever is unemployed, should go and work for Snapp and Tapsi], *Sharq Daily,* April 3, 2023, https://www.sharghdaily.com/fa/tiny/news-878765.

[49] Rithmire and Yucaoglu, "Snapp: Scaling Under Sanctions in Iran," 5.

[50] Van Doorn, "Platform Labor," 901.

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broader political economy, wherein economic liberalization is paired with the deliberate suppression of collective worker power. Platforms like Snapp play a crucial role in this process by converting traditional labor relationships into isolated, algorithmically managed gigs. This fragmentation reduces workers' ability to mobilize or negotiate collectively, reinforcing a political structure that thrives on economic disorganization and worker precarity. A growing body of scholarship has shown that, around the world, platform workers struggle to mobilize "given the inexistence of a delimited workplace, the non-standard employment relationship, the individual and competitive character of work and the implementation of algorithmic management."[51]

Thus, Snapp not only plays into the Iranian government's goal of encouraging profit-making but also its desire to break up the workforce. The algorithmic management of labor does more than merely facilitate economic efficiency; it depersonalizes work, creating a system in which workers are isolated, monitored, and controlled through digital platforms. By removing the need for traditional management or oversight, AI-driven platforms further alienate workers from one another and from any sense of collective identity. This automated fragmentation aligns perfectly with the state's interest in maintaining a disorganized, politically neutral workforce, ensuring that labor remains subservient to both economic and political ends.

Indeed, Snapp – and other apps like it – extend the Iranian government's longstanding efforts to render workforces precarious. Worker protests were central to the success of the 1978–1979 Revolution, with workers even heralded as heroes during the first few years of the Islamic Republic.[52] However, as M. Stella Morgana has argued, since the establishment of the Islamic Republic, the government has worked to shift the values associated with workers. During and immediately following the revolution, workers were seen either as powerful units of mobilization and/or emblematic of the subjugated masses in need of saving. By the early 1990s, however, Akbar Hashemi Rafsanjani's presidency (1989–1997) and liberalization policies meant that workers were positioned more in terms of their productivity and contributions to the country's overall economic success.[53] This shift was not merely semantic but had material consequences as well, as the Iranian workforce became increasingly precarious. As Morgana notes, "Whereas in 1990 only 6% of the labor force worked under temporary contracts, by the end of the 2000s the number climbed to 90%."[54] The precarization of workers is a strategic political decision in Iran, as a unified workforce could be "perceived as a threat to the stability of the Islamic Republic."[55]

Thus, digital labor, like the kind facilitated by Snapp, has not remade the labor market. Instead, it has used new AI-driven technologies to replicate an old pattern: the precarization of workers in the country. Digital labor extends a long-standing state strategy of depoliticizing the labor force, which began with the shift from revolutionary worker mobilization to the productivity-focused policies of the 1990s. Digital labor represents a new phase in this trajectory, one in which AI-driven platforms systematically fragment and depoliticize workforces, ensuring that workers remain atomized and politically neutralized. This reflects a

[51] Sofia Daniela Negri, "The Labour Process and the Emergence of Workers' Mobilisation in Delivery Platforms in Argentina: A Mixed Methods Study," *New Sociological Perspectives* 1, no. 1 (2021): 96.

[52] M. Stella Morgana, "Talking to Workers: From Khomeini to Ahmadinejad, How the Islamic Republic's Discourse on Labor Changed through May Day Speeches (1979—2009)," *Iranian Studies* 52, nos. 1–2 (2019): 136–140. For worker protests during the revolution, see, for example, Peyman Jafari, "Fluid History: Oil Workers and the Iranian Revolution," in *Working for Oil: Comparative Social Histories of Labor in the Global Oil Industry*, eds. Touraj Atabaki, Elisabetta Bini, and Kaveh Ehsani (London: Palgrave MacMillan, 2018), 69–98.

[53] M. Stella Morgana, "Precarious Workers and Neoliberal Narratives in Post-Revolutionary Iran: Top-Down Strategies and Bottom-Up Responses," *Middle East Institute*, January 28, 2020, https://www.mei.edu/publications/precarious-workers-and-neoliberal-narratives-post-revolutionary-iran-top-down.

[54] Morgana, "Precarious Workers and Neoliberal Narratives in Post-Revolutionary Iran."

[55] Morgana, "Talking to Workers," 135.

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broader continuity in the state's use of labor as both an economic and political tool, where worker precarity is instrumental in sustaining political control.

Despite these stark realities, the state's innovation culture continues to celebrate AI as a force for progress and national strength. However, the material realities of digital labor – embodied in the wear and tear of vehicles, the physical strain of navigating Tehran's congested streets, and the dependence on smartphones – tell a different, more grounded story. These tangible, everyday struggles reveal how innovation culture perpetuates labor exploitation and deepens socioeconomic inequalities rather than offering solutions. In focusing on the material conditions of labor, we can see how the abstract promises of technological advancement are built on the very physical realities with which workers must contend daily, exposing the deeper contradictions within Iran's AI ambitions and the broader limitations of innovation as a path to genuine social progress.

Digital labor's material

Digital labor does not just exist in the abstractions of state power and global capital, it is also very much grounded in the material world. While the Iranian state promotes AI as a symbol of technological sovereignty and national empowerment, the lived experiences of workers in AI-driven industries, such as Snapp drivers, reveal a different reality, one deeply rooted in the material conditions of their labor. The work of Snapp drivers is shaped not only by the app's algorithms, which dictate their clientele and routes, but also by the tangible objects and environments they navigate daily, from their cars and phones to the roads and state surveillance systems they encounter. Drawing on Karen Barad's concept of *intra-action*, which emphasizes the co-constitution of human and non-human agents, this section argues that digital labor is not simply managed by abstract technologies but also emerges through the dynamic entanglement of digital processes with material objects. These material realities expose the gap between the Iranian government's rhetoric of AI as a tool of empowerment and the precarity and exploitation faced by workers on the ground. By focusing on the intra-actions between Snapp drivers, their vehicles, their environments, and the state's surveillance infrastructure, this section demonstrates how the material dimensions of digital labor reveal the sociopolitical and economic vulnerabilities that contradict the state narrative of AI as a force of national resilience and sovereignty.

I base this analysis on two primary sources: (1) interviews conducted with five Snapp drivers in Tehran during the summer of 2023 and (2) a growing body of Snapp-related videos available online. While five interviews do not constitute a fully representative sample of Snapp driver experiences, they provide valuable insight into the material conditions of AI-driven labor in Iran. These interviews offer a window into how drivers experience their work and the pressures they face – from heat and traffic to state surveillance. These drivers' accounts serve as provocations to critically reflect on the interplay between digital labor and material realities. These personal narratives are complemented by a broader, emerging genre of Snapp-related content on platforms such as YouTube, including tutorials, driver testimonials, and comparisons with other ride-sharing apps. These videos reflect the rising prominence of Snapp as a platform and the growing fascination with the gig economy in Iran. Together, these sources help to paint a more nuanced picture of the lived experiences of Snapp drivers, illuminating how AI-driven labor is deeply embedded in the material and social contexts that shape workers' daily lives.

The material conditions of Snapp drivers' labor highlight how deeply embedded their work is in physical objects and environments. Indeed, Snapp drivers were interested in talking about three things in summer 2023: the grueling heat, women's hijab, and the unrelenting traffic. Even as I tried to steer the conversation towards Snapp – as both a company and application – drivers often returned their remarks to these three talking points. It made sense. Summer 2023 was exceptional in many ways. Like other parts of the world,

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Tehran endured an unprecedented heatwave, with temperatures regularly climbing above 40°C (104°F) in July and August. Summer 2023 also marked the return of the morality police (*gasht-e ershād*) to the streets of Tehran to patrol women's head coverings. The morality police returned after a long hiatus following the murder of Mahsa Amini in their custody in September 2022 and the ensuing nationwide uprisings. The city's bumper-to-bumper traffic – a longstanding complaint among taxi drivers – was perhaps the only ordinary thing about that summer.

At first, it was tempting to brush aside the Snapp drivers' remarks about the heat, hijabs, and traffic. However, I ultimately came to realize that these elements were central to their digital labor at that moment. Indeed, each of these elements places Snapp drivers' digital labor in the material world in which it occurs. For my interlocutors, as I demonstrate in this section, the oppressive heat unfolds a long list of objects used to manage the effects of climate change. Meanwhile, the headscarf has become emblematic of a larger system of state surveillance. Finally, the city's heavy traffic connects to a network of cement roads and alleys crucial to the work of a Snapp driver but often at odds with the app's navigational system. These three cases show that to study AI-driven labor is to examine digital interactions *and* the material forces intersecting with those interactions. These everyday material conditions are often overlooked in discussions of AI-driven labor, which tend to emphasize the technological aspects while neglecting the physical realities shaping workers' experiences.

The Snapp drivers I spoke to all agreed on one thing. The heat was a mixed blessing. On the one hand, the high temperatures meant a more regular stream of customers, as people tried to minimize their time commuting by foot. As one driver explained to me, what was once a pleasant walk down Valiasr Street in springtime had become a punishing excursion in the summer heat, even under the shady chinar trees. For those with means, hailing a taxi through the Snapp app was preferable to grudging through the city's scorching streets on foot. On the other hand, the heat made the work of Snapp drivers almost unbearable. Air conditioning simply could not keep up with the high temperatures, especially as cars stood still for hours under the sun as they slowly moved through traffic. One driver explained to me that his air conditioning was shot but repairing it was out of the question. Fixing it would mean too much time away from work during prime season, and parts were scarce and expensive given the economic sanctions on the country. When I asked him what it was like driving for Snapp, he replied: "The same as working in a metal box in an oven."

Such a statement highlights not only the perils of driving for Snapp but also the material objects that frame the experience. Drivers described their cars and phones to me as "lifelines." One driver told me, "If anything happens to my car, I don't know what I'll do. I don't know what will happen to my family." His comment brings to focus the importance of something material like a car, perhaps even more important than the invisible, automated processes of the Snapp application. This idea also comes out of a video titled "Working with the Snapp Application," posted by Iranian content creator Mohammad Mohammadi on his channel *Tarrāhi va Tadvin* (Design and Editing). The two-part episode begins with a tutorial on what is required to drive for the app. Before launching into any of the specificities of the app itself, Mohammadi declares, "To begin, you have to have a car and a smartphone." He then spends the first half of the thirty-minute video describing all the objects a driver must manage in order to work with Snapp – from a dashboard mount for the mobile phone to a charger to keep the battery alive for the entire workday. He emphasizes, "If you are working during the summer, because your phone's screen will get hot from the sun, you should get a small valve for the a/c…so that your phone stays cool." These details are not incidental. They show that digital labor is not always high tech; sometimes it amounts to low-tech objects, such as a dashboard mount or a valve extending the car's air conditioning.

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In addition to these tangible material constraints, Snapp drivers must navigate a less visible but equally significant system of control: state surveillance. Just as the app's algorithm dictates their routes, state-imposed veiling laws shape the way drivers interact with passengers, turning them into unwilling enforcers of the government's policies. This dual constraint – one algorithmic, the other political – reinforces the precarity of divers' labor, making it clear that their work is governed by forces both digital and sociopolitical. For example, I asked one driver if he ever cancels trips once they have been assigned to him. He responded, "Yes, sometimes because of the customer's appearance." Confused, I asked him to elaborate. "Look," he said, "if a woman isn't wearing a headscarf, I don't let her in the car anymore." The driver's use of the word "anymore" (*digeh*) struck me. For almost a year, many women had been refusing to veil in public spaces as an act of protest and in defiance of the law. I wondered what had changed recently that he was no longer accepting unveiled women. Perhaps sensing my reluctance, he volunteered, "I am against the compulsory hijab [*hejāb-e ejbāri*]! But they have become so strict recently. I can't afford to take risks." After that interview, I asked other drivers if they also refused entry to unveiled women. All of them reluctantly admitted they did. As one explained, "It's not a political decision. We drivers just need to be careful [*morāqeb*]." What had begun as a straightforward question about algorithms, quickly unraveled a very different set of concerns – namely that of veiling, which was ultimately much more pressing for my interlocutors than the specificities of the Snapp app.

Increased state surveillance in Tehran meant the issue of veiling was pressing for Snapp drivers. Beginning in late spring 2023, many residents of Tehran began receiving text messages informing them that they had violated the country's veiling laws. An interlocutor in Tehran showed me one such message. It read:

> Respected owner of the car with license plate number ********, there was a violation of the country's laws and regulations (unveiling) in your car in a public space at the address of Imam Square on 03/09/1402 [May 30, 2023] at 10:02am. If you repeat this mistake and do not pay attention to previous violations, your car will be automatically impounded for 15 days.

Apparently, the government had begun leveraging its vast network of traffic cameras to identify unveiled women. For months, officials had been promising to use AI-driven facial recognition software to punish those violating the country's veiling laws. However, connecting a violation to an identity presented an obstacle to their plans. The car's license plate number appears to have been a solution, allowing the government to link a particular person to the supposed offense. Yet in this scheme, the responsibility is offloaded to the car owner, who may be different from the person violating the law.

This context clarifies Snapp drivers' hesitations about transporting unveiled women, while also linking the fabric of a headcover from digital labor to other automated systems. Snapp drivers use their personal cars for work. Therefore, they incur the risk for any legal violations that happen in their cars. The Snapp drivers I spoke to had either received a message like the one above or knew another driver who had. Losing access to their cars – their means of livelihood – for fifteen days was a terrifying prospect. They adapted quickly, insisting that women cover in their cars. In contrast, I spoke to an "official" (*darbast*) taxi driver who told me that he does not receive warning messages because of his regulated green car. He is, therefore, willing to carry unveiled women: "As long as they're paying," he said, "unveiling has nothing to do with me [*beh kashf-e hejāb kāri nadarm*]." Although Snapp drivers are sold the idea of "freedom" and "flexibility," their work is actually more constrained than other taxi drivers in the country.[56] As such, AI in this context, far from being

[56] Hassani, "Virtual Platforms and the Sharing Economy," 53.

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a symbol of empowerment, becomes a tool of state control, reinforcing drivers' precarity by making them complicit in the government's surveillance apparatus. This dynamic complicates the state's narrative of AI as a marker of national sovereignty and progress, revealing how it is also used to maintain political power and social control.

The state's surveillance tactics in this case link up with a larger system of traffic, which also determines a Snapp driver's work. Indeed, driving for Snapp is very much connected to a concrete network of roads, streets, and alleys. These, too, are part of the material forces shaping the drivers' digital labor – and in unexpected ways. In particular, the drivers I spoke with lamented the fact that the app's navigational system malfunctions, leads them into congested areas, or picks the longer and less efficient route. These frustrations are not just a matter of passengers' convenience; they affect the driver as well. For example, bad navigation can result in lower ratings by angry passengers or can slow down the driver's ability to finish a trip and begin a new one. Each of these concerns signals how the app's algorithm sometimes operates against the material conditions of Snapp drivers' work, especially the roadways they travel and the other cars they drive alongside.

Indeed, for my interlocutors, complaints about ratings and passenger turnover – although important – were less significant than the more general concern that Snapp did not value their knowledge. In their opinion, the city's congested and convoluted road system needs human intelligence and not automation. Interestingly, Snapp developed its own mapping system based on available open code and migrated away from Google Maps in 2018. According to the company's CEO, the decision to develop an in-house map was one of sustainability, as services like Google Maps may disappear or become unavailable to Iranian companies at some point in the future.[57] Although the app's mapping program was developed to withstand Iran's economic situation (especially the sanctions), it still cannot fully account for the country's traffic patterns, shortcuts, or one-way streets. One driver expressed his frustration with the app's navigational system, saying that it made him feel "like a robot." Another driver told researcher Hossein Hassani:

> I've been a taxi driver [*mosāferkesh*] for twenty years and I've driven for Snapp for two or three years. I know Tehran like the back of my hand. I know how to navigate all of the side streets and back alleys…I used to brag to everyone. Now the navigation system brings the passenger to their destination, and it's like our memory isn't useful anymore.[58]

This statement matches the sentiment I heard in my discussions with Snapp drivers. They described the roads as "alive" and not reducible to a simple set of instructions.

Snapp drivers' navigational knowledge and frustrations with the app's algorithmic inefficiencies echo similar dynamics observed in Juan Manuel del Nido's *Taxis vs. Uber* and Claudio Sopranzetti's *Owners of the Map*.[59] Both works show how drivers in the Global South leverage local knowledge of urban spaces to navigate cities in ways that algorithms struggle to replicate. This embodied expertise represents a form of power and agency that allows drivers to move through their cities creatively and efficiently, using insights gained from years of experience. Platforms such as Snapp and Uber, however, replace this expertise with abstract, algorithmic systems, reducing drivers' knowledge to a secondary factor in the navigation process. Snapp drivers – like the motorcycle taxi drivers in Bangkok that Sopranzetti studies – view their local knowledge as an asset distinguishing them from the impersonal

[57] Rithmire and Yucaoglu, "Snapp: Scaling Under Sanctions in Iran," 8.

[58] Hassani, "Virtual Platforms and the Sharing Economy," 71–72.

[59] Juan Manuel del Nido, *Taxis vs. Uber: Courts, Markets, and Technology in Buenos Aires* (Palo Alto, CA: Stanford University Press, 2021); Claudio Sopranzetti, *Owners of the Map: Motorcycle Taxi Drivers, Mobility, and Politics in Bangkok* (Berkeley, CA: University of California Press, 2017).

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algorithm.[60] Yet, the app's design reduces their role to mere executors of a digital command. This shift not only diminishes drivers' navigational expertise but also aligns with broader trends in gig work in which algorithms exercise control over the labor process, stripping workers of the power once embedded in their skills.

Thus, Snapp drivers' proficiency is not merely a technical skill, it is also a socially and politically charged form of expertise. Unlike the drivers del Nido and Sopranzetti study, Snapp drivers must also conform their digital labor to state-imposed gender norms, specifically the country's veiling laws. As such, their navigational knowledge intersects with the performance of gender, the physical demands of their labor, and the creative ways they navigate the city. This stands in stark contrast to the technologists' view of the roadways as a series of abstract routes to be optimized by algorithms. Like taxi drivers elsewhere in the world, Snapp drivers' knowledge is a form of resistance against the reductive logics of digital platforms that attempt to automate and depersonalize their work. Their lived experiences challenge the platform's technocratic assumptions, revealing the profound gaps between algorithmic management and the realities of life in the Global South. Ultimately, Snapp drivers' labor is shaped not only by the algorithmic management of their work, but also the material conditions of the city and the sociopolitical pressures imposed by the state. Whether navigating the congested streets of Tehran or enforcing veiling laws to avoid state penalties, drivers face a complex web of constraints that extend beyond the digital platform, revealing the multi-layered reality of digital labor in Iran.

In reflecting on the material realities of digital labor in Iran, it becomes clear that the integration of AI into everyday workspaces operates less as a breakthrough in innovation and more as a continuation of deeply embedded labor practices. The reliance on physical tools, vehicles, and urban infrastructures reveals the tangible impact of AI on workers, grounding abstract promises of technological progress in the harsh realities of labor conditions. By focusing on the intra-actions between human and non-human elements, we see that AI in Iran is less a tool for empowerment and more an instrument shaped by, and reinforcing, existing socioeconomic structures. These material conditions challenge the dominant discourse on AI, urging us to reconsider how technological advancement interfaces with the lived experiences of workers who remain at the margins of the digital economy's supposed benefits.

Conclusion

From supercomputers and traffic cameras to labor and roadways, so-called artificial intelligence exists in many material ways. As I have shown in this article, AI's various material endpoints generate differing, even contrasting, narratives in Iran. Data centers and other large infrastructural projects reveal the government's official statements about AI, emphasizing its ability to ensure economic sovereignty despite global sanctions and consolidate state power. This narrative is one of uniqueness, as the promise of an Iran-only intranet haunts major decision-making. In contrast, another material endpoint, AI-facilitated labor, especially that of Snapp drivers, unveils a different vision of AI in Iran. In this vision, the Iranian state is neither closed to nor barricaded from the global economy, but rather oriented towards the global flow of capital, with hybrid neoliberal policies encouraging foreign investors while still retaining elements of state control. Similarly, the materiality of digital labor shows how mundane – if not exploitative – AI-driven work can be. Focusing on the everyday objects interesting to Snapp drivers disrupts the hyperbolic rhetoric about AI often promoted by powerful institutions.

[60] Sopranzetti, *Owners of the Map,* 80.

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To challenge the hype around AI is to challenge the corporate and political institutions that stand to benefit from it. Emily M. Bender and Alex Hanna describe AI hype as "dangerous," claiming: "There is a pack mentality in rushing to invest in these tools, while overlooking the fact that they threaten workers and impact consumers.…"[61] Indeed, it has been well-documented that tech companies benefit from hype around AI – whether positive or negative – because it attracts investment.[62] However, less attention has been paid to the political actors who also benefit from it. When the Iranian state builds consent for AI through nationalist discourse, it also creates cover for the present (and future) harms that AI enacts, including surveillance, policing, and labor exploitation. One way to push back against "dangerous" AI hype is to describe the increasingly harmful effects of algorithms and automation. As this article has suggested, technologies are never neutral.

Drawing on Karen Barad's concept of agential realism, we can understand AI as not simply a disembodied force, but as something actively co-constituted through intra-actions between human and non-human elements. AI in Iran, as this article has shown, is shaped through these intra-actions – whether in the supercomputers dependent on smuggled parts or in the surveillance apparatus intertwined with Snapp drivers' labor. The sociopolitical conditions, infrastructures, and labor practices involved are not passive elements, they actively participate in the ongoing materialization of AI. In this light, the so-called technological sovereignty promoted by the state is revealed to be not an independent achievement but an emergent property shaped through Iran's entanglements with global neoliberalism and material dependencies. Whether advancing the goals of the neoliberal state, promising economic sovereignty, or consolidating the government's power, AI in Iran today is imagined and deployed in a troubling political reality. Tracing the materiality of AI is one way to challenge that reality.

[61] Emily M. Bender and Alex Hanna, "'AI' Hurts Consumers and Works—And Isn't Intelligent," *Tech Policy Press,* August 4, 2023, https://techpolicy.press/ai-hurts-consumers-and-workers-and-isnt-intelligent/.

[62] Timnit Gebru and Paris Marx, "151: Don't Fall for the AI Hype," *Tech Won't Save Us,* January 19, 2023, Harbinger Media Network, podcast, mp3, https://techwontsave.us/episode/151_dont_fall_for_the_ai_hype_w_timnit_gebru.

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