STUDY

Requested by the AIDA committee

European Parliament

Artificial Intelligence diplomacy

Artificial Intelligence governance as a new European Union external policy tool

Policy Department for Economic, Scientific and Quality of Life Policies
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Artificial Intelligence diplomacy

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Abstract

Artificial Intelligence (AI) has become a tool of power politics, and an element of state diplomacy. The European Union (EU), however, approaches AI primarily from an economic, social, and regulatory angle. This paper discusses the way that AI impacts the European Union's geopolitical power and its relationship with other countries. It presents possible scenarios for how AI may change the international balance of power and recommends ways for the EU and its Member States to respond.

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CONTENTS

LIST OF ABBREVIATIONS

AGI	Artificial General Intelligence
AI	Artificial Intelligence
BAT	Baidu, Alibaba, and Tencent (Chinese technology companies)
BRI	China's Belt and Road Initiative
CSET	Center for Security and Emerging Technologies at Georgetown University, US
DARPA	Defense Advanced Research Projects Agency
EU	European Union
FDI	Foreign Direct Investment
GAFAM	Google, Amazon, Facebook, Apple, Microsoft (US technology companies)
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
LAWS	Lethal autonomous weapon systems
LOGSA	Intelligence, Surveillance, and Reconnaissance
NATO	North Atlantic Treaty Organization
US	United States of America
UK	United Kingdom

EXECUTIVE SUMMARY

Background

There is widespread agreement that artificial intelligence will shape the future. The use of machine learning technologies promises to revolutionise many sectors, transform business and the labour market, and change the way research is done. This is well understood in Europe and throughout the EU states are working on ways to strengthen their AI ecosystem, integrate AI in the private sector, and support the use of AI in the public sector. The EU institutions are working at regulating AI, most recently by proposing the world's first comprehensive plan to regulate artificial intelligence,[1] as well as through a focus on trustworthy and ethical AI.

Unfortunately, while the economic, and to some extent the social repercussions of the increasing use of AI are understood in Europe, one area is largely ignored: the way that AI influences global politics and the global balance of power, and how AI may contribute to a reordering of international politics.

Aim

This study aims to support the work of the Special Committee on Artificial Intelligence in a Digital Age (AIDA) by providing an analysis of the geopolitical impact of AI. It discusses the way that AI impacts the European Union's geopolitical power and its relationship with other countries.

Six areas are being discussed through which AI may change the international balance of power:

- AI's role in Sino-American competition;
- AI's use for authoritarian control and weakening of democracy;
- AI nationalism;
- AI's contribution to the rise in power of the private sector versus the state;
- AI's impact on military power and the defence sector; and finally,
- the possibility of a development of Artificial General Intelligence (AGI) with potentially wide-ranging repercussions.

The EU will need to find answers to all these challenges, and, after an analysis of the (largely lacking) current take of Member States this topic, this study recommends ways for the EU and its members to respond.

[1] *Proposal for a Regulation laying down harmonised rules on artificial intelligence*, European Commission, April 2021, https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-laying-down-harmonised-rules-artificial-intelligence-artificial-intelligence.

1. INTRODUCTION

KEY RECOMMENDATIONS

- The EU should establish a European Security Commission on AI whose members should be drawn from different EU Member States, the private sector, and civil society. The Commission should analyse the impact of AI on European security and develop recommendations on how to address the security challenges created by AI.
- The EU should establish a European research centre which focuses on the AI-related questions that are of immediate relevance to Europe. It could serve as a hub for the burgeoning community of European researchers working on these themes in different European states. It should also help educate policymakers, for example through short trainings and regular engagement with relevant institutions and decision-makers.
- The EU and Europeans should work closely with the US. The study discusses some difficulties in transatlantic cooperation on AI, but proposes a range of areas in which the EU and the US can work closely together.
- The EU should keep its focus on ethical and trustworthy AI and work to promote and further disseminate this approach in other countries.
- The EU should encourage Member States to publish military AI strategies, in order to allow for a harmonisation of approaches. Those EU members that are members of NATO should work within NATO to ensure interoperability among the allies.

In the United States (US), a narrative has emerged: artificial intelligence will be a defining element of geopolitical power, impacting heavily on the outcome of the great power competition between the US and China, and on the global balance of power more broadly. In 2018, the US Congress set up the "National Security Commission on AI". The commission's final report was published in March 2021 and presented a strategy for "winning the artificial intelligence era". It noted that "AI systems will be used in the pursuit of power."[2] In August 2019, former US statesman and policymaker Henry Kissinger, together with former Google CEO Eric Schmidt and the academic Daniel Huttenlocher, warned in *The Atlantic* that AI could develop new weapons, strategies, and military tactics and thus undermine or cancel the existing military balance of power.[3] Russian President Vladimir Putin was an early adherent of the 'AI is power' narrative, noting back in 2017 that "artificial intelligence is the future, not only for Russia, but for all humankind. […] Whoever becomes the leader in this sphere will become the ruler of the world."[4] Beijing's 2017 AI plan foresees overtaking the West by 2025.[5] A global "AI race" has been declared – although the term and underlying idea has been criticised by many experts.[6]

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2 US National Security Commission on Artificial Intelligence, Final Report, March 2021, https://reports.nscai.gov/final-report/table-of-contents/.

3 Henry A. Kissinger, Eric Schmidt, and Daniel Huttenlocher, *The Metamorphosis*, The Atlantic, August 2019, https://www.theatlantic.com/magazine/archive/2019/08/henry-kissinger-the-metamorphosis-ai/592771/.

4 James Vincent, *Putin says the nation that leads in AI 'will be the ruler of the world'*, The Verge, 4 September 2017, https://www.theverge.com/2017/9/4/16251226/russia-ai-putin-rule-the-world.

5 Sophie-Charlotte Fischer, *Artificial Intelligence: China's High-Tech Ambitions*, CSS Analyses in Security Policy N0. 220, February 2018, https://css.ethz.ch/content/dam/ethz/special-interest/gess/cis/center-for-securities-studies/pdfs/CSSAnalyse220-EN.pdf ; Dewey Murdick, Daniel Chou, Ryan Fedasiuk, Emily Weinstein, *The Public AI Research Portfolio of China's Security Forces. A High-Level Analysis*, CSET, March 2021, https://cset.georgetown.edu/research/the-public-ai-research-portfolio-of-chinas-security-forces/.

6 Peter Thiel, *Good for Google, Bad for America*, New York Times, 1 August 2019, https://www.nytimes.com/2019/08/01/opinion/peter-thiel-google.html ; Paul Scharre, *Killer Apps. The Real Dangers of an AI Arms Race*, Foreign Affairs, May/June 2019, https://www.foreignaffairs.com/articles/2019-04-16/killer-apps; Franz-Stefan Gady, *Elsa B. Kania on Artificial Intelligence and Great Power*

Europe, however, approaches this challenge differently. A 2021 poll found that only 11% of Europeans consider the risk from the technologies as one the main global challenges for the future of the EU, thus ranking it second-to-last of all options.[7] Nevertheless, EU institutions are active in the digital space. The Commission has proclaimed the "digital decade", it works on a "digital compass", and aims to become a "global digital player".[8] Discussions about "European Digital Sovereignty" abound.[9] In April 2021, the Commission unveiled the world's first comprehensive plan to regulate artificial intelligence.[10] There is the Digital Services Act, the Digital Markets Act, the Digital Decade, the Cyber-Security Strategy, the Data Strategy and more. After the General Data Protection Regulation (GDPR), from 2018, the EU is doubling down on its role as a global rulemaker on technology and wants to take the global lead in that area. However it does not want to engage in the power politics increasingly associated with AI.

Can Europe, can the EU, stay out of this apparent geopolitical power struggle over AI, ignore the rhetoric, and focus on regulation? As tempting as this may sound, it seems unlikely – and might be unadvisable – for two reasons.

First, the technological *is* geopolitical. AI regulation may sound like a boring topic for bureaucrats. However it is also a geopolitical battleground, as is technology development and technology adoption more generally. Breaking up US technology companies at a moment in which the US is fighting for supremacy with China is a geopolitical act. Excluding Chinese telecommunication firms from European networks is a geopolitical decision. Europe's actions have geopolitical consequences that reach beyond the union. In the policymaking process, however, this is often overlooked. Policymaking within the EU is so complex that little time or space is left for anticipating the impact on external actors. If the impact on others is acknowledged, it is usually by referencing the "Brussels effect", the idea that EU regulation, through the trade bloc's market power, becomes a model for others.[11] This is often portrayed like an automatic effect, rather than something that requires further thought. Generally, there is too little thinking about international second and third order effects of EU actions.

Second, too little thought is put into the way internal EU (in)actions influence the union's own geopolitical power. Throughout history, technology has transformed economies and societies, has redistributed (military) power among states, has empowered new actors, and shaped international relations. However the EU, for all its pathbreaking work on regulation, does not appear to have fully registered *just how geopolitical* today's digital technologies, including AI are. At the 2020 Munich Security Conference, it was painfully obvious that the EU was at best considered a moderator between the two real powers, the United States and China.[12] Partly, this geopolitical blind spot is due to questions of EU competency, but even more it is linked to the way the EU sees itself – despite more recent rhetoric over a "geopolitical union".[13] The EU is a market-driven entity in which "high politics"

Competition, The Diplomat, 31 December 2019, https://thediplomat.com/2020/01/elsa-b-kania-on-artificial-intelligence-and-great-power-competition/; *FLI Podcast: Beyond the Arms Race Narrative: AI & China with Helen Toner & Elsa Kania*, Future of Life Institute, 30 August 2019, https://futureoflife.org/2019/08/30/fli-podcast-beyond-the-arms-race-narrative-ai-china-with-helen-toner-elsa-kania/.

7 *Special Eurobarometer 500 - First Results*, European Union, 2021, https://www.europarl.europa.eu/at-your-service/files/be-heard/eurobarometer/2021/future-of-europe-2021/en-report.pdf.

8 The Digital Compass, European Union, https://digital-strategy.ec.europa.eu/en/policies/digital-compass; *Brussels Europe's Digital Decade: Commission sets the course towards a digitally empowered Europe by 2030*, Press release, European Commission, 9 March 2021, https://ec.europa.eu/commission/presscorner/detail/en/IP_21_983.

9 Carla Hobbs (ed.), *Europe's digital sovereignty: From rulemaker to superpower in the age of US-China rivalry*, Essay Collection, *ECFR*, 30 July 2020, https://ecfr.eu/publication/europe_digital_sovereignty_rulemaker_superpower_age_us_china_rivalry/.

10 *Proposal for a Regulation laying down harmonised rules on artificial intelligence*, *European Commission*, April 2021, https://digital-strategy.ec.europa.eu/en/library/proposal-regulation-laying-down-harmonised-rules-artificial-intelligence-artificial-intelligence.

11 Anu Bradford, *The Brussels effect: How the European Union rules the world*, Oxford University Press, USA, 2020.

12 Ulrike Franke, *Upstaged: Europe's struggles to play the great tech game*, ECFR, 25 February 2020, https://ecfr.eu/article/commentary_upstaged_europes_struggles_to_play_the_great_tech_game/.

13 Lili Bayer, *Meet von der Leyen's 'geopolitical Commission'*, *Politico*, 4 December 2019, https://www.politico.eu/article/meet-ursula-von-der-leyen-geopolitical-commission/.

(such as security and defence) is left in the hands of its Member States. However the Member States have not picked up the geopolitical baton on AI. While one can see this as one of the many civilisatory advances of the European Union, the fact remains that while Europe may not want to think about geopolitics, geopolitics certainly is thinking of Europe.

So even if Europe does not want to adopt the AI power politics narrative, or join the rhetoric about an AI race, it must take into account the geopolitical implications of AI. It needs to consider the external dimension of its action, and how to deal with allies, partners, countries it wants to support, and opponents. The EU needs a plan for AI diplomacy.

This paper looks at how AI influences geopolitics and what that means for Europe and the EU. It begins with a short stock-taking: where are we at the moment in terms of AI capabilities (section 2). It then dives into the core of the issue, discussing six ways how AI could plausibly, or already is, influencing the global balance of power and Europe's standing within it (section 3). In section 4, it discusses whether European Member States are considering the issues raised in section 3 and are approaching AI as a geopolitical topic. The paper ends with recommendations for the EU and its Member States, aimed at giving them the right tools to address the challenges they face.

2. WHERE ARE WE AT THE MOMENT? EUROPE'S AI CAPABILITIES, AN OVERVIEW

2.1. Artificial Intelligence – A short primer

Artificial intelligence is an ill-defined term, not least because its meaning has changed over time. AI refers to efforts to build computers and machines able to perform actions that one would expect to require human intelligence. However, whenever scientists created systems that could perform tasks thought to be the preserve of humans, AI came to be defined by even more complex tasks. "Once something works, we stop calling it artificial intelligence and start calling it software."[14]

The field of AI has gone through several cycles of hype and disappointment, with the latter dubbed "AI winters". The field is currently enjoying an "AI spring", with AI development and adoption accelerating significantly over recent years. This is due to the increased availability of large data sets, and technological advances, most notably in computational performance. A 2017 report estimated that 90 percent of the world's data had been created within the preceding five years. The same period saw a fifteen-fold growth in the number of developers of graphics processing units (GPUs) – hardware crucial for AI.[15] Together, these developments have led to a significant increase in AI research around the world, resulting in better algorithms becoming more widely available. This, in turn, has generated more research into further AI. At the moment, the most important advances in AI are being made through machine learning techniques, particularly "deep learning" and neural networks. Machine learning systems use computing power to execute algorithms that learn from data.[16] Three key inputs are crucial for AI, the "AI Triad" of data, talent (to develop algorithms), and computing power.[17]

Some have called AI an omni-use technology, or general-purpose technology,[18] as it can be used in various ways, from helping health-workers interpret x-ray readings, making warehouses run more efficiently, enable military systems, or support data analysis.[19] Given this wide range of applications, it is advisable to think of AI not as one technology, but as an enabler and speak of "AI-enabled" systems.

Despite discussions about possible "superintelligence", today's AI applications are "narrow", meaning that they have perfected doing one specific task, and "brittle", meaning that they fail when confronted with tasks that slightly differ from its training. Artificial General Intelligence (AGI), capable of reproducing human-level intelligence over different tasks, remains in the realm of science fiction, with considerable disagreement among experts on whether and when AGI is likely to emerge (see section 3.6 below).

AI is often grouped with other "emerging technologies", which include 5G, quantum computing, biotechnology, cyber, and more. It can be difficult to keep these apart, as they interact and feed of each

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[14] Ben Buchanan and Taylor Miller, *Machine Learning for Policymakers: What It Is and Why It Matters* (2017), https://www.belfercenter.org/sites/default/files/files/publication/MachineLearningforPolicymakers.pdf.

[15] *Profiles in Innovation Revisited: AI hardware*, Goldman Sachs Equity Research, 11 March 2018, p.7.

[16] Ben Buchanan, "The AI Triad and What It Means for National Security Strategy", *CSET*, August 2020, https://cset.georgetown.edu/wp-content/uploads/CSET-AI-Triad-Report.pdf.

[17] "Profiles in Innovation: Artificial Intelligence: AI, Machine Learning and Data Fuels the Future of Productivity", *Goldman Sachs Research Unit*, 14 November 2016. Ben Buchanan, "The AI Triad and What It Means for National Security Strategy", *CSET*, August 2020, https://cset.georgetown.edu/wp-content/uploads/CSET-AI-Triad-Report.pdf.

[18] Written Testimony of Jack Clark, Policy Director OpenAI, Hearing on "The National Security Challenges of Artificial Intelligence, Manipulated Media, and 'Deep Fakes" before the House Permanent Select Committee on Intelligence, 13 June 2019, https://docs.house.gov/meetings/IG/IG00/20190613/109620/HHRG-116-IG00-Wstate-ClarkJ-20190613.pdf.

[19] Nina Bai, "Artificial Intelligence That Reads Chest X-Rays Is Approved by FDA", University of California San Francisco, 12 September 2019, https://www.ucsf.edu/news/2019/09/415406/artificial-intelligence-reads-chest-x-rays-approved-fda, James Vincent, "Welcome to the automated warehouse of the future", *The Verge*, 8 May 2018, https://www.theverge.com/2018/5/8/17331250/automated-warehouses-jobs-ocado-andover-amazon.

other: 5G helps connect AI-enabled devices, quantum computing could make AI considerably more powerful, while AI could enable research in biotechnology, etc. This report focuses on AI, to the extent possible, but these links need to be kept in mind.

2.2. Overview of AI development and adoption in the EU

There is a general agreement that the adoption of AI will lead to substantial economic gains, even though calculating these gains exactly is a difficult task. A McKinsey study estimates that AI has the potential to deliver additional global economic activity of around $13 trillion by 2030, or about 1.2 percent additional C growth per year.[20]

Europe's AI capabilities, however, have received a lot of bad press. Kai-Fu Lee, former president of Google China, claims that Europe is "not even in the running for bronze AI medal".[21] A 2019 McKinsey study warned that "Europe is adding an AI gap to its digital gap".[22] It said that European companies lag behind their US counterparts in their adoption of big data architecture and of the advanced machine learning techniques that are the foundations of AI. The report, however, noted something that has plagued most such studies, namely that "available data on diffusion are scarce". In fact, overviews of the state of AI often do not even feature Europe as an actor, or only look at some European states. This might be explained by language barriers, and the fact that the number of European states is high – but it also is a testimony to a lack of interest by the EU and its Member States in the topic, and a lack of funding for such studies. The assessment of AI abilities of states (or group of states) is hindered by different understandings of what AI entails, and studies often rely on self-assessments, making them less reliable. Comparisons between states also need to be read particularly carefully, as different countries have different dominant industries, and AI-enabled systems are not affecting all industries at the same pace. Finally, when assessing a state's AI capabilities, one should look at both AI 'output' and 'input'. The output are the actual AI capabilities, measured, for example in the number of AI firms, or the level of AI use by business. However as important advances in machine learning and other AI techniques are being made, it is equally important to study the key inputs for AI development which can point to likely future developments.

European AI Output: A 2020 survey found that only between one and three percent of EU companies with ten employees or more say they use AI such as machine learning, natural language processing, or speech recognition (financial sector not counted).[23] There are considerable differences between countries: 20% of Irish, and 12% of Maltese firms report they analyse big data internally using machine learning, against only 5% in Denmark, 2% in Germany, France, and Italy, and 1% in Greece, Latvia, and Poland (on the other measurements, like language processing, the divergences are not as pronounced).

The Global AI ranking by Tortoise Media ranks states according to Implementation, Innovation, and Investment and gives an aggregated score (arguably mixing output and input measures). Here, three EU states are in the top ten (Germany, Netherlands, and France); 15 EU states are in the top 30, and 22

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[20] "Notes from the AI frontier: Modeling the impact of AI on the world economy", *McKinsey Global Institute*, 4 September 2018, https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy.

[21] Carly Minsky, "One former Google exec says there's no hope for Europe's artificial intelligence sector", *Sifted*, 14 December 2018, https://sifted.eu/articles/interview-google-kaifu-lee-ai-artificial-intelligence/.

[22] "Tackling Europe's gap in digital and AI", *McKinsey Global Institute*, 7 February 2019, https://www.mckinsey.com/featured-insights/artificial-intelligence/tackling-europes-gap-in-digital-and-ai#.

[23] Eurostat, Artificial Intelligence, last update 11/03/2021, https://ec.europa.eu/eurostat/databrowser/view/ISOC_EB_AI__custom_784358/bookmark/table?lang=en&bookmarkId=f34cd95d-77aa-45bd-8496-eabf49549c02.

EU Member States are in the top 50.[24] On different indicators, different states are leading – for example, regarding the operating environment, EU countries top the list with Poland, Slovenia, Lithuania, Slovakia, Luxemburg taking the top five spots. In this context it should be noted that the UK in this ranking has the highest score of any European country (third place in aggregate ranking, after the US and China). The UK is also home to important AI firms, such a Ocado, one of the most sophisticated players in warehouse automation after Amazon. DeepMind, the AI-development superstar behind the AlphaGo/AlphaZero programme (see below) was founded in London, although it was acquired by Google in 2014.

Input: Three key inputs are crucial for AI: data, talent, and computing power.

Data: For the moment, most AI is trained by using large amounts of data.[25] For instance, an AI system may be shown thousands of pictures to learn to identify objects. Data relevant for machine learning can come in many forms, and includes, for example, census data, weather data, or health records. Europe faces a challenge on data collection as European countries' comparatively small size and strong data security rules mean that, in comparison to colleagues elsewhere, European AI developers have relatively limited access to data. Where China and the US benefit from large, homogeneous home markets and many customers abroad (see section 3.1. below), Europeans face a fragmented market. The EU has worked hard to create the digital single market, but data collection has not been unified to the extent that is possible within individual countries, and even in the best of cases, language and cultural barriers remain.

Talent (to develop algorithms): The EU educates good talent. It ranks highly on peer-reviewed AI publications – although it was overtaken by China in 2017 and the EU is losing share in AI journal citations.[26] However Europe struggles to retain the talent it educates, with researchers and entrepreneurs leaving, especially for the US. Funding is a problem, which is why AI developer Cédric Villani recommends "hefty salary top-ups" in the French AI strategy.[27] Again, inner-European divergences are noteworthy. Of the top 30 AI research organisations in the EU, Canada, Australia, New Zealand, and the UK identified in a recent study, eleven are European. However of those, seven are in Germany while Denmark, Austria, France and Italy have one respectively.[28] And on AI workforce, a study based on data from the professional networking website LinkedIn finds that France and Germany alone make up 19% of the AI workforce in in the EU, Canada, Australia, New Zealand, and the UK. [29]

Hardware/compute: Although AI generally refers to software, it requires a hardware element on which to run its computation, and train its algorithms. Advanced semiconductor chips are at the heart of this hardware – and are increasingly perceiving as strategic assets by policymakers. Chips are an important element of the intensifying technology rivalry between the United States and China (see section 3.1.

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[24] The Global AI Index, https://www.tortoisemedia.com/intelligence/global-ai/.

[25] Not all AI requires big data as advances are being made into data efficiency and synthetic data. Therefore, headlines about data being the new oil, or China being "the Saudia Arabia of data" should be avoided. Nevertheless, many AI development methods rely on big databases to train their algorithms.

[26] Artificial Intelligence Index Report 2021, Stanford University, p.20. https://aiindex.stanford.edu/wp-content/uploads/2021/03/2021-AI-Index-Report_Master.pdf.

[27] "AI for Humanity", March 2018, https://www.aiforhumanity.fr/en/.

[28] Max Langenkamp, Melissa Flagg, "AI Hubs, Europe and CANZUK", *CSET*, April 2021, https://cset.georgetown.edu/research/ai-hubs/.

[29] Ibid. Also see "The State of European AI Talent", *Macro Polo* https://macropolo.org/digital-projects/the-global-ai-talent-tracker/the-state-of-european-ai-talent/.

below). Europe remains largely dependent on foreign chipmakers; for the past three decades, the global market share of the EU's semiconductor industry was around 10%.[30]

This brief overview does not claim to be a comprehensive assessment of Europe's AI capabilities. As mentioned, such an assessment is difficult in any case, given the scarcity of available data. But this overview has shown that the EU has AI capabilities, but it lacks in certain areas, and does not have a comfortable or secured lead in any of them. With regard to AI output, Europe is behind other players, but it appears reasonably well positioned with regard to AI inputs. Still, the EU faces several challenges such as retaining AI talent and building up an AI ecosystem. The overview also showed that inner-European differences are significant. Addressing those differences, as well as taking on the other challenges is complicated by a fragmented market, and lack of information. Technology-policy requires a 'whole-of-government' approach which the EU, as a hybrid polity, has a hard time implementing.[31]

[30] Semiconductor Industry Association "SIA Factbook 2020", https://www.semiconductors.org/the-2020-sia-factbook-your-source-for-semiconductor-industry-data/.

[31] Alice Panier, "Europe in the Geopolitics of Technology, Connecting the Internal and External Dimensions", *IFRI*, April 2021, p.1, https://www.ifri.org/sites/default/files/atoms/files/pannier_europe_geopolitics_technology_2021_.pdf.

3. AI'S POSSIBLE IMPACT ON GEOPOLITICS AND THE GLOBAL BALANCE OF POWER.

Throughout history, technology has transformed economies and societies, has redistributed (military) power among states, and has empowered new actors. The following section outlines six ways how AI could, and already is, shaping international relations and the global balance of power and what that means for the European Union.

3.1. US-China competition

Joe Biden, in one of his first major interventions as US President, said the future of the US relationship with China will be dominated by "extreme competition".[32] No geopolitical development is likely to shape global stability as much as Sino-American competition, which will directly impact Europe. And AI plays an important role. Bill Burns, in his confirmation hearing for Director of the CIA noted that technology is the central component of the competition with China.[33] The US National Security Commission on AI took a similar position – its final report mentioned China a whopping 699 times, more than any opponent or ally.[34] "We are in a competition with China and AI is at the absolute center of that competition", the Commission's members emphasised.[35]

Fifteen March 2016 is an important date in that context. On that day, AlphaGo, an AI-enabled system built by DeepMind, beat champion Lee Sedol at the Chinese game of Go.[36] This event has been labelled China's AI "Sputnik moment", referring to the shock to the US when the Soviet Union brought the first satellite into orbit in 1957. That a western-built AI would beat China at its own game was considered humiliating. Although China had pursued AI research before, AlphaGo's win motivated further research and development.[37] Today, the US focus on China finds its mirror image across the Pacific: the Chinese leadership, in its 2017 "Next-Generation Artificial Intelligence Plan" proclaimed its aim to have caught up with the US in 2020.[38] Xi Jingping in 2013 noted that "Advanced technology is the sharp weapon of the modern state. An important reason that Western countries were able to hold sway over the world in modern times was that they held the advanced technology."[39] References to an "AI (arms) race" between the US and China have become so commonplace that a whole academic subfield has emerged to fight this framing.[40]

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[32] Demetri Sevastopulo, "Biden warns China will face 'extreme competition' from US", *Financial Times*, 7 February 2021, https://www.ft.com/content/c23a4e67-2052-4d2f-a844-e5c72a7de214.

[33] Statement for the Record, Senate Select Committee on Intelligence Director of CIA Nominee William J. Burns, 24 February 2021, https://www.intelligence.senate.gov/sites/default/files/documents/os-wburns-022421.pdf.

[34] US National Security Commission on Artificial Intelligence, Final Report, March 2021, https://reports.nscai.gov/final-report/table-of-contents/. Also see: "Oh My, AI", War on the Rocks podcast, 12 May 2021, https://warontherocks.libsyn.com/oh-my-ai.

[35] Commissioners Robert O. Work and Safra Catz at Atlantic Council event "A conversation with the National Security Commission on Artificial Intelligence", 29 April 2021, https://www.youtube.com/watch?v=3lwHPOxvj9E.

[36] Steven Borowiec, "AlphaGo seals 4-1 victory over Go grandmaster Lee Sedol", *Guardian*, 15 March 2016, https://www.theguardian.com/technology/2016/mar/15/googles-alphago-seals-4-1-victory-over-grandmaster-lee-sedol.

[37] For a good discussion of the relevance of this "Sputnik-moment", see "FLI Podcast: Beyond the Arms Race Narrative: AI & China with Helen Toner & Elsa Kania", *Future of Life Institute*, 30 August 2019, https://futureoflife.org/2019/08/30/fli-podcast-beyond-the-arms-race-narrative-ai-china-with-helen-toner-elsa-kania/.

[38] Sophie-Charlotte Fischer, "Artificial Intelligence: China's High-Tech Ambitions", *CSS Analyses in Security Policy N*0. 220, February 2018, https://css.ethz.ch/content/dam/ethz/special-interest/gess/cis/center-for-securities-studies/pdfs/CSSAnalyse220-EN.pdf.

[39] Chris Buckley and Paul Mozur, "What Keeps Xi Jinping Awake at Night", New York Times, 11 May 2018, https://www.nytimes.com/2018/05/11/world/asia/xi-jinping-china-national-security.html.

[40] "FT Series: The AI arms race", *Financial Times*, https://www.ft.com/content/21eb5996-89a3-11e8-bf9e-8771d5404543, Kelsey Piper, "Why an AI arms race with China would be bad for humanity, *Vox*, 10 August 2019, https://www.vox.com/future-perfect/2019/8/10/20757495/peter-thiel-ai-arms-race-china. Heather M. Roff, "The frame problem: The AI "arms race" isn't one", *Bulletin of the Atomic Scientists*, Volume 75, 2019 - Issue 3, pp. 95-98, 26 Apr 2019, https://doi.org/10.1080/00963402.2019.1604836 https://dl.acm.org/doi/abs/10.1145/3278721.3278780.

When looking at Chinese versus American AI capabilities, the aforementioned difficulty of measuring states' AI capabilities should be kept in mind. Still, most AI rankings place the US ahead of China, though not on all aspects. The Tortoise Global AI Index, for example, finds China ahead of the US on AI development, the operating environment, and government strategy.[41] Kai-Fu Lee has argued that China exceeds the US in bringing AI applications into the consumer market and is thus likely to benefit faster, turning into an "AI superpower".[42] China has capable AI companies in Baidu, Alibaba, and Tencent (the "BAT"), and features a dynamic start-up scene in Shenzhen. The importance of the BAT in China, and the GAFAM (Google, Amazon, Facebook, Apple, Microsoft) in the US raises the question whether these private companies should be considered Chinese or American, simply because they are founded and headquartered in the countries. In the US, especially after the Snowden revelations, many firms tried to disengage from the US government.[43] In 2018, Google employees protested against the company's involvement in "Project Maven", an AI collaboration with the Pentagon.[44] This has led some to raise concerns that the US will fall behind China.[45] While it would be a simplification to equate private companies and the Chinese state (or military), compared to the US, Chinese companies are less likely to be able to refuse working with the Chinese government, and private AI development is likely to benefit the state somewhat. Nevertheless, experts have pointed out that US concerns over the Chinese concept of "civil-military fusion," which aims at making available the research advances from the private sector to the state, and the Chinese military, may be exaggerated.[46]

Looking at the AI triad of data, talent, and compute, it can be argued that the US is slightly ahead of China. Both US and Chinese firms benefit from access to significant amounts of data. The usefulness of data, however, depends on its quality and relevance to the respective AI. China's internet users are more numerous than those of any other country and access the internet using smartphones, which tends to generate particularly valuable data.[47] American firms' products, however, are used around the world, which makes their data more diverse. China is aiming to counter this effect through selling its products, and collecting data, abroad.[48] China's access to data on Chinese shopping behaviour will allow China to develop very good algorithms predicting Chinese shopping behaviour, but is unlikely to significantly empower its research on, say, military command and control.

Talent may turn out to be the more relevant indicator. The US world-leading research institutions train significant numbers of AI specialists, including foreigners who often remain in the country to start firms. More than half of the American AI workforce was born abroad, as were around two-thirds of current graduate students in AI-related fields.[49] Silicon Valley companies successfully attract talent from around the world, and the GAFAMs continue to gain talent through so-called "acquihires", the take-over of

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41 The Global AI Index, https://www.tortoisemedia.com/intelligence/global-ai/.

42 Lee, Kai-Fu. *AI superpowers: China, Silicon Valley, and the new world order*. Houghton Mifflin Harcourt, 2018.

43 Sanger, David E. *The perfect weapon: War, sabotage, and fear in the cyber age*. Broadway Books, 2019. p.84. Also see p.266.

44 Scott Shane, Daisuke Wakabayashi, "The Business of War': Google Employees Protest Work for the Pentagon", *New York Times*, 4 April 2018, https://www.nytimes.com/2018/04/04/technology/google-letter-ceo-pentagon-project.html.

45 Peter Thiel, "Good for Google, Bad for America", *New York Times*, 1 August 2019, https://www.nytimes.com/2019/08/01/opinion/peter-thiel-google.html.

46 Elsa B. Kania and Lorand Laskai, "Myths and Realities of China's Military-Civil Fusion Strategy", *CNAS*, 28 January 2021, https://www.cnas.org/publications/reports/myths-and-realities-of-chinas-military-civil-fusion-strategy.

47 "China may match or beat American in AI", *The Economist*, 15 July 2017.

48 Arthur Gwagwa, "Exporting Repression? China's Artificial Intelligence Push into Africa", CFR, 17 December 2018, https://www.cfr.org/blog/exporting-repression-chinas-artificial-intelligence-push-africa ; Francisco Toro, James Bosworth, "Opinion: China exports its high-tech authoritarianism to Venezuela. It must be stopped", *Washington Post,* 5 December 2018, https://www.washingtonpost.com/opinions/2018/12/05/china-exports-its-high-tech-authoritarianism-venezuela-it-must-be-stopped/.

49 Remco Zwetsloot, "Keeping Top AI Talent in the United States", CSET, December 2019, https://cset.georgetown.edu/publication/keeping-top-ai-talent-in-the-united-states/.

smaller firms with the primary aim of hiring their employees.[50] Various US reports focus on AI talent in the US, recommending strategy on how to retain experts, especially those who were educated in the US.[51] While not quite as attractive for global talent as the US, the Chinese education system generates strong skills in maths, and the country has a tradition of language and translation research. China also sees talent as central; President Xi Jinping has repeatedly called talent "the first resource" in China's push for innovation.[52] The Chinese leadership has devised strategies to build its talent base, through the improvement of education, attracting talent from abroad, and bringing back Chinese talent from abroad. According to a recent study, however, so far, these strategies have resulted in mixed results.[53]

On hardware, specifically chip capabilities to develop advanced AI, the US appear to be leading. It has the largest chip design industry and aims to make the leading chip manufacturers, Samsung and the Taiwanese TSMC establish fabs in the United States.[54] Although factories in China produce a significant share of the world's mobile phones and computers, the chips on which they run come from overseas. Reportedly, even the manufacturing processes of China's most technologically advanced chip maker are years behind those of industry leaders.[55] It is here that the US-China competition has come to the forefront most clearly as the US has imposed exports control on Chinese companies in an effort to limit China's AI advances.[56]

The military element. Sino-American competition on technology also has a distinct security and defence element. Already in 2012, the US House Intelligence Committee labelled Chinese firm Huawei a major national security concern.[57] Military AI – AI used to enable military capabilities – is likely to have an important impact on warfare, and possibly the geopolitical balance of power, as explained in detail in section 3.5 below. Both the US and China are extensively funding efforts to use AI in the military, and are clearly focused on each other in this effort.[58] The US national security commission noted that the US needed "ubiquitous AI capabilities and new warfighting paradigms", as, without such AI capabilities, the US "will not be able to defend against AI-enabled threats". In the US, fear is rising that an "innovation gap" is appearing between the United States and China – similar to the concerns over a

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50 "Profiles in Innovation: Artificial Intelligence: AI, Machine Learning and Data Fuels the Future of Productivity", *Goldman Sachs Research Unit,* 14 November 2016, p.11.

51 Remco Zwetsloot, "Keeping Top AI Talent in the United States", *CSET*, December 2019, https://cset.georgetown.edu/publication/keeping-top-ai-talent-in-the-united-states/. Remco Zwetsloot, Jacob Feldgoise, James Dunham, "Trends in U.S. Intention-to-Stay Rates of International Ph.D. Graduates Across Nationality and STEM Fields", CSET, April 2020, https://cset.georgetown.edu/publication/trends-in-u-s-intention-to-stay-rates-of-international-ph-d-graduates-across-nationality-and-stem-fields/.

52 Remco Zwetsloot, "China's Approach to Tech Talent Competition: Policies, Results, and the Developing Global Response", *CSET*, April 2020, https://cset.georgetown.edu/publication/chinas-approach-to-tech-talent-competition-policies-results-and-the-developing-global-response/.

53 Remco Zwetsloot, "China's Approach to Tech Talent Competition: Policies, Results, and the Developing Global Response", *CSET*, April 2020, https://cset.georgetown.edu/publication/chinas-approach-to-tech-talent-competition-policies-results-and-the-developing-global-response/.

54 Jan-Peter Kleinhans, "The lack of semiconductor manufacturing in Europe", *Stiftung Neue Verantwortung*, April 2021, https://www.stiftung-nv.de/sites/default/files/eu-semiconductor-manufacturing.april_.2021.pdf.

55 Ana Swanson, Raymond Zhong, "U.S. Places Restrictions on China's Leading Chip Maker", *New York Times*, 26 September 2020, https://www.nytimes.com/2020/09/26/technology/trump-china-smic-blacklist.html.

56 Ana Swanson, Raymond Zhong, "U.S. Places Restrictions on China's Leading Chip Maker", *New York Times*, 26 September 2020, https://www.nytimes.com/2020/09/26/technology/trump-china-smic-blacklist.html.

57 Michael S. Schmidt, Keith Bradsher, Christine Hauser, "U.S. Panel Cites Risks in Chinese Equipment", *New York Times*, 8 October 2012, https://www.nytimes.com/2012/10/09/us/us-panel-calls-huawei-and-zte-national-security-threat.html.

58 Margarita Konaev, "U.S. Military Investments in Autonomy and AI: A Budgetary Assessment", *CSET*, October 2020, https://cset.georgetown.edu/research/u-s-military-investments-in-autonomy-and-ai-a-budgetary-assessment/ ;
Elsa B Kania, "National AI Strategies, Chinese Military Innovation in the AI Revolution", *RUSI Journal*, Volume 164, 2019 - Issue 5-6, Pages 26-34, 29 November 2019, https://doi.org/10.1080/03071847.2019.1693803; Dewey Murdick, Daniel Chou, Ryan Fedasiuk, Emily Weinstein, "The Public AI Research Portfolio of China's Security Forces", *CSET*, March 2021, https://cset.georgetown.edu/research/the-public-ai-research-portfolio-of-chinas-security-forces/.

"bomber gap" between the US and the Soviet Union during the Cold War.[59] The Chinese military is pursuing "military intelligentization", the development and operationalization of artificial intelligence and the enabling and related technologies that are required for its realization for military applications.[60] Chinese military scientists and strategists are also undertaking extensive theoretical research on the impact of AI on future warfare.[61] The hope is that developing and adopting AI in the defence and military realm is a "rare strategic opportunity for [China] […] to achieve a powerful military, and […] to surpass [competitors]."[62] It is in this context of a competition for military superiority, that the founder of the AI/surveillance firm Palantir, Peter Thiel, has criticised US AI firms for working in China, as their research could ultimately benefit the Chinese military.[63]

This brief overview of Chinese and American capabilities, plans, and visions for AI shows that the two states are both capable AI powers – and increasingly locked in a competition with each other on AI. For Europe, this competition poses several challenges.

First, a (military) confrontation between the two global powers is clearly not in Europe's interest, whether it is over AI or over something else. However beyond this worst-case scenario, other challenges loom. Namely, there is a risk that spheres of influence are emerging, in which Europe will have to take sides. A Sino-American decoupling is already happening; Nicholas Thompson and Ian Bremmer note that "at the dawn of a new stage in the digital revolution, the world's two most powerful nations are rapidly retreating into positions of competitive isolation".[64] While the US is the EU's most important and closest ally, and China a systemic rival, China also is a cooperation partner on some topics, and an important partner in trade. Europe, therefore, has to look in two directions at once: "while the US and China are engaged in a bilateral race, Europe needs to address simultaneously the challenges stemming from American and Chinese technology policies, which are quite different", Alice Pannier notes.[65]

Kai-Fu Lee describes a particularly bleak dependency scenario for countries that are not the US or China, "If most countries will not be able to tax ultra-profitable AI companies to subsidize their workers, what options will they have? I foresee only one: Unless they wish to plunge their people into poverty, they will be forced to negotiate with whichever country supplies most of their AI software — China or the United States — to essentially become that country's economic dependent, taking in welfare subsidies

[59] Laura Schousboe, "The Pitfalls of Writing About Revolutionary Defense Technology", *War on the Rocks*, 15 July 2019, https://warontherocks.com/2019/07/the-pitfalls-of-writing-about-revolutionary-defense-technology/.

[60] "Translation: Tianjin Municipal Action Plan for Military-Civil Fusion Special Projects in Intelligent Technology", *CSET*, https://cset.georgetown.edu/wp-content/uploads/t0033_Tianjin_mil_civil_fusion_EN.pdf; Elsa B. Kania, "Chinese Military Innovation in Artificial Intelligence. Hearing of the U.S.-China Economic and Security Review Commission", 7 June 2019, https://www.cnas.org/publications/congressional-testimony/chinese-military-innovation-in-artificial-intelligence.

[61] Elsa B. Kania, "Chinese Military Innovation in Artificial Intelligence. Hearing of the U.S.-China Economic and Security Review Commission", 7 June 2019, https://www.cnas.org/publications/congressional-testimony/chinese-military-innovation-in-artificial-intelligence.

[62] Elsa B. Kania, "Chinese Military Innovation in Artificial Intelligence. Hearing of the U.S.-China Economic and Security Review Commission", 7 June 2019, https://www.cnas.org/publications/congressional-testimony/chinese-military-innovation-in-artificial-intelligence.

[63] Peter Thiel, "Good for Google, Bad for America", *New York Times*, 1 August 2019, https://www.nytimes.com/2019/08/01/opinion/peter-thiel-google.html. Also see Jessica Bursztynsky, "Ex-Defense chief: Google has a duty to the US, not China, to 'take our values to the battlefield'", CNBC 18 July 2019, https://www.cnbc.com/2019/07/18/ex-defense-secretary-ash-carter-google-has-a-duty-to-the-us-not-china.html.

[64] Nicholas Thompson, "The AI Cold War that threatens us all", *Wired*, 23 October 2018, https://www.wired.com/story/ai-cold-war-china-could-doom-us-all/.

[65] Alice Panier, "Europe in the Geopolitics of Technology, Connecting the Internal and External Dimensions", *IFRI*, April 2021, p.1, https://www.ifri.org/sites/default/files/atoms/files/pannier_europe_geopolitics_technology_2021_.pdf. Also see the discussion at the Dutch Parliament "Impact van technologische ontwikkeling op het buitenlands beleid (via videoverbinding)", 3 february 2021, https://debatgemist.tweedekamer.nl/node/24887.

in exchange for letting the "parent" nation's AI companies continue to profit from the dependent country's users. Such economic arrangements would reshape today's geopolitical alliances."[66]

Furthermore, there is a concern that this competition could create dangerous incentives, such as fielding immature AI in order to gain an advantage over the competitor. This might have particularly problematic consequences in the military area (see section 3.5 below).

3.2. AI-empowered authoritarianism and weakening of democracy

The US-China competition has been framed not only as a competition for geopolitical power and dominance, but also a competition between (AI-enabled) authoritarianism and liberal democracies. Robert O. Work, Deputy Secretary of Defence for both the Obama and Trump administrations from 2014 to 2017 and co-chair of the US National Security Commission on AI, argues: "This technological competition is very much a values competition. We already know how China wants to use AI. They want to use it to surveill their population they want to use it to suppress minorities, they don't care about personal privacy and civil liberties. And those type of values are just incompatible with democratic nations around the world. So it is important that we have this alliance of democracies that work together to establish the norms and values and that deploy platforms that reflect our values."[67] Work of course refers to the widely-reported increasing level of surveillance in China.[68] The worry is that AI may be a powerful enabler of authoritarian rule.

For a long time, there was a belief that digital information technology would contribute to a diffusion of liberal ideas and values. Then US President Bill Clinton noted in 2000: "In the new century, liberty will spread by cell phone and cable modem. [...] We know how much the Internet has changed America, and we are already an open society. Imagine how much it could change China. Now there's no question China has been trying to crack down on the Internet. Good luck! That's sort of like trying to nail Jell-O to the wall."[69] Unfortunately, it appears that such hopes were somewhat misplaced. *Human Rights Watch* warns that authorities in China "conduct compulsory mass collection of biometric data, such as voice samples and DNA, and use artificial intelligence and big data to identify, profile, and track everyone in Xinjiang" home of the Uyghur Muslim minority.[70] Elsewhere in China, the idea of a social credit score had been tested, a "pervasive, highly intrusive AI-enabled surveillance system that tracks you all day every day and that largely determines all of your life chances"[71]. Not all of these surveillance techniques are necessarily AI-enabled or need to be, but AI can contribute to supercharge them further.

This is of immediate concern for the freedom of Chinese citizens. However, geopolitically speaking, there is further concern that we might be moving into a new era of ideological confrontation, akin to the competition between liberal democracy and communism during the Cold War. Several commentators are already framing the competition in Cold War terms.[72] Nicholas Wright argues that

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66 Kai-Fu Lee, "The Real Threat of Artificial Intelligence", New York Times, 24 June 2017, https://www.nytimes.com/2017/06/24/opinion/sunday/artificial-intelligence-economic-inequality.html.

67 "Oh My, AI", War on the Rocks podcast, 12 May 2021, https://warontherocks.libsyn.com/oh-my-ai.

68 Ross Andersen, "The Panopticon Is Already Here", *The Atlantic*, September 2020, https://www.theatlantic.com/magazine/archive/2020/09/china-ai-surveillance/614197/.

69 "Clinton's Words on China: Trade Is the Smart Thing", *New York Times*, March 9, 2000, https://www.nytimes.com/2000/03/09/world/clinton-s-words-on-china-trade-is-the-smart-thing.html.

70 "China's Campaign of Repression Against Xinjiang's Muslims" *Human Rights Watch*, 9 September 2018, https://www.hrw.org/report/2018/09/09/eradicating-ideological-viruses/chinas-campaign-repression-against-xinjiangs.

71 Francisco Toro, James Bosworth "Opinion: China exports its high-tech authoritarianism to Venezuela. It must be stopped", *Washington Post*, 5 December 2018, https://www.washingtonpost.com/opinions/2018/12/05/china-exports-its-high-tech-authoritarianism-venezuela-it-must-be-stopped/?.

72 Nicholas Thompson, "The AI Cold War that threatens us all", *Wired*, 23 October 2018, https://www.wired.com/story/ai-cold-war-china-could-doom-us-all/.

AI-enabled surveillance creates a viable alternative to liberal democracy; it "offers a plausible way for big, economically advanced countries to make their citizens rich while maintaining control over them."[73] This concern is fuelled by China increasingly exporting its surveillance systems. China deploys facial recognition software in Zimbabwe and Malaysia, and Ethiopian security services rely on telecommunications equipment from Chinese firm ZTE to monitor activists.[74] Many of these deals have been part of China's Belt and Road Initiative (BRI), the investment vehicle China uses to finance infrastructure projects abroad.[75]

Beijing has tried to mitigate such concerns, for example through the "Beijing AI Principles" released by the Beijing Academy of Artificial Intelligence, that set out rules for the ethical, diverse, inclusive AI.[76] However, Elsa Kania, an expert of Chinese AI efforts noted that it was "hard not to feel a degree of cognitive dissonance when reading these Beijing AI principles", and noted that she was "sceptical that this espoused commitment to certain ethics will necessarily constrain the Chinese government from using AI in ways that it appears deeply committed to do so."[77]

Such concerns come in addition to worries over the larger democracy-undermining dynamics of digital technology more broadly, such as the increased polarisation in social networks, (AI-enabled) disinformation that chips away at social cohesion and public confidence in the democratic system itself (see section 3.5.8 below), and the rise of online media and big tech firms has undermined the traditional media, making it harder for it to hold those in power accountable.[78]

This hits at the very heart of European values – and the EU's understanding of itself. Democracy and the rule of law are primary EU values. And this is not an elite idea: Europeans, when asked about the main assets of the EU rank "the EU's respect for democracy, human rights, and the rule of law" as first response.[79] And when asked about the role that the EU should play in the world, almost 30 percent of Europeans say that the EU "should be a beacon of democracy and human rights", making it the number one answer.[80]

3.3. AI Nationalism

The competition between major countries to lead in AI is growing, and states around the world – including Europe – are trying to support their AI ecosystem, through investments, tax breaks, the creation of platforms for knowledge exchange, and more. However, given the potential gains

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[73] Nicholas Wright, "How Artificial Intelligence Will Reshape the Global Order", *Foreign Affairs*, 10 July 2018, https://www.foreignaffairs.com/articles/world/2018-07-10/how-artificial-intelligence-will-reshape-global-order.

[74] https://www.washingtonpost.com/opinions/2018/12/05/china-exports-its-high-tech-authoritarianism-venezuela-it-must-be-stopped/ ; Stephen Feldstein, "The Road to Unfreedom: How Artificial Intelligence is Reshaping Repression," Journal of Democracy 30, no. 1 (January 2019): 40, https://www.journalofdemocracy.org/articles/the-road-to-digitalunfreedom-how-artificial-intelligence-is-reshaping-repression/. "Ethiopia: Telecom Surveillance Chills Rights," Human Rights Watch, March 25, 2014, https://www.hrw.org/news/2014/03/25/ethiopia-telecom-surveillance-chills-rights. Lynsey Chutel, "China is exporting facial recognition software to Africa, expanding its vast database," Quartz, May 25, 2018, https://qz.com/africa/1287675/china-is-exporting-facial-recognition-to-africaensuring-ai-dominance-through-diversity/ ; Arthur Gwagwa, "Exporting Repression? China's Artificial Intelligence Push into Africa," Council on Foreign Relations, December 17, 2018, https://www.cfr.org/blog/exporting-repression-chinas-artificial-intelligence-push-africa. Alina Polyakova, Chris Meserole, "Exporting digital authoritarianism. The Russian and Chinese models", *Brookings Institute*, August 2019 https://www.brookings.edu/research/exporting-digital-authoritarianism/.

[75] Alina Polyakova, Chris Meserole, "Exporting digital authoritarianism. The Russian and Chinese models", *Brookings Institute*, August 2019, https://www.brookings.edu/research/exporting-digital-authoritarianism/.

[76] Beijing AI Principles, https://www.baai.ac.cn/news/beijing-ai-principles-en.html.

[77] "FLI Podcast: Beyond the Arms Race Narrative: AI & China with Helen Toner & Elsa Kania", *Future of Life Institute*, 30 August 2019, https://futureoflife.org/2019/08/30/fli-podcast-beyond-the-arms-race-narrative-ai-china-with-helen-toner-elsa-kania/.

[78] For a discussion of these dangers see Bartlett, Jamie. The People vs Tech: How the Internet is killing democracy (and how we save it). Random House, 2018.

[79] Special Eurobarometer 500 - First Results, European Union, 2021, https://www.europarl.europa.eu/at-your-service/files/be-heard/eurobarometer/2021/future-of-europe-2021/en-report.pdf.

[80] Survey by the European Council on Foreign Relations in 2021, forthcoming.

associated with AI – and the fear of potential losses for those left behind – states may have incentives to go further. This could lay the foundation for a new type of nationalism. One of the most prominent proponents of this idea is Ian Hogarth, a British entrepreneur and investor. In a 2018 article he warned that the "continued rapid progress in machine learning will drive the emergence of a new kind of geopolitics: […] AI Nationalism." Hogarth worries that in addition to 'normal' policies of support for national AI research and AI firms, states might adopt more controversial, protectionist policies such as blocking acquisitions of domestic AI companies by foreign companies to preserve their independence; blocking investment in domestic AI companies by foreign investors; blocking international partnerships; or even the nationalisation of key domestic AI companies. Such tendencies may be exacerbated further by the fact that the world has seen China implement protectionist strategies rather successfully over the last years.

A slide into AI nationalism is not guaranteed, but recent developments should keep everyone alert. The British government is currently reviewing whether it should block the sale of UK-based computer chip designer ARM Holdings to the American graphics chip specialist Nvidia.[81] The US has imposed export bans on chips – and worked forcefully to convince European firms, such as the Dutch semiconductor equipment company ASML, to not export chips to China either.[82] And the European discussions about strategic (digital) autonomy[83] can also be misconstrued as European nationalism. While these actions are not necessarily nationalist, protectionist tendencies are developing in many regions in the world. This could endanger the free flow of goods and free exchange between nations that Europeans in particular benefits from and that Europe stands for – and which create interdependencies that can help ensure cooperative approaches between nations. Europe's historical experiences have shown how dangerous nationalism can be, and should thus be particularly attentive of such developments.

3.4. Empowering of the private sector

The shift in power from the state to the private sector, and particularly to big tech firms could become one the most fundamental changes in how politics functions in this century. This development is related to the rise of digital technologies more broadly, but AI can exacerbate this further, potentially pushing it to an extreme through the development of Artificial General Intelligence (see section 3.6 below). While in the past decades, in the western world, a significant part of research was done in state-funded (in the US especially military-funded) laboratories and universities, today, most of the cutting-edge AI research is happening in private firms. Kate Crawford goes so far as to say that "AI began as a major public project of the twentieth century and was relentlessly privatized to produce enormous financial gains for the tiny minority at the top of the extraction pyramid."[84]

Whether AI developments by the private sector directly benefits a state (or its military) depends on a variety of factors. Most importantly, the relationship between the private sector and the state diverge by country and world region. In the western world, the private sector tends to be independent from the government, though there are many areas of cooperation. Elsewhere, the separation might be less clear. What is clear is that the rise in digital technology has led to a significant rise in power of the

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81 ARM had already been bought by Japanese conglomerate Softbank four years earlier. "UK government intervenes in Nvidia takeover of chip designer Arm", *BBC*, 19 April 2021, https://www.bbc.co.uk/news/business-56804007.

82 Alexandra Alper, Toby Sterling, Stephen Nellis, "Trump administration pressed Dutch hard to cancel China chip-equipment sale: sources", *Reuters*, 6 January 2020, https://www.reuters.com/article/us-asml-holding-usa-china-insight-idUSKBN1Z50HN. Also see Noah Barkin, "Export Controls and the US-China Tech War", China Monitor, *Merics*, March 2020, https://merics.org/en/report/export-controls-and-us-china-tech-war.

83 "2030 Digital Compass: the European way for the Digital Decade", Communication From The Commission To The European Parliament, The Council, The European Economic And Social Committee And The Committee Of The Regions, Brussels, 9.3.2021, https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021DC0118.

84 Kate Crawford, *Atlas of AI*, Yale University Press, 2021, p.217.

private sector, rivalling the power of states. The *New York Times* calculates that "the ten largest tech firms, which have become gatekeepers in commerce, finance, entertainment and communications, now have a combined market capitalization of more than $10 trillion. In gross domestic product terms, that would rank them as the world's third-largest economy."[85]

The rise in power of private firms raises several challenges. For one, it means that the state has less sway to influence the direction of research in a direction that is beneficial to it. A recent study of AI research at the major US firms warned that "the private sector may be failing to make research investments consistent with ensuring long-term national competitiveness. None of the leading companies examined in this analysis appear to be prioritizing work on problem areas within machine learning that will offset the broader structural challenges the United States faces in deploying and benefitting from the technology when competing against authoritarian regimes."[86]

Secondly, big tech firms' ability to influence and shape politics is rising. Beyond the usual lobbying, companies such as Google or Facebook can reach more people than most official communications. In 2012, the US Congress considered the "Stop Online Piracy Act", legislation that Google opposed as it endangered its business model. As Jamie Bartlett recounts, "it used its status as the front page of the internet to let this be known. For 24 hours visitors to the site found a giant black box over the Google logo and a link: 'Tell Congress – please don't censor the web'. On clicking, it redirected to a petition that urged Congress to reject the bill. No company has ever been able to reach more people more quickly. Millions clicked the link, of course, overwhelming the web servers of Congress. The bill failed."[87] In the EU, no firms of the size of the GAFAM exist, but GAFAM's (and potentially BAT's) reach extends beyond their countries of origin. The firms power also mean that regulating some of their most problematic practices, such as surveillance capitalism, is a challenge.[88]

For the military realm, this shift of power, and innovation, from the state to the private realm is particularly problematic. The very beginning of modern AI was at least partly military-funded: the Summer Research Project on Artificial Intelligence at Dartmouth College in 1956, which is by many considered the birth of modern AI development, was funded by the US Office of Naval Research, which coordinates, executes and promotes the science and technology programs of the United States Navy and Marine Corps.[89] The French strategic review 2017 notes this, stating that while "in the past, major breakthroughs in armament have been the result of dedicated military R&D funding […] the civilian public and private sectors are generating an ever increasing number of technologies with military applications."[90] Therefore, the military has less say, and is a customer, rather than in the driving seat of technological innovation. A striking demonstration of the change in power took place in December 2015. When the US government, following a terrorist attack in California, wanted to break into one of the terrorist's iPhone, it could not do so – and the phone's manufacturer, Apple, refused to bow to pressure and provide a back door into the phone's operating system. In the end, the FBI had to hire a private firm from Israel, which used a technology unknown to the FBI to break the phone's encryption.[91] In addition, following Google employees' rejection of the company's cooperation with the Pentagon,

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85 Paul Mozur, Cecilia Kang, Adam Satariano, David McCabe, "A Global Tipping Point for Reining In Tech Has Arrived", *New York Times*, Updated April 30, 2021, https://www.nytimes.com/2021/04/20/technology/global-tipping-point-tech.html.

86 Rebecca Gelles, Tim Hwang, Simon Rodriguez, "Mapping Research Agendas in U.S. Corporate AI Laboratories", CSET, April 2021, https://cset.georgetown.edu/research/mapping-research-agendas-in-u-s-corporate-ai-laboratories/.

87 Bartlett, Jamie. *The People vs Tech: How the Internet is killing democracy (and how we save it)*. Random House, 2018, p.148.

88 Zuboff, Shoshana, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*, Profile Books, 2019.

89 Kate Crawford, *Atlas of AI*, Yale University Press, 2021, p.184.

90 French Defence and National Security Strategic Review2017, Ministry of Defence, October 2017, https://www.defense.gouv.fr/layout/set/popup/content/download/520198/8733095/version/2/file/DEFENCE+AND+NATIONAL+SECURITY+STRATEGIC+REVIEW+2017.pdf.

91 Sanger, David E., *The perfect weapon: War, sabotage, and fear in the cyber age*. Broadway Books, 2019, p.98.

concerns in the US but also in Europe have risen that tech companies may not want to work with the military, for ethical or economic reasons, thus further weakening the military's access to cutting-edge technology.[92] Recent studies of cooperation between the US military and Silicon Valley firms, however, suggest that this concern may have been overplayed.[93]

3.5. AI in Security and Defence

There have been several moments in history when warfare changed because of the introduction and innovative use of a new military technology. From the crossbow to gunpowder, tanks to nuclear weapons – when new technologies are introduced and used in novel ways, they can have a fundamental impact on how wars are fought, militaries are organised, and strategies are developed. Such moments have been called "revolutions in military affairs", and there is an extensive scholarly literature and discussion on past revolutions, how and when new technologies cause revolutions, and how many revolutions have taken place in the past. Some of them had repercussions for society more widely: the crossbow put untrained foot soldiers on a par with knights, thereby upending the social balance. The nuclear bomb fundamentally changed great powers' strategic assessments and affected the lives of millions for decades.

AI in the military and defence realm often revolves around discussions of lethal autonomous weapons, or "killer robots". However the functions that AI can enable and support in the military realm are manifold, reaching from logistics to autonomous weapons, cyber warfare, and disinformation. It includes offensive and defensive systems, frontline, and support systems. New weapon technology can impact the relative military strength of a country or alliance, and might require, for example, the reallocation of funds, the development and funding of new research and development strands, or the creation of new doctrine and strategy. However AI-enabled military systems also raise some more fundamental, societal, and geopolitical concerns.

Military experts agree that AI will increasingly be used in the military realm, and that this inclusion will have important implications. Assessments of what kind of implications, however, range from maximalist statements that AI may "alter the immutable nature of war",[94] or that AI changes "the psychological essence of strategic affairs",[95] to less extreme views that focus on more specific and limited changes in weapons technology.[96] In recent years, the maximal reading has taken hold in US circles in particular. The US National Security Commission on AI argues that the US "will not be able to defend against AI-enabled threats without ubiquitous AI capabilities and new warfighting paradigms."[97] A study notes that "the applications of AI to warfare and espionage are likely to be as irresistible as aircraft. Preventing expanded military use of AI is likely impossible."[98] Such extreme

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92 Rachel Olney, "The Rift Between Silicon Valley and the Pentagon Is Economic, Not Moral", *War on the Rocks*, 28 January 2019, https://warontherocks.com/2019/01/the-rift-between-silicon-valley-and-the-pentagon-is-economic-not-moral/.

93 Patrick McGee, "Silicon Valley reboots its relationship with the US military", *Financial Times*, 17 May 2021, https://www.ft.com/content/541f0a02-ea27-43a4-b554-96048c40040d?shareType=nongift.

94 "Getting to grips with military robotics", *The Economist*, 25 January 2018, https://www.economist.com/special-report/2018/01/25/getting-to-grips-with-military-robotics.

95 Kenneth Payne, "Artificial Intelligence: A Revolution in Strategic Affairs?", *Survival,* Volume 60, Issue 5, pp. 7-32, 18 September 2018, https://www.tandfonline.com/doi/full/10.1080/00396338.2018.1518374.

96 Paul Scharre, "How swarming will change warfare", *Bulletin of the Atomic Scientists*, Volume 74, Issue 6, Pages 385-389, 22 October 2018, https://www.tandfonline.com/doi/abs/10.1080/00963402.2018.1533209.

97 US National Security Commission on Artificial Intelligence, Final Report, March 2021, https://reports.nscai.gov/final-report/table-of-contents/.

98 Greg Allen, Taniel Chan, "Artificial Intelligence and National Security", Belfer Center, 2017, https://www.belfercenter.org/sites/default/files/files/publication/AI%20NatSec%20-%20final.pdf.

assessments might not be universally shared. Nobody, however, seems to believe that AI will not impact on the military realm, though some authors point to mitigating factors.[99]

Making predictions about where AI will have the biggest impact on military systems and operations is a difficult endeavour. First, making predictions about not just the likely development of military technology, but especially its impact on warfare and beyond is made difficult by the fact that what matters for a military technology's impact is not just the technology's capabilities, but how the new technology is used.[100] In order for new technology to be impactful, novel ways of how to use the technology need to be developed. Tanks were brought onto the battlefield already in 1916. However it took until World War II and Blitzkrieg doctrine for their military potential to show – the German Wehrmacht developed a novel way to use their tanks in combination with radios and as independent units, allowing it to break through the French defences in a matter of days. With regard to military AI, we do not yet know which doctrines (as well as organisational changes, and new training regimes) will be developed and what impact they will have.

Also, AI is still in development, with new methods still being invented, and important improvements being made. Therefore, making definite statements on the impact on military systems is difficult. As most of the most ground-breaking work on AI is not done by/for the military but in the civilian realm (see above), it becomes even harder to assess what technological developments are likely in what timeframe. This is made even more difficult as AI can enable many different military systems.

Finally, in parallel with development of AI, several other technologies are maturing, many of which are relevant for the defence realm, such as quantum computing, 3D printing, or hypersonic systems. These technologies interact with each other, further making it harder to make definite statements about their development.

As in the civilian realm, it is advisable to consider AI as an 'enabler' in the military realm, rather than a single technology. AI is of interest for militaries as AI can improve (cost) efficiency, speed, stealth, may help to shield humans from danger or alleviate psychological and physical pressure, and can offer new military capabilities. For example, AI may allow a solar-powered drone to use its energy more efficiently and thus stay in the air longer.[101] AI-enabled autonomy can allow to reduce, or even make completely unnecessary, up- and downlinks to unmanned systems. This can increase a system's stealth. These advantages will not necessarily happen together (nor are they guaranteed). At times they may even be trade-offs; for example, a particularly elaborate AI-enabled system may be more, not less expensive than a system without AI-supported functions.

3.5.1. Intelligence, Surveillance, and Reconaissance (ISR)

The most obvious use of machine learning in the military realm is for intelligence, surveillance, and reconnaissance (ISR). AI can help shift through the mass of data collected by various sensors, such as the hundred-thousands of hours of video feed collected by US drones.[102] AI can look at photographs and single out changes from one picture to the next, indicating, for example, an IED hidden in the time

[99] Andrea Gilli, "Preparing for "NATO-mation": the Atlantic Alliance toward the age of artificial intelligence", NDC Policy Brief 4-19, https://www.ndc.nato.int/news/news.php?icode=1270.

[100] Michael Horowitz and Casey Mahoney, "Artificial Intelligence and the Military: Technology Is Only Half the Battle", *War on the Rocks*, 25 December 2018, https://warontherocks.com/2018/12/artificial-intelligence-and-the-military-technology-is-only-half-the-battle/.

[101] Kelsey D. Atherton, "Watch the Navy's new drone fly using just sunlight and hydrogen", Popsci, 21 April 2021, https://www.popsci.com/story/technology/navy-hybrid-tiger-drone/.

[102] Gregory C. Allen, "Project Maven brings AI to the fight against ISIS", The Bulletin of the Atomic Scientists, 21 December 2017, https://thebulletin.org/2017/12/project-maven-brings-ai-to-the-fight-against-isis/.

between the photos were taken. This is of particular interest in the context of urban warfare.[103] Other AI applications in this context are image and face recognition, speech recognition and translation, geolocation, pattern of life analysis and more. According to a US Congressional Research Service report, the CIA alone has 140 projects in this area.[104]

3.5.2. Logistics

Logistics describes the transfer of personnel and materiel from one location to another, as well as the maintenance of that materiel. AI can help to better maintain equipment, reduce operational costs, and improve readiness. For example, AI can support military logistics through "predictive maintenance" which monitors the functioning of a system, such as an aircraft, and, based on various sensory inputs and data analysis, predicts whenever a part needs exchanging. Equally, AI can improve efficiency by ensuring the right amount of supplies are delivered at the right time.[105]

Since this is relevant also to the civilian market, AI-enabled logistics is comparatively far advanced. Dassault's Rafale aircraft uses predictive maintenance.[106] The US Army's Logistics Support Activity (LOGSA) and IBM's Watson work together to develop tailored maintenance schedules and to analyse shipping flows for repair parts distribution.[107]

3.5.3. Cyber Operations

Cyber operations range from espionage activity and "non-peace" attacks[108] to the complete shutdown of a country's infrastructure.[109] Cyber warfare and artificial intelligence are intimately linked, as they mutually influence and cross-fertilise each other, which can lead to some analyses conflating the two. However, the two are distinct, and cyberattacks predate the machine learning developments this report is primarily concerned with. Russia's cyber espionage campaign "Moonlight Maze" which resulted in the theft of a massive amount of classified information from numerous US government agencies dates back to 1996.[110] Work on what would become the "Stuxnet" worm that destroyed Iranian nuclear enrichment centrifuges reportedly begun already in 2005. These cyberattacks were, as far as is known, not AI-enabled. However AI can contribute to increasing the power and utility of cyberattacks.[111] And as there are almost no physical limitations, cyber warfare is an area in which some of the most important changes through AI are being discussed.

One way that AI can support cyber operations is through AI-enabled data analysis which can contribute to making cyber espionage operations considerably more powerful. In 2014, Chinese hackers stole an

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[103] Margarita Konaev, "With AI, We'll See Faster Fights, but Longer Wars", *War on the Rocks*, 29 October 2019, https://warontherocks.com/2019/10/with-ai-well-see-faster-fights-but-longer-wars/.

[104] "Artificial Intelligence and National Security", *US Congressional Research Service*, 10 November 2020, https://crsreports.congress.gov/product/pdf/R/R45178.

[105] Margarita Konaev, Husanjot Chahal, "The Path of Least Resistance, Multinational Collaboration on AI for Military Logistics and Sustainment", *CSET*, April 2021, https://cset.georgetown.edu/research/the-path-of-least-resistance/.

[106] Dassault Aviation and Artificial Intelligence, https://www.dassault-aviation.com/en/group/about-us/artificial-intelligence/dassault-aviation-and-artificial-intelligence/.

[107] "Artificial Intelligence and National Security", *US Congressional Research Service*, 10 November 2020, https://crsreports.congress.gov/product/pdf/R/R45178.

[108] Kello, Lucas. The virtual weapon and international order. Yale University Press, 2019.

[109] Such as the US plans of Operation Nitro Zeus against Iran. Sanger, David E. The perfect weapon: War, sabotage, and fear in the cyber age. Broadway Books, 2019. P.39.

[110] Jody Westby, "Russia Has Carried Out 20-Years Of Cyber Attacks That Call For International Response", *Forbes*, 20 December 2020, https://www.forbes.com/sites/jodywestby/2020/12/20/russia-has-carried-out-20-years-of-cyber-attacks-that-call-for-international-response/.

[111] Ben Buchanan, John Bansemer, Dakota Cary, Jack Lucas, Micah Musser "Automating Cyber Attacks, Hype and Reality", *CSET*, November 2020 https://cset.georgetown.edu/research/automating-cyber-attacks/. Dakota Cary, Daniel Cebul, "Destructive Cyber Operations and Machine Learning", *CSET*, November 2020, https://cset.georgetown.edu/research/destructive-cyber-operations-and-machine-learning/.

estimated 22 million files on American government employees from the US Office of Personnel Management through a cyber intrusion.[112] Without data analysis tools, these mountains of files would be largely useless. Data analysis tools, and especially AI-enabled data analysis tools, can not only help sort them. AI could help identify spies in this network, by finding unusual trainings, or gaps in biographies. Based on this data, an AI-enabled system might also be able to impersonate one of the individuals. Thus, even past cyber incursions could be made more impactful after the fact thanks to AI.

AI also could help make cyber-attacks more successful. Phishing emails used to distribute computer viruses could become highly tailored by leveraging an AI's ability to replicate natural language and analysing the context of an email thread.[113] Automated cyber wars could soon involve autonomously attacking and self-replicating cyber weapons. At the same time, AI can help reduce vulnerabilities in the cyber realm and help defenders by detecting anomalous changes and help to quickly address configuration errors and other vulnerabilities.[114]

Cyberattacks are likely to become more of a problem in a world in which AI-enabled systems become more ubiquitous. Because AI promises to make many digital tools more capable, they are likely to become more common ("Internet of things"). As cars get connected and Alexa manages peoples' houses, more vulnerabilities will appear. Cyber expert Bruce Schneier noted that on cyber defence: "we are getting better. But we are getting worse faster."[115]

There is controversy over how decisive AI will be for cyberoperations in the future. A recent study warned that machine learning could shape cyber operations in ways that drive more aggressive and destabilising engagements between states.[116] At the same time, another study notes that machine learning has notable limitations, arguing that "as a result of these constraints and flaws, attackers are less likely to apply machine learning techniques than many expect, and will likely do so only if they see unique benefits".[117] It is worth noting is that in the cyber realm, autonomy is furthest developed. The Stuxnet code, for example, did not require anyone to "pull the trigger". Instead, it relied on several exploits which allowed the code to spread without human help, autonomously looking for its target (a special type of pump used in Natanz) and engaging it once found.[118] The Russian attacks against the Ukrainian electricity network in December 2016 followed a similar logic as their code had the ability to "map out targets, then launch at a pre-set time, opening circuits on cue without even having an internet connection back to the hackers."[119] Hence, while the discussion regarding autonomy in the physical world is largely about systems that are not quite yet in operation, in the cyber-world, autonomy is already a reality.

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[112] Sanger, David E. The perfect weapon: War, sabotage, and fear in the cyber age. Broadway Books, 2019. P.115.

[113] William Dixon, Nicole Eagan, "3 ways AI will change the nature of cyber attacks", World Economic Forum, 19 June 2019, https://www.weforum.org/agenda/2019/06/ai-is-powering-a-new-generation-of-cyberattack-its-also-our-best-defence/.

[114] William Dixon, Nicole Eagan, "3 ways AI will change the nature of cyber attacks", World Economic Forum, 19 June 2019, https://www.weforum.org/agenda/2019/06/ai-is-powering-a-new-generation-of-cyberattack-its-also-our-best-defence/;
Michael Sulmeyer, Kathryn Dura, "Beyond Killer Robots: How Artificial Intelligence Can Improve Resilience in Cyber Space", *War on the Rocks*, 6 September 2018, https://warontherocks.com/2018/09/beyond-killer-robots-how-artificial-intelligence-can-improve-resilience-in-cyber-space/.

[115] Quoted in Sanger, David E., *The perfect weapon: War, sabotage, and fear in the cyber age*. Broadway Books, 2019. P.300.

[116] Wyatt Hoffman, "AI and the Future of Cyber Competition", *CSET*, January 2021, https://cset.georgetown.edu/research/ai-and-the-future-of-cyber-competition/.

[117] Ben Buchanan, John Bansemer, Dakota Cary, Jack Lucas, Micah Musser "Automating Cyber Attacks, Hype and Reality", *CSET*, November 2020, https://cset.georgetown.edu/research/automating-cyber-attacks/.

[118] Sanger, David E., *The perfect weapon: War, sabotage, and fear in the cyber age*. Broadway Books, 2019. p.23.

[119] Andy Greenberg, "How an Entire Nation Became Russia's Test Lab for Cyberwar", *Wired*, 20 June 2017, https://www.wired.com/story/russian-hackers-attack-ukraine/.

3.5.4. Command and Control

AI in the command and control realm aims to centralise the planning and execution of military operations. The idea is to use AI to link together and fuse information from different sensors, and create a single source of information (a "common operating picture").[120] AI could also help with communication links (find alternative means to distribute information if communication links are cut). This capability will be of importance for joint operations, most notably operations including different armed forces (such as NATO or EU operations). An example is Defense Advanced Research Projects Agency's "Mosaic Warfare program" (DARPA) which seeks to coordinate autonomous forces and generate multidomain command and control nodes, thus building a "mosaic" battle plan.[121] As AI advances further, AI algorithms may also be capable of providing commanders with a menu of possible courses of action based on real-time analysis of all available information, thus potentially improving the quality and speed of decision making.[122]

3.5.5. Autonomous vehicles and weapon systems

AI and autonomy are different things, but they are closely related and often discussed together. In this context, AI denotes a system's ability to determine the best course of action to achieve its goals, while autonomy describes a system's freedom to accomplish its goals. As the United Nations Institute for Disarmament Research notes, "more intelligent machines are capable of taking on more challenging tasks in more complex environments."[123] Thus, AI can enable autonomy as intelligent systems can be given greater freedom to act.

Militaries are exploring autonomy because machines are faster than humans in analysing data and taking decisions. AI-enabled autonomy is particularly attractive for defensive systems, such as those that provide protection against rockets or missiles. Providing unmanned systems with more autonomy can also help to make them stealthier, as autonomous systems do not need communications uplinks or downlinks to an operator, making them harder for enemy defences to detect. And autonomous systems could help reduce militaries' reliance on humans. While this factor is also a cause for concern, it can reduce human error and costs, and alleviate the physical or cognitive strain on soldiers.

While AI-enabled autonomy promises many military advantages, it also comes with risks.[124] From an ethical and legal viewpoint, autonomous systems are problematic because they may lead to the delegation of decisions over life and death to machines and algorithms, or create 'responsibility gaps', making it unclear who is responsible for mistakes. There is also a danger that, following unexpected events, AI-enabled autonomy could spark "flash wars" reminiscent of "flash crashes" on stock markets – in which hundreds of billions of dollars have been wiped off share prices faster than humans can react.[125] Within the framework of the Convention on Certain Conventional Weapons, the United

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"Artificial Intelligence and National Security", *US Congressional Research Service*, 10 November 2020, https://crsreports.congress.gov/product/pdf/R/R45178.

[121] Theresa Hitchens, "DARPA Builds AI To Avoid Army, AF Fratricide", *Breaking Defense*, 17 February 2021, https://breakingdefense.com/2021/02/darpa-builds-ai-to-avoid-army-af-fratricide/.

[122] "Generating Actionable Understanding of Real-World Phenomena with AI", *DARPA*, 4 January 2019, https://www.darpa.mil/news-events/2019-01-04.

[123] "The Weaponization of Increasingly Autonomous Technologies: Artificial Intelligence. A primer for CCW delegates", UNIDIR, 2018, https://unidir.org/files/publications/pdfs/the-weaponization-of-increasingly-autonomous-technologies-artificial-intelligence-en-700.pdf. On the problems of defining autonomy also see "Interview: Paul Scharre on weapon autonomy and the human role in future warfighting", *Metis* No. 4, April 2021, https://metis.unibw.de/assets/pdf/metis-interview04-2021_04-scharre-human_machine_interaction.pdf.

[124] For a good overview see Jürgen Altmann, Frank Sauer, "Autonomous Weapon Systems and Strategic Stability", *Survival*, pp. 117-142, 17 Sep 2017, https://doi.org/10.1080/00396338.2017.1375263/.

[125] Ulrike Franke, "Flash Wars: Where could an autonomous weapons revolution lead us?", ECFR, 22 November 2018, https://ecfr.eu/article/Flash_Wars_Where_could_an_autonomous_weapons_revolution_lead_us/.

Nations have been discussing a possible regulation, or ban, of lethal autonomous weapons since 2014, though so far with limited success.[126]

3.5.6. Swarming

Swarming describes the combination of many systems, for example drones, unmanned boats, or tanks into a swarm whose units act independently but in a coordinated manner. Swarms do not just mean "many units". Rather swarms are systems that operate as a collective.[127] Hence, the drone "swarms" that were used as firework substitutes over London on New Year's Eve 2020/21 are not, properly speaking, swarms, but rather massed drones, as they were pre-programmed and did not operate together. And the Turkish attack on a Syrian military convoy in March 2020 that media reports characterised as involving a "swarm" really involved multiple remotely controlled units.[128] Swarms are thought to be ideal for "overwhelming a nonlinear battlespace, creating a focused, relentless, and scaled attack, using a deliberately structured, coordinated, strategic way to strike from all directions".[129] This means that swarms offer genuinely new capabilities, and make new tactics such as flying minefields, waves of attacks, or 'kill webs' possible.

Because of this, there is a lot of interest in swarms by armed forces and the defence industry around the world. The US is working on drone swarms,[130] as is Russia,[131] India, or China.[132] In Europe, among others, Spain, Italy, and the UK are looking into swarms for their armed forces.[133] The EU's Horizon 2020 funding also supports swarm research, namely "Roborder": "autonomous border surveillance system with unmanned mobile robots including aerial, water surface, underwater and ground vehicles, capable of functioning both as standalone and in swarms".[134]

3.5.7. AI and Nuclear Weapons

There have been some discussions on the integration of AI into nuclear weapons – such as an AI-enabled automation of nuclear defence, or AI-enabled autonomous systems carrying nuclear weapons.[135] An expert notes that "the key question is not if, but when, how and by whom recent

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126 Frank Sauer, "Stepping back from the brink: Why multilateral regulation of autonomy in weapons systems is difficult, yet imperative and feasible", *International Review of the Red Cross,* Volume 102 , Issue 913, April 2020, pp. 235–259, DOI: https://doi.org/10.1017/S1816383120000466. Also see Anja Dahlmann, Marcel Dickow, "Präventive Regulierung autonomer Waffensysteme", SWP, January 2019, https://www.swp-berlin.org/publikation/praeventive-regulierung-autonomer-waffensysteme/.

127 Maaike Verbruggen, "Drone swarms: coming (sometime) to a war near you. Just not today", *The Bulletin of the Atomic Scientists,* 3 February 2021, https://thebulletin.org/2021/02/drone-swarms-coming-sometime-to-a-war-near-you-just-not-today/.

128 Kelsey D. Atherton, "Turkey's drones are battle tested and ready for export", *C4ISRNET*, 4 March 2020, https://www.c4isrnet.com/unmanned/2020/03/04/turkeys-drones-are-battle-tested-and-ready-for-export/.

129 Ian Shaw, "Robot Wars: US Empire and geopolitics in the robotic age." *Security dialogue* 48.5 (2017): 451-470. https://journals.sagepub.com/doi/pdf/10.1177/0967010617713157.

130 Margarita Konaev, "With AI, We'll See Faster Fights, but Longer Wars", *War on the Rocks*, 29 October 2019, https://warontherocks.com/2019/10/with-ai-well-see-faster-fights-but-longer-wars/.

131 Samuel Bendett, "Strength in Numbers: Russia and the Future of Drone Swarms", *Modern War Institute*, 20 April 2021, https://mwi.usma.edu/strength-in-numbers-russia-and-the-future-of-drone-swarms/.

132 Joseph Trevithick, "China Conducts Test Of Massive Suicide Drone Swarm Launched From A Box On A Truck", *The Drive*, 14 October 2020, https://www.thedrive.com/the-war-zone/37062/china-conducts-test-of-massive-suicide-drone-swarm-launched-from-a-box-on-a-truck.

133 Eyal Boguslavsky, "Spain's Escribano to supply UAV swarm system to Spanish military", Israel Defense, 6/01/2021, https://www.israeldefense.co.il/en/node/47558 ; Joseph Trevithick, "RAF Tests Swarm Loaded With BriteCloud Electronic Warfare Decoys To Overwhelm Air Defenses", *The Drive*, 8 October 2020, https://www.thedrive.com/the-war-zone/36950/raf-tests-swarm-loaded-with-britecloud-electronic-warfare-decoys-to-overwhelm-air-defenses ; "Defence in Global Britain. Defence Secretary Gavin Williamson gave a speech at RUSI outlining the future direction of the UK Armed Forces", 11 February 2019, https://www.gov.uk/government/speeches/defence-in-global-britain.

134 ROBORDER, autonomous swarm of heterogeneous RObots for BORDER surveillance, https://cordis.europa.eu/project/id/740593.

135 Adam Lowther, Curtis McGiffin, "America Needs a "Dead Hand"", *War on the Rocks*, 16 August 2019, https://warontherocks.com/2019/08/america-needs-a-dead-hand/.

advances in AI will be adopted for nuclear-related purposes".[136] Still, broadly speaking there is a reticence about integrating AI in nuclear weapons, given the potential of catastrophic risk. However AI can still indirectly impact nuclear deterrence and the global nuclear order. AI-enabled disinformation (see section 3.5.8. below) can undermine trust in intelligence that political leaders receive, and, as Maria Favaro notes "If decision-makers have to assume that their intelligence collection means are compromised, this could result in their striking blindly, and potentially first, in a crisis."[137] There have also been concerns that AI-enabled systems might contribute to undermining states' second-strike capability, for example by 'turning the oceans transparent' through the combination of sensors and AI-enabled data analysis, and thus undermining deterrence at sea.[138] Equally, AI-enabled systems may improve the defence against nuclear attack to such an extent, as to undermine the current system of nuclear deterrence. As this systen, for better or worse, has been part of the international security architecture of the last decades, such a development could be massively destabilising.

At the same time, it has been pointed out that AI-enabled surveillance might help improve information availability and early warning, and thus decrease the risk of faulty decisions, while AI might also provide new tools for monitoring and verification of (nuclear) arms control regimes.[139]

3.5.8. Disinformation

Disinformation is a security challenge, as well as a political, societal, and ideological challenge. Disinformation – AI-enabled or not – is guaranteed to play a role in any future conflicts. Propaganda and disinformation predates AI by centuries, if not millennia, but appears particularly relevant at the moment. An investigation by the Associated Press and the Oxford Internet Institute found that China deployed an army of fake Twitter accounts to amplify state propaganda.[140] In the 2020 Nagarno-Karaback conflict, drone videos were an important propaganda tool. And in March 2021, the US National Intelligence Council concluded that Russia used disinformation to undermine voter confidence in the electoral process and exacerbate existing divisions in the US society.[141] As far as is known, none of these efforts were AI-enabled, but (as it is the case for cyber operations), AI can make disinformation even more powerful, more targeted – or easier to produce: US company OpenAI created the AI-enabled language model GPT-3 which can produce human-like text.[142] It was obvious to the developers that this system could be abused to create disinformation – which is why OpenAI originally did not release the complete code.[143] Equally, AI-enabled "deep fakes" allow to falsify videos, thus making it possible, for example to create videos of political leaders making statements.[144]

This overview has shown that, similar to the civilian realm, there are a multitude of ways how AI can impact military systems and military operations. Some AI-induced changes may solely be relevant for

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136 "Recent advances in artificial intelligence contribute to nuclear risk—new SIPRI report", *SIPRI*, 22 June 2020, https://sipri.org/media/2020/recent-advances-artificial-intelligence-contribute-nuclear-risk-new-sipri-report.

137 Marina Favaro, "Weapons of Mass Distortion. A new approach to emerging technologies, risk reduction, and the global nuclear order", *King's College London,* June 2021, https://www.kcl.ac.uk/csss/assets/weapons-of-mass-distortion.pdf.

138 Ocean of Things, DARPA, https://www.darpa.mil/program/ocean-of-things ; Vincent Boulanin, Lora Saalman, Petr Topychkanov, Fei Su, Moa Peldán Carlsson, "Artificial Intelligence, Strategic Stability and Nuclear Risk", *SIPRI,* June 2020, https://www.sipri.org/sites/default/files/2020-06/artificial_intelligence_strategic_stability_and_nuclear_risk.pdf.

139 Vincent Boulanin, Lora Saalman, Petr Topychkanov, Fei Su, Moa Peldán Carlsson, "Artificial Intelligence, Strategic Stability and Nuclear Risk", *SIPRI,* June 2020, https://www.sipri.org/sites/default/files/2020-06/artificial_intelligence_strategic_stability_and_nuclear_risk.pdf.

140 Erika Kinetz, "Army of fake fans boosts China's messaging on Twitter", *AP News*, 28 May 2021, https://apnews.com/article/asia-pacific-china-europe-middle-east-government-and-politics-62b13895aa6665ae4d887dcc8d196dfc.

141 "Foreign Threats to the 2020 US Federal Elections", 10 March 2021, https://www.dni.gov/files/ODNI/documents/assessments/ICA-declass-16MAR21.pdf.

142 OpenAI API, 11 Juni 2020, https://openai.com/blog/openai-api/.

143 Alex Hern, "New AI fake text generator may be too dangerous to release, say creators", *Guardian*, 14 February 2019, https://www.theguardian.com/technology/2019/feb/14/elon-musk-backed-ai-writes-convincing-news-fiction.

144 Obama Deep Fake Video https://www.youtube.com/watch?v=cQ54GDm1eL0.

military experts or practitioners. Others, however, may have direct geopolitical repercussions. For example, AI-enabled military systems might change the military balance of power by giving one actor overwhelming power against which others cannot defend themselves, or by undermining existing capabilities. Of the AI-enabled systems listed above, none appear to represent such an obvious overwhelming military advantage, but new developments are possible, and if, as mentioned above, AI-enabled systems might undermine the existing system of nuclear stability, this could have significant geopolitical implications. Also, even just the belief that a new weapons system may provide a significant advantage may cause escalatory dynamics such as an arms races between opponents. Arms races are highly destabilising and can create dangerous incentives, such as fielding not-yet-mature weapons. This is of relevance in the context of the aforementioned Sino-American competition.

A particular challenge for Europe is the impact of AI on military interoperability, the ability of allied militaries to work together. As is shown in section 4 below, few European states appear to have made the development and introduction of AI-enabled defence capabilities a priority, while the United States is focussing on military AI in an intensity that has made experts warn of a hype.[145] There is a danger that great variation in allied forces' adoption of AI may cause interoperability problems, as different systems may not be technologically compatible. This could end up causing problems within NATO. Discussions about armed forces' technology gap (or "transformation gap") in NATO goes back to the military alliance's beginning. So far, the alliance has always succeeded in bridging these technological gaps during operations – but more detailed research is needed to determine how, and to what extent, this will be possible with AI-enabled capabilities. At the same time, it has also been argued that AI-enabled command and control systems may, in fact, be able to improve interoperability between joint forces.[146] Specifically, AI can help combine data from different sources, and distribute it quickly and efficiently, thereby helping create joint situational awareness. Thus, it is conceivable that AI could help more technologically advanced militaries act as hubs, which other militaries could plug in to and thereby acquire the same level of intelligence. This hope, however, should not be used as an excuse for Europeans to disregard AI-enabled defence.

3.6. General Artificial Intelligence

Artificial General Intelligence (AGI), or "strong AI" describes AI able to understand or learn any intellectual task that a human being can. Authors also use the term "Superintelligence" to describe AI that exceeds human intelligence across any task.[147]

AGI would have superhuman powers: "Imagine a human who, every time they opened their mouth, had spent a solid year to ponder and research whether their responsive was going to be maximally effective. That is what a social AI would be like". [148] In addition, an AGI would have equal superpowers in, say, the economic realm, and would thus be able to perfectly read and profit from the stock market. That AGI would also be superhumanly skilled at technology development: "it would do research and development simultaneously in hundreds of technical subfields and relentlessly combine ideas between fields. Human technological development would cease, and AI or AI-guided research technologies would quickly become ubiquitous."[149] AGI could quite literally make humans obsolete.

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[145] Julia Ciocca, Michael C. Horowitz, Lauren Kahn, "The Perils of Overhyping Artificial Intelligence", *Foreign Affairs*, 6 April 2021, https://www.foreignaffairs.com/articles/united-states/2021-04-06/perils-overhyping-artificial-intelligence.

[146] As argued by Bob Work in a conversation at Forum Alpbach, "Future Warfighting - A Conversation with Robert O. Work", Forum Alpbach, 27 August 2020, https://2020.alpbach.org/events/96.

[147] Some make a difference between AGI as AI that equals humans across tasks, while Superintelligence exceeds human intelligence, but this distinction is not universally shared. Usually, once a computer masters a skill, it automatically exceeds humans.

[148] Armstrong, Stuart, *Smarter than us: The rise of machine intelligence*. Machine Intelligence Research Institute, 2014., p.14.

[149] Ibid. 15.

Stuard Armstrong notes argues that the dear of a super strong "Terminator" might be misguided. Humankind's comparative advantage over the rest of the earth's species does not lie in our strength – but our brain: "we should fear entities that are capable of beating us at our own game. It is the 'intelligence' part of 'artificial intelligence' that we have to fear. If machines can outthink us and outcompete us in the fields of human domination – economics, politics, science, propaganda – *then* we have a serious problem."[150]

The emergence of AGI should not be discarded as belonging in the realm of science fiction, as unlikely as it sounds. OpenAI, the US-based AI firm behind the GPT-3 language model has as its stated goal the development of "discovering and enacting the path to safe artificial general intelligence".[151] A large survey among machine-learning experts found in 2018 that researchers believe there is a 50% chance of AI outperforming humans in all tasks in 45 years.[152] Another survey, whose results were similar, notes that the experts estimate "the chance is about one in three that this development turns out to be 'bad' or 'extremely bad' for humanity".[153]

These "bad outcomes" for humanity would also have geopolitical implications – and, incidentally, some of them would not even require the actual emergence of AGI.

AGI could create an existential risk for humankind.[154] The primary concern is not about AGI turning evil. Rather, the risk emerges from a lack of "value alignment" – AGI need not have humanlike motives or values.[155] An AGI tasked to manufacture paperclips might end up devouring all resources on earth to produce paperclips.[156] An AGI tasked with solving climate change could end up killing all humans since this would indeed end human-made climate change. Considerations such as these have influenced the field of AI safety and research is being carried out by AI firms on ensuring value alignment for AI in development, including AI falling short of AGI.[157]

If AGI that could be controlled were to be developed, Putin's statement that whoever leads on AI becomes the ruler of the world, might finally become appropriate. If one actor, whether it is a state or private company, were to achieve AGI, this actor would gain unrivalled power, influence and gain. Researchers at the University of Oxford are trying to address these concerns, at least regarding economic gains. They argue that if the financial revenue resulting from AGI (or very successful narrow AI) were to accrue to a narrow set of actors, this could give rise "to a level of inequality with no close historical analogy" and propose ways how the winners could distribute the "windfall" from such success.[158] Still, the potential gain in (geopolitical) power could be so significant that it might be extremely difficult to rein in.

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150 Ibid., p.7.

151 OpenAI https://openai.com/.

152 Also see Müller, Vincent C. and Bostrom, Nick (forthcoming 2014), 'Future progress in artificial intelligence: A Survey of Expert Opinion, in Vincent C. Müller (ed.), Fundamental Issues of Artificial Intelligence (Synthese Library; Berlin: Springer). https://www.nickbostrom.com/papers/survey.pdf.

153 Katja Grace, John Salvatier, Allan Dafoe, Baobao Zhang, Owain Evans, "When Will AI Exceed Human Performance? Evidence from AI Experts" https://arxiv.org/pdf/1705.08807.pdf.

154 Matt McFarland, "Elon Musk: 'With artificial intelligence we are summoning the demon.'", *The Washington Post*, 24 October 2014, https://www.washingtonpost.com/news/innovations/wp/2014/10/24/elon-musk-with-artificial-intelligence-we-are-summoning-the-demon/. Also see Allan Dafoe, Stuart Russell, "Yes, We Are Worried About the Existential Risk of Artificial Intelligence", *MIT Technology Review*,2 November 2016, https://www.technologyreview.com/2016/11/02/156285/yes-we-are-worried-about-the-existential-risk-of-artificial-intelligence/.

155 Nick Bostrom, *Superintelligence: Paths, dangers, strategies*, Oxford University Press, 2014

156 Nick Bostrom, "Ethical Issues in Advanced Artificial Intelligence", https://nickbostrom.com/ethics/ai.html.

157 Iason Gabriel, "Artificial Intelligence, Values and Alignment", *Deep Mind*, 13 January 2020, https://deepmind.com/research/publications/Artificial-Intelligence-Values-and-Alignment.

158 Cullen O'Keefe, Peter Cihon, Ben Garfinkel, Carrick Flynn, Jade Leung, Allan Dafoe, "The Windfall Clause: Distributing the Benefits of AI", Future of Humanity Institute, 30 January 2020, https://www.fhi.ox.ac.uk/windfallclause/.

Deliberations such as the above could contribute to another geopolitical concern related to AGI – one that most likely as it does not depend on AGI actually materialising. Namely, concerns, or just rumours, over the imminent emergence of AGI could create a security dilemma. If a state were to believe that an opponent was close to AGI, they might consider striking pre-emptively, in order to pre-empt the associated boost in power.

4. IS EUROPE PREPARING ITSELF? A COMPARATIVE ANALYSIS OF NATIONAL AI STRATEGIES IN EUROPE

European policymakers' efforts to grapple with the rapid pace of AI development have gone through several phases over the last years. The first phase was marked by uncertainty over what to make of the rapid and seemingly ground-breaking developments in AI. This phase lasted until around 2018 – though, in some European states, and on some issues, uncertainty remains.[159] The second phase consisted of efforts to frame and AI challenges politically, and to address them, on a domestic level. In its December 2018 "Coordinated Plan on Artificial Intelligence", the European Commission encouraged Member States to develop national AI strategies by mid-2019.[160] As of May 2021, twenty-one Member States have now published these policy documents in which they identify areas of focus, develop recommendations, and decide funding priorities.[161] The strategies differ in several aspects; the shortest AI strategy is 10 pages (Estonia), the longest 152 pages (France); Finland has already published two AI strategies, while some EU countries have not yet published their first. And four Member States chose to publish their strategies in their national language only.

A unifying characteristic is that many of these strategies are strikingly ambitious. Czechia, for example has set the goal to become "a model European country for AI". The Swedish government's goal is "to make Sweden a leader in harnessing the opportunities that the use of AI can offer". Portugal aims to be "at the forefront of AI education for all" by 2030, and Denmark wants to be "a front-runner in responsible development and use of artificial intelligence". Even small states like Malta aim to be the "Ultimate AI Launchpad"; Luxembourg wants to be a "digital frontrunner".

However the national AI strategies also reveal that in the EU, AI is primarily seen through economic lenses. Almost all strategies are written by, or under the leadership of economy ministries (and variations thereof) or, less often, ministries of innovation (and variations thereof). Within this field, the national strategies discuss a wide range of topics, most notably AI development, adoption, and AI principles.

On AI development, the strategies show that the importance of talent is well understood throughout Europe. Finland worries that Europe will soon start "suffering from brain drain" to other AI powers if it does not act to prevent this. Germany, in its strategy, announces the creation of at least 100 additional AI professorships, to ensure the education of new talent and sufficient development space for existing experts. France wants to triple the number of people trained in AI in France and proposes salary top-ups and reductions in administrative formalities for AI researchers. However AI education also goes beyond the training of specialists and includes training the wider public on how to use and navigate AI. Portugal, for example, wants to foster "digital minds" and to be at the forefront of AI education by teaching every student computer science.

The strategies also aim to encourage data collection and sharing. France wants data to become a common good, its strategy encourage economic players to share and pool their data and argues that the state could act as a trusted third party. The French strategy says that in some circumstances public authorities could "impose openness on certain data of public interest". Spain vows to create a "National Data Institute" to plan and define governance over data from different levels of government.

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[159] Parts of this section are adopted from Ulrike Franke, "Artificial Divide. How Europe and America could clash over AI", *ECFR*, January 2021, https://ecfr.eu/publication/artificial-divide-how-europe-and-america-could-clash-over-ai/.

[160] Coordinated Plan on Artificial Intelligence, European Commission, https://ec.europa.eu/digital-single-market/en/news/coordinated-plan-artificial-intelligence.

[161] For the full list and links to all national AI strategies published by EU Member States, please see Annex.

On AI research, there is agreement that international and European cooperation is important, especially for smaller states. Luxembourg's strategy, for instance, notes that "the country's opportunities to develop ground-breaking fundamental AI research are limited." Its solution: "Luxembourg could become part of a cutting-edge, cross-border hub for applied AI research of the highest level of excellence." However larger states also consider research cooperation crucial: Germany will form a European innovation cluster providing funding for cooperative research projects over the next five years. France and Germany have also agreed to build a joint virtual research and development centre.

The strategies also aim to encourage the use of AI for private firms. Germany, home of many small and medium-sized companies, aims to increase AI-specific support by employing "AI trainers" that visit companies and work with them on integrating AI. Lithuania wants to establish a platform for business leaders to exchange experiences with AI. Slovakia is looking to set up public-private partnerships.

Finally, a topic that appears in all national AI strategies across Europe is ethical AI. Ethical, or "trustworthy" AI is a topic that the EU early on defined as a primary area of interest and work, and no actor, however, has so publicly put itself at the forefront of this issue as the EU has.[162] The European Commission created a "High-Level Expert Group on AI", which in April 2019 released its Ethics Guidelines for Trustworthy Artificial Intelligence, followed by its Policy and Investment Recommendations for Trustworthy Artificial Intelligence.[163] Ethical AI is not just a concern for EU institutions: worry over the (un)ethical use of AI or its misuse[164] is a shared concern throughout the union, with every national AI strategy published by Member States touches on the topic, and several countries, such as Denmark and Lithuania, identify ethical rules as their first priority. Malta proposes the "world's first national AI certification programme" as a concrete measure in its strategy. Spain's proposes the drafting of an "AI Code of Ethics, aligned with the efforts made by the European Commission". Interestingly, the Danish strategy notes that ethical AI is a particularly European approach: "Europe and Denmark should not copy the US or China. Both countries are investing heavily in artificial intelligence, but with little regard for responsibility, ethical principles and privacy."

In addition to these shared themes, there are national idiosyncrasies such as Italy discussing how to use AI for the conservation and protection of cultural assets, and tourism. The use of AI in agriculture and ecology is mentioned by France, Poland, and Hungary, while Portugal is looking into AI for sustainable cities, and sustainable energy networks.

Strikingly, however, the strategies largely ignore the topic of this report: the geopolitical implication of artificial intelligence. The impact of AI on international stability, on international cooperation, and the use of AI in the military realm – with very few exceptions, the European states do not engage with the challenges posed by the way AI development and uptake might impact the international balance of power.[165] Of the 21 national AI strategies, only a handful discuss the topic of the military implications of AI. Even larger states such as Italy, NATO's fifth-largest defence spender, do not engage with the topic of military applications of AI and what they may mean for the future of military operations or alliance interoperability. If the military elements of AI are mentioned, it is done in passing, such as in

[162] Janosch Delcker, "In global AI race, Europe pins hopes on ethics", *Politico*, 25 April 2018, https://www.politico.eu/article/europe-commission-andrus-ansip-hopes-ethical-approach-will-be-its-edge-in-global-ai-artificial-intelligence-race/.

[163] "Ethics Guidelines for Trustworthy Artificial Intelligence", High-Level Expert Group on AI, April 2019, https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai; "Policy and investment recommendations for trustworthy Artificial Intelligence", High-Level Expert Group on AI, https://digital-strategy.ec.europa.eu/en/library/policy-and-investment-recommendations-trustworthy-artificial-intelligence.

[164] On the misuse of AI, see "The Malicious Use of Artificial Intelligence", Report February 2018, https://maliciousaireport.com/.

[165] On this also see Ulrike Franke, "Not smart enough: The poverty of European military thinking on artificial intelligence", *ECFR*, December 2019, https://ecfr.eu/publication/not_smart_enough_poverty_european_military_thinking_artificial_intelligence/.

the German strategy which shifts responsibility for this area to the ministry of defence, stating: "with regard to new threat scenarios for internal and external security, in addition to research on civil security, the Federal Government [will] promote research to detect manipulated or automatically generated content in the context of cyber security. The research on AI applications, in particular for the protection of external security and for military purposes, will be carried out within the scope of the departmental responsibilities." Most national strategies do not mention military AI at all, and very few note other geopolitical challenges.

On this, the French AI strategy is an outlier. France's national AI strategy is grounded in and motivated by geopolitical concerns. It notes that "France and Europe need to ensure that their voices are heard and must do their utmost to remain independent. But there is a lot of competition: the United States and China are at the forefront of this technology and their investments far exceed those made in Europe." The strategy also warns that "France and Europe can already be regarded as 'cybercolonies' in many aspects". The French national strategy also identifies AI-enabled defence as one of four strategic sectors for industrial policy. It discusses at length how the US is able to utilise new technologies in the military realm and what Europe may learn from this experience. Most strikingly, France is also the only country in the EU that has published a dedicated strategy on military AI.[166] In addition to France, the Netherlands are also showing increased interest in military AI. A military AI strategy is reportedly being prepared by the Dutch Ministry of Defence, but has yet to be published. The Dutch national AI strategy notes opportunities offered by AI in the field of military decision support, intelligence gathering, data analysis, and accelerated responsiveness in the defence of Dutch territory. It also notes that AI-enabled unmanned systems could create opportunities to intervene in areas that are not accessible to people due to anti-access/area denial weapons systems.[167] Other EU Member States to at least briefly acknowledge AI's impact on the military and defence realm are Hungary, Sweden, and Latvia. In many countries, officials seem uncomfortable discussing the subject, unless the focus is on whether and how to ban lethal autonomous weapon systems (LAWS).[168]

[166] « Communiqué : Publication du rapport du ministère des Armées sur l'intelligence artificielle », September 2019, https://www.defense.gouv.fr/english/salle-de-presse/communiques/communique_publication-du-rapport-du-ministere-des-armees-sur-l-intelligence-artificielle.

[167] "Strategic Action Plan for Artificial Intelligence", Government of the Netherlands, October 2019, https://www.government.nl/documents/reports/2019/10/09/strategic-action-plan-for-artificial-intelligence.

[168] Ulrike Franke, "Europe needs a plan for AI in the military realm", The Security Times, February 2020, https://www.the-security-times.com/europe-needs-plan-ai-military-realm/.

5. WHERE TO GO FROM HERE? EUROPE'S AI DIPLOMACY

Europe is working to develop artificial intelligence. Despite some hurdles, section two of this paper showed that European states are reasonably well placed to support research and development of AI, as well as the adoption of AI-enabled systems. Challenges exist and need to be dealt with by national governments and the EU, and inner-European differences should be addressed. The EU does face some specific challenges, as a hybrid polity not having the same capabilities as nations but bringing together nations with different languages and cultures Still, there are no fundamental reasons why Europe should not be in the running "for the bronze medal" – or more. Section 3 outlined six ways how AI could have geopolitical implications – while section 4 demonstrated that all these concerns remain worryingly underdiscussed in Europe. This last section takes the six themes and recommends ways how the EU, and its Member States, can address the challenges that arise from them. However, more than any of the recommendations below, it is crucially important for the EU to encourage the debate, and fund European research on the geopolitical elements of AI, as the European viewpoint remains understudied.

This paper has referenced several times the 700+ pages report that the US National Security Commission on AI published in early 2021. It has quoted the Commissioners and discussed many of the points the report raised. The paper has also cited many US studies, in particular analyses done by the Center for Security and Emerging Technologies (CSET), a research centre at Georgetown University which was founded in 2019 with support from philanthropical institutions and US technology firms. This may be surprising in a study of *European* geopolitical interest, and European security concerns related to AI. But it is a testimony of the dominance of US thinking in this space – and a testimony of the relative lack of European official publications.

This dominance of US research is a problem for Europe. Of course, a lot of the US analysis applies to Europe (and other allies) and therefore deserves to be taken into account. But if Europe does not engage with these themes from a European viewpoint, it leaves the interpretative power to others. US thinking will shape the debate in a way that is most conducive to US interests. And these interests will not always align perfectly with European interests. Second, this dynamic also risks that the focus is on those threats that are primarily threats to the US which means that there is a danger that threats to European interests and security will remain understudied unless Europe begins to take this on. The US security community is focused primarily on China; the AI Commission's report mentions China 699 times, CSET regularly translates important Chinese-language documents relevant to China's AI strategy.[169] But other actors, such as Russia, attract less attention (the Commission's report mentions Russia only 64 times).[170] For European security, however, Russian plans, actions, and capabilities are at least equally important. Furthermore, some questions relating to geopolitical and military power changes caused by AI are less relevant to the US, but highly relevant to Europeans. For example, the

[169] See for example: "Translation: Outline of the People's Republic of China 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2035", *CSET*, https://cset.georgetown.edu/publication/china-14th-five-year-plan/; "Translation: A Study of Shenzhen's International Technology Transfer Model and Measures to Improve It", *CSET*, April 29, 2021 https://cset.georgetown.edu/publication/a-study-of-shenzhens-international-technology-transfer-model-and-measures-to-improve-it/; "Translation: Miao Wei: Advancing the High-Quality Development of the Manufacturing Industry", *CSET*, April 15, 2021, https://cset.georgetown.edu/publication/miao-wei-advancing-the-high-quality-development-of-the-manufacturing-industry/; "Translation: Certain Opinions of the Ministry of Education, the China National Intellectual Property Administration, and the Ministry of Science and Technology on Improving the Quality of Patents at Institutes of Higher Education and Promoting [Patent] Conversion and Use", *CSET*, March 26, 2021 https://cset.georgetown.edu/publication/certain-opinions-of-the-ministry-of-education-the-china-national-intellectual-property-administration-and-the-ministry-of-science-and-technology-on-improving-the-quality-of-patents-at-institutes-of/.

[170] CSET also works on Russia: "Translation: Draft Resolutions Have Been Prepared Concerning the Allocation of 16.5 Billion Rubles in Subsidies for the Development of AI in Russia", *CSET*, April 15, 2021, https://cset.georgetown.edu/publication/draft-resolutions-have-been-prepared-concerning-the-allocation-of-16-5-billion-rubles-in-subsidies-for-the-development-of-ai-in-russia/ ; "Translation: Development of Artificial Intelligence", *CSET*, April 15, 2021, https://cset.georgetown.edu/publication/development-of-artificial-intelligence/.

impact that AI-enabled military systems might have on smaller states is of crucial importance and interest to Europeans and deserves considerably more attention – which can only come through European research.

Therefore, the first two concrete recommendations of this report are the creation of a European research institute specifically focused on geopolitical and security impacts of AI, and the establishment of a European Security Commission on Artificial Intelligence. The idea is not to copy the US institutions (or approach), but to take the example and make it work for Europe. The European research institute could focus on questions that are of immediate relevance to Europe. It could serve as a hub for the burgeoning community of European researchers working on these themes in different European states, and allow them to exchange their work and cooperate. It could also help educate policymakers, for example through short trainings and regular engagement with relevant institutions and decisionmakers.[171]

The European Security Commission on Artificial Intelligence should bring together high-level European experts, policymakers, and representatives from the private sector. It should aim to have a pan-European representation, thus allowing for different European views to be expressed and shape the main messages. Importantly, its mandate should be specifically to study and make recommendations on European security concerns on AI. Both the research institute and the commission could then reach out to partners outside of Europe, helping to achieve the goals set out below.

5.1. Europe's interests and goals - Recommendations on how to face the geopolitical AI challenges

Section three has laid out six areas in which AI poses geopolitical challenges. In all these areas, Europe has interests. It may be to avoid catastrophic outcomes like flash wars caused by the uncontrolled and too fast adoption of AI-enabled autonomous weapons, or the rise of a superintelligence able to obliterate humankind. Or it can be an interest to shape the developments in its favour and benefit from them where possible.

In the area of **US-China competition**, the first immediate European interest is to help both actors avoid a (military) confrontation. A direct confrontation between the US and China, (independently of the role of AI in it), would have catastrophic consequences for Europe and the world. This does not mean to overlook differences, or to kowtow to China. But Europe could encourage both sides to tone down their rhetoric, to avoid an unnecessary escalation.

Working with the US: The US are Europe's most important partner, and the EU should work closely with the US on AI as well as on other topics to face China. However, with regard to transatlantic cooperation on AI, it may be advisable not to place US-European cooperation on AI in the confrontation with China context. Although there is some change in European attitudes toward China happening at the moment (see below), Europeans do not feel the same urgency as the US when it comes to pushing back against Beijing. This means that the American interest in using transatlantic AI cooperation as a means to curb Chinese power is likely to have only limited traction in Europe.

Calls for cooperation between the United States and Europe have become particularly loud in recent times. All discussions of American positioning on technology note the importance of working with allies.[172] The European Commission is proposing a "Transatlantic Trade and Technology Council", to set

[171] Michael C. Horowitz, Lauren Kahn, "The AI Literacy Gap Hobbling American Officialdom", *War on the Rocks*, 14 January 2020, https://warontherocks.com/2020/01/the-ai-literacy-gap-hobbling-american-officialdom/.

[172] "American Edge Project: Security Policy", *American Edge Project*, February 2021, https://americanedgeproject.org/wp-content/uploads/2021/02/American-Edge-Project-National-Security-Policy.pdf. Imbrie, Andrew; Fedasiuk, Ryan; Aiken, Catherine;

joint standards on new technologies. In June 2020, the Global Partnership on Artificial Intelligence was founded to consider the responsible development of AI; it counts among its members the US, four European states, and the European Union. In September 2020, the US set up a group of like-minded countries "to provide values-based global leadership in defense for policies and approaches in adopting AI", which included seven European states, in addition to countries such as Australia, Canada, and South Korea. Several other forums, like a D-10 for democratic states, or a 'summit for democracy' have been proposed.[173]

The EU should keep an eye on such new forums. On the one hand, it might be advisable for EU Member States to join such partnerships. But groups or alliances that include only a few European countries and some of the United States' other like-minded partners might be problematic from an EU viewpoint. Europeans should strive for Europe-wide harmonisation, not the creation of further differences. Therefore, the EU may want to mobilise existing multilateral frameworks to deal with technology and AI, rather than create new forums. In addition, it would also be advisable for the EU itself to join any such grouping as a member to ensure that European positions are not watered down, or Member States divided among themselves.

The EU's aforementioned effort to strengthen ethical AI, and to make 'trustworthy AI' a unique selling point for Europe, could also create problems for transatlantic cooperation.[174] Many EU policymakers believe that the EU's insistence on ethical AI could eventually become a location advantage for Europe (much like data privacy): as more people become concerned about unethical AI and data security, they will prefer to use or buy AI 'made in Europe' rather than elsewhere. In this respect, two European aims are at odds with each other: on the one hand, Europeans want to ensure that AI is developed and used in an ethical way. Partnering with a powerful player such as the US on this matter should be an obvious way to help them achieve this goal. However, if the EU considers ethical AI not just a goal for humanity but a development that may also create commercial advantages for Europe, then transatlantic cooperation on this issue is counterproductive, as it would undermine Europe's uniqueness. Furthermore, some Europeans have expressed scepticism about the extent to which Europe and the US are indeed aligned on ethical AI principles. For example, the Danish national AI strategy describes ethical AI as a particularly European approach: "Europe and Denmark should not copy the US or China. Both countries are investing heavily in artificial intelligence, but with little regard for responsibility, ethical principles and privacy." Many Europeans feel that the US "has no idea how to regulate" cyberspace and continues to show little enthusiasm for doing so.[175]

None of these differences between the partners should, however, preclude US-EU cooperation on AI. There are many areas for transatlantic AI cooperation, and investing in potentially less controversial areas may help create new platforms and lay important groundwork for greater cooperation. For example, the transatlantic allies should facilitate the exchange of knowledge and best practices on AI, and invest in mutually beneficial research, such as privacy-preserving machine learning. Defence might also be a promising area for transatlantic cooperation, given the close military ties between the US and Europe through NATO. Given the aforementioned concerns over how the introduction of AI onto the

Chhabra, Tarun; Chahal, Husanjot, "Agile Alliances. How the US and its Allies can Deliver a Democratic Way of AI", CSET, February 2020, https://cset.georgetown.edu/publication/agile-alliances/.

[173] See Ulrike Franke, "Artificial Divide. How Europe and America could clash over AI", *ECFR*, January 2021, https://ecfr.eu/publication/artificial-divide-how-europe-and-america-could-clash-over-ai/. And Panier, Alice, "Europe in the Geopolitics of Technology, Connecting the Internal and External Dimensions", *IFRI*, April 2021, https://www.ifri.org/sites/default/files/atoms/files/pannier_europe_geopolitics_technology_2021_.pdf.

[174] This section has been adopted from Ulrike Franke, "Artificial Divide. How Europe and America could clash over AI", *ECFR*, January 2021, https://ecfr.eu/publication/artificial-divide-how-europe-and-america-could-clash-over-ai/.

[175] Carla Hobbs, "The EU as a digital regulatory superpower: Implications for the United States", *ECFR*, 8 April 2020, https://ecfr.eu/article/commentary_the_eu_as_a_digital_regulatory_superpower_implications_for_the_u/.

battlefield may hinder interoperability between allied forces, cooperation in the defence realm would be a good realm in which to strengthen cooperation (see below).

Positioning towards China: With regard to China, any effective European AI policy will depend on a common position, which appears to still be lacking. A virtual simulation which simulated an EU-China technology summit in November 2020 ended in a collapse of the negotiations, with no final statement.[176] The simulations of the pre-summit inner-European deliberations depicted EU-Member States at odds with each other on many points. One issue was over whether to allow Chinese investment into European technology and European digital infrastructures, something most important to economically weaker countries. There was an agreement over the importance of reciprocity and the creation of a level playing field with China. However the Europeans had problems agreeing on common positions, which contributed to the breakdown of the simulation's negotiations.[177]

There appears to be some movement on this. While European policymakers so far do not want to follow the US lead of decoupling from China, and are generally sceptical of export controls, increasingly, Europeans are growing wary of China.[178] Relations have soured (exacerbated by the Chinese sanctioning of EU policymakers, and there is more realisation that while a conciliatory approach is laudable, if hedging and strategic indecisiveness continues, European policymakers risk new forms of dependency that the Chinese leadership deliberately wants to create, thereby actively undercutting its own sovereignty agenda.[179] Surveys among policymakers have shown that there is a growing agreement in EU Member States that the EU needs to restrict Chinese investments in strategic sectors,[180] and most commentators agree that with the EU framework for screening foreign direct investment (FDI) which became operational in October 2020 and which provides the EU Commission and Member States with a mechanism to exchange information about investment projects by third country investors, the EU has taken a major step forward in protecting its interests from harmful foreign investments and takeovers.[181] Still, the ultimate choice to accept or reject a foreign investment remains within national capitals, which have different degrees of sensitivity. Revealingly, as of now, ten EU Member States still do not have national FDI screening mechanisms.[182]

Europe's position between the US and China will continue to be a difficult one. The EU will need to look both ways, east and west, and its interests will not always align perfectly with the US' interests. But it should be clear that the transatlantic relationship is key to Europe's external tech policy, and that there is and cannot be an equidistance between the US and China.

Authoritarianism and weakening of democracy: This area is a core concern for Europeans, and arguable the area in which the EU can have the most important impact. Trustworthy or ethical AI is a primary focus for the EU. Trustworthy AI is defined as lawful, ethical (adhering to ethical principles and

[176] "Virtual EU-China Technology Summit Simulation", *Aspen Institute*, 17 November 2020, https://www.aspeninstitute.de/wp-content/uploads/Findings_Aspen-EU-China-Summit-Simulation.pdf.

[177] "Virtual EU-China Technology Summit Simulation", *Aspen Institute*, 17 November 2020, https://www.aspeninstitute.de/wp-content/uploads/Findings_Aspen-EU-China-Summit-Simulation.pdf.

[178] Janka Oertel, "The new China consensus: How Europe is growing wary of Beijing", *ECFR*, September 2020, https://ecfr.eu/publication/the_new_china_consensus_how_europe_is_growing_wary_of_beijing/.

[179] Janka Oertel, "US-China confrontation and repercussions for the EU", *ECFR*, March 2021, https://ecfr.eu/article/us-china-systemic-rivalry-repercussions-for-the-eu/.

[180] ECFR, EU Coalition Explorer 2020, https://ecfr.eu/special/eucoalitionexplorer/policy_intentions_mapping/.

[181] Manisha Reuter, "Responding to the China challenge: The state of play on investment screening in Europe", *ECFR*, 27 November 2020, https://ecfr.eu/article/responding-to-the-china-challenge-the-state-of-play-on-investment-screening-in-europe/; "New EU screening framework also targeting Chinese FDI is finally in place", *Merics*, 22 October 2020, https://merics.org/en/short-analysis/new-eu-screening-framework-also-targeting-chinese-fdi-finally-place.

[182] Noted in Alice Panier, "Europe in the Geopolitics of Technology, Connecting the Internal and External Dimensions", *IFRI*, April 2021, p.2, https://www.ifri.org/sites/default/files/atoms/files/pannier_europe_geopolitics_technology_2021_.pdf.

values), and robust from a technical and social perspective. The 2021 EU AI regulation notes the union's objective of being a global leader in the development of trustworthy and ethical AI, And, as shown above, concern over unethical AI is shared throughout the union with every European national AI strategy touching upon the topic. It is crucially important for the EU to keep this focus, and not compromise on its values for alleged benefits.

Trustworthy AI is beneficial for all users of AI-enabled systems – in Europe and beyond. Ensuring that all AI-enabled systems used in the EU are ethical is good for Europeans who can trust that their technologies will not be biased, illegal or otherwise harmful. This is likely to encourage and thus increase AI adoption rates, which can be expected to have a positive economic impact. If the EU succeeded in encouraging others to adopt trustworthy AI standards, this would further widen the circle of beneficiaries. Even better would be if the EU succeeded to establish itself as a leader in the field of ethical AI, making others follow its regulations. Not only would this ensure that those ideals that Europeans value in particular would be adequately reflected. The EU could furthermore get a location advantage, meaning that because of its leadership on ethical AI, 'AI made in Europe' would be known to follow the highest standards, thus becoming a sought-after commodity.

In this context, the EU should also make offers to third countries, especially emerging countries. It is in Europe's immediate interest that these countries use (trustworthy) technology from Europe, instead of Chinese systems that may help promote authoritarian structures.

With regard to the dangers of **AI nationalism**, Europe's main role will be to be aware of the danger, and weigh each decision to support domestic AI development against the concern that it may fuel nationalist tendencies. This report certainly does not want to discourage efforts to build up European Digital Sovereignty – but recommends not walking into the trap of AI nationalism in a European disguise. Europe has a long history of working with partners around the world – it is in this context that this ability will be of particular importance.

Empowering of private firms: When it comes to the regulation of firms, the EU is probably the furthest advanced, which can be explained by the union's competencies in the area of trade and regulation. Much has been made by the EU Commission's "push against big Tech"[183], driven most notably by Commissioners Margrethe Vestager and Thierry Breton, and epitomised in the high number of regulations mentioned above. Still, given that the major technology firms are American and increasingly Chinese, the EU has limited power to impact the general shift of power from the state to private firms described in section 3.4.

Defence and security: Section 3.5 has shown that AI in the military realm can create important military advantages, while at the same time creating risks and danger that need to be addressed. So far, most Europeans have overlooked the area of military AI in a way that is not sustainable. Europe should engage with the use of AI in the military and defence realm in order to strengthen its defence capabilities and helping to guarantee the safety and security of its citizens. Europe's military-industrial base could get a boost through the work on cutting-edge technology. As they are new, AI-enabled capabilities could become an important area of cooperation between different European companies, thus strengthening *common* European defence.

Given the lack of interest displayed in the topic by Europeans, the EU should officially ask its Member States to develop and publish military AI strategies.[184] The European Commission's encouragement to

[183] Thibault Larger, Mark Scott, Laura Kayali "Inside the EU's divisions on how to go after Big Tech", *Politico*, 14 December 2020, https://www.politico.eu/article/margrethe-vestager-thierry-breton-europe-big-tech-regulation-digital-services-markets-act/.

[184] Ulrike Franke, "Europe needs a plan for AI in the military realm", *The Security Times*, February 2020, https://www.the-security-times.com/europe-needs-plan-ai-military-realm/.

develop national AI strategies played an important role in encouraging Member States to engage with the topic.[185] A similar encouragement regarding military AI could lead to a better understanding in Europe of the challenges and potential benefits of the use of AI in the military realm and encourage European cooperation and help guarantee European military interoperability.

EU Member States that are also members of NATO should encourage NATO to focus on allied interoperability. With regard to transatlantic cooperation on military AI, non-controversial uses, like the use of AI in sustainment and logistics may be a great area for cooperation. Transatlantic cooperation in this field would uncontroversial, but extremely useful – especially when carried out within NATO, as this could help bring allies closer together, establish joint procedures, and thereby ensure interoperability.[186] In this context, the EU may also want to react to the proposal of a creation of an "Atlantic-Pacific Security Technology Partnership to improve defense and intelligence interoperability across Europe and the Indo-Pacific" which the US national security commission on AI proposed.[187]

As pointed out above, the EU should create a European Security Commission on AI whose task it would be to engage with the challenges and benefits AI can bring for European security and defence. By engaging in the debate on the problems related to the use of AI-enabled weapons, Europe can contribute to mitigating the most problematic uses, such as lethal autonomous weapons.

Artificial General Intelligence: With regard to the danger arising from AGI, Europe should pay more attention to and invest in AI safety. The Centre for Long-Term Resilience in the UK has just published a study of extreme risk, in which it identified AGI as a threat to humanity.[188] The authors recommend investing more into progress tracking in AI in Europe, and bringing more technical expertise into governments.

5.2. Conclusion

The technological is geopolitical. Artificial intelligence has become an element of great power competition. This is the reality that the EU and its Member States need to face. AI is set to influence the global balance of power, and the relationship between states, as well as geopolitics more generally. The EU needs to take this challenge seriously, and engage with the changes outlined in this paper. It needs to consider the external dimension of its action, and how to deal with allies, partners, countries it wants to support, and opponents. This paper has given an overview of the EU's capabilities in AI, and has discussed six ways how AI might influence the global balance of power and Europe's standing within it. It has proposed ways how the EU and its Member States can take on these challenges – something most European states have not yet begun to do. It is high time for Europe to invest more time, effort, and ultimately money to guarantee that Europe benefits from the international challenges that AI is introducing, while mitigating the downsides of this development.

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[185] Coordinated Plan on Artificial Intelligence, European Commission, https://ec.europa.eu/digital-single-market/en/news/coordinated-plan-artificial-intelligence.

[186] Margarita Konaev, Husanjot Chahal, "The Path of Least Resistance, Multinational Collaboration on AI for Military Logistics and Sustainment", *CSET*, April 2021, https://cset.georgetown.edu/research/the-path-of-least-resistance/ Also see Franke, Ulrike, "Artificial Divide. How Europe and America could clash over AI", ECFR, January 2021, https://ecfr.eu/publication/artificial-divide-how-europe-and-america-could-clash-over-ai/.

[187] US National Security Commission on Artificial Intelligence, Final Report, March 2021, p.82, https://reports.nscai.gov/final-report/table-of-contents/.

[188] Toby Ord, Angus Mercer, Sophie Dannreuther, "Future Proof", *Centre for Long-Term Resilience,* June 2021, https://drive.google.com/file/d/1LHn3nzxF2p68SfhwiPLCb5FMaMLg1dk6/view.

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ANNEX: EU MEMBER STATES' NATIONAL AI STRATEGIES

By alphabetical order

Austria:	https://www.bmdw.gv.at/Themen/Digitalisierung/Strategien/Kuenstliche-Intelligenz.html
Bulgaria:	http://www.bas.bg/wp-content/uploads/2020/07/Proposal-National-Strategy-AI-2030-24June2020.pdf
Cyprus:	https://ec.europa.eu/knowledge4policy/sites/know4pol/files/cyprus_ai_strategy.pdf
Czechia:	https://www.mpo.cz/assets/cz/rozcestnik/pro-media/tiskove-zpravy/2019/6/NAIS_eng_korektura_06-19_web.pdf
Denmark:	https://eng.em.dk/media/13081/305755-gb-version_4k.pdf
Estonia:	https://www.kratid.ee/in-english
Finland:	https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/160391/TEMrap_47_2017_verkkojulkaisu.pdf?sequence=1&isAllowed=y
	https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161688/41_19_Leading%20the%20way%20into%20the%20age%20of%20artificial%20intelligence.pdf?sequence=4&isAllowed=y
France:	https://www.aiforhumanity.fr/pdfs/MissionVillani_Report_ENG-VF.pdf
Germany:	https://ec.europa.eu/knowledge4policy/publication/germany-artificial-intelligence-strategy_en
Hungary:	https://ai-hungary.com/files/e8/dd/e8dd79bd380a40c9890dd2fb01dd771b.pdf
Italy:	https://www.mise.gov.it/images/stories/documenti/Strategia_Nazionale_AI_2020.pdf
Latvia:	tap.mk.gov.lv/doc/2019_07/VARAMZin_080719.680.docx
Lithuania:	http://kurklt.lt/wp-content/uploads/2018/09/StrategyIndesignpdf.pdf
Luxembourg:	https://digital-luxembourg.public.lu/sites/default/files/2020-09/AI_EN_0.pdf
Malta:	https://malta.ai/wp-content/uploads/2019/11/Malta_The_Ultimate_AI_Launchpad_vFinal.pdf
Netherlands:	https://www.government.nl/documents/reports/2019/10/09/strategic-action-plan-for-artificial-intelligence
Portugal:	https://www.incode2030.gov.pt/sites/default/files/julho_incode_brochura.pdf
Slovakia:	https://www.mirri.gov.sk/wp-content/uploads/2019/10/AP-DT-English-Version-FINAL.pdf
Spain:	https://www.ciencia.gob.es/stfls/MICINN/Ciencia/Ficheros/Estrategia_Inteligencia_Artificial_EN.PDF
Sweden:	https://www.government.se/information-material/2019/02/national-approach-to-artificial-intelligence/

Artificial Intelligence (AI) has become a tool of power politics, and an element of state diplomacy. The European Union (EU), however, approaches AI primarily from an economic, social, and regulatory angle. This paper discusses the way that AI impacts the European Union's geopolitical power and its relationship with other countries. It presents possible scenarios for how AI may change the international balance of power and recommends ways for the EU and its Member States to respond.

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