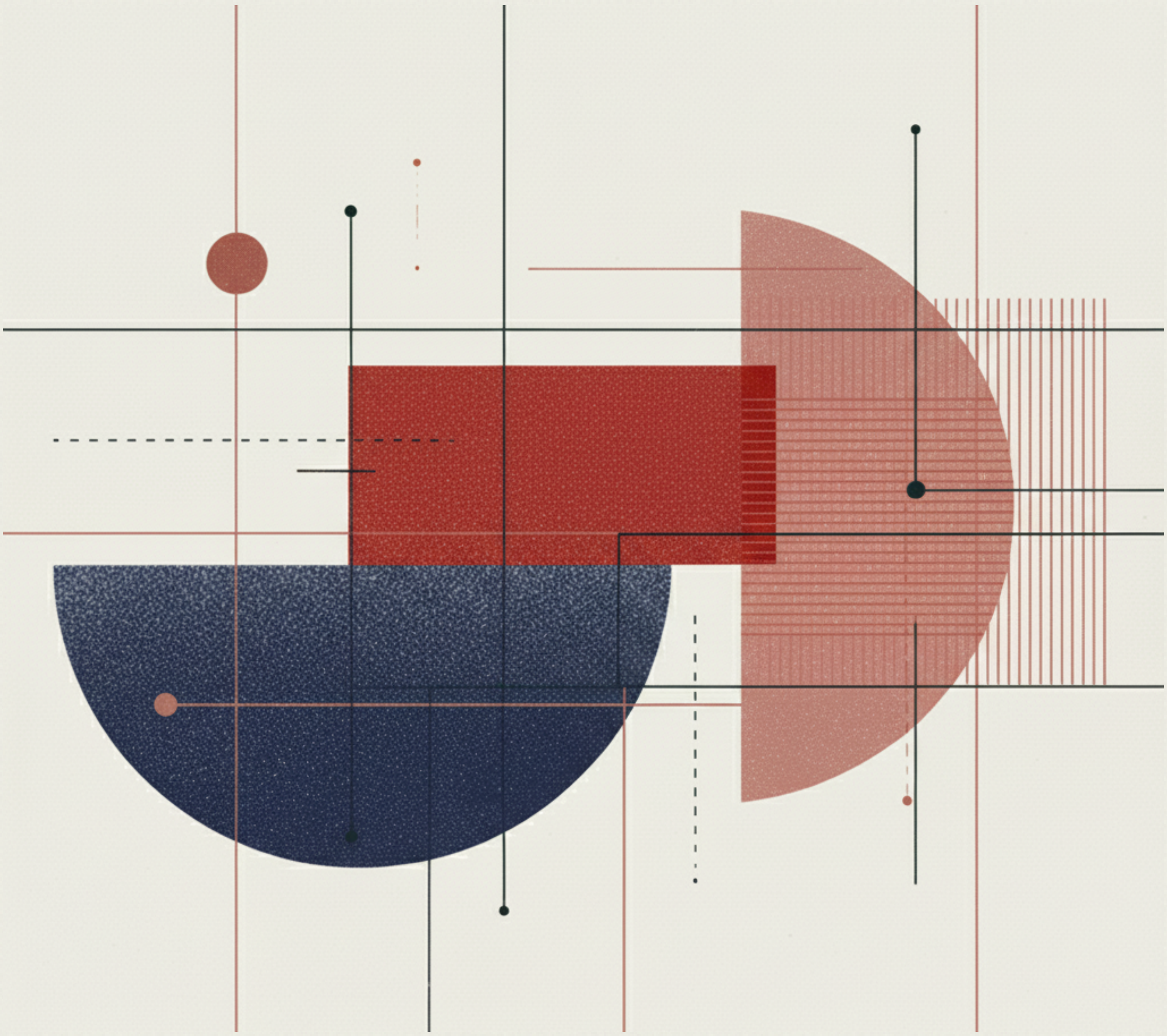
A Blueprint for Multinational Advanced AI Development

by Adrien Abecassis, Jonathan Barry, Ima Bello, Yoshua Bengio, Antonin Bergeaud, Yann Bonnet, Philipp Hacker, Ben Harack, Sophia Hatz, Joachim Henkel, Holger H. Hoos, Kit Kitamura, Ranjit Lall, Yann Lechelle, Constance de Leusse, Charles Martinet, Nicolas Miailhe, Julia C. Morse, Maximilian Negele, Kyung Ryul Park, Miro Pluckebaum, Murielle Popa-Fabre, Benjamin Prud'homme, Yohann Ralle, Mark Robinson, Charbel-Raphael Segerie, José-Ignacio Torreblanca, Lucia Velasco, K. VijayRaghavan

November 2025



This memo is authored by:

Adrien Abecassis — Paris Peace Forum

Jonathan Barry — Mila – Quebec Artificial Intelligence Institute

Ima Bello — Future of Life Institute

Yoshua Bengio — Mila – Quebec Artificial Intelligence Institute

Antonin Bergeaud — HEC Paris

Yann Bonnet — Paris Peace Forum

Philipp Hacker — European University Viadrina

Ben Harack — Oxford Martin AI Governance Initiative

Sophia Hatz — Uppsala University

Joachim Henkel — Technische Universität München (TUM)

Holger H. Hoos — RWTH Aachen University, Leiden University

Kit Kitamura — Independent expert

Ranjit Lall — University of Oxford

Yann Lechelle — Probabl

Constance de Leusse — AI & Society Institute (ENS - PSL)

Charles Martinet* — Oxford Martin AI Governance Initiative, Centre pour la Sécurité de l'IA (CeSIA)

Nicolas Miailhe — AI Safety Connect, PRISM Eval

Julia C. Morse — Oxford Martin AI Governance Initiative, University of California, Santa Barbara

Maximilian Negele — Oxford Martin AI Governance Initiative

Kyung Ryul Park — Korea Advanced Institute of Science and Technology

Miro Pluckebaum — Oxford Martin AI Governance Initiative

Murielle Popa-Fabre — AI & Society Institute (ENS - PSL)

Benjamin Prud'homme — Mila – Quebec Artificial Intelligence Institute

Yohann Ralle — The Future Society

Mark Robinson — Oxford Martin AI Governance Initiative

Charbel-Raphael Segerie — Centre pour la Sécurité de l'IA (CeSIA)

José-Ignacio Torreblanca — European Council on Foreign Relations

Lucia Velasco — Oxford Martin AI Governance Initiative

K. VijayRaghavan — Former Principal Scientific Advisor to the Government of India

**Lead drafter*

The authors are grateful to Toby Ord, Milo Rignell, Philip Fox, Lily Stelling, and Rafael Andersson Lipcsey for their comments and suggestions.

Thesis: an international advanced AI research & development partnership of AI bridge powers[1] (1) can feasibly produce frontier AI models; and (2) is essential for safeguarding the sovereignty, democratic values, economic competitiveness and growth, technical innovation, and national security of these bridge power states.

Executive Summary

The global race to develop advanced AI has entered a new phase marked by staggering investments, rapid technical breakthroughs, and intensifying geopolitical competition. The United States now controls approximately 75% of global AI compute capacity, China 15%, and the EU 5%.[2] This concentration of compute, alongside concentrations of AI development talent, data, and AI model ownership suggests that **mid-sized economies likely face insurmountable barriers to independent frontier AI development**.

At the same time, economic, cultural, and security infrastructures are coming to rely ever more on frontier models. States that are unable to develop their own frontier models or access the computing hardware required to train them will have to choose between dependency and weakness:

- *Dependency*: if states adopt U.S. or Chinese AI systems, these frontier AI states[3] can then exploit their privileged position in ways that harm dependent states, for example through data theft, service restrictions, selectively withholding frontier capabilities, embedding values in foundation models, and unfavorable terms of trade.
- *Weakness*: if, on the other hand, states limit their adoption of frontier systems to avoid dependency, frontier AI states may achieve breakthrough capabilities—in economic productivity, in scientific discovery, in military operations—that create widening gaps in economic and military capabilities.

Yet, mid-sized economies are also *AI bridge powers*, possessing substantial AI development capabilities and resources that, if combined, would allow them to challenge the status quo. By **working together and strategically choosing their AI development approaches, AI bridge powers can develop competitive frontier models**:

- First, **pooled computing infrastructure** can support frontier-scale development. Coordinated deployment of existing, planned, and within-reach European and other bridge power AI compute capacity is likely to provide sufficient computational resources to produce frontier AI models in the next few years, although significantly more investments are probably required to keep up with the moving frontier.
- Second, a significant portion of **top AI talent** has ties to AI bridge power countries. 87 of the 100 most-cited AI researchers originate from or currently work in countries outside the United States and China. Bridge powers could “call home” leading researchers if they had an inspiring vision backed by sufficient resources and an ethical development path.
- Third, while most of the **data** used to train frontier models is already public, bridge powers could pool domain-specific data and resources for data cleaning and expert labeling efforts.
- Fourth, bridge powers should make **strategic, frontier development bets**, leveraging shared digital infrastructures (e.g. pooled pre-training) and R&D efforts to focus on promising areas that do not rely on matching scale elsewhere, in order to reach and then track or even surpass the AI frontier.
- Fifth, **building reliable AI represents an unmet market need where bridge powers have structural advantages**. High-value industries require control over AI tools and confidence in their reliability before deploying them at scale. Bridge powers can act as trusted brokers by leveraging strong

data protection regimes, robust rule of law, and responsive governance to speed up sustainable adoption.

A multinational partnership could enable members to **preserve sovereignty, have more weight in shaping global AI governance, and lead through ethical stewardship**. Some precedents of similar multilateral projects exist through CERN or Airbus[4], and the capabilities exist through collective action. The question is then whether bridge powers will act decisively before dependencies deepen and the bipolar structure consolidates.

Contents

Introduction

The strategic implications of concentrated AI investment are now undeniable. With U.S. companies expected to spend over $300 billion and China nearly $100 billion on AI infrastructure in 2025, the computational divide has become a chasm: American control of approximately 75% of global AI compute capacity, combined with talent, data, and AI model ownership concentrations, creates barriers that individual mid-sized economies cannot overcome through national efforts alone. The question is no longer whether bridge powers face disadvantages, but whether they will act collectively before those disadvantages harden into structural constraints.

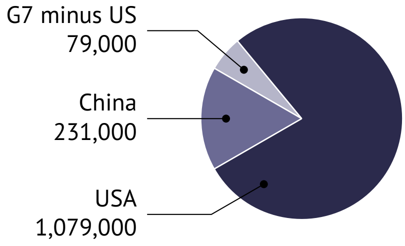


Figure 1: Global Distribution of AI Compute in October 2025 (H100 equivalents)[5]

However, AI bridge powers have substantial AI development capabilities of their own. By **partnering strategically and coordinating their investments, compute, talent, data, and governance, they can participate in the frontier of AI development** and safeguard their sovereignty and values.

A. The Strategic Downside of Bipolar Frontier AI

AI is poised to become the defining asset of the 21st century. Frontier AI systems already demonstrate rapidly improving abstract thinking and reasoning skills, and match or exceed human experts across wide-ranging domains. They are increasingly enmeshed with economic, cultural, scientific, and security processes, directly and through myriad applications,[6] but this may just be the tip of the iceberg if AI advances continue according to current trends. Many experts believe that superhuman general AI will be achieved within the next 5–10 years. While such claims are highly uncertain, the pace of development over the past two years suggests that human-level AI is plausible in the near future.

AI advances are likely to undermine the sovereignty of non-frontier states. If states cannot independently develop, train, or modify frontier AI systems, they may find themselves faced with a choice between two different forms of vulnerability: either buy AI systems from frontier states and become structurally dependent on them (**dependency**), or be left behind by frontier states altogether (**weakness**).[7]

In a **dependency** scenario, non-frontier states are dependent on frontier states' AI systems. This allows frontier AI states to exploit the power differential between them and the states that depend upon them. For example, frontier states could copy sensitive data exchanged with their AI models and use it for economic or political advantage.[8] They could also selectively modify AI access, threatening service degradation or even a full cut-off;[9] and their values and design choices will be embedded in foundation models, impacting all downstream applications.[10] Dependency may also make terms of trade more unfavorable to non-frontier states.

Efforts to limit adoption in order to avoid dependency may lead instead to **weakness**: a world where frontier states use AI to achieve breakthroughs in economic productivity, scientific discovery, and military operations, allowing them to build out asymmetric capabilities (such as AI-enabled cyber operations that make conventional defenses obsolete[11]) or automate core economic and security functions. Such gaps could widen dramatically as AI models are used to further accelerate their own development.

Bridge powers thus face a strategic choice between fundamentally different approaches to accessing frontier AI. Each strategy implies having access to sufficient computing power[12], and involves distinct trade-offs between capability, sovereignty, and cost:

Table 1: Strategic Alternatives for Bridge Power Access to Frontier AI[13]

Strategy	Frontier-competitive?	Sovereignty protected?	Financially viable?
Import closed models	⚠ Yes, but several months behind; access can be restricted	✖ Vulnerable to service denial, licensing restrictions	✔ Low upfront cost; high ongoing dependency
Adopt open models	✖ Behind frontier; released open models lag more than 6 months behind closed models, which could grow due to national security restrictions	⚠ Reduces but doesn't eliminate foreign dependencies	✔ Low direct cost
National champions	⚠ Behind frontier; fragmented efforts	⚠ Partial sovereignty; may require significant foreign ownership	✖ Expensive per country; duplicates infrastructure
Multinational partnership	✔ Achievable through pooled resources and strategic development choices	✔ Reinforced sovereignty through collective governance, guaranteed AI access, improved domestic AI ecosystems	✔ Shared costs; economies of scale

As illustrated by Table 1's first three strategies, importing, adopting, or domestically developing frontier AI each involve unacceptable trade-offs: **a multinational partnership is the only viable path to achieving frontier competitiveness while preserving sovereignty at manageable cost**. Although they differ in many ways, AI bridge powers have common interests in safeguarding sovereignty and protecting their values and way of life. These common interests imply that there is potential for international cooperation on frontier AI development.

B. A Multinational Frontier AI Partnership

A multinational frontier AI partnership offers a viable and scalable strategic option. A joint AI bridge power partnership has a much greater chance of reaching the technological frontier than individual bridge powers or national champions operating alone. Advantages include pooled computing infrastructure, talent, and data.

Advantage 1: Pooled Computing Infrastructure

The logic of compute pooling is rooted in the fundamental economics of AI development. AI inference, or use, involves costs that are decentralized and scale proportionally with the number of users in each country. In contrast, AI training and development costs are unrelated to the number of users in a country. Those costs require a massive, concentrated expenditure of compute resources. This economic reality means that by pooling resources to cover the high, fixed costs of training a frontier model, a group of bridge powers can achieve a level of capability and competitiveness that no single member could reach independently.

While individual bridge powers cannot match the scale of initiatives like OpenAI's Stargate project (>$100B/year announced), groups of bridge powers collectively possess significant datacenter capacity.[14] Frontier AI development costs may exceed several billions per model by 2028 (see Figure 2), and the required infrastructure investments will require tens of billions.

Given this, the costs of maintaining a frontier AI program under existing paradigms using only domestic compute—building not just one model, but maintaining frontier competitiveness through continuous R&D[15]—are arguably of an order that no single bridge power can sustain on its own, short of shifting into a war-time type of economy with politically untenable costs.[16]

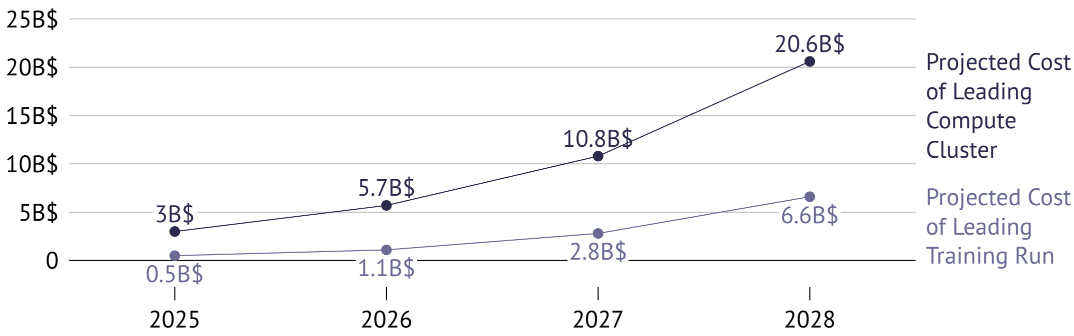


Figure 2: Projected Hardware and Training Costs for State-of-the-Art AI Systems (USD, Billions)[17]
Sources: Pilz et al., 2025; Cottier et al., 2024; Epoch AI, 2025.

The infrastructure foundation is already taking shape: in the EU, AI Factories and public supercomputers like Jupiter (Germany, 24,000 GPUs, operational) and Alice Recoque (France, exascale, 2026) are deploying near-term capacity, while in the mid-term, five Gigafactories will deliver 100,000+ specialized AI chips each by 2027.[18] Coordinated through a multinational partnership, these assets—valued at €20+ billion in EU commitments alone—could support frontier development at scale.

In the short term, it is neither feasible nor necessary for bridge powers to match the scale of U.S. or Chinese investment. Indeed, frontier competitiveness derives not just from the sheer amount of resources, but how they are deployed, as demonstrated by DeepSeek and Mistral, which, through architectural innovations and strategic focus, achieved performance below but comparable to frontier models while spending less. By coordinating investments and adopting novel approaches, a multinational partnership can achieve outcomes at or near the frontier without matching the spending in leading countries.[19] Furthermore, a targeted focus can alleviate resource requirements:[20] rather than attempting to eliminate all dependencies across the AI stack simultaneously, the partnership could concentrate on developing frontier models with general capabilities in reasoning, planning, trustworthiness, and multimodal understanding. Downstream applications can leverage these, and they would be valuable cards to bridge powers in future negotiations around global AI geopolitics.

The multinational partnership should aim to minimize its use of compute located in non-member states and compute owned by foreign entities. Although it could begin by renting compute, this reinforces and creates substantial vulnerabilities over time.[21] Bridge power investments in AI infrastructure must therefore continue and increase significantly. It is important to highlight the key role within the AI stack of frontier AI algorithms for capability advances: if capabilities approach or surpass human-level as current trends suggest, frontier AIs themselves will enable rapid innovation and improvements to the other components of the stack.

Advantage 2: Pooled AI Talent

AI bridge powers have good prospects of recruiting and retaining significant AI talent through preexisting ties to AI researchers. Evidence suggests that a substantial pool of elite AI talent is needed to reach the frontier. Despite an abundance of compute and data resources, companies like

Meta appear to have struggled to reach the frontier in part because they lack a critical mass of leading researchers. At the same time, of the 100 most cited AI researchers in the world, 87 come originally from countries other than the U.S. and China, or are currently working in them.[22] Thus, *a group of bridge powers might "call home" a large proportion or even a majority of leading researchers*, drawn by substantial salaries and the chance to work on civilization-defining questions within collective governance structures. The brain drain is reversible when infrastructure meets values and a galvanizing, visible, and feasible project.

Advantage 3: Pooled Data

Data pooling offers a significant advantage to partnership members. While most of the data needed for frontier AI R&D is publicly available on the internet, the most expensive and hard-to-get data, which comes from expert labeling and annotation, is usually privately generated and owned. Bridge powers can thus pool the cost of data cleaning and labeling efforts, which companies in frontier AI states fund independently at massive scale. Furthermore, some companies may be willing to share their data with the partnership through preferential access or licensing arrangements. Combined with the proprietary datasets of member nations, and in some cases those shared by their domestic industries, these pooled data resources would provide a scale and differentiation advantage.

To attract a diverse and durable pool of AI researchers, a partnership would require an inspiring vision, credible and sufficient capacity and resources, and exciting, leading-edge tasks. Bridge powers could jointly offer this combination by pooling their talent and computing infrastructure. They could also offer access to substantial portions of the world's AI data. Together, these three resources—**compute, talent, and data**—comprise the core inputs for frontier development.

Adopting or replicating existing AI models are no silver bullets: One might think that bridge powers need not develop frontier models themselves, but could instead adopt open-weight releases (like Llama) or rapidly replicate frontier advances from behind ("fast-following"). For many commercial applications, this may prove adequate, since some open models now nearly match closed frontier models in certain capabilities, with only a 3-month lag. Yet, this strategy faces fundamental limitations:

1. **Licensing and access restrictions impose limits on use**. Foreign closed-source models offer no guaranteed access, with providers able to restrict, degrade, or terminate service.[23] But even "open source" models carry licensing restrictions: Meta's Llama prohibits most military applications, while others may impose commercial-use limitations. Defense planning and critical infrastructure should not rely on systems where legal access may be revoked or denied in the first place.
2. The most advanced **closed-source models have reportedly already exceeded national security risk thresholds** that trigger strong security measures to protect their weights.[24] When open-weight models approach that point, there will likely be strong pressure from national security agencies in frontier states to prevent their release to mitigate the risks that these models be weaponized in dangerous ways. This would allow the gap with leading closed-source models to grow. Historical cases of other dual-use technologies (e.g., nuclear technology, cryptography) show how logics of national security and industrial advantage justified strict controls on international transfer. But AI differs in scope: in addition to security, frontier models may underpin a substantial portion of economic activity, aggravating the consequences of dependence or exclusion. Countries controlling frontier AI will have limited structural incentives to diffuse these capabilities globally.

3. Foundation model economics suggest **natural monopoly tendencies and widening moats**. The extreme fixed costs of frontier development (>$100M for model training) combined with low marginal serving costs create winner-take-most markets. The $500 billion Stargate investment and Amazon's $8 billion Anthropic stake indicate that leading actors believe frontier AI will generate durable advantages for its developers and growing capability gaps (rather than commoditization).
4. Although it appears cheaper initially, **fast-following imposes mounting costs through three mechanisms**: (1) frontier states capture significant economic gains from AI advances, creating revenue to fund further development that followers lack; (2) deploying behind-frontier models imposes efficiency costs on the entire domestic economy; and (3) maintaining even a fast-follower position requires continuous subsidization of capability-building and expensive reconstruction efforts, as demonstrated in other sectors.[25] Finally, if the leading AI systems reach the point where they can augment, emulate, or surpass the AI R&D capabilities of the top experts,[26] this would likely further increase the gap with both open-weight and weaker "fast follow" strategies. If AI capabilities continue to advance quickly, this competitiveness gap could become a serious economic weakness.

C. Feasibility and Timeliness of a Multinational Partnership

Large-scale, international research and development collaborations such as CERN, Airbus, ITER, Intelsat, and the Human Genome Project demonstrate the strengths and weaknesses of different approaches.[27] Drawing from these precedents, and without preempting the sovereign choices of founding members, a multinational partnership could feature:

(1) A semi-distributed structure, with a few core facilities, leveraging members' comparative advantages. Core facilities—fewer in number than the participating states—are necessary to create a critical mass of talent. Similarly, distributed compute can be leveraged,[28] but compute concentrations will continue to convey marginal performance advantages.

(2) Equitable cost and benefit sharing through funding, distributed in-kind contributions, and licensing arrangements. Other international research collaborations provide models for these processes.[29] In some cases, licensing rights would be shared by all members;[30] in others, licensing agreements could distribute benefits according to the scale of funding and in-kind contributions; in any case, any agreement must both protect existing IP and make provision for sharing collaboratively-developed IP (including not just patents but also collaboratively-developed industrial secrets).[31] Research findings could be regularly shared among members. Flexible participation models could accommodate varying levels of engagement, from founding members to research partners, enabling broader international cooperation while preserving core members' strategic autonomy and taking into account national security risks.

(3) A commitment to responsible AI development as a strategic goal and talent attractor. Leading voices within the AI research community have expressed growing concern over the impact and opacity of frontier AI progress, particularly within concentrated and unaccountable corporate ecosystems. This disquiet has generated interest in alternative models grounded in transparency, safety, and democratic legitimacy. This research community sentiment is a strategic asset to an AI bridge power partnership. Coupled with access to frontier-scale infrastructure and adequate compensation, leading researchers have strong motivations to join a responsible project in the service of their homelands and of humanity.

(4) Agile and streamlined governance architecture. The partnership's governance structure should enable rapid decision-making and resource deployment to avoid the coordination challenges and lengthy consensus processes that have hampered previous multinational initiatives in some cases. The partnership should learn from successful models that combine member state oversight with operational autonomy for appointed leadership, ensuring accountability without paralysis.[32]

(5) Strategic frontier development bets. While scaling up the compute and data allocated to AI projects has yielded significant performance gains so far, there is no guarantee that further scaling will be a sufficient, efficient, or wise choice. It is **plausible that further AI capability advances, e.g., in reasoning, will require algorithmic advances beyond the currently established recipes**—a bridge power project can focus on such advances.

Moreover, the goals and stakeholders of such a partnership go beyond the intense short-term competition between the leading private AI labs: such goals might include sovereignty and guaranteed access, trustworthiness for sensitive government applications, and democratic legitimacy. Due to these differing aims, it makes sense for bridge powers to pursue different strategies to corporate labs, for example pushing advances in trustworthiness and ethical behavior of advanced AI. In this way, the partnership can pursue promising new approaches and find ways to leverage shared digital infrastructures (e.g. for pooled pre-training) as a foundation for diverse downstream uses.

Furthermore, because the frontier will keep moving, this effort should include investments on the spectrum from (many) highly exploratory small-scale research efforts to (a few, but diverse) larger-scale projects actually training the largest and most secure models, for which engineering and mission-driven R&D will dominate the costs.

Such a multinational partnership need not dominate the frontier to exert meaningful influence. Even without achieving absolute leadership, such a partnership would significantly enhance members' economic productivity, strengthen their military capabilities, and reduce dependence on foreign systems. Its strategic utility would extend further through the diplomatic leverage it engenders, strengthening the negotiating power of AI bridge powers on international AI policy and preventing unilateral rule-setting by the U.S. or China. Through its commitment to effective, responsible development, the partnership could also encourage such practices elsewhere through a race-to-the-top in the competition for scarce research talent.

Frontier AI's pace of development is accelerating, and a critical window of opportunity is closing. To seize the economic, security, and sovereignty benefits of this initiative, nations will likely need to take rapid action. Current frontier training costs remain within the reach of coordinated bridge powers; however, latecomers to AI development risk lasting strategic weakness given increasing barriers to entry, such as compute monopolies, talent drain, and entrenched geopolitical leverage.

D. Reversing Strategic Vulnerabilities: Benefits for Member Countries

The benefits of this initiative span economic, security, diplomatic, and socio-cultural domains, each measurably strengthening member states' strategic positions relative to frontier states and non-participating countries.

Domestic industries can gain competitive advantages through privileged foundation model access

Without frontier capabilities, member states may face a systematic erosion of economic competitiveness and GDP. If AI concentrates economic value in frontier-controlling states, domestic industries in non-frontier states may become price-takers, and their workforces may lose comparative advantages to foreign-controlled automation. If profits are concentrated in foreign states, automation-driven unemployment may rise, which may not be compensated by local governments;

and non-frontier states' innovation ecosystems and social safety nets are likely to struggle. Collective development would reverse this: guaranteed, cheap access to jointly-developed models would enable domestic firms to capture automation gains without dependency on foreign providers; structured licensing would stimulate local application ecosystems; and equitable benefit-sharing would ensure that economic growth accrues domestically rather than to foreign platforms.

Collective frontier development would also enable member nations' AI companies to focus on downstream developments, for example on post-training, application development, and domain-specific innovations. This would help bridge powers capture efficiency gains while preserving competitive domestic ecosystems, just as public utilities and transportation infrastructure allow private firms to specialize in higher-value activities rather than duplicating foundational capacity.

Member nations will have reduced foreign dependency, more protection against coercion, and more autonomous decision-making

Such a partnership would reduce member countries' technical dependency on foreign models and lessen their vulnerability to external coercion or disruption, allowing them to achieve greater independence from other frontier AI states in their strategic and economic decision-making.

Collective frontier capabilities will make members rule-makers in global AI governance

Collective AI capability would strengthen members' negotiating power, providing a pathway for participating governments to nurture international governance arrangements for AI that are aligned with their values and principles. Leadership in responsible AI development would also provide diplomatic leverage in international governance, strengthening the case for international collaboration and positioning members as more credible rule-makers rather than simply rule-takers. If the partnership successfully demonstrates that international collaboration can tackle frontier technical challenges, e.g. through shared compute, this would position the partnership as a global public good that advances responsible AI development and the common good even beyond its membership.

Ethical stewardship will build legitimacy that will durably attract talent, investment, and international partnership

Member nations would lead not only in innovation but in responsible development, leading in both its technical aspects (e.g., developing more reliable models) and in its governance aspects (with decision power distributed rather than concentrated). These attributes would enhance members' domestic and international legitimacy, attract responsible investment and top researchers who increasingly reject opaque corporate development, and provide a strategic narrative that would resonate with citizens and industry alike.[33]

Finally, this investment is not all-or-nothing. Whether the partnership reached the frontier or not, it would yield valuable outputs, like attracting world-class AI talent currently abroad or working for foreign companies; collecting high-quality datasets; building domestic AI ecosystems capable of deep technical engagement with frontier capabilities; developing infrastructure that reduces downstream application costs; strengthening government capacity to deploy AI for more efficient public services; or fostering CERN-like spillovers that would generate domestic commercial returns. Still, only by developing frontier-competitive capabilities will the partnership reduce members' vulnerability to the dependency and weakness risks outlined above.

Acting now preserves option value: if AI capabilities plateau, coordination costs remain modest and infrastructure investments serve national priorities; if frontier AI proves economically transformative, collective capabilities provide sovereignty and competitive advantage.

Notes

[1]We use 'AI bridge powers' to describe countries possessing significant AI development capabilities such as research and engineering talent, data resources, and compute infrastructure, but lacking the scale to independently sustain frontier development.

[2]Note: This memo contains hyperlinks. For a complete list of URLs, see the bibliography section.

[3]We use 'frontier AI states' to describe countries that possess the integrated capabilities to independently develop, deploy, and continuously advance frontier AI models, defined as AI systems at or near the current state-of-the-art in key capabilities.

[4]Some existing AI-specific initiatives are also pursuing similar goals. One example is the Trillion Parameters Consortium, a global collaboration between major supercomputing centres and research labs to develop and use very large AI models for scientific and engineering purposes.

[5]'H100 equivalents' is an approximate comparison of AI computing power. Source: Epoch AI, Data on GPU Clusters, as of 25/10/2025.

[6]The Stanford 2025 AI Index Report already documents significant AI adoption across healthcare (diagnosis, drug discovery), education (personalized learning), scientific research (protein folding, materials science), and defense applications (autonomous systems, intelligence analysis).

[7]A third, still worse outcome looms: complete exclusion from frontier-dependent economic sectors. As AI-driven automation eliminates labor as a meaningful input, partner nations without frontier access may find themselves unable to participate in entire economic sectors at any cost.

[8]Government deployment of frontier AI deserves particular attention: while private firms can switch suppliers when dependencies become problematic, citizens cannot opt out of public services (revenue, health, education), creating compounded vulnerabilities when these monopoly providers depend on foreign AI systems.

[9]Incidents such as cloud service outages highlight the impact of reliance on concentrated ecosystems.

[10]Decisions about what content to prioritize in training data, what behaviors to reinforce or suppress during training, and what cultural norms to embed in response generation then influence the myriad applications built on top.

[11]See the concerning recent advances in cyberattack capabilities of frontier models, with both documented actual attacks and zero-day and other software vulnerability discovery benchmarks.

[12]In practice, this means U.S.-produced GPUs.

[13]Table adapted from Public AI Network (2025), "An Airbus for AI", page 4 ("How does your country access frontier AI?"). Available at: https://publicai.co/airbus-for-ai.pdf. The revised table presented here also evaluates the multinational partnership model. Strategy definitions: 1) 'Import closed models' refers to purchasing API access or licenses for proprietary models (e.g., GPT, Claude, Gemini); 2) 'Adopt open models' means deploying publicly released open-weight models (e.g., Llama, Mistral); 3) 'National champions' involves relying on domestic AI companies (that are usually behind the frontier in the case of bridge powers); 4) 'Multinational partnership' proposes pooled resources and governance among multiple countries.

[14]Some of this capacity can be pooled for coordinated development tasks (e.g., pre-training) through distributed training approaches that network datacenters across borders, while other workloads can run independently at individual facilities (e.g., deployment-time inference, specialized fine-tuning).

[15]This usually involves multiple training runs, experiments, and rapid iteration on failed approaches over the course of each successive generation.

[16]Even then, such levels of spending would only be achievable by very few bridge powers.

[17]These figures represent the cost per training run and per compute cluster build, not annual budgets. Leading AI labs

may undertake multiple such projects per year.
Leading Training Run Costs: Baseline of $480M (2025, Grok-4 total amortized cost including hardware and electricity, excluding talent; Epoch AI). Projected using 2.4x annual growth rate derived from 2016–2024 historical trends for most compute-intensive models (Cottier et al., 2024). Anthropic CEO anticipates $5–10B runs by 2026 (vs. our $1.15B). Cambridge researcher Haydn Belfield estimates $1–10B by 2028 and $10–100B by 2030 (vs. our $6.62B by 2028).
Leading Compute Cluster Costs: Baseline of $3B (2025, Grok-3 hardware acquisition cost including GPUs, server components, and networking; Epoch AI). Projected using 1.9x annual growth rate from 2019–2025 historical trends for leading AI supercomputer hardware costs (Pilz et al., 2025). Aschenbrenner forecasts "$100s of billions" of clusters by 2028 and "$1T+" by 2030 (vs. our $20.58B by 2028). Cambridge researcher Haydn Belfield estimates $10–100B by 2028 and $100B–$1T by 2030.
Note: These figures are "based on a methodology that lacks reliability or has significant limitations, and the resulting values or measurements should be interpreted with caution" (Epoch AI).

[18]This assumes continued access to advanced computing hardware, much of which is sold by U.S. companies. Reducing this dependency would require parallel investment in domestic semiconductor capabilities.

[19]The partnership would not be obligated to pursue short-term shareholder profit or market share and could thus make more strategic use of its resources in the pursuit of safe, transformative AI capabilities.

[20]This memo focuses on training infrastructure required for frontier model development rather than inference infrastructure for deployment. Specific deployment strategies may be determined by partnership members based on use cases, sovereignty considerations, and economic efficiency.

[21]Section A above outlines the different vulnerabilities associated with dependency on foreign digital systems. Regarding compute providers, this includes: data and algorithms lacking security guarantees, foreign providers injecting vulnerabilities or manipulating model behavior, and compute access being severed if geopolitical competition intensifies. This assessment of foreign compute may change over time, especially if advances are made in AI hardware security and verification which make it much more difficult for a compute provider to exploit their physical access to the infrastructure.

[22]Figure derived from Google Scholar's top 100 most-cited researchers tagged "machine learning" as of 25/10/25. The 87 figure represents researchers either (a) currently affiliated with institutions outside the U.S. and China, or (b) who originate from countries other than the U.S. or China, based on publicly available biographical information.

[23]And these dependencies may affect even frontier states: U.S. startups increasingly adopt Chinese open-source models.

[24]See the August 2025 report, "Opportunities to Strengthen U.S. Biosecurity from AI-Enabled Bioterrorism: What Policymakers Should Know", among other sources, such as Anthropic's activation of AI safety level 3 protections: "We are deploying Claude Opus 4 with our ASL-3 measures as a precautionary and provisional action. [...] due to continued improvements in CBRN-related knowledge and capabilities, we have determined that clearly ruling out ASL-3 risks is not possible".

[25]For example, U.S. semiconductor reshoring required $500+ billion over 20 years with ongoing subsidies to offset cost disadvantages, while aerospace R&D's "formidable barrier" demanded "determined government policies" and sustained capability-building to challenge incumbent advantages.

[26]See Clymer et al. 2025 as well as the Oct 15, 2025, Key Update of the International AI Safety Report.

[27]These precedents would need to be adapted significantly in order to achieve the required agility and speed of execution, given current trends in the growth of AI capabilities.

[28]The Franco-British collaboration between GENCI and the University of Bristol on distributed and federated learning shows that it is already possible for countries to pool compute capacity without centralising sensitive data or depending on a single operator. Federated learning allows sovereign compute centres to contribute to a shared training workflow while maintaining full control over their datasets and infrastructure. Advancing this line of work could let actors pool resources, cut duplication, and develop AI collaboratively without compromising sovereignty.

[29]While no direct precedent exists for multinational frontier AI development, CERN's proportional contribution model and collaborative governance offer relevant frameworks: members could contribute funding, compute infrastructure, data, or talent in calibrated amounts, with licensing rights and access scaled accordingly.

[30]The partnership's founding members would determine whether models are: (a) licensed, (b) deployed by a central entity with member access, (c) openly released, (d) other options or (e) combinations thereof. This document does not prescribe a specific model but assumes for illustrative purposes that they will be licensed.

[31]While patent policy is generally subject to careful consideration in large-scale collaborative ventures, frontier AI development relies primarily on trade secrets rather than patents, as leading labs avoid revealing crucial technical information.

[32]The partnership should also not replicate pitfalls related to weak coordination, short-term funding, and reliance on general-purpose agencies or bodies not designed for work on frontier AI development.

[33]An additional related benefit is that multinational development structurally incentivizes broader technology diffusion compared to monopolistic control. Single states face few internal constraints on restricting access to preserve economic and security advantages. By contrast, the presence of member states with differing strategic interests makes blanket withholding harder to sustain.

Bibliography

- Adamson, G., & Allen, G. C. (2025). *Opportunities to Strengthen U.S. Biosecurity from AI-Enabled Bioterrorism: What Policymakers Should Know*. https://www.csis.org/analysis/opportunities-strengthen-us-biosecurity-ai-enabled-bioterrorism-what-policymakers-should
- Anthropic. (2024). *Powering the next generation of AI development with AWS*. https://www.anthropic.com/news/anthropic-amazon-trainium
- Anthropic. (2025a). *Activating AI Safety Level 3 protections*. https://www.anthropic.com/news/activating-asl3-protections
- Anthropic. (2025). *Disrupting the first reported AI-orchestrated cyber espionage campaign*. https://assets.anthropic.com/m/ec212e6566a0d47/original/Disrupting-the-first-reported-AI-orchestrated-cyber-espionage-campaign.pdf
- ARIA. (n.d.). *Safeguarded AI*. https://aria.org.uk/opportunity-spaces/mathematics-for-safe-ai/safeguarded-ai
- Belfield, H. (2025). *Domestic frontier AI regulation, an IAEA for AI, an NPT for AI, and a US-led Allied Public-Private Partnership for AI: Four institutions for governing and developing frontier AI* (No. arXiv:2507.06379; Version 1). arXiv. https://doi.org/10.48550/arXiv.2507.06379
- Bengio, Y. (2025). Introducing LawZero. *Yoshua Bengio*. https://yoshuabengio.org/2025/06/03/introducing-lawzero/
- Chavez, P. (2024). Sovereign AI in a Hybrid World: National Strategies and Policy Responses. *Lawfare*. https://www.lawfaremedia.org/article/sovereign-ai-in-a-hybrid-world--national-strategies-and-policy-responses
- Clymer, J., Duan, I., Cundy, C., Duan, Y., Heide, F., Lu, C., Mindermann, S., McGurk, C., Pan, X., Siddiqui, S., Wang, J., Yang, M., & Zhan, X. (2025). *Bare Minimum Mitigations for Autonomous AI Development* (No. arXiv:2504.15416). arXiv. https://doi.org/10.48550/arXiv.2504.15416
- Congressional Research Service. (2001). *Encryption Export Controls*. https://web.archive.org/web/20190228095041/http://www.au.af.mil/au/awc/awcgate/crs/rl30273.pdf
- Cottier, B. (2024). *How far behind are open models?* Epoch AI. https://epoch.ai/blog/open-models-report
- Cottier, B., Rahman, R., Fattorini, L., Maslej, N., Besiroglu, T., & Owen, D. (2025). *The rising costs of training frontier AI models* (No. arXiv:2405.21015). arXiv. https://doi.org/10.48550/arXiv.2405.21015
- Donnelly, J. M. (2022). *Cost to rebuild US semiconductor manufacturing will keep growing*. https://techxplore.com/news/2022-02-rebuild-semiconductor.html
- Emberson, L., & Somala, V. (2025). Build times for gigawatt-scale data centers can be 2 years or less. *Epoch AI*. https://epochai.substack.com/p/build-times-for-gigawatt-scale-data
- Epoch AI. (2024). *Machine Learning Trends*. Archive.Ph. https://archive.ph/Nzogc
- EuroHPC JU. (2024). *New Call to Procure the European Exascale Supercomputer, Alice Recoque*. https://www.eurohpc-ju.europa.eu/new-call-procure-european-exascale-supercomputer-alice-recoque-2024-09-09_en
- European Commission. (2025). *AI Factories*. https://digital-strategy.ec.europa.eu/en/policies/ai-factories
- Farrell, H., & Newman, A. L. (2019). Weaponized Interdependence: How Global Economic Networks Shape State Coercion. *International Security*, *44*(1), 42–79. https://doi.org/10.1162/isec_a_00351
- Goodin, D. (2025). *New hack uses prompt injection to corrupt Gemini's long-term memory*. Ars Technica. https://arstechnica.com/security/2025/02/new-hack-uses-prompt-injection-to-corrupt-geminis-long-term-memory/
- Gooding, M. (2025). *Cities across Europe line up to host EU's AI "gigafactories."* https://www.datacenterdynamics.com/en/news/cities-across-europe-line-up-to-host-eus-ai-gigafactories/
- Google Scholar. (n.d.). *Researchers tagged "Machine Learning."* https://scholar.google.com/citations?view_op=search_authors&hl=en&mauthors=label:machine_learning&before_author=vsT-_

_H1DgAJ&astart=0
- IEEE Spectrum. (2025). *Europe's First Exascale Supercomputer JUPITER Powers Science*. https://spectrum.ieee.org/jupiter-exascale-supercomputer-europe
- International AI Safety Report. (2025). *First Key Update: Capabilities and Risk Implications*. https://internationalaisafetyreport.org/publication/first-key-update-capabilities-and-risk-implications
- Kleinman, Z. (2025). *What caused the AWS outage—And why did it make the internet fall apart?* https://www.bbc.com/news/articles/cev1en9077ro
- Knowledge Centre Data & Society. (2025). *Invest AI initiative*. EN. https://data-en-maatschappij.ai/en/publications/europese-commissie-invest-ai
- Lambert, N. (2023). *DeepSeek V3 and the cost of frontier AI models*. https://www.interconnects.ai/p/deepseek-v3-and-the-actual-cost-of
- Lee, S. (2025). *Securing the Backbone of Artificial Intelligence: Protecting Data Centers*. New America. http://newamerica.org/future-security/reports/securing-the-backbone-of-ai/
- Maletta, G. (2025). *Non-proliferation, Nuclear Technology and Peaceful Uses: Examining the Role and Impact of Export Controls*.
- McGuire, S., & Islam, N. (2015). Indigenous technological capabilities, emerging market firms and the aerospace industry. *Technology Analysis & Strategic Management*, *27*(7), 739–758. https://doi.org/10.1080/09537325.2014.959482
- Moretti, E. (2021). The Effect of High-Tech Clusters on the Productivity of Top Inventors. *American Economic Review*, *111*(10), 3328–3375. https://doi.org/10.1257/aer.20191277
- OpenAI. (2025b). *Announcing The Stargate Project*. https://openai.com/index/announcing-the-stargate-project/
- Pancevski, B. (2020). Officials Say Huawei Can Covertly Access Telecom Networks. *Wall Street Journal*. https://www.wsj.com/articles/u-s-officials-say-huawei-can-covertly-access-telecom-networks-11581452256
- Pang, J., & Pomfret, J. (2024). *Chinese researchers develop AI model for military use on back of Meta's Llama*. Reuters. https://www.cnbc.com/2024/11/01/chinese-researchers-build-ai-model-for-military-use-on-back-of-metas-llama.html
- Pilz, K. (2025). *Data on GPU clusters*. Epoch AI. https://epoch.ai/data/gpu-clusters
- Pilz, K. F. (2025). *The US hosts the majority of GPU cluster performance, followed by China*. Epoch AI. https://epoch.ai/data-insights/ai-supercomputers-performance-share-by-country
- Pilz, K. F., Sanders, J., Rahman, R., & Heim, L. (2025). *Trends in AI Supercomputers* (No. arXiv:2504.16026). arXiv. https://doi.org/10.48550/arXiv.2504.16026
- Rosenberg, S. (2025). *Mark Zuckerberg fuels AI's talent lottery with high pay offers*. Axios. https://archive.ph/2FYgO
- Sett, G. (2024). *How AI Can Automate AI Research and Development*. https://www.rand.org/pubs/commentary/2024/10/how-ai-can-automate-ai-research-and-development.html
- Shen, X. (2025). *China's AI capital spending set to reach up to US$98 billion in 2025: BofA*. South China Morning Post. https://www.scmp.com/tech/tech-war/article/3315805/chinas-ai-capital-spending-set-reach-us98-billion-2025-amid-rivalry-us
- Smith, T. (2023). *'The economics of trading equity for compute are not great'—Mistral releases its first model*. Sifted. https://sifted.eu/articles/mistral-releases-first-ai-model/
- Stanford HAI. (2025). *The 2025 AI Index Report*. https://hai.stanford.edu/ai-index/2025-ai-index-report
- Stevens, R., Matsuoka, S., Valero, M., Catlett, C., Foster, I., & Gagliardi, F. (2025). *The Trillion Parameter Consortium (TPC)*.
- Subin, S. (2025). *Tech megacaps plan to spend more than $300 billion in 2025 as AI race intensifies*. CNBC. https://www.cnbc.com/2025/02/08/tech-megacaps-to-spend-more-than-300-billion-in-2025-to-win-in-ai.html
- Suominen, A., Kauppinen, H., & Hyytinen, K. (2021). 'Gold', 'Ribbon' or 'Puzzle': What motivates researchers to work in Research and Technology Organizations. *Technological Forecasting and*

Social Change, *170*, 120882. https://doi.org/10.1016/j.techfore.2021.120882

- Tan, J., Jackson, B., Berjon, R., & Coyle, D. (n.d.). Airbus for AI: A global strategy for public value creation. *Bennett School for Public Policy, University of Cambridge*. https://publicai.co/airbus-for-ai.pdf
- Temple-Raston, D. (2021). A "Worst Nightmare" Cyberattack: The Untold Story Of The SolarWinds Hack. *NPR*. https://www.npr.org/2021/04/16/985439655/a-worst-nightmare-cyberattack-the-untold-story-of-the-solarwinds-hack
- The Ezra Klein Show. (2024). What if Dario Amodei Is Right About A.I.? *The New York Times*. https://www.nytimes.com/2024/04/12/opinion/ezra-klein-podcast-dario-amodei.html
- Tiku, N. (2024). Top AI researchers say OpenAI, Meta and more hinder independent evaluations. *The Washington Post*. https://www.washingtonpost.com/technology/2024/03/05/ai-research-letter-openai-meta-midjourney/
- Todd, B. (2025). When do experts expect AGI to arrive? 80,000 *Hours*. https://80000hours.org/2025/03/when-do-experts-expect-agi-to-arrive/
- University of Bristol. (2025). *UK-France Summit: University of Bristol to lead a supercomputing partnership with France*. https://www.bristol.ac.uk/news/2025/july/france-ai-partnership.html
- Verification for International AI Governance. (n.d.). *Oxford Martin AIGI*. https://aigi.ox.ac.uk/publications/verification-for-international-ai-governance/
- Vipra, J., & Korinek, A. (2023). *Market Concentration Implications of Foundation Models* (No. arXiv:2311.01550). arXiv. https://doi.org/10.48550/arXiv.2311.01550
- Wang, Z., Shi, T., He, J., Cai, M., Zhang, J., & Song, D. (2025). *CyberGym: Evaluating AI Agents' Real-World Cybersecurity Capabilities at Scale*. https://rdi.berkeley.edu/blog/cybergym/