Diffusion of Power and Multiplexed Governance Evolving Networks and Clusters for Global Governance of Artificial Intelligence Infrastructures*

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Abstract

Over 60 countries and international organizations have announced and published artificial intelligence policies beginning with the United States in 2016. The paper locates these policies in the shift from a hierarchical distribution of power to a flatter diffusion of power in which systemic interactions are top-down, bottom-up, and horizontal. A diffusion of power across multiple actors and regions weakens both the material and socialization capabilities of hegemonic actors. The computational models employed in this paper show the complex networks and clusters that outline the patterns of global governance for the evolving artificial intelligence infrastructure. These networks and clusters cast doubt or modify many of the extant theories of global governance: ones rooted in material power wherein hegemonic states shape global governance, those where normatively motivated actors shape governance in national contexts, or ones where regional patterns (North-South, East-West) are easily discernible. Instead, the paper locates the origins of multiplexity in a diffusion of power entailing intersecting networks, regions, actors, and worldviews. There are leaders and great powers but the rest are not followers but actors in a diffused power scenario in which multiple ontologies about the world co-exist. For evidence, this paper questions the parsimony of existing explanations through empirical methods that outline the multiplexed outcomes as probabilistic explanations through generalizable computational models. The paper employs big data mining, specifically LDA models from computer science, and process tracing to provide evidence of governance mechanisms for artificial intelligence. The results reveal complex patterns of global governance.

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1 Introduction

Global governance consists of recognized institutions and charters, explicit global rules, and implicit collective understandings among global actors (Rosenau and Czempiel, 1992). Patterns of global governance have been historically explained in various international relations theories through global distribution of material resources in which hegemonic powers constrain or expand options (Drezner, 2008; Farrell and Newman, 2019), national and international governance agendas respond to market and other actors (Zacher and Sutton, 1996; Singh, 2008) or capitalist ideologies (Cox, 1996; Singh, 2025), or global actors champion norms through intense socialization (Finnemore and Sikkink, 1998; Guzzini, 2000). These explanations posit clearly identified outcomes such as the presence of a global liberal order or the presence of international norms traceable to socializing agents. One of the contentions of this paper is that global governance is not easily captured as a simplified outcome such as a global hierarchy of powers or a liberal international order, or even a dependent variable with a single outcome specified statistically as a vector in a matrix. To demonstrate its claims, the paper's evidence attends to perhaps the most important infrastructural and global governance issue of our times, namely artificial intelligence.

How do national and international actors coordinate their activities in important emergent issue-areas such as artificial intelligence (AI) infrastructures? The empirical evidence in this paper shows that the infrastructural rollouts in AI are not easily categorized as rival global orders (capitalist versus non-capitalist, for instance), competition among rival great power blocks, or the product of socialization through international actors. If anything, the evidence presented below contains elements of all these international processes, which leads us to

characterize the global governance outcomes as "multiplexed" (Acharya, Estevadeordal and Goodman, 2023; Acharya, 2017).[1]

While the emerging "networks and clusters" among types of AI infrastructures conform to Amitav Acharya's notion of multiplex forms of governance, multiplexity can be understood as a world order outcome that describes emerging patterns of governance, and begs for an explanation regarding its origins. Therefore. scholars working on mutliplexity and similar frameworks such as "interlocking regional works" have noted the importance of regional and intersecting networks, and the trickle-up of local and regional and epistemes and values (Fisher-Onar and Kavalski, 2022). Most of these ontologies are theoretical but descriptive, though recent work has begun to use network analysis (Acharya, Estevadeordal and Goodman, 2023). This paper utilizes computational models to highlight the convergences and divergences among AI networks. Such network analyses feature interlocking and divergent pathways that do not conform to simple linear explanations that describe outcomes shaped through distribution or weaponization of capabilities, or the socialization of actors around some pre-ponderant norms or ideologies.

The paper locates the explanation for mutiplexity in the shift from a hierarchical distribution of power to a flatter diffusion of power in which systemic interactions are top-down, bottom-up, and horizontal. A diffusion of power across multiple actors and regions weakens both the material and socialization capabilities of hegemonic actors. Global AI infrastructures and policies are emerging when top-down enforcement capabilities of powerful nation-states to order the world to their liking continues to break down or be challenged.

This paper examines national AI policies and selected United Nations (UN)

[1] Amitav Acharya's formulation calls it 'multiplexity' after multiplex theaters in India that offer a variety of services – films, vendors, video-games. While appreciating the diversity of interlocked outcomes, this paper's use of 'multiplexed' as verb calls attention to multiplexity as a variable process rather than just a fixed noun (thing) in the same way as we may distinguish between a network and a networked process.

level AI reports for the multiplexity outcomes. Arguably the most impactful technology of the 21st century, AI's rapid global rollout is taking place in an era that is often characterized as de-globalization and less multilateralist than in the post-war 20th century. AI policies are then an important case for examining complex global governance processes in a diffusion of power. AI infrastuctures constitute the processing or manipulation of large data sets with machine learning algorithms. Although AI was identified (or coined as a term) since the 1950s, it is only in the last decade that states have begun formulating national strategies for AI infrastructures, and international organizations are often involved in trying to shape AI infrastructures through directives and reports. These policies include security and regulatory issues for data and algorithms, benchmarks and standards, workforce training, human rights issues, and innovation and competitiveness. This paper utilizes computer science methodologies to examine how actors' expectations converge or diverge around norms, rules, and decision-making procedures embedded in national AI infrastructures or fostered through UN organizations.[2]

While this paper analyzes AI policies from national governments and international organizations, the analysis makes clear the priortizations and expectations from a host of other actors that include societal stratifications (labor, class, gender, youth, etc.), occupations (commerce, health, education, transportation), civil society (NGOs, human rights groups, data privacy organizations), businesses (start-ups, big-tech, firms, commercial organizations), and educational and research organizations. The analysis of the state also shows the involvement of various agencies, ministries, and regulatory organizations.

Our explanation is not dismissive of hierarchical capabilities among states or IOs in terms of leading or influencing other states or IOs. In fact, our com-

[2]The last sentence draws from regime theory in global governance. See Krasner (1983) for regime definition.

putational methodologies point out clear 'leaders' in AI infrastructures in terms of their capabilities. However, our analysis shows that leaders do not lead as clearly as once thought, and many 'non-leaders' have many opportunities for empowerment and not just suffer as they must, as Thucydides characterized their lot. This claim in equally about capabilities as it is about global justice. Earlier we hinted at regime theory in which hegemonic or leading powers often played a preeminent role in making actor expectations converge. Global actors have not shied away from playing leadership roles, but their activities are not as hegemonic as once imagined. Other hegemocic actors such as Microsoft or leading universities also play different roles when assisting with AI efforts on low-resource languages or designing machine-learning for development efforts in health, agriculture, and education. Second, global actors can be non-hegemonic, and global understandings about AI can arise from leading and non-leading states. Global crowdsourcing platforms such as Ushahidi or mobile-money ones such as M-Pesa, both of which now employ machine-learning algorithms, arose in Kenya. These platforms have introduced new understandings in our politics about everyday participation (Ushahidi) or the transactions capacities and velocity of money (M-Pesa).

In the analysis presented below of national AI infrastructures, the leading powers do what they can, but the non-leaders do not suffer as they must. They cluster with others, join complex networks, and sometimes even make the great suffer as they must. The diffusion of power in the world today among complex and interlocking networks and regional or international clusters is not without sources of power or disruption (such as through weaponization or misinformation, for example), but it is equally about a mutiplex world. The clusters and networks presented in a diffusion of power help us explain these multiplex outcomes. As we will see below, computational methods provide an interlocking

way of examining processes and outcomes, that we have elsewhere descrived as "entangled narratives".

This paper proceeds as follows. The next section posits diffusion of power as a generalized condition leading to multiplexed outcomes in the world. Second, we outline the computational methodology we employ to outline the emergent clusters and networks of global AI governance. Next, we present the empirical results before returning to the broad theme of global governance in the concluding discussion.

2 Diffusion of Power and Multiplexity

The variability of AI policies covering issues of business, society, politics, and regulation is as remarkable as the fact that most of these policies are less than a decade old. While AI commanded the attention of data scientists and psychologists since the 1950s, it was not until big-tech platforms such as Google, Amazon, Facebook (now Meta), Alibaba, and Tancent began using algorithms to process user or consumer data, that AI became "visible" and of concern to policy-makers, regulators, firms, and societal actors. These concerns varied from regulations on data-storage and flows to boosting skills for economic development and competitiveness. With the ability to manipulate individuals as voters, consumers, or activists, challenges have arisen about the ubiquitous presence of AI in political and social realms. For example, stovepiping or channeling groups through ideologically aligned media can threaten compromise or deliberation that are core to democratic processes.

AI is now an omni-present global term. Starting with the US and Canadian national AI strategies in 2016, over 60 countries and several UN and other international organizations have now published strategies and policy recommendations for AI infrastructures. These reports are often aspirations for the future,

but they also document existing needs and capabilities. For instance, most developing countries link AI infrastructures to developmental goals in areas such as agriculture and health, while the policies from leading (great) powers in AI are about growing basic science capabilities and maintaining competitive advantage. In past research, we have noted that the policies borrow from a *prix-fixe* menu of options, but that the way the countries borrow from this may depend on a variety of domestic, regional, and international factors (Singh et al., 2025, 2023).

Importantly, infrastructures have their own "dispositions" or "affordances" – terms connoting the way technologies enable or constrain particular policies and actions (De Goede and Westermeier, 2022; Earl and Kimport, 2011). For example, the ability to manipulate vast amounts of data about users and then stovepipe their actions through recommender algorithms is a peculiar quality of AI infrastructure. As science, technology and society (STS) scholars have long-argued, technological infrastructures themselves have agentic power. They embody past values and priorities and shape future ones (Winner, 1980; De Goede and Westermeier, 2022). To make the connection with policies and regulations, AI infrastructures have brought to fore concerns such as privacy, surveillance, and cybersecurity as a result of the ability to manipulate vast amounts of data.

Moving beyond infrastructural affordances, various types of international influences and interactions remain important for understanding AI rollouts. The distinction this paper makes between hierarchical distribution of power versus diffusion of power is especially important. Diffusion of power is both material and ontological. The material aspects of diffusion of power points to flattened hierarchies and cross-crossing ties among multiple actors in an international system. The ontological aspects refer to collectively held beliefs and values that influence or, as posited above, are influenced through infrastructures. Table 1

captures the main elements of diffusion of power as opposed to hierarchical distributions of power.

Characteristic	**Diffusion of Power**	**Hierarchy**
Dominant Worldview	Multiple and intersecting ontologies	Great power ontologies often framed as 'security'
Number of actors (states, international organizations, NGOs, MNCs)	Multiple	Framed as bilateral, even in pluralistic contexts (e.g. North-South, U.S.-EU, West-China)
Forms of Decision-making	Collective, Networked, Clustered	Hierarchical
Outcomes	Multiplexity	Simplexity

Table 1: Power Configurations and Outcomes
Note: adapted from Singh and Woolcock (2022, 5)

Hierarchical capabilities of actors in international and national political economies hold some value for explaining the rollout of infrastructural policies, and they remain an enduring explanatory feature of social sciences. In hierarchical environments instruments such as coercion or socialization will bind non-hegemonic and subaltern actors to obey or adopt top-down prerogatives. As the case of socialization shows, instruments of domination need not be material: they can be equally administrative and ideological. Sheer force can solve problems of collective action in a hierarchy and even bind the subaltern into accepting the benefits of public goods (Lake, 2009). Stephen Lukes (2005) also shows that the effects of power can be so total that the subaltern need not even realize that they are being dominated. The anthropologist James Scott has shown that the modernizing state developed its instruments of domination through an administrative "cadestral lens": the state developed its habit of domination through its power to count, categorize, and then affix subjects in roles (including as recipients of state favors) (Scott, 1998). If a state wants its

AI policies to benefit the poor, then it must count and categorize the poor. Similarly, a great power's provision of a public good uses a cadestral lens. Singh (2017) argues in *Sweet Power* that the public good of the liberal international order worked both by including and excluding the developing world, and the instruments of inclusion and exclusion included racialized ontologies that resulted in policies such as "special and differential treatment" of the developing world (Singh, 2017).

Hierarchies work best when they can be imposed, accepted, or internalized. However, the weapons of the weak have always entailed challenging or disobeying hierarchy (Scott, 1985). At a broader level, even if the great make the weak conform, it does not mean that the weak have acquiesced, unless the strong literally kill them – as in the Athenians killing the Melians during the Peloponesian war. Outside of the world of brutal force – for example, in matters such as data security policies – actors may have an enormous range of options. For example, while many EU states complain about the restrictions of EU's data protection policies, other states such as the Czech Republic and Estonia have leapfrogged through these data spaces with start-ups and AI providers.

Liberal international theory has always attributed more agentic power to actors than allowed in hierachical conceptions of politics. For example, Simmons and Elkins (2004) and Simmons, Dobbin and Garrett (2006) show that technology diffusion can result from a variety of processes including competition, learning, emulation, and coercion. Liberal conceptions of world order come closest to the diffusion of power processes described below. However, liberalism often takes its ontology as given rather than being dynamically constructed or changing as technologies evolve. These conceptions are also problematic for hierarchical distributions of power where technology adoption is a simple categorical variable to be switched on or off. In such conceptions, international

organizations succeed in making states conform to their diktats (Barnett and Finnemore, 1999), or powerful ideologies socialize actors into adopting policies and practices (Comor, 2001). In the latter world, big-tech companies produce almost complete ideological systems, where the material extractions and dominations are not immediately obvious. Crawford (2021) shows that AI depends on highly exploitative and material economies of resource extraction. Similarly, recent concerns about the negative environmental and energy impact of big tech has shown that "AI" has material roots (Edwards, Gelms and Shivener, 2023).

Diffusion of power could be seen in the liberal international order of the past but goes beyond it in according more agency to non-dominant actors and, as noted aboe, to technologies themselves. Liberal conceptions often rest on idealized models of market exchange where agentic behavior results in beneficial or pareto-optimal outcomes for many. Such ideals have in fact been critiqued as ideologies. In the words of Karl Polanyi (2024), laissez-faire was invented to increase the power of capitalism. Such critiques notwithstanding, material or ideological power is seldom so totalizing as not to allow for any deviation or variability in outcomes (Singh, 2025). Along with scholars of multiplexity, this paper's evidence presented later shows that the presence and outcomes of complex and variable outcomes is more regular than those of hierarchy. Importantly, multiplexity and hierarchy are not binaries but co-existent. For example, the presence of local values favoring forms of patriarchy does not make gender relations less hierarchical even when global human rights norms favor gender equality. Gender relations are varied and mutliplex. Therefore, our argument for multiplexity need not be taken to mean emancipatory possibilities unless multiplexity opens spaces for inclusion, deliberation, or contestability from a variety of actors. Imposition of autocratic and hierarchical practices in a multiplex world are exactly that. For instance, we show later that Chinese AI policies

are not predicated toward dialogues and human rights concerns as opposed to AI policies in pluralist states. Nevertheless, both types of states have also encouraged basic science capabilities and are locked in a competitive game in obtaining the most number of patents in AI. Taken together, mutiplexity allows one to see a more complex and bigger picture of convergences and divergences among political actors.

3 The Evidence for Multiplexity

The complex patterns of global governance are now spelled out through our empirical methodology that points to multiple entangled outcomes and clusters. We utilize a computer science technique known as Latent Dirichlet Allocation (LDA) to find topics or themes in documents, in this case national and international AI policies. The methodology can find more than one topic in a document and a topic may be shared in a probabalistic way (called Hellinger distance) with documents from other countries, which allows us to see how countries might share topics,

3.1 Methodology

The methodology extracts topic-based representations of any text – in our case national and international AI documents – via concepts and techniques that reside at the intersection of machine learning and natural language processing. The underlying framework is probabilistic in that it presents a topic as a probability distribution over jointly-occurring words. Specifically, the methodology we employ builds over the Latent Dirichlet Allocation (LDA) algorithm, which operationalizes the probabilistic framework and so builds probability distributions; each document is represented as a probability distribution over identified topics, and each topic is itself represented as a probability distribution over the

words in the vocabulary built over the entire corpus of documents.

We select LDA for our methodology for its faithfulness of extracting information from a given corpus (as opposed to hallucinating as now observed other generative models based on the transformer encoder-decoder architecture (Xu, Jain and Kankanhalli, 2024)).[3] However, as in many probabilistic frameworks (and computational methods), key decisions are presented to the user. In LDA, these concern the number of topics and two hyperparameters that control the shape of the Dirichlet distributions (that the algorithm builds for documents — over topics – and topics – over words). Therefore, the methodology we employ here explores the (configuration) space of these three parameters, building thousands of LDA models (each with their own topics) and then effectively merges the models via clustering to identify reliable topics and corresponding probability distributions that are not dependent on arbitrary user decisions.

What one obtains from our methodology are as follows: each document as a probability distribution over identified topics, and each topic 'defined' as a probability distribution over words. While the outputs are quantitative, they are amenable to visualization through clever data visualization techniques, as we do in this paper. For instance, a topic, while a probability distribution over words, can be visualized as a cluster of words, with the words rendered in font sizes that reflect the probabilities. A document, while a probability distribution over topics, can be visualized as a 'heat' vector, and doing so for all documents produces a heatmap, where the probability of a topic in a country is related with color, in a color scheme that is gradated to show low to high probabilities. Such a color scheme is shown in Figure 1. A yellow-to-blue color scheme tracks the low-to-high probability of a topic in a document.

Our methodology identifies 18 topics (over many LDA models with a com-

[3] AI produces probabilistic predictions from underlying data and texts, and can produce faulty predictions when the data sets are large or biased, something that can control in an LDA environment with limited texts and supervised learning

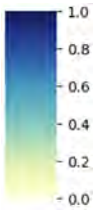

Figure 1: The color scale used in heatmap figures.

bined 2400 potential topics, merging highly similar topics yet allowing for topic overlaps to obtain a rich and nuanced picture). We draw a distinction here between 'training' and 'testing,' common terms in machine learning literature. Our methodology identifies topics by 'training' LDA models over a training dataset of document. Each document in the training dataset can be viewed as a probability distribution over the identified topics. However, the identified topics (over the training dataset) can additionally be 'tested' over a different dataset (corpus of documents). Any document not included in the training dataset can be re-formulated as a probability distribution over topics identified in a separate dataset. This approach allows us to investigate interesting hypotheses, such as for instance, what is the potential presence of topics identified in (that is, resulting from models trained over) Set A in a different Set B of documents (serving as a testing dataset).

It is worth noting that a topic may appear with different probabilities in different documents. Topics may also themselves be related to one another. Our analysis of the quantitative findings additionally allows seeing the correlation among topics because of common features (shared, highly-probable words). For example, topics in the German and US national plans, as we present below, are related because of their emphasis on federal processes and national standard or benchmarking agencies. We present potential topic overlaps through a heatmap, where the overlap/similarity between two topics is computed using two different similarity measures that are well-suited for comparing sets,

the Jaccard Similarity and Rank-Biased Overlap (Mantyla, Claes and Farooq, 2018; Hosseiny Marani and Baumer, 2023). The topic-similarity is computed as an average over the Jaccard Similarity and Rank-Biased Overlap between topics, computed over the word probability distribution of each topic's top 20, 50 and 100 words.

3.2 Results

We now present two sets of findings. Our first set of findings presents the topics we found in reports from national and international agencies (Figure 2 and Figure 3). Documents from these agencies are collected in a corpus over which the methodology trains LDA models and identifies topics. The national corpus of documents deals with national level AI strategies for broad comparison among countries. For the UN or EU documents, we used reports or directives that were in the form of guidelines or meant to provide a broad coverage of issues for all member-states. All documents from the same UN agency are combined in one document. UN agency-based documents and national documents are collected in a corpus over which the methodology identifies topics. Each document in the training dataset is available then as a probability distribution over topics.

Our second set of findings deals solely with international levels agencies (Figure 5). In this setting, we focus only on the UN documents. UN documents are not categorized and combined by UN agency but kept as separate in the training dataset so as to obtain a potentially rich and diverse landscape of topics. The testing dataset combines the documents by UN agency, and each UN agency then is available and analyzed as a probability distribution over the identified topics.

At a broad level, our findings show that except for the European Union, international reports are not heavily correlated with national plans. However, the

international reports are instructive for understanding how priorities are being set in global governance. The lack of high correlation among the plans from UN or international agencies leads us to conclude later that these agencies develop distinct areas of competence. Not surprisingly, the World Health Organization has emphasized patient and provider centered strategies, while the World Bank showcases a market-oriented development focus.

Now we describe the results in detail, starting first with our findings from Setting 1 described above. Figure 2 relates the documents-topics heatmap. It shows the countries and UN organization on the Y-axis and topics on the X-axis. The identified topics are presented as word clouds in Figure 3. Figure 4 relates topic similarities/overlaps. In all in this setting, there are 53 countries, the European Union, and 6 UN or UN-associated organizations analyzed here, a total of 60 documents (recall that potentially multiple documents by the same UN agency are merged in this setting). The UN or UN-associated organizations are the United Nations Secretariat, the International Telecommunications Union, UNESCO, the World Health Organization, World Intellectual Property Organization, and the World Bank. The EU is included because of the connections with member-states AI policies. In 2019, the EU also asked each of its member states to draft an AI policy and, therefore, the EU strategies precede those of many EU states.

The policies analyzed in the 60 sets of documents are national or AI strategies and the top-level or macro policy reports or recommendations from UN-associated agencies. Therefore, the set includes the ethics guidelines, regulatory considerations, and the digital health strategy from the WHO. At the UN level, we include the AI Advisory Body's interim report. Our LDA-based methodology outlines 18 major topics in these 60 sets of documents. Of these 18 topics, five topics seem to be exclusive to UN, while 14 cover national plans among

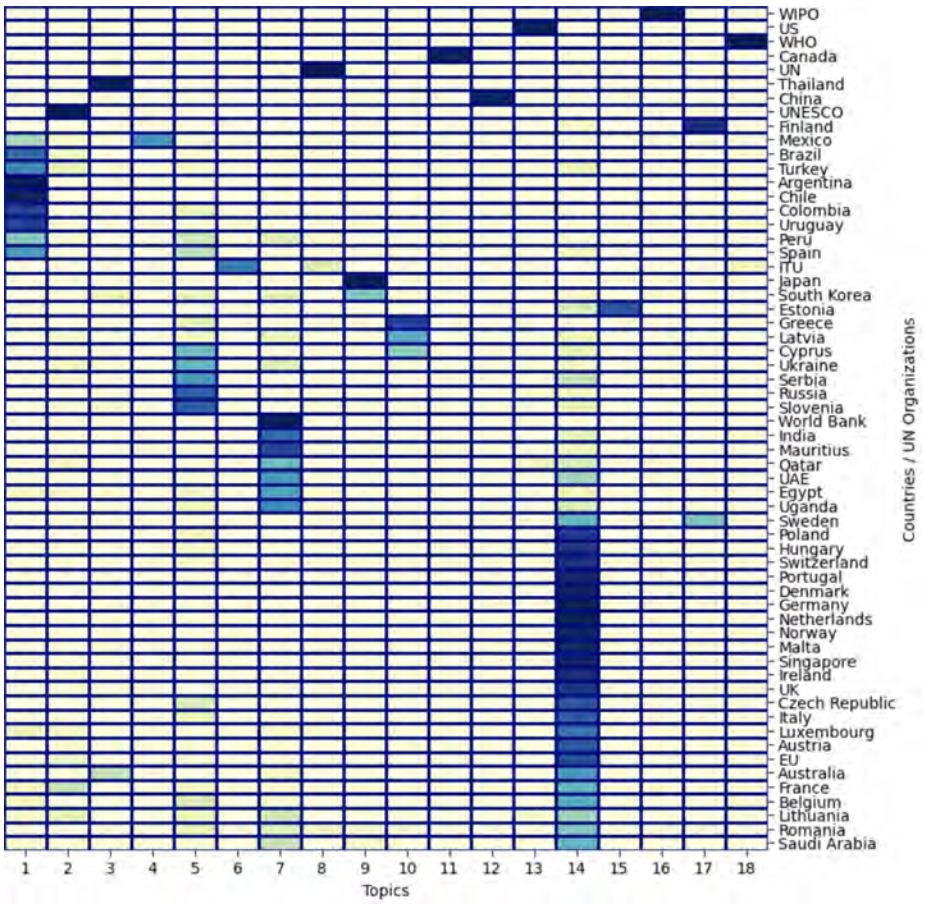

Figure 2: UN + National AI Infrastructures: Heatmap relating UN organization / country - topic distributions. The yellow-to-blue color scheme related earlier visually conveys low-to-high probabilities of topics in a given country or UN agency.

Figure 3: UN + National AI Infrastructures Topic Word Clouds. Font size visually conveys the probability with which a word is found in a given topic, with larger font sizes denoting higher probabilities.

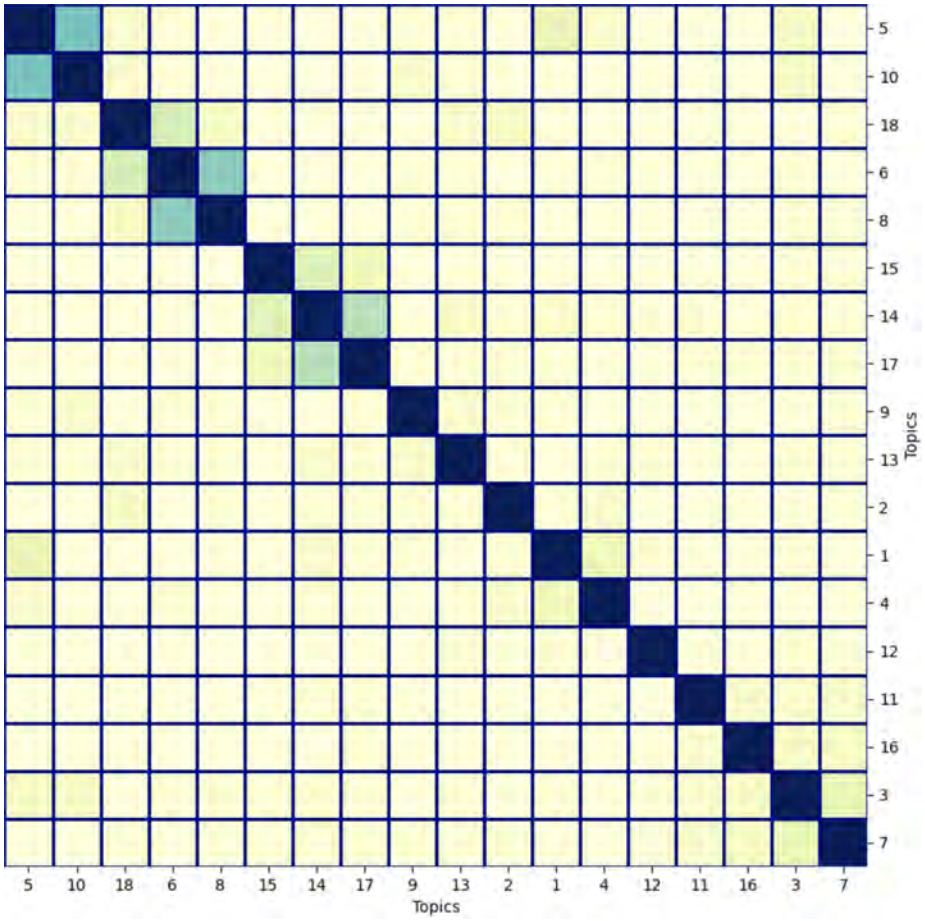

Figure 4: UN + National AI Infrastructures: Heatmap relating topic similarities. The yellow-to-blue color scheme visually relates low-to-high pairwise topic similarities.

countries.

Table 2 below lists the topics/themes in the national or IO plans. The first column provides the topic number and a label for the topic (for which we cleverly utilized ChatGPT to generate potentially informative labels as restricted by the word clouds in a topic). The second column lists the states or the international organizations where the top-level documents contain this topic more prominently present (at higher probabilities).

Table 2: Topics, Corresponding Highlighted Priorities and Associated UN Organizations / Countries

Topic Description / Highlighted Priorities	**UN Orgs / Countries**
1 – Incorporation of Labor & Freedom / Startup Schemes / Productive Axis & Inclusion / Instrument Evolution & Transformation	Argentina, Chile, Colombia, Uruguay, Brazil, Turkey, Spain, Peru, Mexico
2 – Journalism & Democracy / Algorithmic News & Inclusion / Global South & Civil Society / Cultural Implications & Media Diversity / Journalistic Competency & Gender Equality	UNESCO, France
3 – Strategic Plans in Entrepreneurship & Tourism / Agriculture / Startup & Manufacturing	Thailand, Australia
4 – Freedom of Expression & Discrimination & Federal Investigations / United Nations Articles on Bias / Equality & Indigenous Rights	Mexico
5 – Digitization & Upgrades / Tourism & Laboratory Utilization / Evaluation of Justice & Certification / Medium-Term Plans / Academy	Slovenia, Russia, Serbia, Ukraine, Cyprus, Spain, Peru, Czech Republic, Belgium, Greece
6 – SDGs & Multilateral Development Goals / Manufacturer Description & & COVID Response / Gender Bias in Medical Devices / Multimedia Outputs & SDG Impact	ITU
7 – IFC Investments / Emerging Markets / Blockchain / Farmers / Startups / Transportation	World Bank, Mauritius, India, Uganda, UAE, Egypt, Qatar
8 – SDGs & Development Goals / Gender Gaps / Food Security & Water / Lessons from Nuclear Development	UN, ITU

9 – Mathematical Models / Disaster Response & Diversity / Labor Reform & Venture Architecture / Domestic Welfare & Food Security / Inclusion	Japan, South Korea
10 – Digitization & Registry Upgrades / Tourism & Short-Term Contracts / Certification in Cultural Equipment / Digital Records / Cyber Security Measures	Greece, Latvia, Cyprus
11 – Startups & AI Research Centers / Deep Learning / Occupational Trends & AI Index / University Research Fellowships / Brain Research & AI Faculty	Canada
12 – Theory / Unmanned Equipment & Military Hardware / Cluster Chain & Quantum Evaluation / Home Perception & Defense Architectures / Deep Learning / Manufacturing	China
13 – Strategy / Benchmarking / Societal Perception & Bias Testing / Understanding Defense / Effective Testbeds / Interface Leverage / Federalism	US
14 – Programs in Digitalization / Economic Affairs & Societal Trustworthiness / Climate Dialogue & Ministerial Initiatives / Labour Market Strategies / Action Plans in Defence	Germany, Netherlands, Denmark, Norway, Malta, Singapore, Portugal, Ireland, Switzerland, UK, Hungary, Poland, EU, Czech Republic, Italy, Austria, Luxembourg, Australia, Belgium, France, Saudi Arabia, Sweden, Romania, Lithuania, UAE, Serbia, Estonia, Qatar, Uganda, India, Cyprus
15 – Artificial Intelligence & Liability / Expert Group in Digitalization / Specialization in Programme Management / Chatbot Sustainability & Managerial Clarity / Obstacles to AI Implementation	Estonia
16 – Patents & Intellectual Property / Deep Learning in Patent Applications / Global IPJurisdictions / NLP	WIPO
17 – Economic Affairs & Digital Utilization / AI Accelerators / Startup Trials / Societal Reforms & Labour Market Themes	Finland, Sweden
18 – Clinical Evaluation & Medical Device Validation / Regulatory Engagement & Accountability / Accuracy / Consent & Accountability / Clinician Diagnosis	WHO, ITU,

There are five findings at the national-international levels that validate our thesis regarding multiplexity. These findings present cross-cutting priorities across state and IOs in terms of uniformity, diversity, and clusters further enhanced through a close examination of topics themselves as they relate to these five findings. The broad features of this multiplexity are explained here.

Uniformity: While this may not be readily obvious when looking at the different word clouds for each topic, there is uniformity across countries on some of the main features that occur in different ways in different countries/organizations. These include policy and regulatory concerns such as those about algorithms, data, harm and liability. Further shared concerns relate to start-ups, education and training.

Heterogeneity: The heterogeneity follows from the uniformity: the way countries prioritize and shape the main features and issues mentioned above varies among countries. Another form of heterogeneity is the depth or probability with which a topic may be shared among countries. The darker the color for a topic for a country for any topic, the more strong the presence of that topic. Topic 1 is important for many Latin-American states and Spain. While Mexico is in this group, Topic 1 is less important for Mexico than Topic 4. Similarly, Japan and South Korea share Topic 9, but whereas Topic 9 is almost the only topic that appears in Japan's national plans, topics 7, 5, and 3 also appear in South Korea's national strategy.

Clusters: There are several clusters or topics around which AI priorities for groups of countries can be located. Interestingly, the clusters make intuitive sense for historical or political economy reasons. Computer scientists refer to this as external validity (of a methodology's findings). The topic 1 cluster includes many Latin American states and Spain. Topic 14 is most present in EU states and EU itself. Topic 7 is shared between the World Bank and many

developing countries, though curiously a majority such countries have a history rooted in British colonial rule. The latter feature may be accidental: outside of Latin America, many of the developing countries with a national level AI strategy also experienced British colonialism in the past. While this paper does not explore at depth how the flow of influences between between ex-coloninal countries and their former colonies, the Latin American cluster in Topic 1 also includes the ex-colonial power Spain.

Another finding about clusters refers to differences among pluralist and non-pluralist states. Therefore, the topic for the EU and United States show concern for federal and democratic processes that are missing in China (topic 12) or Russia, Ukraine, and Serbia (topic 5) clusters. South Korea and Japan also showcase societal concerns but they seem to be more dirigiste (topic 9) with words like nurture and diversity as opposed to words like dialogue in the EU strategies (topic 14).

Leaders: Countries often believed to be leaders in AI seem not to share a topic with other countries, which may speak to the uniqueness of their national strategy (or competitive advantage). Leading AI states have very high basic science capabilities, and world class educational institutions that produce PhDs in relevant disciplines (mathematics, physics, statistics, computer sciences). We see stark differentiations. Topic 11 is exclusive to Canada, Topic 12 to China, Topic 13 to the United States, while Topic 9 speaks mainly to Japan and to some extent South Korea. An exception might be Topic 14, which includes the EU as well as leading AI countries such as France and Germany. The EU itself can be taken to be an AI leader, and terms like the "Brussels Effect" capture the influence of the EU on the rest of the world (Bradford, 2020).

International Organizations: Like leaders, the UN-affiliated organizations analyzed here tend to feature unique topics in their documents. This is not

surprising: these organizations have specific priorities, whereas national plans are much broader. The World Health Organization's Topic 18 is mostly about health, while Topic 2 from UNESCO is mostly about the organization's concerns such as inclusion, social stratifications, and journalism and media. The exception is Topic 6 for the World Bank that in its development concern also shares features among several developing countries' national plan documents, especially those which experienced British colonialism. As explained in the next sub-section, the topics for the UN also offer a counter-intuition. The specificity of the UN's specialized agencies is understandable. However, the UN Secretariat or the ITU have taken broader stances and have sought to play a leadership role within the UN system, therefore there can be an expectation that these plans would intersect with national strategies. This is not the case, and the uniqueness of their topics might also speak to the limits of international influences. A small but interesting finding is that Topic 2 for UNESCO also shows up in the French national strategy. The close connection between France and UNESCO, with the agency's headquarters in Paris, has been the subject of a great deal of literature (Singh, 2011).

Unexpected Lack of Clusters: This point follows from the one above. The UN affiliated organizations do not cluster with other countries (except for the World Bank). Further, the UN organizations' AI strategies do not overlap or correlate to each other much either. Figures 5-7 provide the evidence. The topic heatmap for UN documents reveals unique topics for three of six UN organizations: World Bank, WIPO, and UNESCO. The overlaps are for Topic 7 for ITU and UN, which reflects the close coordination among the UN Secretariat and the ITU. The latter organizes the premier summit for the UN system in Geneva each year known as 'AI4Good'. ITU documents also contain Topic 4, which shows up in WHO documents. This is not surprising either. Many of the

ITU and WHO documents on health are jointly written.

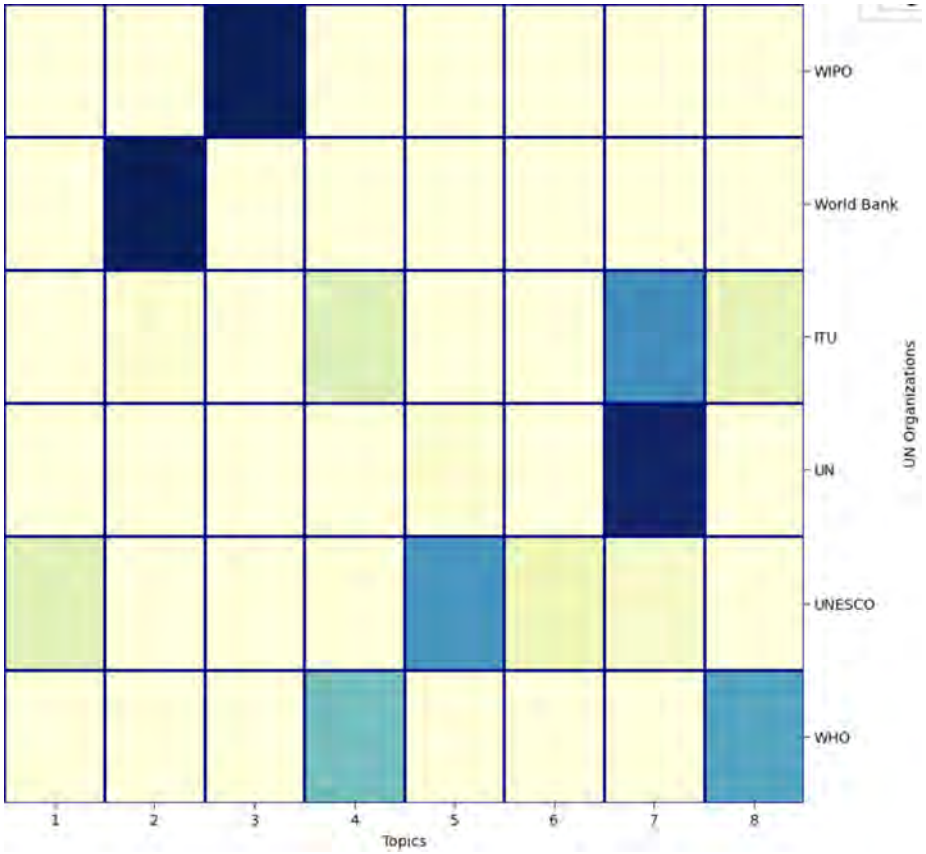

Figure 5: UN AI Infrastructures: Heatmap relating UN organization - topic distributions. The yellow-to-blue color scheme related earlier visually conveys low-to-high probabilities of topics in a given agency.

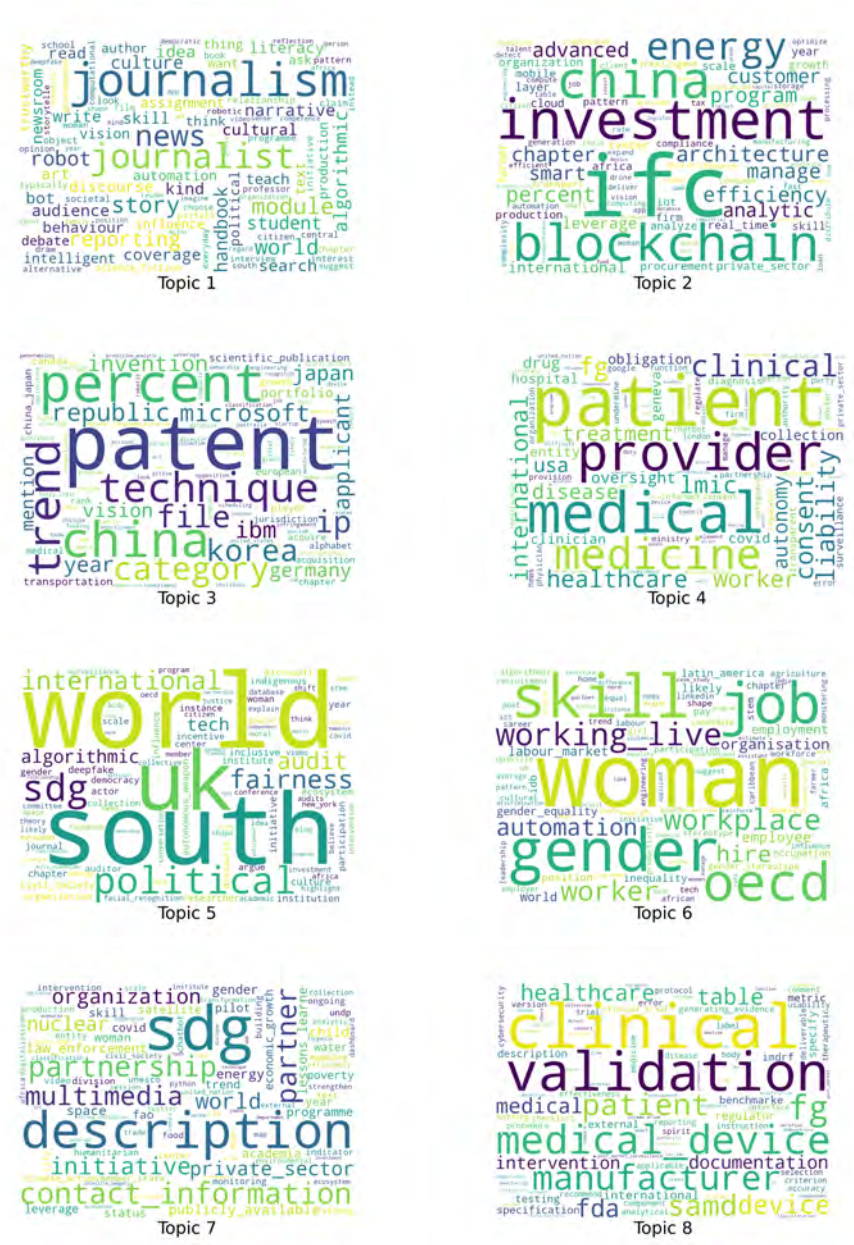

Figure 6: UN AI Infrastructures Topic Word Clouds. Font size visually conveys the probability with which a word is found in a given topic, with larger font sizes denoting higher probabilities.

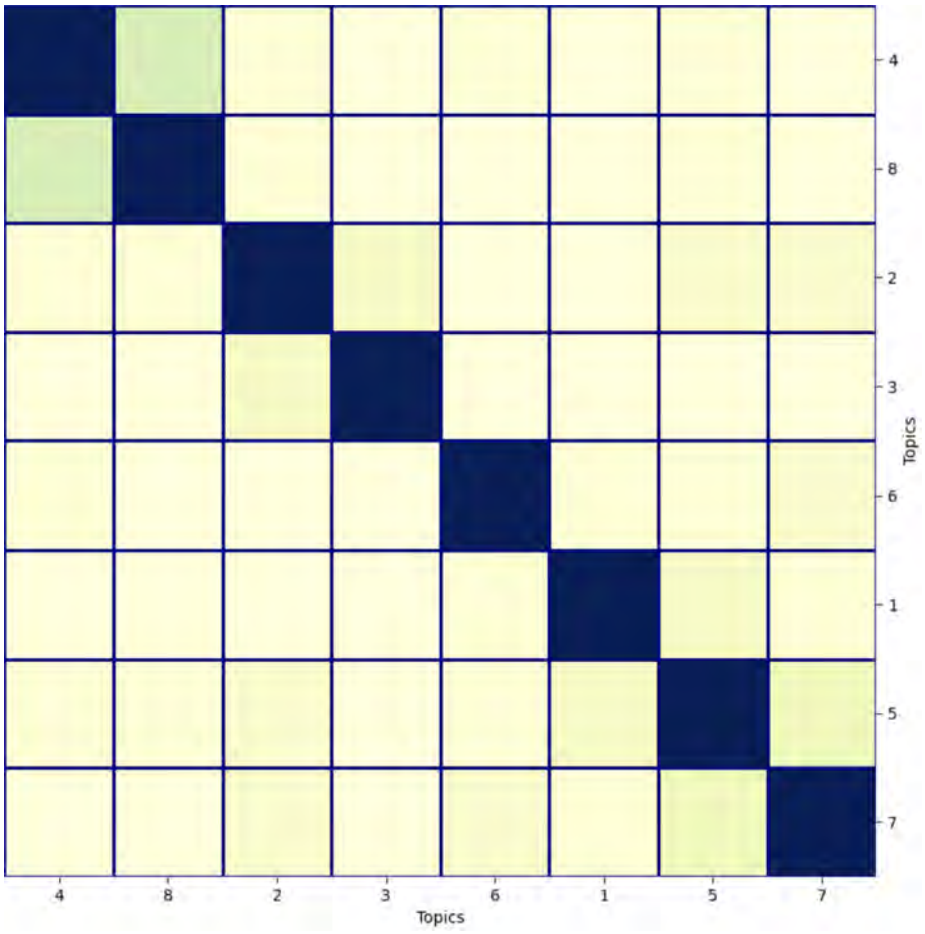

Figure 7: UN AI Infrastructures: Heatmap relating topic similarities. The yellow-to-blue color scheme visually relates low-to-high pairwise topic similarities.

A few notable differences that cut across clusters and states or IOs yield patterns that further address multiplexity.

- The leading states (China, U.S., Japan, South, Korea, and EU) prioritize basic science, standards and regulation, and competitiveness calculations but with different valences. The Chinese topic (12) is much more heavily focused on science, theory, and hardware than other leaders. The U.S. topic balances the science and hardware capabilities with regulatory and

societal concerns (topic 13). The EU topic (14) is shared with most of the member-states and reveals concerns for programs and organization. The Japanese and South Korean topic (9) also feature high level capabilities focus (mathematics) but are more focused on utilization of the AI infrastructures for economic and societal needs.

- There are two clusters in the global south that are of interest. The Latin America cluster (Topic 1) is focused on evolving from digital to an AI infrastructure and includes economic and social objectives (or axis/*ejes* in spanish in the national plans). Topic 7 is present in several other developing countries and the World Bank. This topic is much more traditionally focused on development concerns such as importance given to economic sectors, albeit here with an AI focus (blockchains, fintech, startup) and with leading players (IFC, China).

- Five topics dominate the UN level plans in Figure 2. Interestingly, these topics remain almost unchanged when UN plans are analyzed separately (Figure 5) but we do obtain some further granularity in Figure 5. The UNESCO topic (2) in Figure 2 is focused on media, journalism, biases, and social inclusion. In Figure 5, topic 6 is similar. However, Figure 5 also provides two additional topics for UNESCO. One of these is topic 5 in Figure 5 that deals with fairness, inclusion, and SDGs in the global south and the world. Therefore, while topic 2 of Figure 3 and topic 6 of Figure 6 are similar, when UN plans are analyzed separately in Figure 5, topic 5 is more present than topic 6, suggesting that the latter gets diluted when UNESCO plans are analyzed with national plans. Similarly, when UN plans are analyzed separately (Figure 5), the WHO topic is broken in two (topics 4 $ 8) and also ITU (topics 7 & 4).

Table 3 below lists the themes in the IO plans. The first column provides the

topic number and a label for the topic (for which we again utilized ChatGPT to generate potentially informative labels as restricted by the word clouds in a topic). The second column lists the international organizations where the top-level documents display this topic more prominently (at higher probabilities).

Topic Description / Highlighted Priorities	**UN Orgs**
1 – Algorithmic Journalism & News Reporting / Cultural Narratives & Audience Engagement / Intelligent Journalism Modules / AI in Media Discourse	UNESCO
2 – IFC Investments & Blockchain in Private Sector / Smart Energy Efficiency Programs / International Procurement & Mobile Solutions	World Bank
3 – Patent Trends & IP Strategies / Scientific Publications & Technological Innovation / Global IP Jurisdictions & Growth Trends / Innovative Patent Filings	WIPO
4 – Medical Ethics & Patient Consent / Clinical Oversight & Healthcare Regulations / Liability in Medical Practice / Transparent Medical Diagnosis	WHO, ITU
5 – Fairness & Inclusivity / Tech Ethics, Deepfake Detection & Civil Society / Energy, Ecosystem & Sustainable Development	UNESCO
6 – Gender Equality in STEM & Workplace / Women in the Global Labor Market / Gender Stereotypes in Job Automation	UNESCO
7 – Sustainability Development & Global Initiatives / Multimedia Partnerships & Public Sector Engagement / Water & Energy Sustainability / Poverty Alleviation & Economic Growth	UN, ITU
8 – Clinical Validation & Medical Device Standards / Healthcare Benchmarking & Regulatory Testing / International Medical Standards / FDA Regulations & Healthcare Metrics	WHO, ITU

Table 3: Topics, Corresponding Highlighted Priorities and Associated UN Organizations

The discussion on multiplexity can be extended further to include elements of diffusion of power that was explained theoretically in a previous section. The clusters and networks analyzed above collectively point to convergences and differences among global AI leaders and other countries. With the exception of EU's influence over its member-states. It is hard to locate the influence of global leaders in global south states on Latin America, Africa or Asia. Overall, the top-down norm diffusion influence of UN or international organizations is

not apparent in the AI plans (Finnemore and Sikkink, 1998). The World Bank's influence may be indicative of the historic role that the World Bank has played in the developing world. But this does not carry over into the Latin American states.

The diversity of outcomes or AI ontologies (topics and world clouds in Tables 2 & 3 above) reflect the underlying diversity of national, international, economic, business and societal actors. This diffusion of power was presented in Table 1. The abstractions can now be named. The ontologies are the world views and those of non-leaders do not always intersect with countries in other parts of the world, especially in the global south where we would expect this to be the case. The most obvious case of influence here may be that of the European Union, but here the influence is more reciprocal and consensual between member-states and the EU. In the past, UN organizations were preeminent champions of global norms (Fukuda-Parr, 2017). International organizations may now be seen as informational actors or as orchestrators (Abbott et al., 2015). The relationship between states and IOs can also be analyzed in a principal-agent framework, where states as principals broker their demands through international organizations (agents) (Hawkins et al., 2006). As actors that help to spread information or orchestrate solutions, the processes are representative of a diffused collaborative rather than hierarchical forms of governance. The shift toward informal modes of governance among international and national actors is another layer of this trend (Roger, 2020). This informality includes the tremendous growth of informal and regulatory organizations in the international system that allows for collaboration. An example is the AI4Good Summit in Geneva organized through the UN and the ITU.

4 Conclusion

This paper has shown that the intersecting ties of various international actors, pluralist ontologies and regionalisms, and the varying affordances of infrastructures can lead to multiplexed outcomes. We do not regard the imposition of simplexity (as opposed to mutiplexity) as impossible. Simplexity follows from highly hierarchical power distributions and the work of several actors in world politics can allow simplexities to re-emerge: weaponizing infrastructures to constrain the actions or options for others is an example. Farrell and Newman (2023) call this weaponization on the part of the United States an "underground empire". David Lake (2024) provides a more positively valenced view of the hierarchies that the United States enabled. In many circumstances, such simplexity may command little legitimacy among those who must accept the outcomes of weaponization. Nevertheless, simplexity exists. So does multiplexity and we claim that a diffusion of power allows for the continuation and deepening of mutiplexity.

Our empirical evidence on clusters and networks among actors, chiefly states and international organizations in our analysis, explains the interlocking and divergent ways for national and international artificial intelligence infrastructures. There are leaders and great powers but the rest are not followers but actors in a diffused power scenario in which multiple ontologies about the world co-exist. In the empirical language of this paper, these ontologies are topics, which are shared among states and related to other topics.

Global governance in artificial intelligence is multilayered. At one level the collective work of diverse artificial intelligence infrastructures makes up the heterogeneous global architecture of artificial intelligence. It is interconnected but not without posing vulnerabilities and challenges for actors ranging from human rights concerns to national security threats. In a hierarchical environment,

great powers provide public goods. AI policies to the extent that they can be characterized as public goods within national and international contexts need authoritative allocation of resources in institutional contexts. In a multiplexed world, under girded by a diffusion of power as we posit, the public good arise from the "interaction capacity" of states (Acharya, Estevadeordal and Goodman, 2023; Buzan and Little, 2000). These interaction capacities reveal the work of networks and clusters.

The methodological contribution of this paper lies in providing a computational vocabulary and rich empirical evidence for understanding the overlapping and intersecting topics in global affairs, in our case the evolving artificial intelligence infrastructures. As the world moves beyond simplexity, such computational and probabilistic methodologies will be increasingly needed to puzzle and analyze international affairs.

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