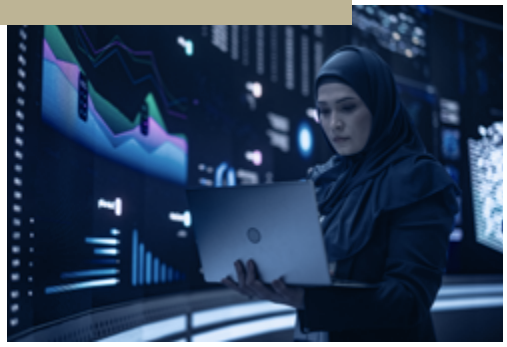
FUTURE TRENDS

Report

Issue no. 7 - February 2025



Future Trends Report

Future Trends Report, published in English and Arabic by TRENDS Virtual Office in Montreal, stands out as a distinctive publication dedicated to highlighting:
1. the most important forward-looking studies that aim to identify future trends, analyze various variables that may influence these trends, and determine the best future scenarios.
2. the most important applied studies that explore the application of knowledge, scientific theories, and information to solve current problems and overcome future challenges.
3. the most important illustrative and graphic forms that visually summarize significant studies, helping readers understand the trends and challenges of the future world.

Editorial board

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Knowledge management: how to make the most out of it?

https://www.hbrfrance.fr/strategie/la-gestion-des-connaissances-retour-vers-le-futur-60479

The author of this article, Vincent Ribière, practitioner-researcher and lecturer at Bangkok University (Thailand), looks at knowledge management (KM). He begins by explaining why companies invest in KM, which enables them to gain considerable efficiency by reproducing certain scenarios with customers.

Ribière defines KM as "the process of capturing a company's collective expertise, knowledge and skills, wherever they may be - in people's heads, on paper or in data/information repositories - and distributing them where they can contribute to the greatest benefit". It is more a question of sharing knowledge than controlling or retaining it for no purpose.

The author begins with a brief history of KM. He recalls that the 90s saw a growing interest in technologies to improve the circulation of knowledge. However, without a clear strategic objective, many of these initiatives ultimately failed. Then, in the 2000s, it became clear that the focus should be on the people themselves. Communities of practice are an example of what began to be put in place to retain, share and improve knowledge. Technology became the "enabler, not the main driver."

The creation of an ISO standard (30401) in 2018 has continued to consolidate the importance of KM for organizations. This standard "sets requirements and provides guidelines for establishing, implementing, maintaining, reviewing and improving an effective management system for knowledge management in organizations."

The article refers to a recent survey (American Productivity Quality Consortium, 2024) which shows that knowledge management is perceived "as a tool for improving operational efficiency and process improvement within organizations." Another study conducted by the International Data Corporation (IDC) concludes that KM's benefits include improvements in several key areas: operational performance, customer service, satisfaction and engagement, and employee performance.

The importance of KM is now undeniable. In fact, international awards such as the Global Most Innovative Knowledge Enterprise Award and the APQC Excellence in Knowledge Management Award annually recognize organizations that excel in KM.

Ribière concludes with the increasingly practical use of AI as a KM tool. He notes that "AI will help improve, perfect and automate some tedious knowledge management processes, such as content cleansing, content tagging and content restructuring." "Becoming a learning organization, an organization that continuously and systematically manages knowledge at different organizational levels (individual, team, organization, ecosystem) is a key factor in organizational agility and productivity."

ISO 30401:2018, ISO/AWI 30401 - Knowledge management systems — Requirements.

"Given that knowledge resides mainly in the minds of employees, it is estimated that on average organizations lose 70% of their know-how every night when employees leave the company. In fact, only 30% of knowledge is documented in any way." (Knowledge Management Report, The Delphi Group, 1998).

Prospective research

Do algorithms shape us?

https://podcast.ausha.co/la-jungle-des-miroirs/episode-4-algorithme

This podcast, which aims to raise awareness, understanding and critical thinking skills, attempts to decipher what is meant by the term "algorithm." This episode, the third in a series of 20, aims to understand how algorithms shape perceptions of the contemporary world.

The speakers start from the observation of what a company can put in place to manipulate information, taking the example of Cambridge Analytica and the outcry, it created at the time of Donald Trump's election in the United States.
The question here is: when you open your networks and access content instantly, how is that content chosen? Content that seems random but is in fact skillfully decided by an algorithm. In fact, the sites' creators analyze your likes, shares and all your online actions in order to understand who you are, your values, beliefs, political opinions, tastes and so on.
Here, the guest mentions the striking example of a book published in 2022, Toxic Data, by David Chavalarias, which aims to reflect on digital manipulation via social networks as a threat to democracy. The author, a mathematician and director of research at the Centre d'analyse et de mathématique sociales (CNRS) and the Institut des systèmes complexes de Paris Ile-de-France, is dedicated to the analysis of social networks and online political activism. His book suggests ways of resisting the intoxication of opinion at individual level, and of collectively protecting democracy by adapting it to the new digital order. One of the examples taken from the book and mentioned in La Jungle des Miroirs is that of an author who decides to "like" all possible publications and links on Facebook related to extremist postures. He notices that after just 48 hours, his News Feed offers him only extremist suggestions.
Every social network implements this kind of tool. The algorithms play on three psychological concepts: 1) reinforcement or confirmation bias: opinion is reinforced when we are exposed to things we already believe; 2) the filter bubble: it's impossible to be exposed to contradictory information, so we don't see opposing thoughts; and 3) negativity bias: on representations of your fears, indignation generates much more engagement than other ways. These are all addictive mechanisms, generating a maximum of emotions, and playing on the dopamine release phenomena they imply.
The podcast concludes that the social networking system is based on a "vicious model", and that we need to be aware that data is now worth its weight in gold. The guests, despite the anxiety-inducing discussion they publish here, offer some hope for the future, mentioning that the solution lies in knowledge: we need to train, read and learn, so as to sharpen a critical mind that "is our only possible shield."

"The 19th century was the century of the gold rush, the 20th century was the century of the oil rush, the 21st century is and will be the century of the rush for the world's personal data."

"The solution lies in knowledge: we need to train, read and learn, so as to sharpen a critical mind that "is our only possible shield."

Prospective research

What impact will AI have on geopolitics?

“Géopolitique de l’intelligence artificielle – comment la révolution numérique va bouleverser nos sociétés,” February 2021, IRIS (Institut de Relations Internationales et Stratégiques) https://www.youtube.com/watch?v=bHINSVhX_Ss

A videoconference was organized by IRIS, an independent French research institute, in February 2021, on the occasion of the publication of the book “Géopolitique de l'intelligence artificielle: comment la révolution numérique va bouleverser nos sociétés” (Eyrolles) by Pascal Boniface, Director of IRIS. The discussion, moderated by Sylvie Matelly, Deputy Director of IRIS, focuses on the geopolitical issues surrounding AI, drawing on the expertise of author Pascal Boniface, as well as Gilles Babinet, advisor to the Institut Montaigne on digital issues (France), and Rahaf Harfoush, digital anthropologist and lecturer at Sciences Po Paris.

The panelists attempt to address the impact of AI from a global perspective, discussing from the outset issues such as the replacement of certain jobs by technological innovations. The speakers refer in particular to Marx on the development of productive forces. While certain jobs may diminish or disappear due to AI, the speakers note that a kind of “cornucopia” could soon emerge. For example, research could evolve through collaboration between intellectuals and algorithms. As Boniface observes, “someone could be a bricklayer in the morning, and an architect in the evening.” AI would also drive certain developments in creative industries, such as design projects.

These perspectives highlight why companies need to prepare for these challenges, notably by rethinking their value systems, and adapting to the changes brought by AI. Harfoush, an anthropologist specializing in digital issues, explains the reasons behind the lack of discussion around these challenges. In her view, thinking is often blocked by an overly binary vision of the digital future where there seem to be only two possible scenarios: utopia or dystopia. Yet, in her perspective, the scenario towards which the world is moving is rather a duality between these two extremes. AI will be both formidable and terrible, and the role of states will be to manage the balance between these opposing outcomes.

In particular, the book discusses cybersecurity issues, since AI can also be seen as creating new threats, such as situations where algorithms give greater visibility to certain political agendas, encouraging high-risk geopolitical situations. Data sharing is also discussed, as it could pose significant dangers to populations.

Speakers discuss at length the role of GAFAMs, and ask: Will they kill off states or will they become vectors of democracy? An example is given of the rivalry between the U.S. and China, and the role of multinationals in these geopolitical issues. Will a digital giant necessarily follow the priorities set by the state in which it was created? According to Boniface, “companies think market, not flag.”

Governments were too slow to react, and didn’t realize the power that technological innovation— and the giants leading it would eventually hold. These corporations are now providing essential services to the public, notably during the COVID-19 health crisis. However, as Babinet says, “the important thing is that they continue to be our servants, and that they don't become our masters.”

AI will be both formidable and terrible, and the role of states will be to manage the balance between these opposing outcomes.

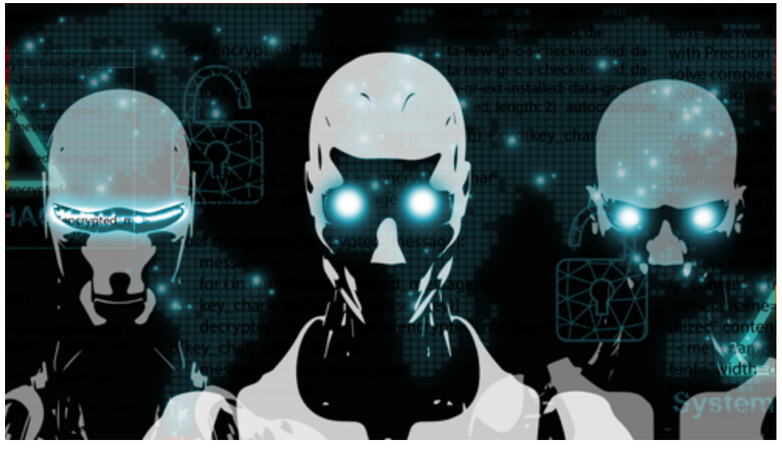
In conclusion, the priority should be to answer the question: How can innovation continue without breaking the social contract of our societies? How can we maintain equitable growth and drive innovation without compromising the well-being of our societies?

Prospective research

AI & warfare – the inevitable future?

Fatal equations – The lethal impact of algorithms in wars, Solveij Mailander, July 2024 - https://farsight.cifs.dk/fatal-equations/

The "disregard for thorough assessment and ethical consideration not only highlights the alarming dehumanization inherent in autonomous warfare, but also underscores the potential for – and exemplifies – the catastrophic consequences that can ensue when machines are entrusted with life-and-death decisions."



Solveij Mailänder, a research fellow at Oxford University's Future of Humanity Institute, explores the ethical and societal implications of using Artificial Intelligence (AI) in warfare. Her July 2024 article examines the moral concerns surrounding AI by referencing a case study on the everyday use of ChatGPT. She highlights the discomfort that can arise from relying on AI for daily decisions, as illustrated by Maxwell Strachan's experience in "I Asked ChatGPT to Control My Life, and It Immediately Fell Apart" (Vice, 2023).

Initially, outsourcing daily decisions to AI might seem harmless, but Mailänder delves into the more troubling ethical questions related to AI's role in warfare. She underscores the historical connection between the tech industry and the military, citing the example of companies like Anduril, which develop autonomous weapons systems. Anduril's AI-powered drones have led to significant contracts with the US military, highlighting the increasing use of AI in combat.

Mailänder points to disturbing instances, such as the Israeli military's use of the 'Lavender' autonomous system in Gaza. This system, operating with minimal human oversight, has facilitated airstrikes that sometimes target individuals with imprecise ammunition, often harming civilians and their families. Such developments provoke serious concerns about the moral implications of AI-driven decision-making in conflict zones.

The article questions who should make critical decisions in warfare and critiques the growing detachment associated with AI. Historically, new technologies have transformed warfare, as seen with the use of drones in the Vietnam War. Mailänder notes that AI lacks the moral and emotional capabilities inherent to human decision-making. Critics argue that remote warfare, facilitated by AI, involves an emotional detachment that undermines the ethical considerations crucial to conflict.

As AI technology advances, Mailänder urges caution. While AI systems may evolve and become more capable, their decisions could have profound life-and-death consequences. The integration of AI in warfare demands careful consideration of the human element, questioning whether such decisions should be left to machines or remain under human control.

"The "disregard for thorough assessment and ethical consideration not only highlights the alarming dehumanization inherent in autonomous warfare, but also underscores the potential for – and exemplifies – the catastrophic consequences that can ensue when machines are entrusted with life-and-death decisions."

Prospective research

The combat against organized crime – a two-year prospect

Stratégie 20242026- – De nouvelles façons de penser et d'agir – Global initiative against organized crime, February 2024, https://globalinitiative.net/wp-content/uploads/202402//Strategie-2024%E2932026-%80%GI-TOC-Fevrier-2024.v1.pdf

GI-TOC's theory of change focuses on four areas of action: 1) analytical work; 2) disrupting criminal markets; 3) building resilience; and 4) creating inclusive networks.

The Global Initiative Against Transnational Organized Crime (GI-TOC) is an international network of 600 experts founded in 2013, aimed at fostering debate and developing innovative strategies to combat organized crime globally.

The February 2024 report outlines GI-TOC's strategic plan for the next two years to tackle vulnerabilities created by organized crime and mitigate its impact on people, businesses, governments, and the environment.

The report introduces GI-TOC's "theory of change," which focuses on reducing organized crime and its detrimental effects. It proposes four key areas of action: 1) enhancing analytical work and data; 2) disrupting criminal markets; 3) building resilience; and 4) creating inclusive action networks.

First, GI-TOC plans to improve analytical work by conducting research on illicit economies to better understand and respond to organized crime. This includes expanding publications based on the Global Organized Crime Index and addressing emerging crime types. Activities include raising awareness in regions like Central Asia and developing an online platform to share best practices in combating organized crime.

The second area involves disrupting criminal markets through innovative programs. GI-TOC will provide guidance to governments, law enforcement, the private sector, and civil society. This includes using technological tools, such as the ECO-SOLVE program, which aims to enhance intelligence and data to combat environmental crime more effectively.

The third focus is on strengthening community resilience to reduce organized crime's impact. GI-TOC has established a Resilience Fund supporting individuals and groups in over 50 countries and plans to increase funding and develop tools for sharing experiences and strategies to enhance community resilience.

Additionally, GI-TOC aims to build global action networks, exemplified by proposed collaborations with UNODC and INTERPOL. This includes forming annual partnerships with private sector entities to strengthen global efforts against organized crime.

Finally, the report emphasizes improving GI-TOC's operational efficiency through an Enterprise Resource Planning (ERP) system for better integration of functions and project audits to enhance performance, with a focus on staff well-being.

"Reducing organized crime and mitigating its negative impact on people, the environment, businesses and governments."

GI-TOC's theory of change focuses on four areas of action: 1) analytical work; 2) disrupting criminal markets; 3) building

"Reducing organized crime and mitigating its negative impact on people, the environment, businesses and governments."

2 Applied research

AI in education: impacts

Nguyen, N. D. (2023). Exploring the role of AI in education. London Journal of Social Sciences, (6), 8495-.

In this paper, Nguyen explores the role of Artificial Intelligence (AI) in education. Published in 2024 in the London Journal of Social Sciences, this paper reflects on AI applications in education, focusing on the approaches adopted up to the 2020s, in order to better plan their use in the future. The impacts of AI in education are categorized into three aspects: "guidance", "teacher" and "student".

The "Guidance" AI approaches refer to programs that support students and teachers in making decisions. These applications can, for example, facilitate academic choices for students with certain learning disabilities. The author gives the example of a study published in 2021, where "AI was used to predict students at risk of failing to provide intervention" (Hlosta et al., 2021). Here, AI helps to fill certain gaps in education, and to promote a more accessible and adapted education for all.

The "Student" AI approaches refer to technological and educational tools that improve the quality of education, such as 'learning AI', which implements innovative learning tools, such as game-based learning or learning analytics. "According to the Entertainment Software Association, 65% of Americans, or 212.6 million, play at least 1 hour of video games a week" (Pierre-Louis, 2023). Therefore, it's easy to see why using the appeal of video games in education can help make the learning experience more adapted, efficient, and engaging.

The "Teacher" AI approaches are all technologies that help teachers to teach. AI tools become true partners for the teaching staff, who see their preparation time reduced, and can therefore devote more of their time to the teaching itself. For example, "automated essay scorers", which use machine learning and natural language processing to score essays, enable teachers to spend less time grading papers by hand, and more time interacting with their students. Nguyen demonstrates the importance of categorizing the impacts of AI in education, as this enables a better understanding of improvements in the field, while providing a very clear framework. The impact categories also enable us to better envisage the future, by distinguishing grey areas, which would deserve more attention in the future.

The paper does, however, put the results into perspective with some of the drawbacks that the use of AI in education could represent, notably in relation to questions of lack of human interaction, costs, or even ethics in relation to privacy and data security.

The author concludes that the rapid development of AI call for careful examination of its applications and regulations in education, as AI could become integral to the sector in the coming decades. The categorization of AI applications can help developers in creating targeted solutions while leveraging existing principles. However, it is essential to address ethical concerns, technical limitations, and costs to ensure the safe and effective implementation of AI in education.

Pierre-Louis, S. (2023, July 6). Essential Facts - Entertainment Software Association. Retrieved from https://www.theesa.com/2023-essential-facts/.

"The impacts of AI in education are categorized into three aspects: "guidance", "teacher" and "student".

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Applied research

Out-of-distribution detection in multi-label classification: a crucial theoretical framework

Zhang, Dell, and Bilyana Taneva-Popova. "A Theoretical Analysis of Out-of-Distribution Detection in Multi-Label Classification." https://doi.org/10.11453578337.3605116/.

The article "A Theoretical Analysis of Out-of-Distribution Detection (ODD) in Multi-Label Classification" by Dell Zhang and Bilyana Taneva-Popova explores the theoretical foundations of detecting out-of-distribution (OOD) inputs specifically within multi-label classification contexts. The need for effective OOD detection is critical for the safe deployment of machine learning models, especially in real-world applications like medical diagnostics and financial fraud detection, where encountering inputs significantly different from training data can lead to severe consequences.

Traditionally, OOD detection research has concentrated on multi-class classification problems, where each input belongs to only one class. In contrast, multi-label classification involves scenarios where a single input can belong to multiple classes simultaneously, complicating the OOD detection process. This paper aims to bridge this gap by analyzing existing methods and providing a deeper understanding of their mechanisms.

The authors systematically review various OOD detection methods such as Maximum Softmax Probability (MSP), Maximum Logit, and JointEnergy. They classify these methods based on two dimensions: label-wise scoring functions (e.g., softmax probabilities, logistic probabilities) and aggregation functions (e.g., maximum, sum, average). Interestingly, they find that some methods yield equivalent results under appropriate conditions, such as MaxProb and MaxLogit, indicating that multiple approaches can achieve similar performance outcomes.

A significant contribution of the paper is the proof that JointEnergy is the optimal probabilistic solution for OOD detection in scenarios where class labels are conditionally independent. This insight offers a more rigorous interpretation of JointEnergy's effectiveness compared to its original joint-likelihood interpretation, emphasizing that its performance relies more on the independence of labels than on their interrelationships.

The paper discusses practical implications for deploying OOD detection methods in multi-label classification tasks, especially in fields where inputs can be ambiguous or multifaceted. The findings suggest that understanding the underlying assumptions and relationships of various methods can lead to better model designs and improved detection accuracy.

The authors highlight potential future research areas, including the exploration of label relationships in OOD detection and the development of new models that can effectively leverage these relationships. They call for further empirical studies to validate the theoretical findings and enhance the practical applicability of OOD detection techniques in multi-label settings.

In summary, this paper provides a crucial theoretical framework for understanding OOD detection in multi-label classification. By analyzing existing methods and establishing the optimality of JointEnergy under specific conditions, the authors contribute valuable insights that could lead to advancements in machine learning practices, particularly in safety-critical domains. The exploration of label relationships and the proposed future research avenues underscore the importance of ongoing inquiry into this complex area of machine learning.

Effective OOD detection is critical for the safe deployment of machine learning models, especially in real-world applications like medical diagnostics and financial fraud detection.

Understanding the underlying assumptions and relationships of various methods can lead to better model designs and improved detection accuracy.

Applied research

How can geopolitics affect scientific research? The example of Russia

Zhang, L., Cao, Z., Sivertsen, G. et al. The influence of geopolitics on research activity and international collaboration in science: the case of Russia. Scientometrics (2024). https://doi.org/10.1007/s11192-024-04984-

In recent years, the tension between open science policies and those focused on competition and security has highlighted a paradox: global scientific collaboration is not keeping pace with defense alliances. Despite political tensions, the United States collaborates massively with China and Russia. The Russia-Ukraine war has led to sanctions affecting scientific collaboration, but scientific communities are resisting, favoring individual exchanges.

This phenomenon reflects the idea that science should be above political boundaries, although the geopolitical situation is gradually influencing these relationships. To test the hypothesis of the relative stability of Russia's collaboration and publication patterns, we used a long-term perspective, with annual and monthly analyses. The data come from the Web of Science™ and InCites, covering 461,366 international publications from January 2022 to April 2023. Two indicators were developed: relative intensity of collaboration (RIC), measuring bilateral activity, and balance in collaboration (BIC), measuring the balance of a country's collaboration profile. These indicators make it possible to analyze the impact of geopolitics on Russia's scientific collaborations.

The results of this study show a complex evolution in Russia's scientific contribution to international journals. Between 2000 and 2014, the share of Russian publications declined, as it did for other countries, due to the increase in contributions from other regions, notably China and India. However, after 2014, Russia managed to reverse this trend for a while thanks to scientific policies, such as the 5top100 project, aimed at improving academic mobility and international cooperation. But since 2022, this dynamic has declined sharply, partly due to sanctions and geopolitical difficulties linked to the war in Ukraine.

Analysis of international collaboration, measured by the rate of foreign co-authors, shows a relative stability in scientific cooperation despite a decline in Russian scientific output. However, collaboration with countries such as Germany and the U.S. has decreased, while with China and India it has increased. In addition, the study reveals significant variations in certain domains such as particles and fields, where Russia has seen a significant reduction in its partnerships, in contrast to fields such as astronomy, where collaborations have been maintained. These results suggest that geopolitical decisions influence scientific fields differently.

The results confirm the hypothesis that geopolitical conflicts marginally affect long-term trends in international scientific collaboration. Russian science is well integrated into global science, and the intensity of bilateral collaboration remains stable, particularly with the U.S. and China. However, collaboration with Germany is declining, while it is increasing with China and India. The decline in Russian contributions to scientific journals seems to be due to internal factors, such as the repression of academic freedom.

Science should be above political boundaries.

Geopolitical conflicts marginally affect long-term trends in international scientific collaboration.

Applied research

The future of cybersecurity: findings and insights

Cybersecurity Futures 2030 – World Economic Forum, 2023, https://www3.weforum.org/docs/WEF_Cybersecurity_Futures_2030_New_Foundations_2023.pdf

The Cybersecurity Future 2030 was published by the UC Berkeley Center for Long-Term Cybersecurity (CLTC), the World Economic Forum Centre for Cybersecurity and CNA's Institute for Public Research. The report brings together findings and insights, observations and variances to lay the groundwork for thinking about the strengths, weaknesses and objectives of cybersecurity in the years ahead.

The first part is a collection of observations, based on the results of a series of in-depth workshops held in six international locations (Dubai, Washington DC, Kigali, New Dehli, Singapore and virtually in a few European countries), revealing the challenges, uncertainties and opportunities represented by today's cybersecurity landscape.

Innovations in the world of technology are accelerating daily, both in a licit and illicit way. The increase in mis- and disinformation, the risk of cyber-attacks, the lack of trusted and expert regulatory bodies in some regions are all challenges with which decision-makers have to contend

Therefore, according to the authors of this report, it is necessary to take advantage of the opportunities offered by the world of cybersecurity, such as the multiplication of public-private partnerships, the exchange of standard-setting processes between developing countries and those who have become 'trusted brands' in the field, or the strategic use of regulations designed to guard against the downsides of AI products.

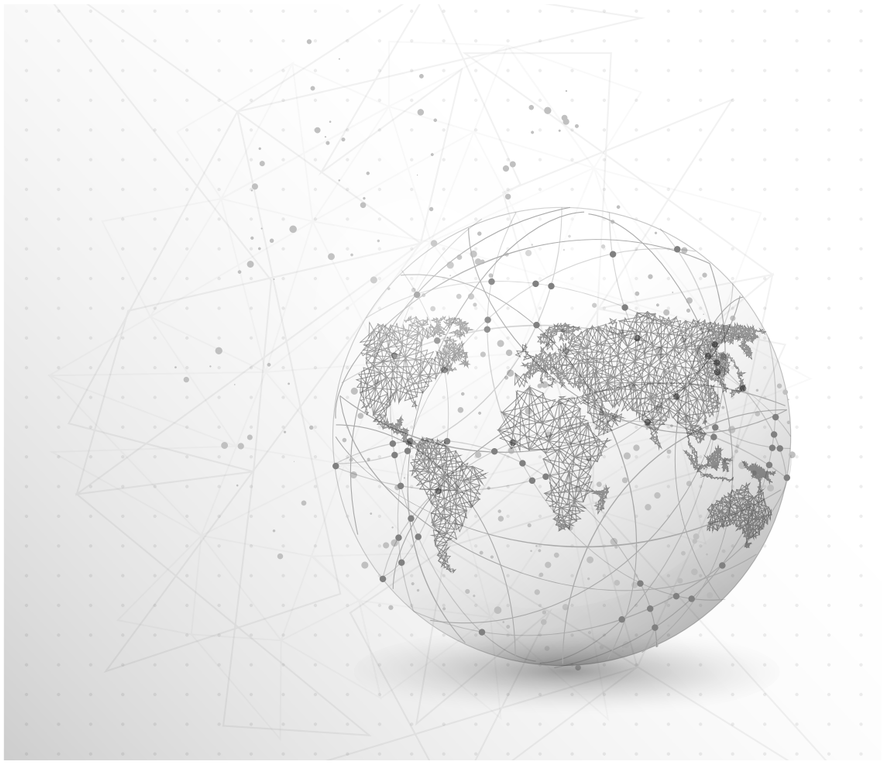
The findings of this report will greatly help decision-makers (government, industry, academia and civil society) to understand the risks and challenges posed by cybersecurity and take initiative to mitigate the risks and securely harness the technological progress.

"Countries should form and strengthen trusted research institutions, particularly in less-developed economies, to support governments in addressing the most challenging social and technical cybersecurity problems of 2030."

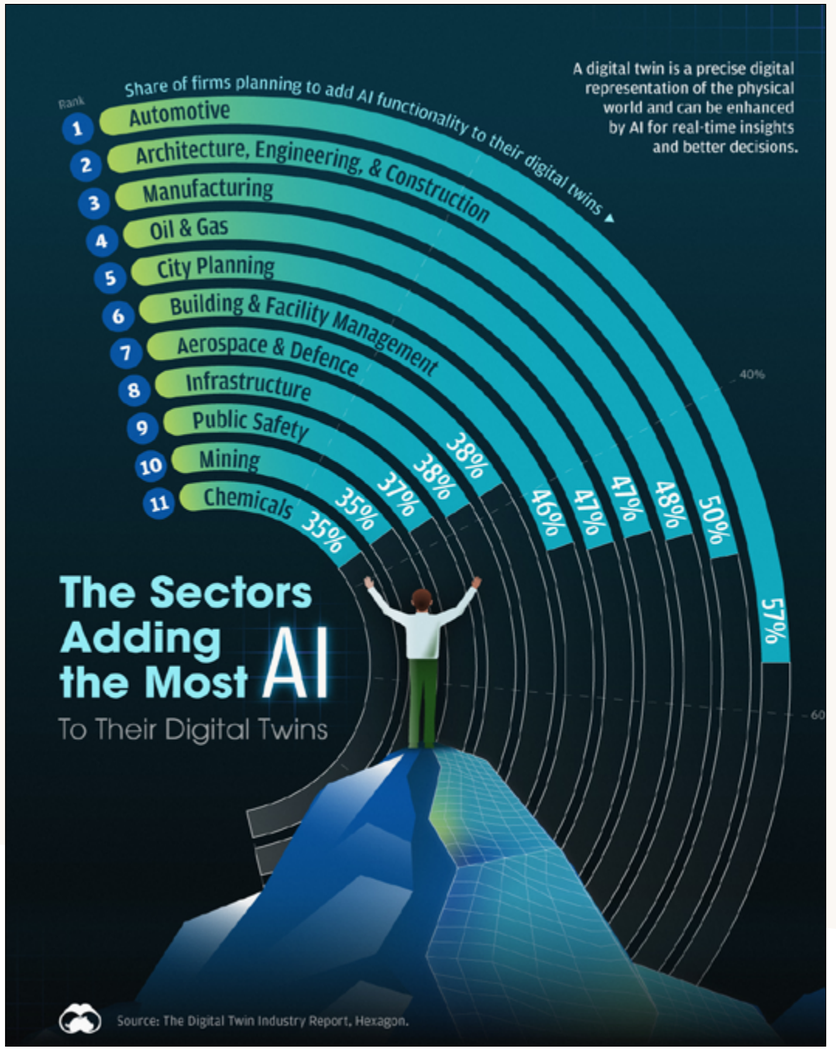
"Cybersecurity will become less about protecting the confidentiality and availability of information and more about protecting its integrity and provenance."

"Countries should form and strengthen trusted research institutions, particularly in less-developed economies, to support governments in addressing the most challenging social and technical cybersecurity problems of 2030."

3 The future in numbers



The Sectors Adding the Most AI to Their Digital Twins



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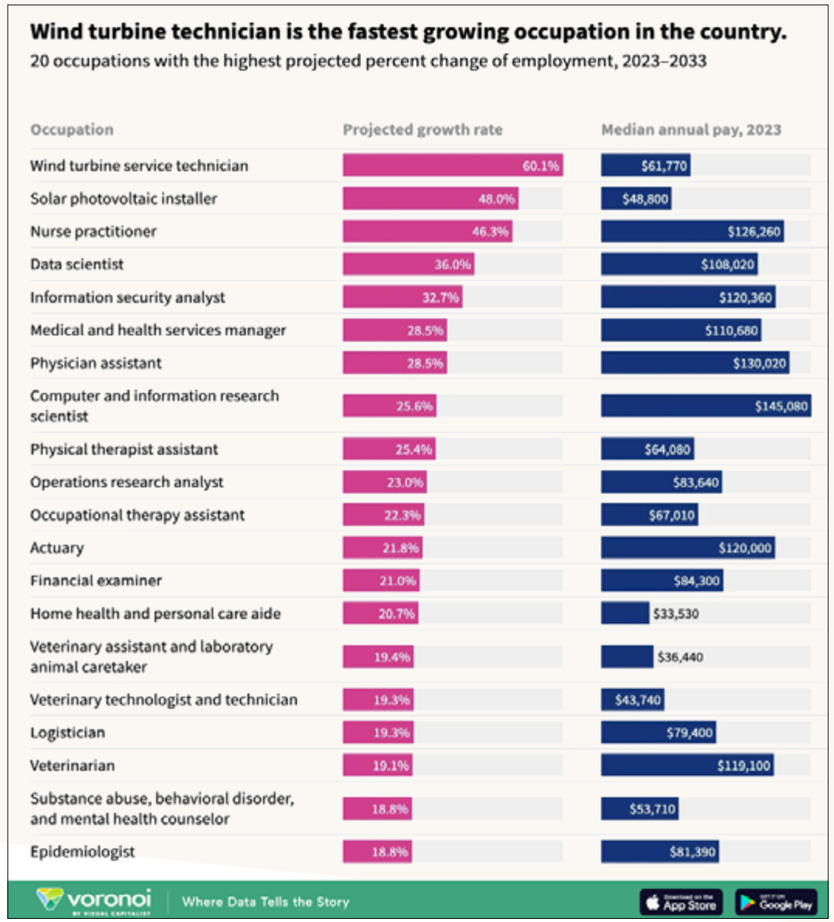
The Fastest-Growing Jobs in the U.S (2023- 2033)



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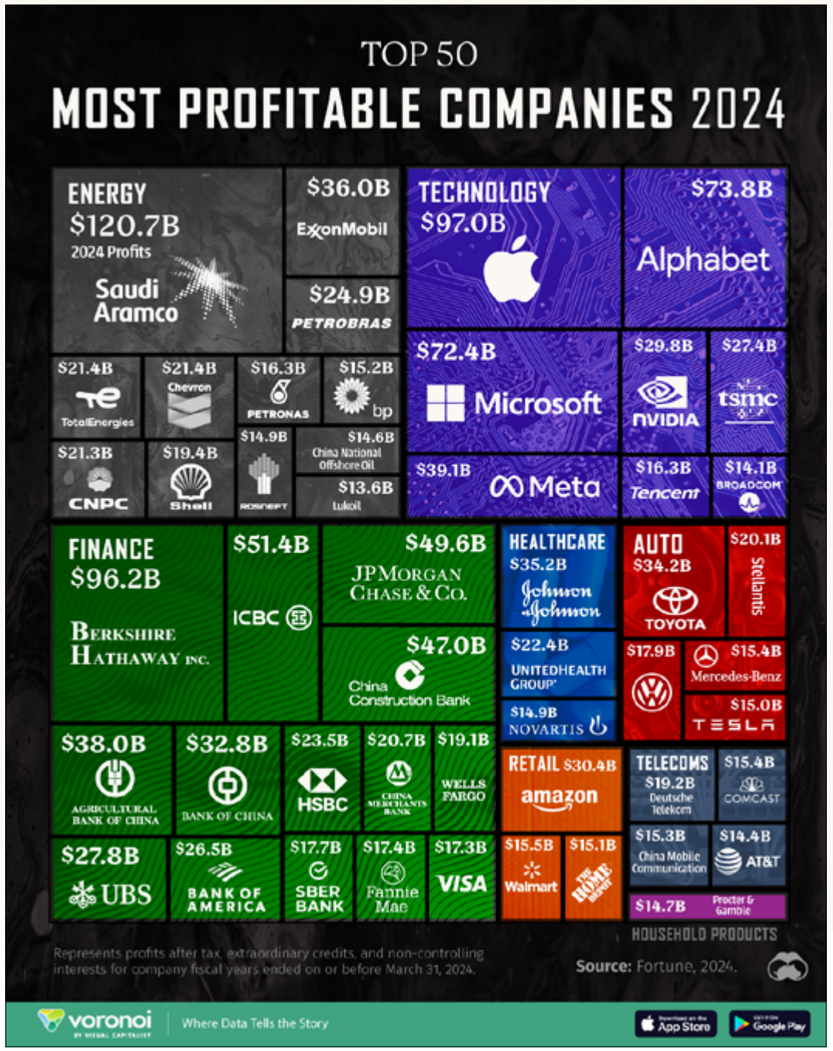
The World's 50 Most Profitable Companies in 2024



the Global Population in 2035, by Generation