

Frontier Technologies

- Market predicted to grow to USD 3.2 trillion by 2025
- Significant potential to transform our world for good
- Driven by intellectual property



Frontier technologies are emerging at the intersection of radical scientific breakthrough and real-world implementation. Artificial intelligence. Big data. The Metaverse. Bioprinting. Quantum computing. These technologies are changing our lives. How we communicate, innovate, create and do business. And they hold one of the keys to addressing some of the most pressing global issues we face.

How important are frontier technologies for the economy?

Frontier technologies already represent a USD 350 billion market, and one that by 2025 could grow to over USD 3.2 trillion.

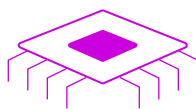
Artificial Intelligence	Internet of Thing (IoT)	Big data	Blockchain
The AI market is expected to grow from USD 16 billion in 2017 to USD 191 billion in 2024.	The IoT market is expected to grow from USD 130 billion in 2018 to USD 1.5 trillion in 2025.	The big data market is expected to grow from USD 32 billion in 2017 to USD 157 billion in 2026.	The blockchain market is expected to grow from USD 708 million in 2017 to USD 61 billion in 2024.
403,596 publications between 1996 and 2018.	66,467 publications between 1996 and 2018.	73,957 publications between 1996 and 2018.	4,821 publications between 1996 and 2018.

Source: Technology and Innovation Report 2021 (UN Conference on Trade and Development).

What are the main types of frontier technologies?



Digital technologies
The Metaverse, Internet of things (IoT), blockchain, artificial intelligence (AI), big data, and quantum computing



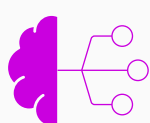
Physical technologies
Autonomous driving, 3D printing and hardware innovations



Biological technologies
Bioprinting, organoids, genetic engineering, human augmentation and the brain-computer-interface

How fast are frontier technologies growing?

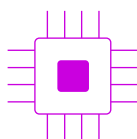
Growth of technologies as percent of total patents average growth, 2016-2020



Artificial intelligence
+718%



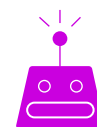
Big data
+699%



Digital technologies
+172%



Cloud computing
+122%



Autonomous systems
+109%



Internet of Things (IoT)
-81%

Source: World Intellectual Property Report, 2022 (WIPO).

Why is IP key to fostering frontier technologies?

In the rapidly changing world, intellectual property (IP) and intangible assets are rapidly gaining importance and one of the important tasks is to ensure that the current IP system needs to continue to promote innovation in the age of frontier technologies to drive economic growth for everyone, everywhere.

How is WIPO addressing IP and frontier technology issues?

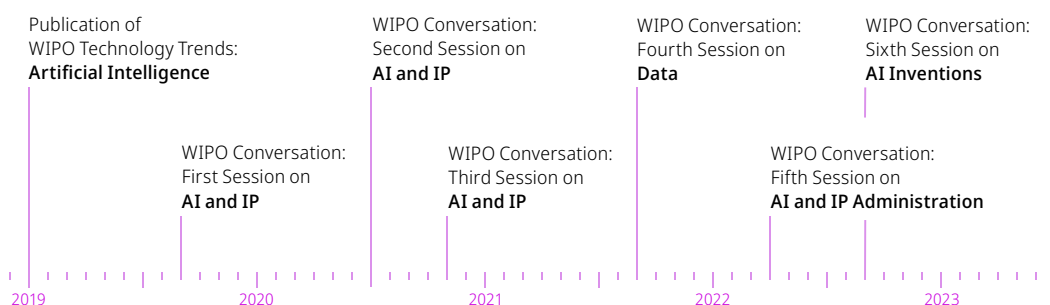
The World Intellectual Property Organization (WIPO) facilitates discussion and knowledge building among Member States and other stakeholders on the impact of frontier technologies on IP to support well-informed policy choices and to provide practical tools and guidance to help us all navigate IP questions in the new digital world.

We also support information sharing amongst IP offices on how to best adopt new technologies to make IP administration faster, more efficient and more accessible.

What are some of the policy questions around IP and frontier technologies?

Patents	Can AI invent and what does AI mean for human inventions?
Copyright and Related Rights	How to best foster access to data for machine learning and AI?
Data	Which role does IP play in balancing access to data , fostering generation of data and protecting legitimate interests?
Trade Secrets	Does the current law of trade secrets strike the right balance between protecting innovations in the AI field and the legitimate interests of third parties in having access to certain data and algorithms?
IP Administration	How can frontier technologies assist innovators and creators everywhere to benefit from IP?
Capacity Building	What policy measures could contribute to the reduction in the technology gap and help frontier technologies solve pressing global issues?

Timeline of WIPO activities on frontier technologies



The WIPO Conversation on IP and Frontier Technologies is a leading forum bringing together around 2,000 participants from 120 countries in two sessions a year. It encourages private enterprises, IP professionals, innovators and creators to connect with the work of policymakers and tackle challenging questions around IP and frontier technologies.

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