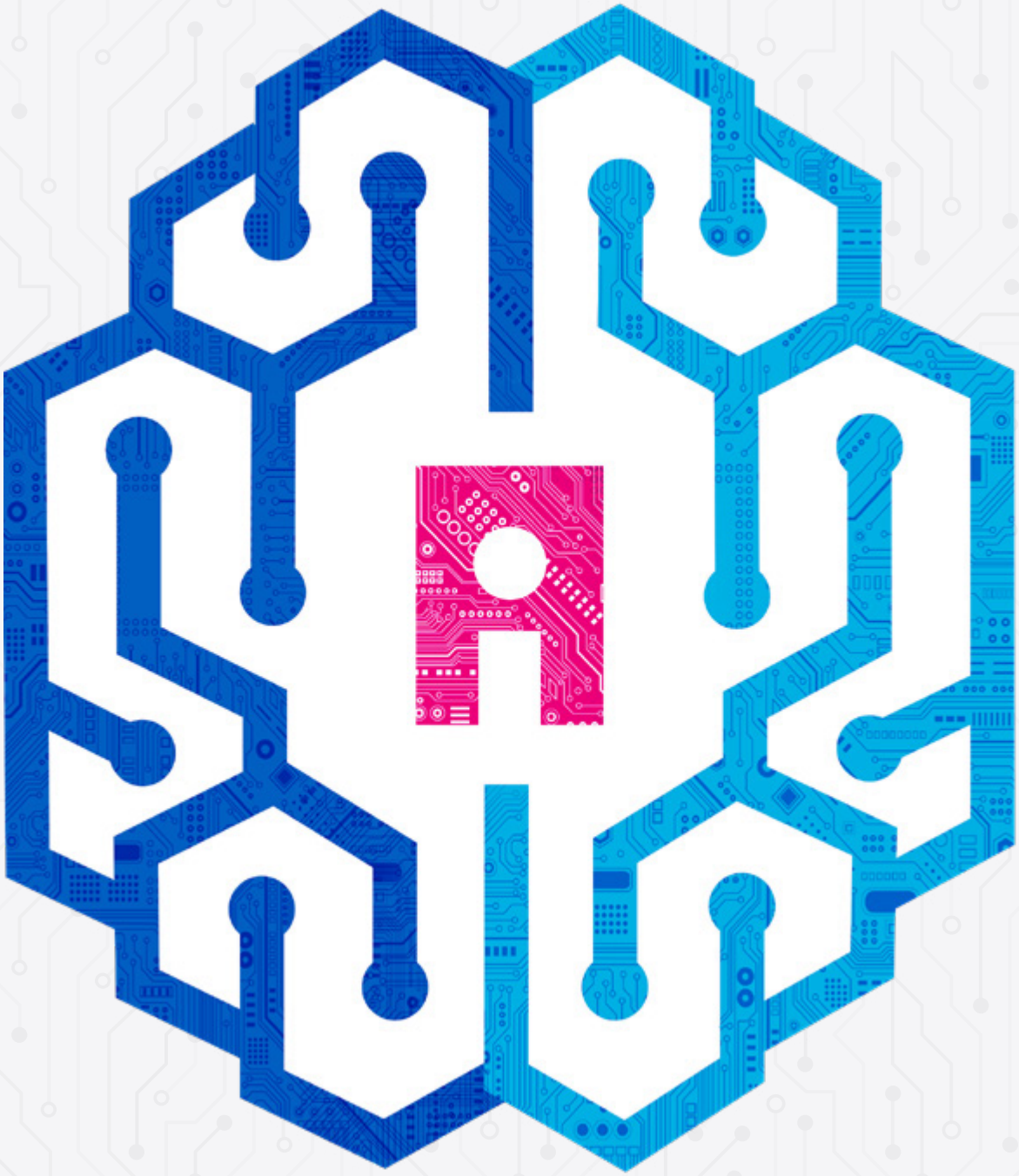
SNAPSHOT REPORT

ARTIFICIAL INTELLIGENCE PATENTS



Intellectual Property Ontario

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Note: The number of patent applications filed in 2021 and 2022 may increase as patent applications have an 18 month delay and therefore this data may not have been captured at the time of research.

SNAPSHOT REPORT

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PATENT LANDSCAPE REPORT: ARTIFICIAL INTELLIGENCE TECHNOLOGIES

What is a patent landscape report?

In simple terms, a patent landscape report provides an overview of patent rights for a specific technology in a selected country, region, or globally. For this report, the focus is upon patents within the global artificial intelligence (AI) sector. As patent applications are publicly disclosed 18 months after filing, the content of this report is based on a search of public databases maintained by intellectual property (IP) offices around the world. Due to a correlation between patents and economic indicators, patent landscape reports can disclose patent filing trends that reveal important information such as filing strategies, sector competitors, economic opportunities, as well as potential risks in the given sector.

What is the value?

In business terms, the patent landscape report is essentially a competitive analysis, serving to identify key players in what may be a competitive landscape. The information revealed serves to inform decision makers and may factor into the IP and business strategies of a company. A greater awareness of important markets and competitors in the sector enhances the ability to enact commercialization strategies to drive value into the company.

How can I use this information?

Innovator and policy makers — Patent landscape reports are tremendously valuable to small-to-medium size enterprises (SMEs). The reports may enable SMEs to make refinements to their IP and business strategies to ensure the company's R&D and commercialization efforts remain relevant to the industry sector. Analytics based on the report permits for informed strategic decisions, especially when it comes to investment in IP. The alignment of investment dollars to areas of high growth potential increases downstream commercialization opportunities, therefore driving economic growth for the company, for Ontario, and Canada as a whole.

WHY PATENT AI?

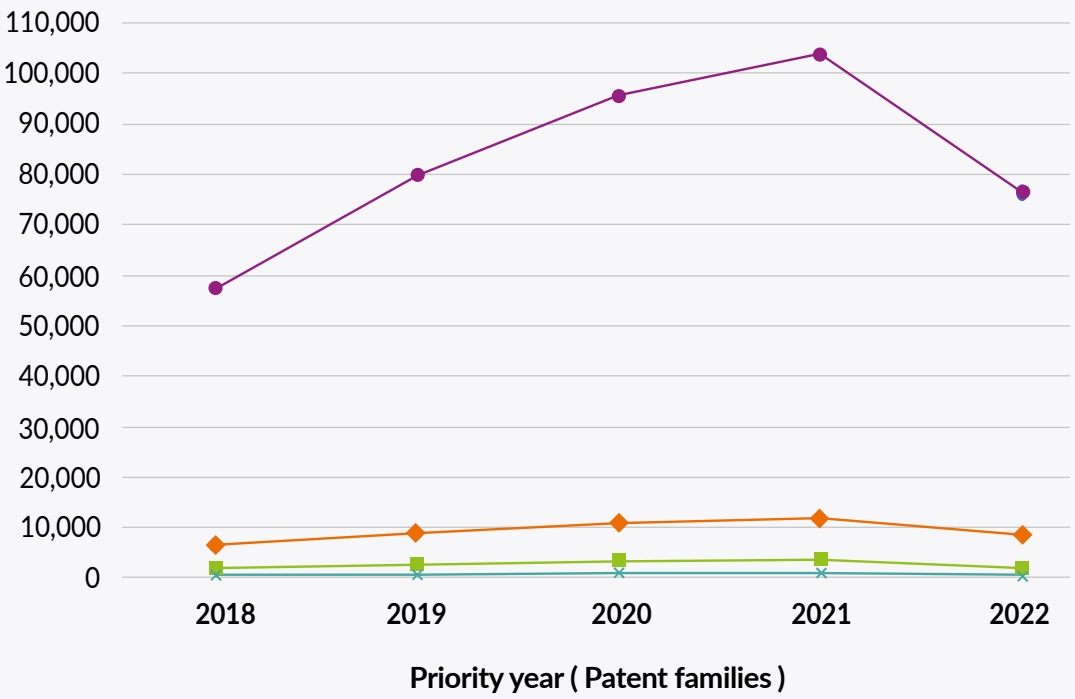
- Other than any underlying inventive AI machine or apparatus (e.g., for vision or AI hardware), AI and machine learning based inventions are essentially software in the opinion of patent offices. This does not preclude such inventions from obtaining patent protection. More than half of the patents issued (~63%) in the US each year since 2005 have been for software-related inventions, while almost half of the patents issued (~49%) in the European Patent Office each year are for software-related inventions.
- Software code cannot be protected by a patent, but the functional aspects of the software can. A patent prevents competitors from using the functional aspects of the patented software. However, copyright only prevents competitors from copying the copyrighted code. Confronted with copyrighted software, a competitor can still independently develop identical software or copy the functional aspects of the copyrighted software without infringing the copyright.
- In addition to enabling a patent holder to prevent a competitor from infringing on the patented invention, a patent can be valuable as a commercial asset. Like any asset, it can increase the underlying value of the patent holder. This in turn can make the patent holder more attractive for investment. Finally, a published patent portfolio can also work to deter or slow potential competitors from entering the market without the patent holder even knowing it, which often leads to the patent holder unknowingly becoming a more appealing target for acquisition.
- When seeking a patent on an AI or machine learning invention or improvements to an existing model, it should be treated as a trade secret to ensure accidental disclosure does not take place. Any accidental or purposeful disclosure can allow a competitor to subvert attempts at obtaining patent protection or give them a roadmap for developing competing products/services.

SCOPE & OBJECTIVE OF THIS REPORT

- This patent landscape report provides a snapshot of the global patent landscape for the AI sector, with a particular focus on **data collection, prescriptive data analysis, decision making, AI in hardware and various application areas of AI.**
- This public report is a condensed overview of a much larger study prepared for Intellectual Property Ontario (IPON) by Evalueserve—a third party data services provider that focuses on legal and IP data and research. The larger study is an important tool used by IPON's IP analysts to provide tailored patent landscape reports specific to a clients' area of specialty.
- The objective of this report is to identify opportunities for Canadian businesses in the AI sector by analyzing the current state of patent filing activities, potential technology gaps, and to provide actionable recommendations that companies can adopt in developing their IP strategy.
- Around 438,000 patents were identified in the preparation of this report. This study focused on all patent applications that are granted, pending and expired in the past five years, globally. All have been analyzed and segmented into the AI subcategories noted above.
- The methodology used in the report involved categorization of patents under multiple technology segments and extracting useful insights from the patent datasets.

EXECUTIVE SUMMARY

- **The field of AI** has witnessed a significant surge in patent filings since 2018. Notably, this growth has proven resilient even in the years 2020 and 2021, demonstrating a sustained interest and investment in AI innovation despite the global pandemic (COVID-19). This enduring interest can be attributed to several factors, including technological advancements, rising demand for effective solutions, government backing, and private sector investments.
- Since 2018, the sector of **decision-making AI** has exhibited high growth in patent filings, indicating its prominence among various AI technologies. Decision-making AI plays a crucial role across industries and domains due to its potential to assimilate and utilize complex data to address intricate problems. A large component of the AI patent portfolio (around 90%) is allocated to the decision-making category. There is also a focus on the sub-categories of neural networks (32.6% of the total AI patents) and functional applications (18.5% of the total AI patents).
- Companies have started exploring in-house **hardware solutions for AI**, aiming to enhance the integration between hardware and software, enabling better efficiency and performance, while simultaneously reducing reliance on third-party systems. China has emerged as a major contributor to AI inventions, with an exponential surge in patent filings since 2018. The State Council of China set a roadmap in 2017 to position themselves as a global AI leader. The plan outlines ambitious goals, including significant technological advancements, economic transformation, and projecting the industry to reach around USD $150 billion in value by 2030.



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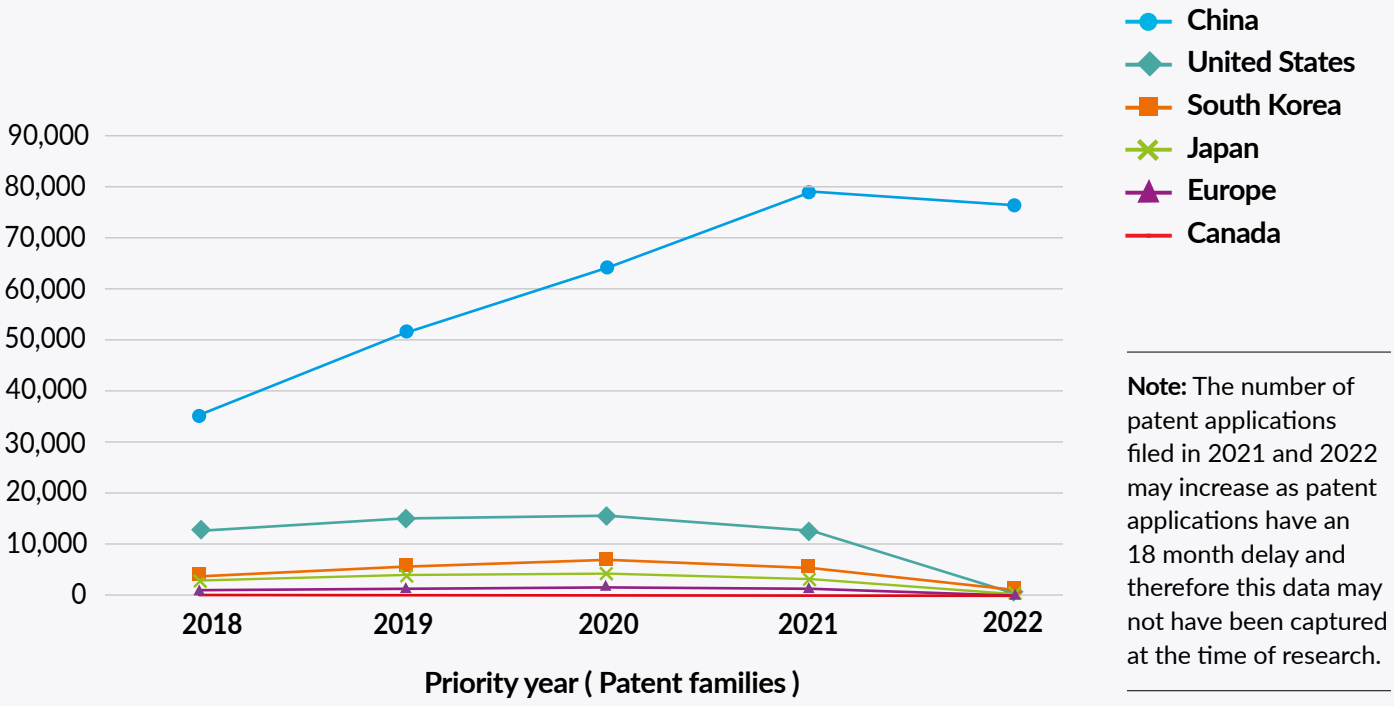
- There is a strong culture of **collaboration** between universities, technology giants, and government entities in China. Notable examples include collaborative relationships with state-owned enterprises such as State Grid Corporation of China. These relationships foster knowledge exchange, research partnerships, and the sharing of resources and expertise, which further fuels AI innovation.
- In 2020, **Chinese tech giants Huawei, Alibaba, Tencent and Baidu, teamed with State Grid Corporation of China** on new digital infrastructure including big data centres and AI. China has initiated a massive campaign to modernize and expand its electricity grid, with planned investments worth 3 trillion renminbi (USD $415 billion) over the five years from 2020–2025.



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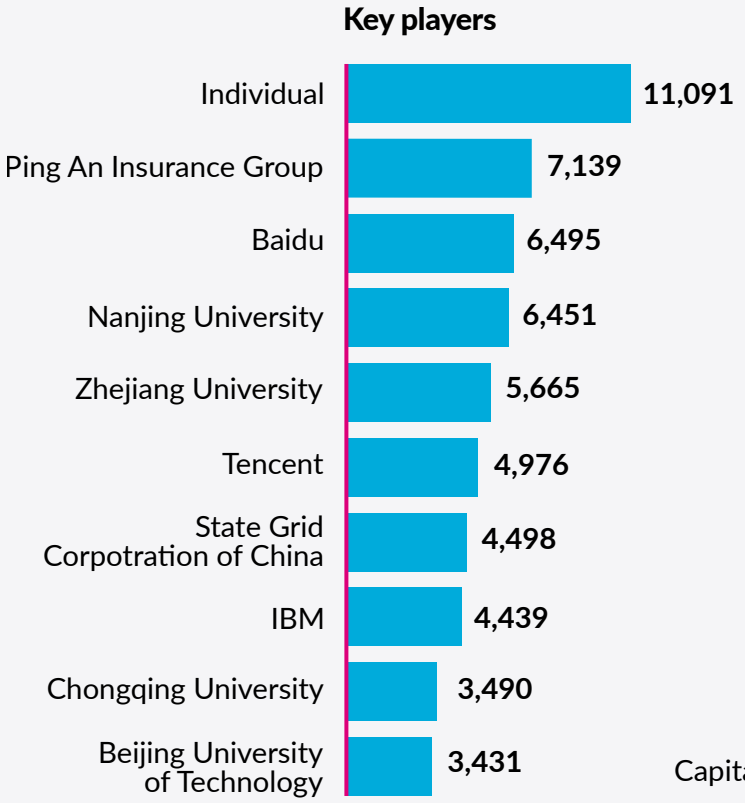
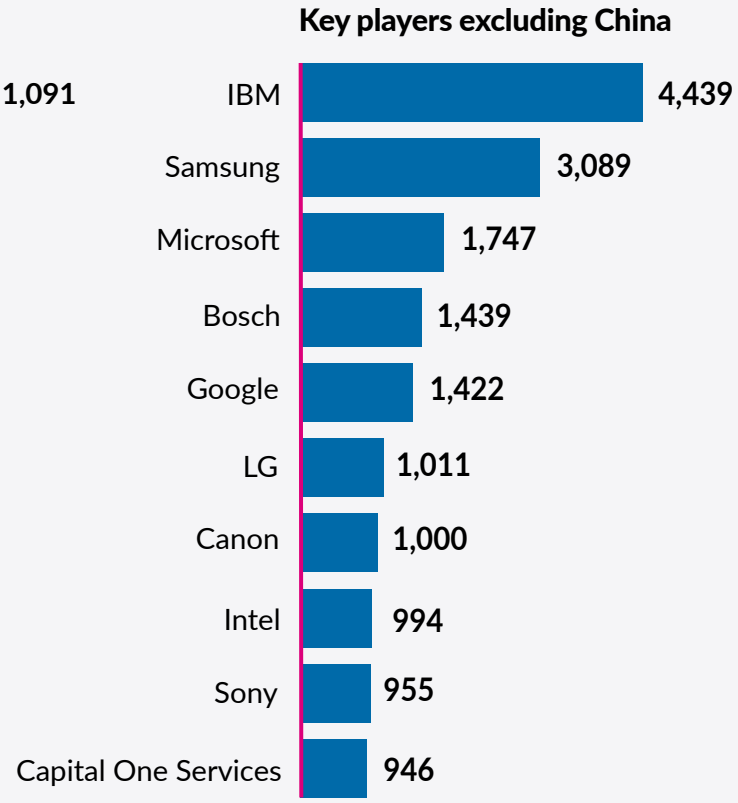
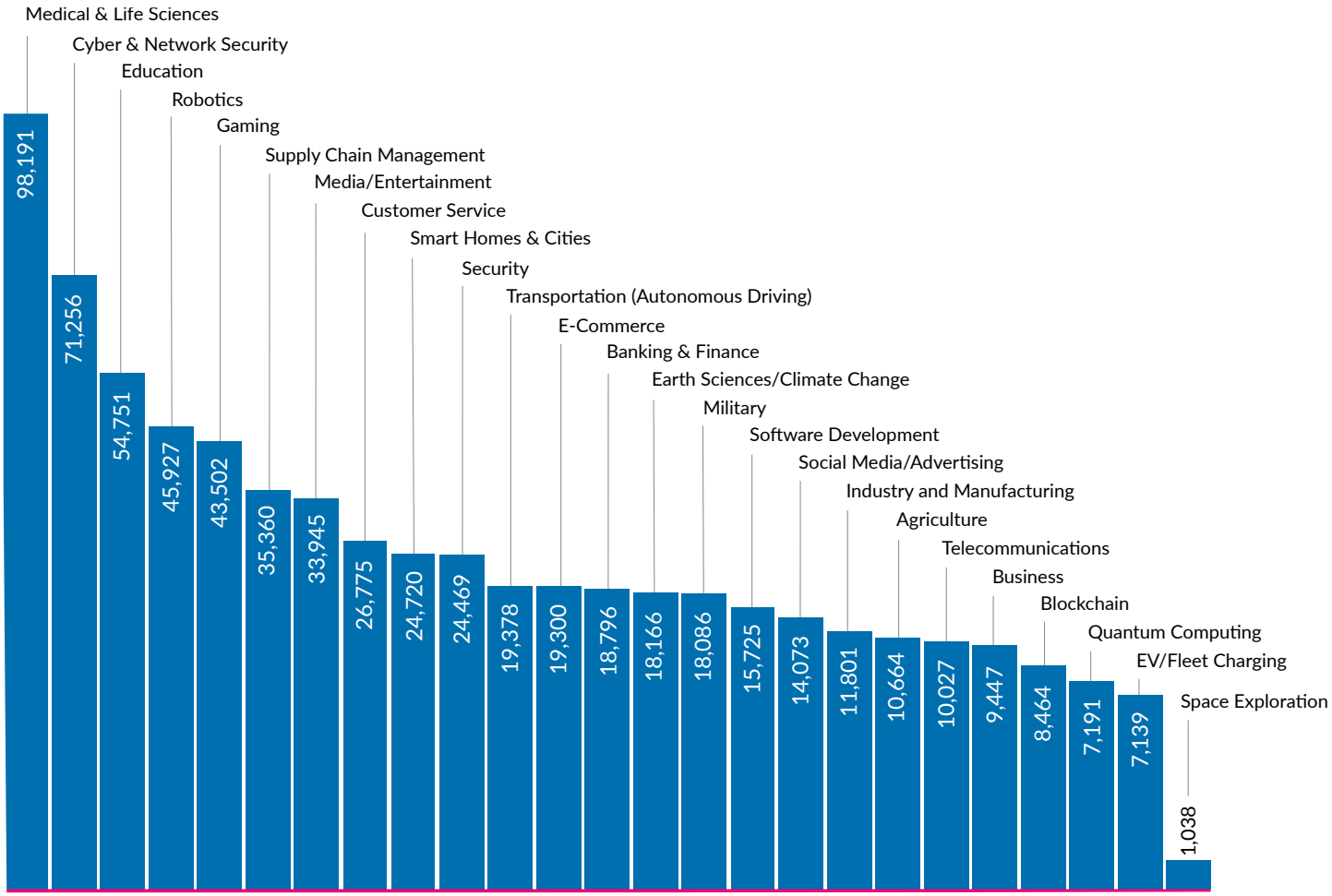




- Data indicates a clearer picture of **individual researcher's or inventor's dominance** in the field of AI which indicates a diverse and decentralized innovation landscape. The geographies which they prioritize for filings are China, Korea followed by the US. The category with the most patent filings is decision-making and the primary application areas are medical and life sciences followed by education and cyber security.
- A substantial number of **prominent players in the AI field have emerged from China,** indicating a clear dominance of China. The majority of the key players are China-based, with only IBM representing the US and asserting American priority for a significant number of patent families.
- It's worth noting that the top 10 players cover just 12% of the total AI patent filings. Chinese insurance giant, Ping An Insurance Group, has been actively investing in AI-based startups (link). **Ping An Insurance Group** is prominent in the cyber security application area. **Baidu,** a prominent Chinese technology company, is substantially invested in AI. They established AI research labs, Baidu Ventures, for funding and supporting AI-related startups and collaborations with leading academic institutions and research organizations and corporates globally to drive AI research forward. Baidu holds patents primarily in education, gaming and media/ entertainment. Tech giant **IBM** predominantly files in the category of education, in collaboration with several academic institutions in the US. Major patent filers in the US are IBM, Samsung, Microsoft, Google and Baidu. Samsung files patents mainly for medical and life sciences, while Microsoft and Google actively file for gaming applications.

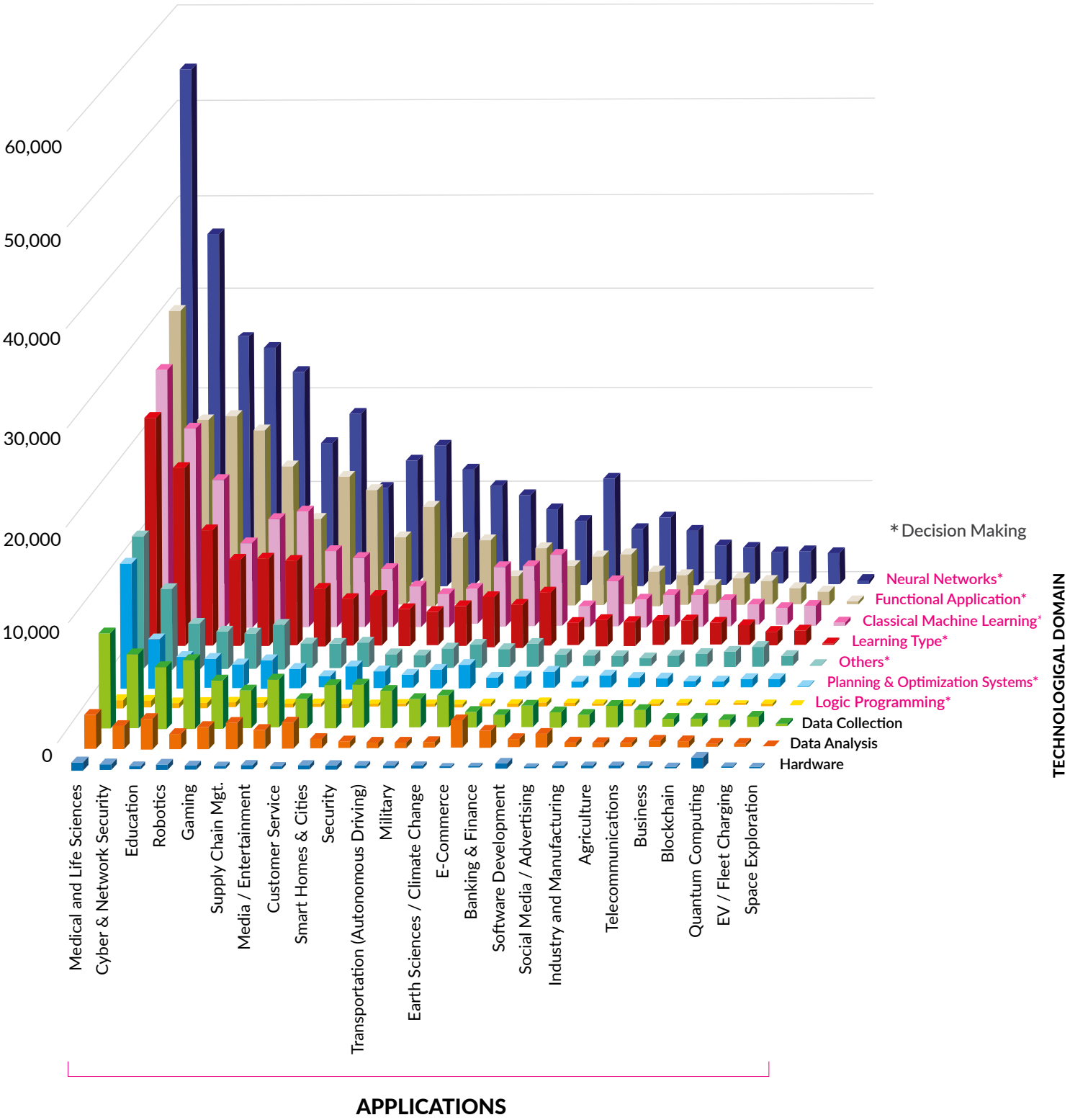
- There is a significant AI **dominance of universities, especially Chinese universities.** Nanjing University and Zhejiang University are leading patent applicants in the field of AI, demonstrating their strong presence and contribution in AI research and innovation. Their main technology area of interest is medical and life sciences. Some of the other noticeable universities are Tsinghua University, Wuhan University, University of Electronic Science & Technology of China, Southeast University, Xidian University, South China University of Technology, Tianjing University, Hangzhou Dianzi University, and Shangdong University.
- **The Grid Corporation of China,** a state-owned electric utility company, is the top leading patent applicant in the field of AI, with a particular emphasis on techniques associated with neural networks.
- Other major players in the AI space are **Bosch, LG Electronics, Intel** and **Capital One Services.** The patent filing activity of Bosch and LG are primarily on robotics and transportation whereas Intel focuses on gaming. Capital One Services holds patents in the field of banking and finance.
- **Canada's patent filings** account for only 0.9% of global patent filings and Ontario based companies' market share is 0.2% of global AI filings.
- **Some of the Canadian and Ontarian players who have patents include** Royal Bank of Canada (RBC), Toronto Dominion Bank, 10353744 CANADA LTD (a non-distributing corporation), Shopify and the University of Toronto. RBC and TD Bank file for cyber and network security, as well as banking and finance patent applications. Shopify files patent applications related to e-commerce, while 10353744 CANADA holds patents on supply chain management and customer service applications. The University of Toronto holds patents mostly for neural networks and actively files healthcare applications.
- **Darwin AI,** based in Waterloo, Ontario, specializes in developing explainable AI solutions for decision-making. Similarly, **Borealis AI,** the AI research division of RBC and Montreal-based company **Element AI** (acquired by ServiceNow) has invested in AI technologies, including decision-making AI. These examples demonstrate the **active involvement of Canadian startups** in decision-making AI through investments, research, and collaborations.
- Some Canadian Universities such as the University of Toronto, University Health Network, and McGill University hold patents in the AI sector. Canadian universities are predominantly **prioritizing the US** for their patent filings.

LEADING APPLICATION AREAS IN THE AI SPACE



- Approximately 70% of the total patent families are directed to one or more application areas in the AI taxonomy according to the selected application categories shown above.
- The COVID-19 pandemic has placed a significant spotlight on the medical and life sciences sector, leading to a notable rise in the integration of AI technologies within the **subcategory of healthcare in medical and life sciences.** This trend suggests the potential for substantial transformative changes in the healthcare industry in the future.
- In addition to medical and life science applications, cyber and network security is a prominent area with a significant number of patents in the field of AI. With the rise of digitalization and interconnected systems, cyber threats have become more sophisticated and prevalent. AI offers the potential to enhance cybersecurity measures by leveraging its capabilities in threat detection, anomaly detection, and real-time monitoring. As a result, there has been a growing interest in developing AI-based solutions to address cyber threats effectively.
- **Education** is also a trending application area for AI. It is revolutionizing education through personalized learning, intelligent tutoring systems, and automated grading and assessment, enhancing student engagement and learning outcomes.

APPLIED AREAS OF AI



APPLIED AREAS OF AI

(CONTINUED)

- Apart from medical and life sciences, media and entertainment is an up and coming AI application area. Recent disruption of AI in the media and entertainment space can be attributed to the high volume of filings indicating research being done in this space.
- Decision-making AI plays a crucial role across industries and domains due to its potential to assimilate and utilize complex data to address intricate problems. Within the decision-making category:
  - In addition to neural networks and functional applications, the subcategories of classic machine learning and learning types are seeing substantial activity.
  - Areas of focus within these subcategories include general machine learning and supervised/unsupervised learning.
- Examining the convergence of technology categories with specific application areas provides valuable insights into the patent landscape within your areas of interest. It is crucial to analyze datasets that are pertinent to your application and technology category. This analysis will enable you to discern trends and market dynamics, as the trends and markets vary for each technology category and application.

TECHNOLOGICAL CATEGORIES

DATA COLLECTION
(SENSOR-BASED, IoT)

FILING TRENDS & TOP GEOGRAPHIES

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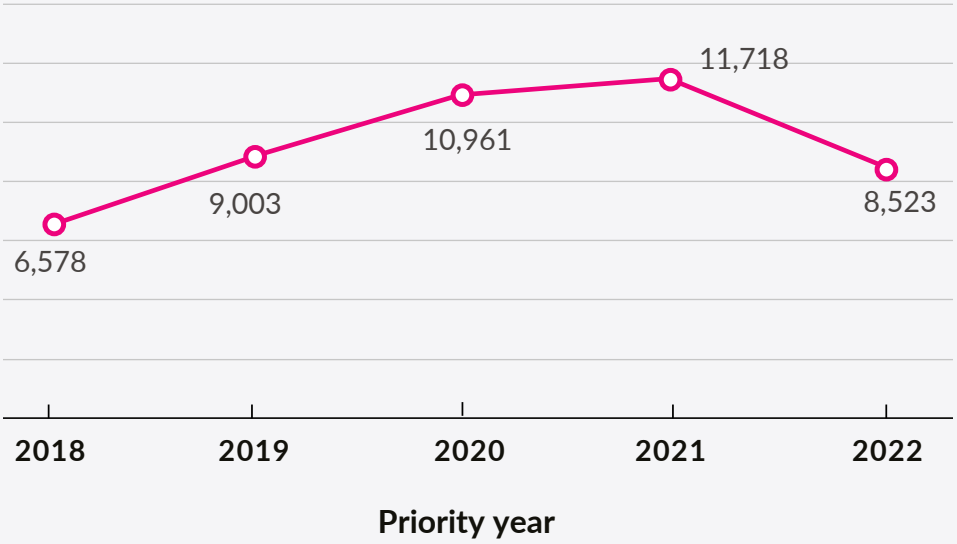
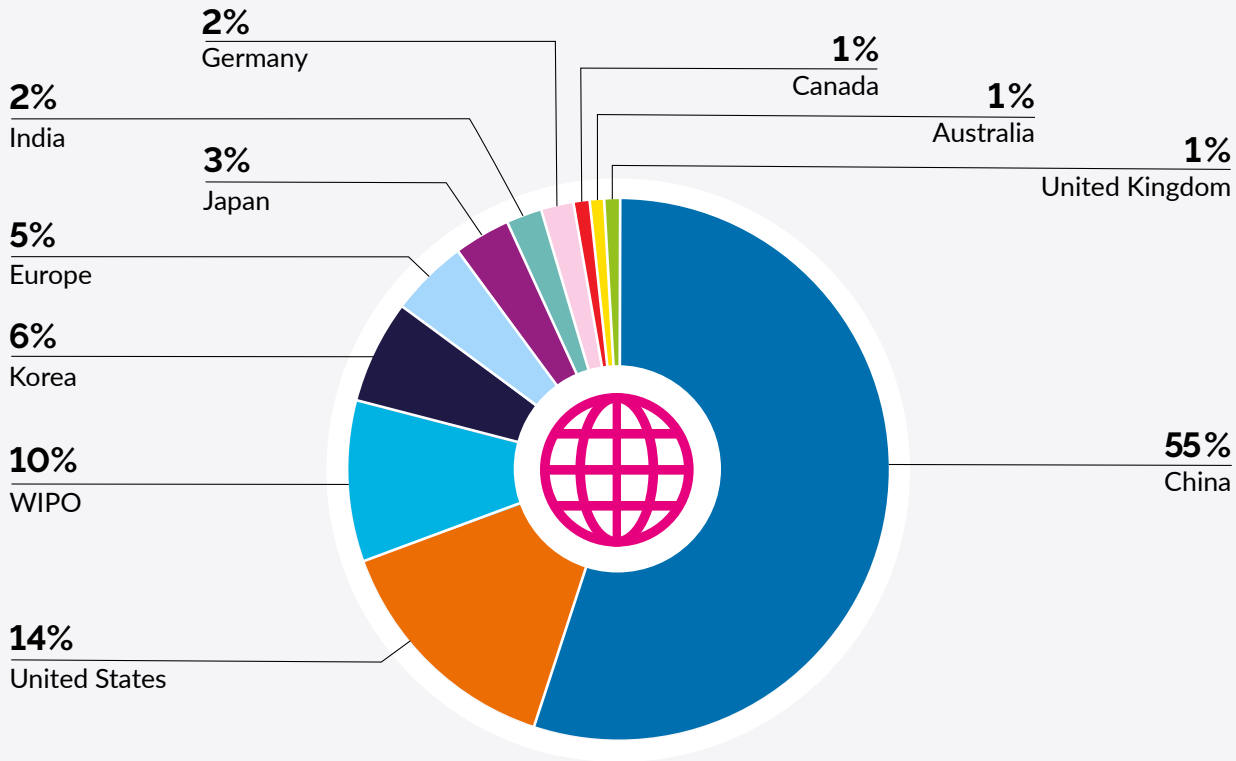




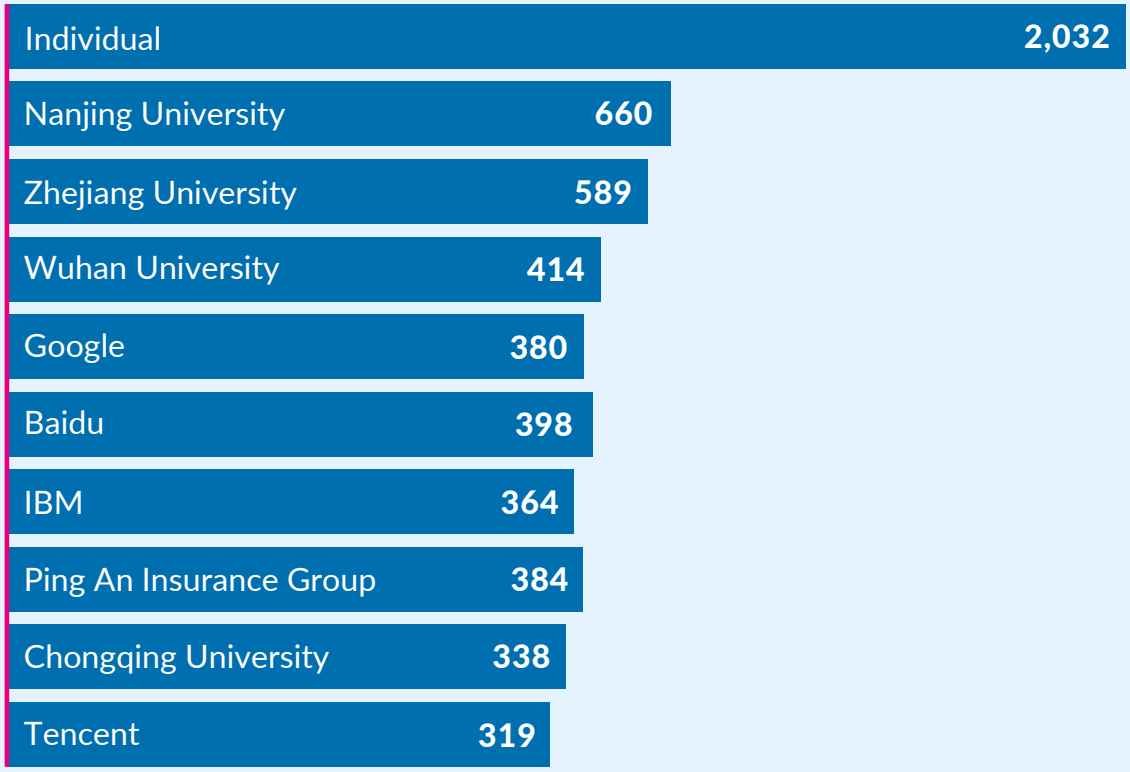
DATA COLLECTION (SENSOR-BASED, IoT)

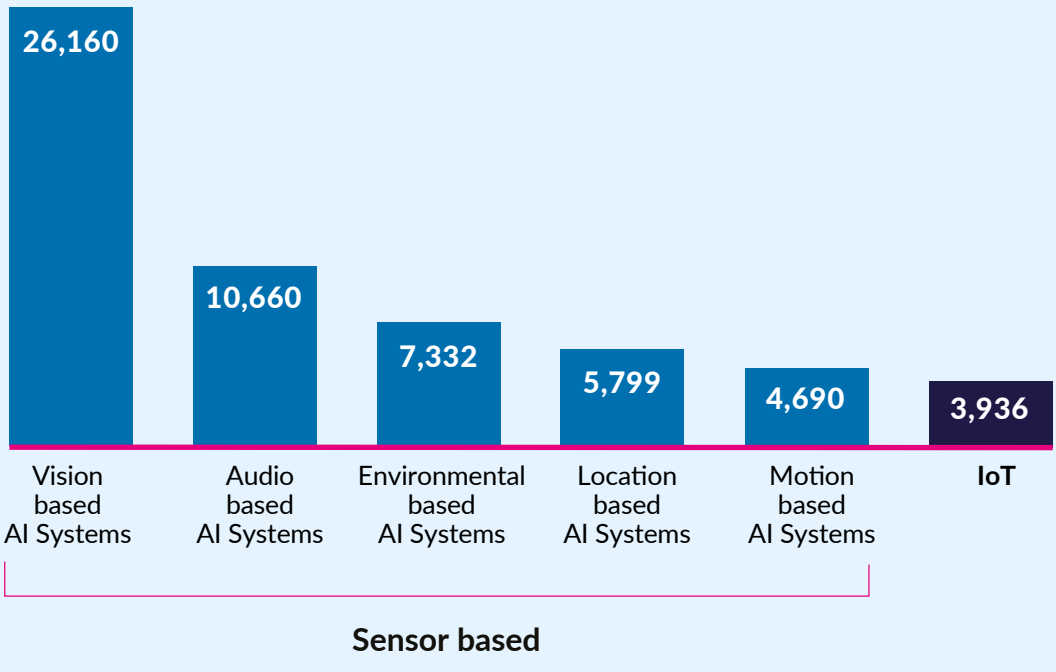
FILING TRENDS & TOP GEOGRAPHIES

- Since 2018, there has been a consistent increase in patent filings for **vision-based techniques,** an AI system that focuses on **Data Collection.**
- China is the predominant market with around 55% of the total patent publications related to data collection, followed by 14% in the US, 10% in the WIPO, 6% in South Korea, and 5% in Europe. Approximately 71% of patents published by the top five players are in China. A significant number of individual inventors are filing applications in China, followed by academic institutions such as Nanjing University and Zhejiang University. Activity among the top Chinese patent applicants suggests a China-only filing strategy, with greater than 90% of the Chinese filings not having corresponding foreign applications. The top US applicants are Google and IBM, and their filing strategies continue to be centred on the US, with a secondary focus on China. Google actively files audio-based AI systems and location-based AI systems, while IBM is focused on location-based AI systems and IoT.

DATA COLLECTION
(SENSOR-BASED, IoT)

KEY PLAYERS & TECHNOLOGY SEGMENTS





DATA COLLECTION (SENSOR-BASED, IoT)

KEY PLAYERS & TECHNOLOGY SEGMENTS

- Within the AI category of data collection, Wuhan University and Google have emerged as new significant players, with a focus upon the vision-based and audio-based technology segments.
- Vision-based AI systems and audio-based AI systems have emerged as the two primary domains for patent filings. For vision-based systems, Chinese universities lead the patent filings. Companies like Bosch, Baidu, Samsung, SGCC and LG are the other patent filers in this subcategory. For Audio-based systems, Google, Baidu, Tencent, Ping An Insurance Group, Amazon and IBM are the prolific players.
- Emergent applications are enabled by the application of AI to vision sensor data. Exemplary implementations include object recognition (e.g., autonomous driving), optical character recognition (OCR), image/video analysis, biometric analysis, and quality control.
- Other than the top players listed here, companies such as Amazon and Capital One Services hold patents on audio-based AI systems and location-based AI systems. State Grid Corporation of China files patents on environmental-based AI systems and IoT-based systems. Chinese players Tencent, Baidu and Ping An Insurance Group hold patents mainly in the category of audio-based AI systems followed by vision-based AI systems.
- In terms of other players, academic institutions are showing strong patent filing activity within this category. Several Chinese universities, such as Nanjing University, Zhejiang University, Wuhan University, Xidian University, and Chongqing University are dominating in the various technology segments of data collection AI.
- Other players demonstrating patent filing activity in this category include Samsung, LG, Bosch, Huawei, Sony, Nvidia, Alibaba, Microsoft, and Intel. Among the top 50 players, 30 are academic institutions mostly located in China.
- Some of the players who have patent filings in Canada are Capital One Services, UATC, Boeing, and Allstate Insurance.

PRESCRIPTIVE DATA ANALYSIS

FILING TRENDS & TOP GEOGRAPHIES

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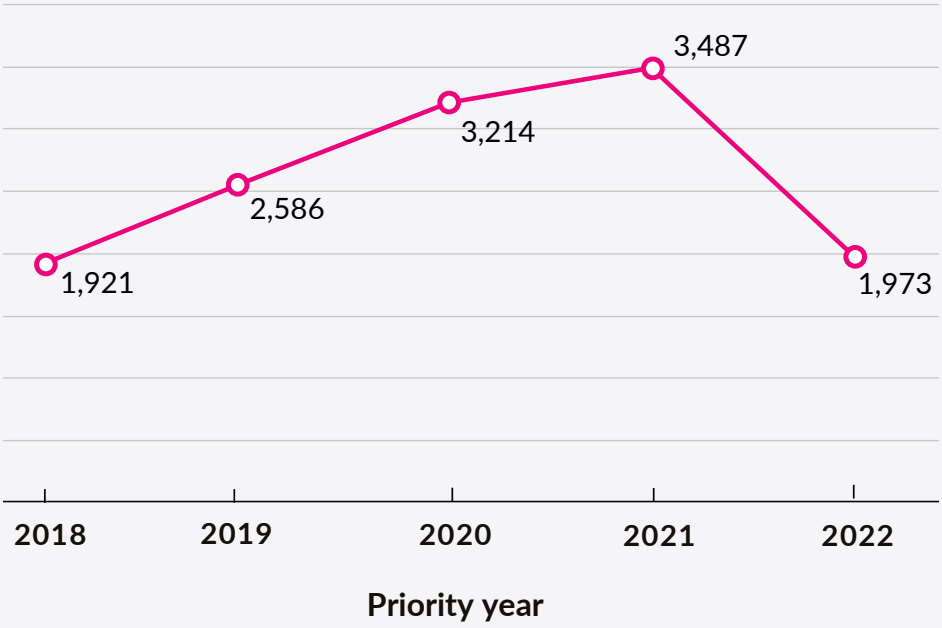
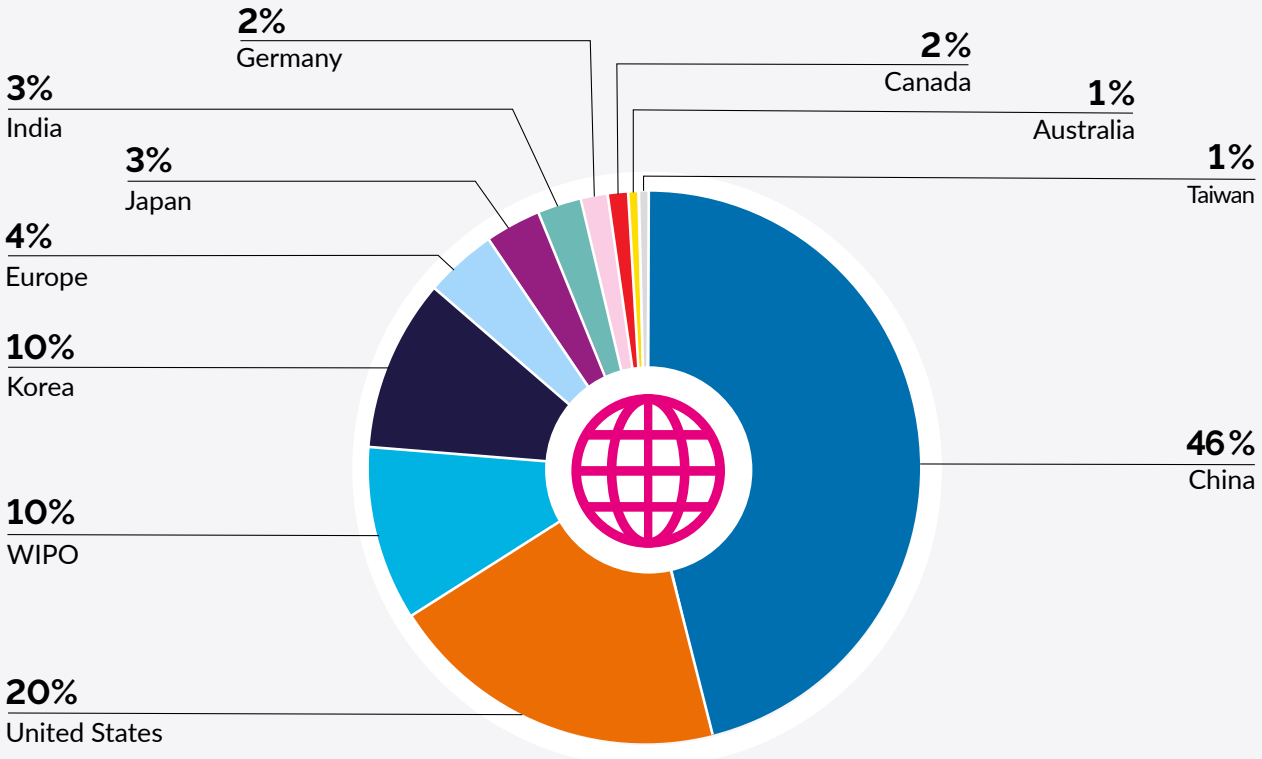




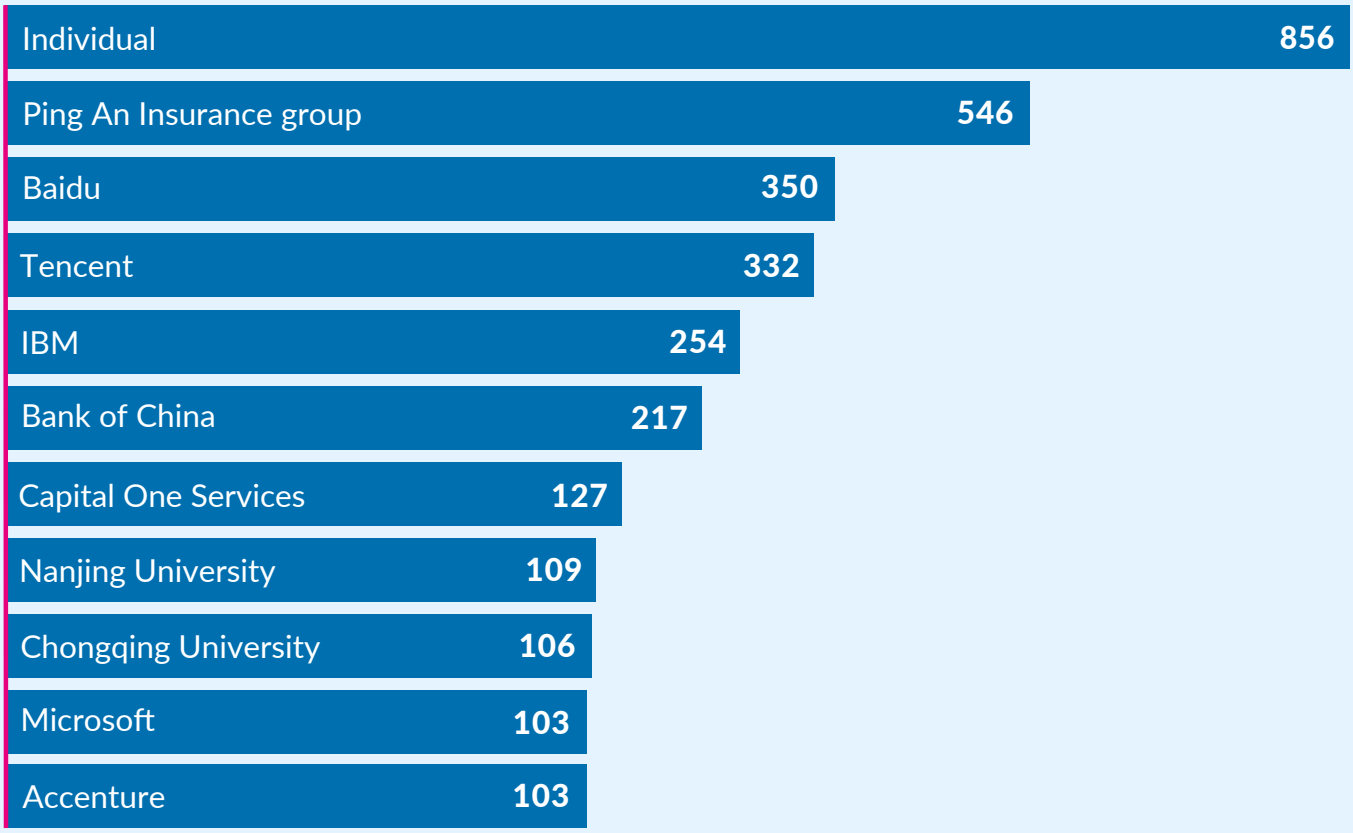
PRESCRIPTIVE DATA ANALYSIS

FILING TRENDS & TOP GEOGRAPHIES

- Since 2018, there has been a consistent increase in patent filings for **Prescriptive Data Analysis** which is an AI system that recommends the optimal course of action based on data analysis.
- China has positioned itself as a leading player in terms of patent filings with around 46% of total patent filings related to AI data analysis, followed by the US with 20%, WIPO with 10% and South Korea with 10%. Among the top filings based in China, Chinese players dominate the field with much of the patent filing activities arising from academic institutions, including Nanjing University, Chonqing University, and Zhejiang University. Ping An Insurance Group, Tencent, and Baidu are the top technology players in China. Activity amongst the top Chinese patent applicants suggests a China-only filing strategy, with very few corresponding foreign applications.
- US players such as IBM, Capital One Services, Microsoft, and Oracle, along with Accenture and Baidu lead the patent filing activity in the US.

PRESCRIPTIVE DATA ANALYSIS

KEY PLAYERS



PRESCRIPTIVE DATA ANALYSIS

KEY PLAYERS

- Other players demonstrating patent filing activity in this category include Samsung, Huawei, SGCC, Alibaba, LG Electronics, Google, Oracle, and OneConnect Technology.
- Individual inventors, Intuit, Capital One Services, Strong Force portfolio, and RBC are some of the players who conduct patent filing activities in Canada in this category.
- **Medical and life sciences** is the top application field for prescriptive analytics, followed by **education**.

DECISION MAKING

FILING TRENDS & TOP GEOGRAPHIES

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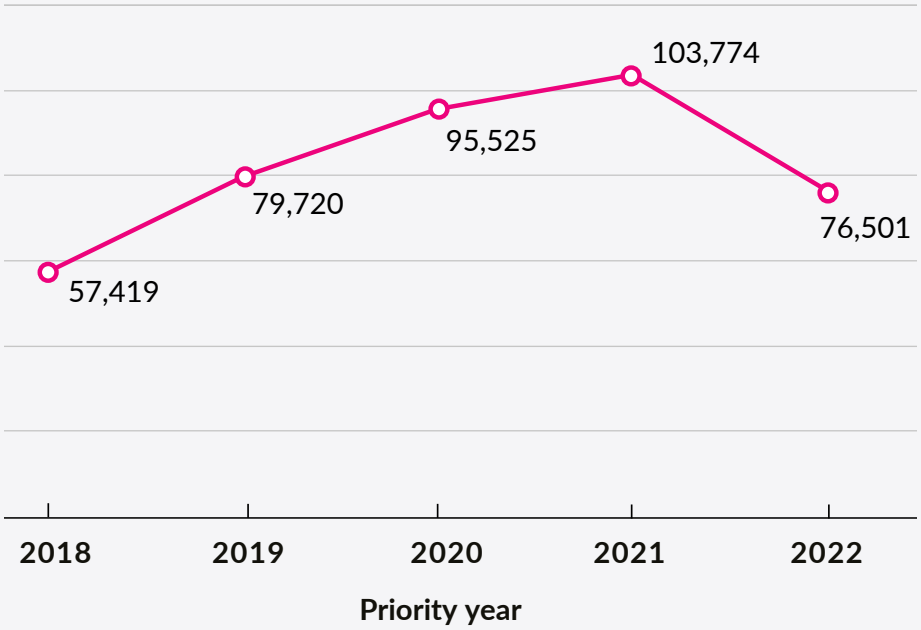
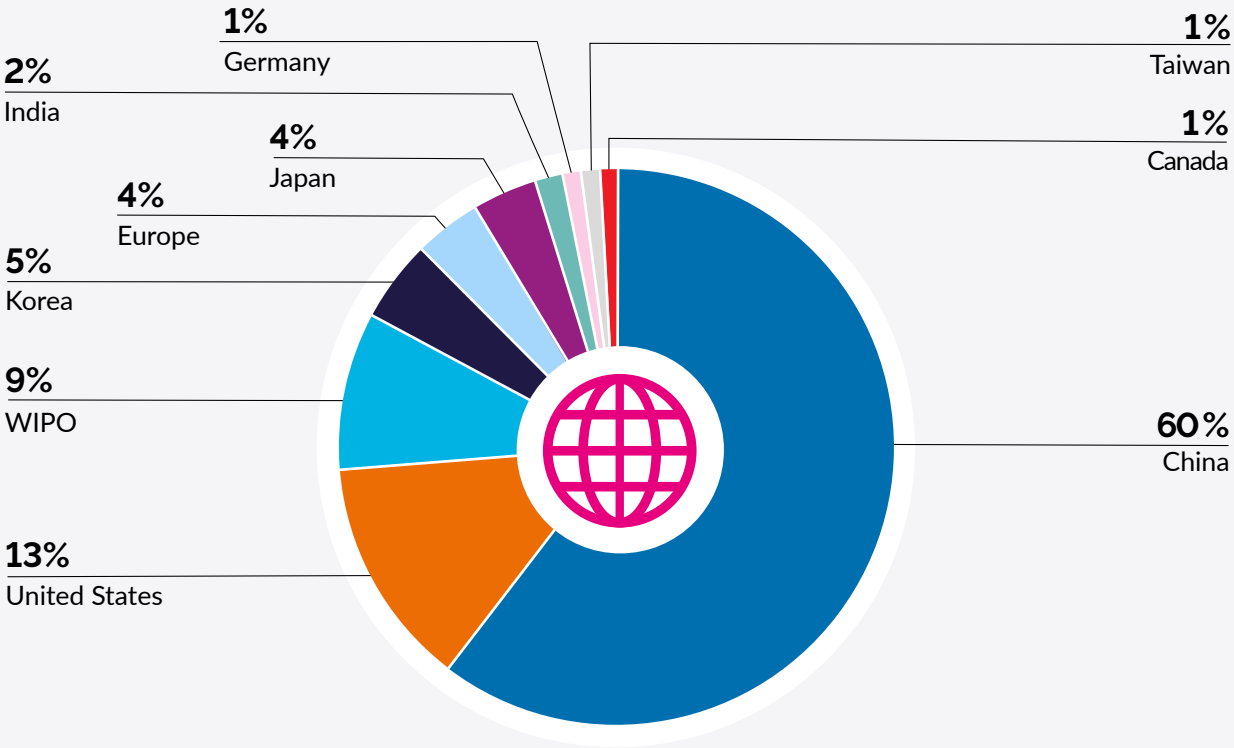




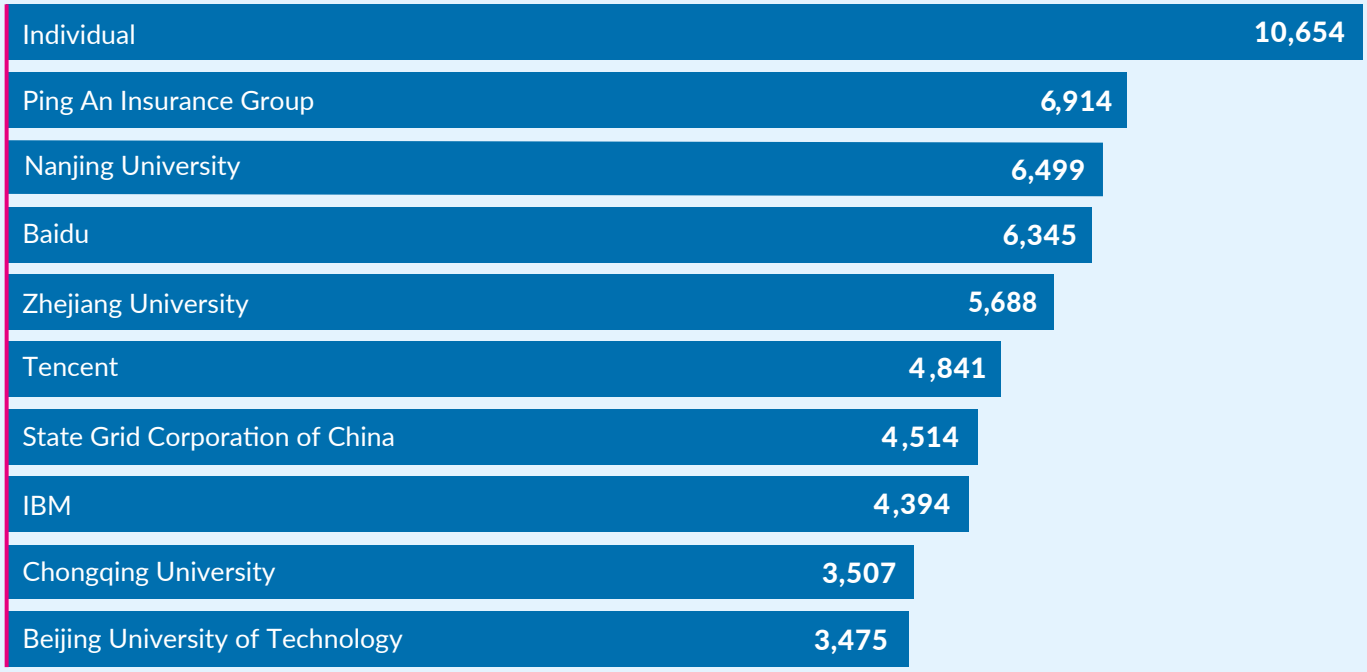
DECISION MAKING

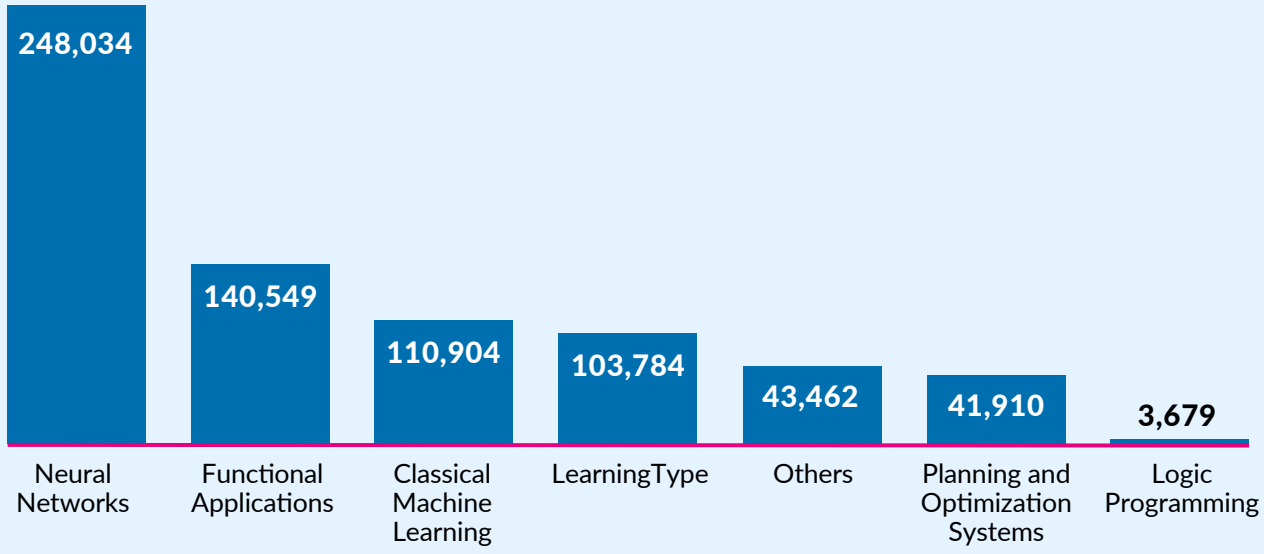
FILING TRENDS & TOP GEOGRAPHIES

- There has been a consistent and significant increase in patent filings focused on **Decision Making (AI).** Starting in 2018, each successive year has seen larger volumes of patents being filed in this category, which underscores the importance of decision-making AI across multiple industries.
- Globally, Chinese patent filings dominate. Both China and US have shown significant activity and expertise in developing and protecting IP in this category. Ping An Insurance Group, Nanjing University, Baidu, Zhejiang University and Tencent are the major patent filers in China. IBM is the only non-Chinese player placed within the top 10 filers. Patent filings in the US are dominated by IBM, Samsung, Microsoft, and Google. Chinese giants Baidu and Tencent have significant patent filings in China. Activity amongst the top Chinese patent applicants suggests a China-only filing strategy, with very few corresponding foreign applications.

DECISION MAKING

KEY PLAYERS & TECHNOLOGY SEGMENTS





DECISION MAKING

KEY PLAYERS & TECHNOLOGY SEGMENTS

- In terms of decision-making AI, the subcategory of neural networks is experiencing significant growth. It is considered one of the fastest-growing research areas, with extensive research and development activities focused on improving neural network architectures, training techniques, and applications. Artificial Neural Networks (ANNs) are decades old and form the foundation of modern neural network architectures. ANNs and Convolutional Neural Networks (CNNs) are versatile and can be applied to a wide range of tasks. ANNs are widely used for general purpose machine learning tasks, while CNNs excel in tasks involving image and video analysis. Their flexibility and broad applicability have led to their widespread adoption and subsequent patent filings. Other types of neural networks, (e.g., Recurrent Neural Networks (RNNs) or Spiking Neural Networks (SNNs), are gaining more prominence for future use as their applications expand and research progresses. Generative Adversarial Networks (GANs) have emerged as highly popular and influential models fueling the growth of generative AI. Nanjing University, Zhejiang University, Ping An Insurance Group, and Tencent are the key filers in the field of neural networks.

- China's universities have made significant contributions to the field of neural networks and have accumulated a considerable number of patents in this area. Individual inventors have displayed a keen interest in neural networks and have actively filed a growing number of patents in this field.

- The **functional applications** subcategory includes computer vision, natural language processing and speech processing, with computer vision AI showing a significant rise in patent filings. Inventors and organizations are actively seeking patent protection for their innovations in this area, highlighting the importance and potential of this technology. Baidu, Ping An Insurance Group and Tencent are the prolific players in the functional applications subcategory.

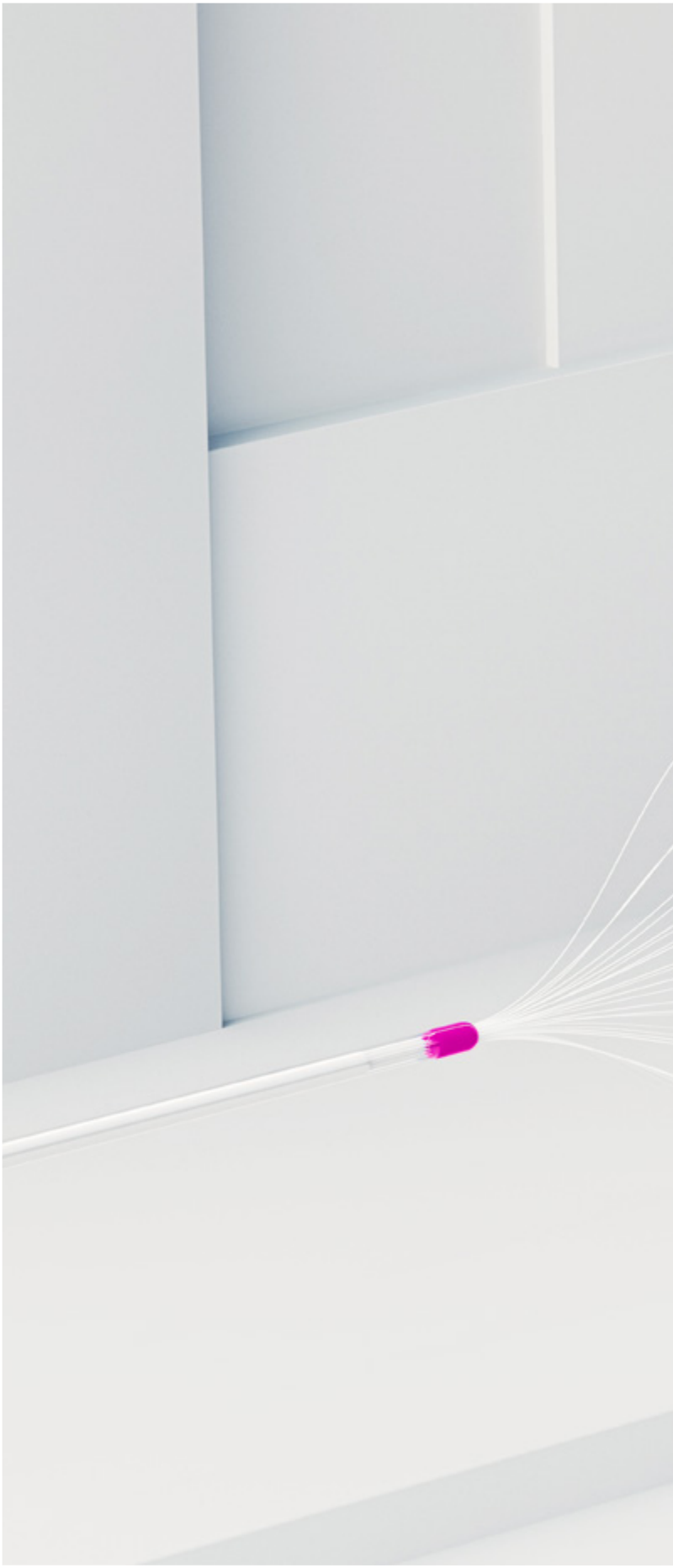
- Among the different branches of **classical machine learning**, general machine learning has attracted substantial attention from key industry players. Additionally, alongside Support Vector Machine (SVM), Decision Tree stands out as another top machine learning model. Players such as IBM, State Grid Corporation of China, and Nanjing University dominate this subcategory with extensive numbers of patents.

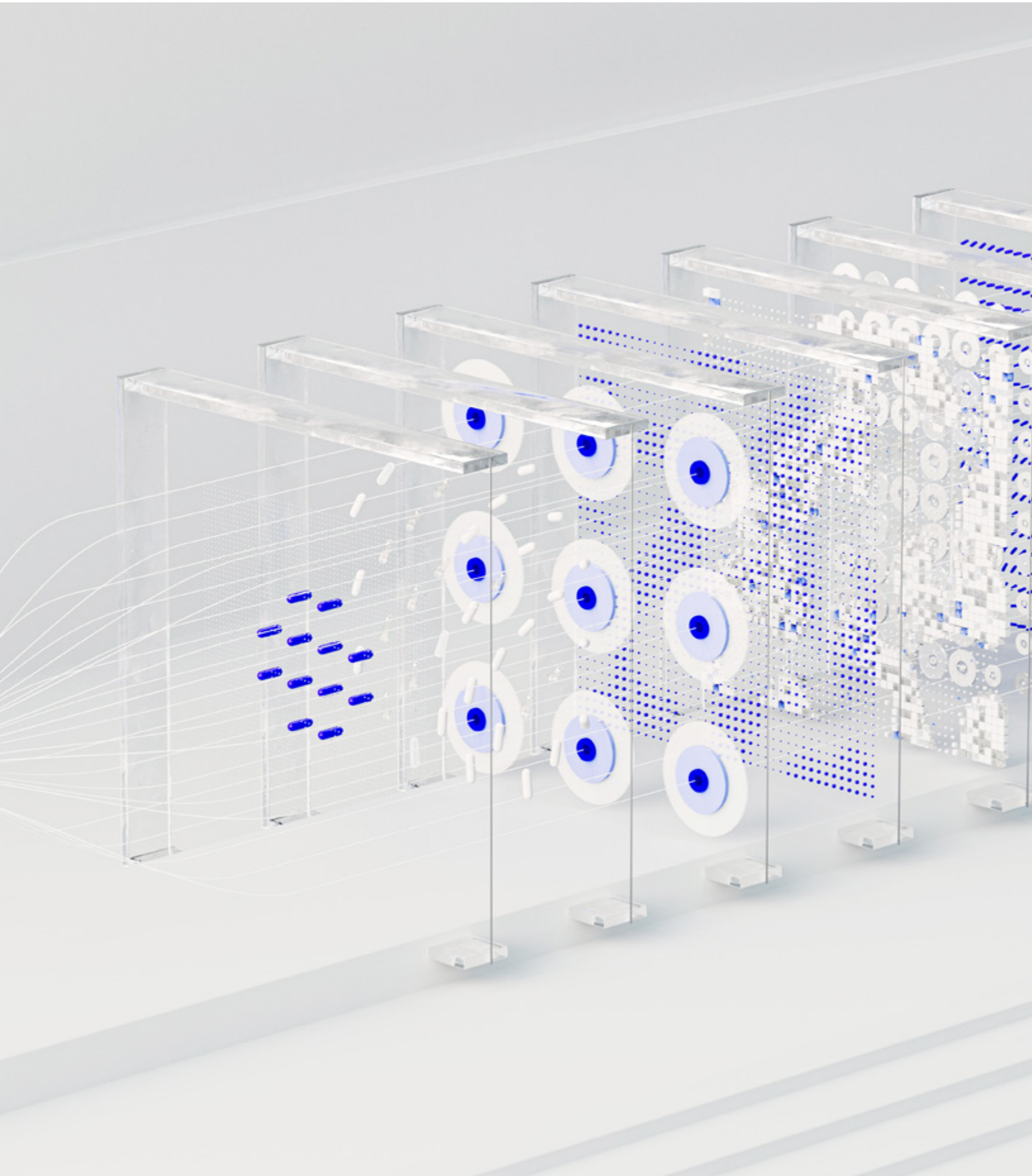
- For the **learning type** segment, **supervised learning** exhibits a larger number of patents compared to other learning type areas. Supervised learning has found practical applications in diverse industries, including healthcare, finance, marketing, and autonomous driving. It has been successfully used for tasks such as image recognition, natural language processing, fraud detection, and recommendation systems. The tangible impact of supervised learning in solving real-world problems has motivated inventors to patent their inventions in this area. Patent filing activity is strongly led by Chinese universities and the State Grid Corporation of China in the learning type subcategory.

DECISION MAKING

(CONTINUED)

- The **others subcategory** contains areas of patent filings that include knowledge graphs, Particle Swarm Optimization (PSO) systems, genetic algorithms, Quantum computing AI, AI ethics, AI hallucination, etc. Knowledge graphs, as a subfield of AI, has witnessed a greater number of patent filings compared to other areas. Knowledge graphs have economic and market potential due to their ability to enhance data understanding, improve decision-making, and enable advanced applications. PSO has been witnessing increasing interest from players, indicating its potential as a growing area in the future.
- **Planning and optimization AI** algorithms have garnered significant interest in the field of AI, with top players actively investing in this area. Noticeable patent filing activity from Chinese universities has been observed in this subcategory.
- **Logic programming covers** topics like expert systems, logic programming (general), and fuzzy logic in AI. Key patent filers in these subcategories include IBM, Intel, Microsoft, and Micron Technology.
- Capital One Services, RBC, TD, and Intuit are some of the players who have filings in Canada.

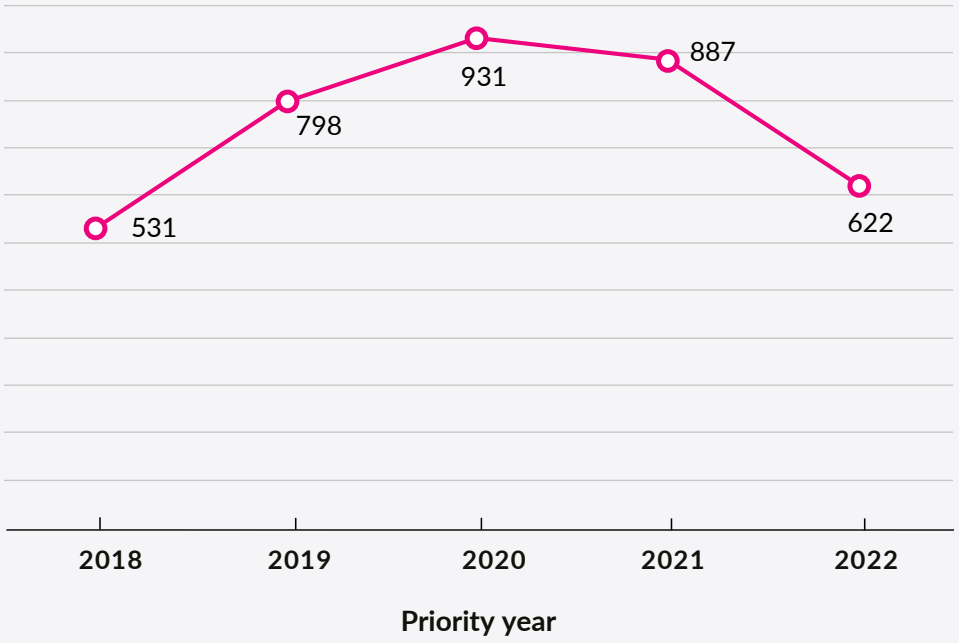


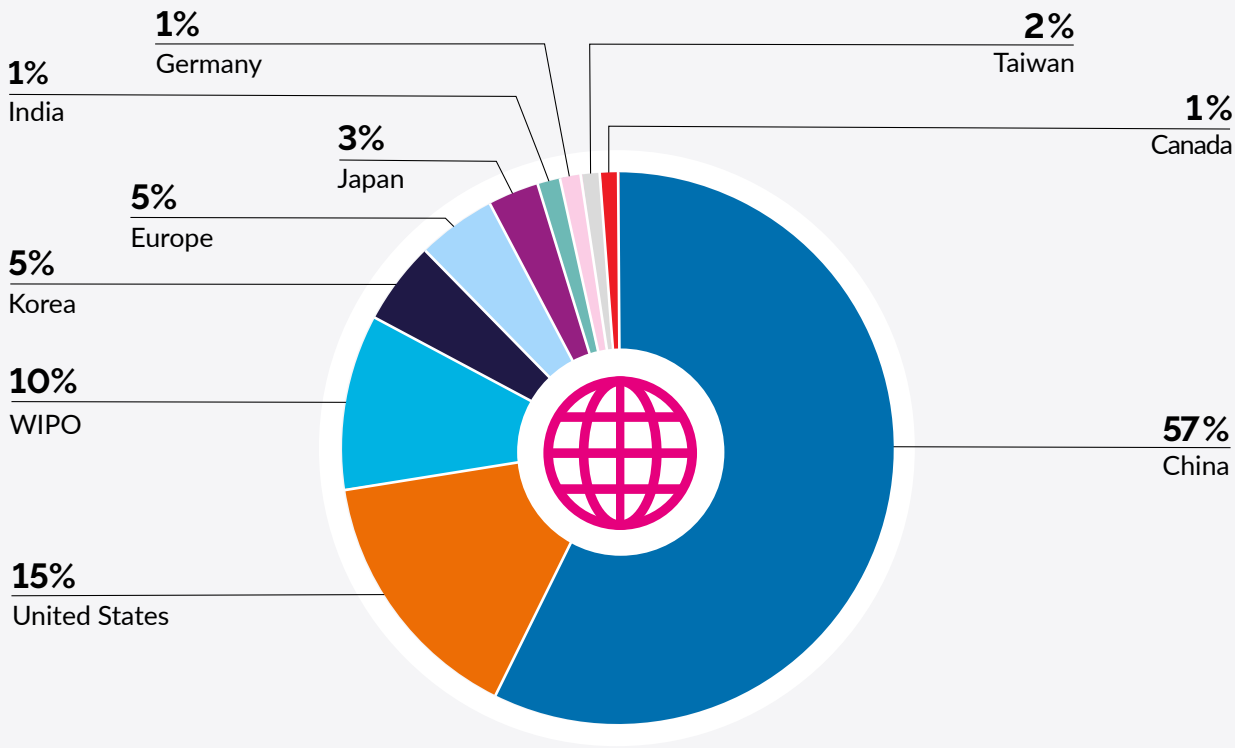


AI HARDWARE

FILING TRENDS & TOP GEOGRAPHIES

Note: The number of patent applications filed in 2021 and 2022 may increase as patent applications have an 18 month delay and therefore this data may not have been captured at the time of research.





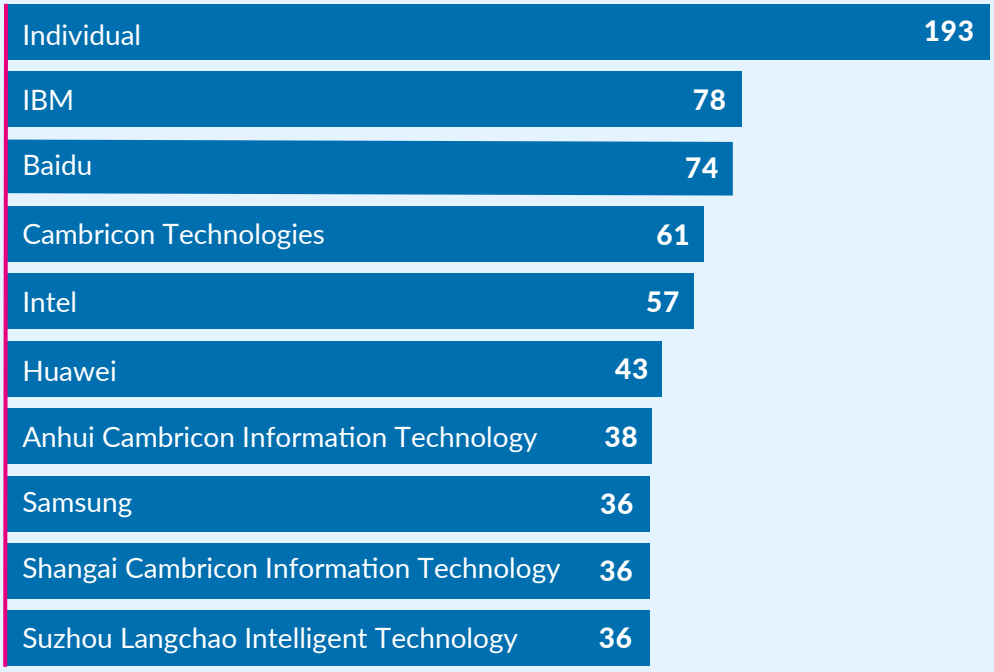
AI HARDWARE

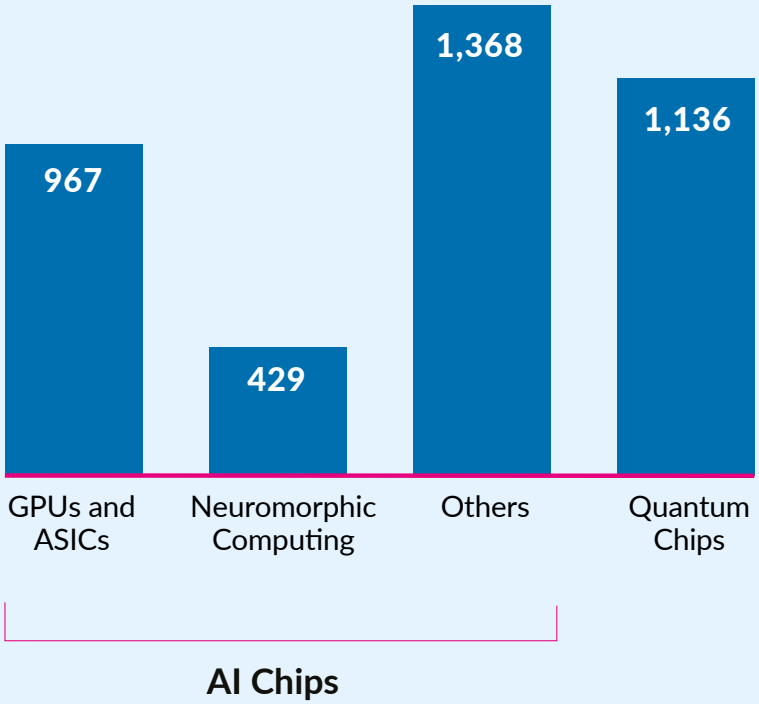
FILING TRENDS & TOP GEOGRAPHIES

- There has been a notable increase in invention filing activity within the **AI Hardware** space over the past five years. However, the number of patent filings are noticeably less than other AI subcategories.
- China has the largest number of patent filings in this category, having approximately 57% of the total AI hardware patents filed. Individual inventors, Baidu, Cambricon Technologies, Suzhou Langchao Intelligent Technology, and Huawei are the key filers in China. Samsung is the only non-Chinese company of the top 20 filers who have patents in China.
- IBM, Intel, Samsung, Micron Technology, Baidu, and Gyrfalcon Technology are the key players who have substantial filings in the US.
- Major companies have begun prioritizing AI hardware to achieve enhanced hardware-software integration while gradually reducing dependencies on other companies. In February 2023, IBM introduced Vela, its latest AI supercomputer designed for foundation model training and research. While the official unveiling of this cloud-native system, which utilizes x86 silicon, Nvidia graphic processing units (GPUs), and ethernet-based networking, is relatively recent, it has been operational since May 2022, supporting diverse IBM functions online. Microsoft is reportedly developing an AI processor using a TSMC 5nm process named "Athena" as an alternative to Nvidia's GPU chips as per reports in May 2023. The company aims to secure the supply of AI processor chips and explore new market options. With a significant investment of around $2 billion and a dedicated chip division, Microsoft is focused on creating custom chips for AI data centers, offering a competitive solution for training and inference of AI models.

AI HARDWARE

KEY PLAYERS & TECHNOLOGY SEGMENTS





AI HARDWARE

KEY PLAYERS & TECHNOLOGY SEGMENTS

- In terms of technology segments of AI hardware, quantum chips, neuromorphic computing (NPUs) and other types of AI chips (besides GPUs) and application specific integrated circuits (ASICs) are currently experiencing significant growth.
- IBM, BAIDU, and Cambricon Technologies are prominent players in the AI-based hardware domain. Chinese chip manufacturer, Cambricon Technologies, has successfully raised hundreds of millions of dollars in its latest funding round (link).
- The key players in quantum chips are Individual inventors, IBM, Heifei Origin Quantum Calculating Technology, Shanghai Tailingwishi Calculation Science & Technology, Baidu, and Nanjing University. Individual inventors, Cambricon Technologies, Intel, Baidu, Huawei, and IBM dominate filings in the field of AI chips.
- The number of patent applications filed in Canada is much less in the AI hardware field. Some of the players who have patent filings in Canada are individual inventors, Zapata Computing, 1QB Information Technologies, Google, and Applied Brain Research.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TRENDING AREAS IN AI

	Priority Year				
	2018	2019	2020	2021	2022
Generative AI	**3,141**	**5,087**	**6,702**	**8,003**	**6,687**
Spiking (SNNs)	123	198	219	232	254
Transfer Learning	538	904	1,214	1,478	1,213
Federated Learning	49	217	752	1,142	1,064
Shallow Learning	245	365	433	573	540
Online Learning	133	153	180	184	153
Active Learning	26	50	55	48	18
Differential Privacy	404	671	1,040	1,307	1,119
Quantum Computing-AI	225	254	321	388	292
ML Interpretability/Explainability	67	127	192	245	145
Artificial General Intelligence	14	23	24	21	14
AI Ethics	17	14	18	27	16
AI Hallucination	10	9	14	8	4
Quantum Chips	148	209	235	289	215
Neuromorphic Computing	94	83	127	75	40

- Since 2019, most players have aggressively scaled up innovation activities to position themselves as leaders in **generative AI.**
- **AI ethics, AI hallucination,** and **Artificial General Intelligence (AGI)** have emerged as prominent and trending areas of development in the field of AI. Patent filings in these domains have increased since 2018, indicating a growing focus and investment in these specific aspects of AI. Notably, many of the patents in these domains are held by individual inventors, reflecting the active involvement and contributions of individual researchers and innovators in shaping the developments in these areas.
- **China-based Nanjing University and Zhejiang University are at the forefront of patent filings in the field of generative AI, showcasing their significant contributions.** The majority of top players in the emerging field of AI technologies predominantly originate from China.
- **Canadian universities and research institutions are actively contributing to the field of generative AI.** Vector Institute, a Toronto-based globally renown AI research institute, focuses on generative AI models.
- Canada's strong AI research community and government support contribute to Generative AI advancements. Programs like the Canadian Institute for Advanced Research (CIFAR) and funding initiatives from organizations like the Natural Sciences and Engineering Research Council of Canada (NSERC) support research in AI, including Generative AI models.
- ServiceNow and NVIDIA have partnered to collaborate on the development of generative AI capabilities.

IP STRATEGY CONSIDERATIONS

China and the US need to be a part of your global IP strategy as more than half of the patents are filed in these countries. Top players of all technology categories of AI are China-based, and most of their inventions are protected only in China. The absence of foreign filings by these China-based players indicates that China is the key jurisdictional component of their IP strategy. Your IP strategy needs to consider the influence of both US and China patent filings, in addition to other jurisdictions relevant to your business. If China is critical, budgets and estimates need to be mapped out, as translation fees will increase the cost to execute this strategy.

There are a significant number of patents filed by individual inventors or researchers in the domain of AI. Identifying and collaborating with these individuals could be considered a key part of your IP strategy.

There has been a noticeable increase in activity in the area of generative AI in recent years. Accordingly, an IP strategy should carefully consider the volume and scope of patent protection needed to carve out a position in this rapidly growing space.

An IP strategy should consider some less patent-heavy areas with more opportunities for IP ownership and leadership, such as spiking neural networks (SNNs), neuromorphic computing, federated AI learning type, transfer AI learning type, application areas such as AI in EV charging, and AI in space exploration. An IP strategy needs to consider what the end-goal of IP ownership would be in a less crowded patent space and if there is an opportunity to be an IP leader to protect future whitespace.

Chinese universities and companies dominate patent filing activity in the field of AI. Along with these entities, IBM, Microsoft, Google, Amazon, Capital One Services, Intel and several individual researchers hold significant numbers of patents in this field. An IP strategy should include monitoring their patents and patent filings to understand what specific technologies they are exploring, identify licensing opportunities, and avoid patent infringement risks.

The top patent owners of various AI application areas differ, so an IP strategy needs to be based on relevant players in your technology and application area of interest, as well as the overall patent leaders.

Given the dynamic nature of the AI field and the multitude of participants entering this field, it is essential to stay watchful for emerging developments and trends.

AI systems analyze large data sets and produce predictions and recommendations that often have a real-world impact in various application areas. AI technology holds vast commercial potential across diverse industries. Neural networks for decision-making is considered one of the fastest-growing research areas, with extensive research and development activities focused on improving neural network architectures, training techniques, and applications. Some leading industries that are putting AI technology to work include medical and health sciences, followed by cyber security. The risks associated with FTO in AI differ depending on the specific application areas. SMEs ought to tailor their IP strategy in alignment with their selected application domain. They should integrate an IP strategy that incorporates specialized clearance searches for new technologies throughout the product development phase, aiming to comprehend risks and address (FTO) concerns. A clearance search needs to be completed by an IP or legal professional. IPON's funding program can help offset this cost among other IP expenses.

If you're interested in becoming a client, visit www.ip-ontario.ca/apply

NEXT STEPS

I'M AN IPON CLIENT

As a client you have access to the full report and can book time with one of IPON's IP analysts who will help you:

- Validate your corporate planning
- Update your IP strategy
- Determine potential markets
- See how your competitors are positioned with IP
- Learn about the emerging players
- Understand the IP risks and opportunities specific to your business

I'M AN INNOVATOR

We're glad you're interested in learning more about IP. As an innovator in Ontario's ecosystem there are several resources available to help you protect and leverage your IP:

- Apply to be an IPON client to be eligible for tailored IP services and grants
- Learn IP basics through an on-demand self-guided study program
- Reach out to your Regional Innovation Centre to discuss their IP services or mentorship opportunities
- Join IPON for future events and review existing resources such as how to conduct a patent search

I'M A POLICY MAKER

IP is the economic driving force in the 21st century economy. When Ontario companies own and retain IP, communities, cities and the province benefit.

IPON welcomes the opportunity to advise on ways to integrate IP-based decision making such as funding opportunities, strategic planning and IP due diligence frameworks.

Contact your IPON representative today at

info@ip-ontario.ca

For more information, please visit: www.ip-ontario.ca/apply

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