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*Improving EU Access to National and Regional
Financial Incentives for Innovation in China*

SECOND AD HOC STUDY

*China's '1+N' funding strategy for
Artificial Intelligence*



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Executive Summary

2018 appeared to be a turning point for the European Union in terms of **artificial intelligence (AI)**. The European Commission first decided to increase its annual investment in AI under Horizon 2020, to reach the value of 1.5 billion EUR during the 2018-2020 work programme. In April, 25 EU Member States signed a *Declaration of Cooperation on Artificial Intelligence* – signalling a strong will to join forces and engage in a European approach to deal therewith. On this basis, in December the Commission and Member States presented a coordinated plan to foster the development and use of AI in Europe, based on four main pillars. Current proposals on the Digital Europe programme also show an increased focus on aligning the EU budget with digital challenges and AI.

At the same time, there are no doubts that **China has become a key player on the global AI scene**. At least since 2015, the Chinese government has been extremely proactive in designing and pushing forward several AI initiatives. A national strategy on AI was finally released in July 2017 by the State Council, aiming to guide China to become the world leader in AI by 2030. In December that same year, a three-year action plan was released by the Ministry of Industry and Information Technology, outlining four specific tasks and key sectors on which China will focus its efforts until 2020.

Funding is a central part of China's national AI strategy. The State Council's plan outlines a "**1+N' project cluster strategy**" for artificial intelligence – that is, the establishment of '1' new Megaproject focusing exclusively on new generation AI; and of several 'N' tasks and topics relating to AI to be included in other existing national funding programmes. The strategy aims to create a synergic funding support mechanism linking together basic research with application, demonstration and commercialisation of AI technologies.

This study provides a comprehensive overview of how China has been translating its '1+N' funding approach into practice, one year and a half since the release of the national AI strategy. It does so in particular by examining:

- The official launch of the **New Generation Artificial Intelligence Megaproject** in October 2018, which allocates 870 million RMB to support projects in the areas of fundamental theories, key technologies serving major needs, and smart chips and systems;
- The introduction of two new AI-related categories and areas of projects under the **National Natural Science Fund**, which in 2018 received nearly 700 million RMB to fund around 500 projects;
- The increasing number of AI-related topics introduced under **National Key R&D Programmes** since the release of the national AI strategy by the State Council;
- The establishment of an increasing number of **key bases and infrastructures** focusing on AI research, involving universities, industry-university cooperation, and enterprises; and finally
- The ecosystem that China is creating to support and stimulate **investment and financing** for AI start-ups.

This study also provides an overview of how administrations at the **provincial level are replicating the State Council's '1+N' AI funding strategy** within their jurisdictions. It does so in particular by focusing on what are the funding schemes and programmes introduced in the three main emerging clusters for AI development: Beijing, Shanghai (Yangtze River delta), and Shenzhen (Pearl River delta).

An overview of how Chinese AI actors are "**going global**" will also be provided, focusing mainly on outbound foreign investments flows and the establishment of overseas research facilities. This section will also introduce what are some of the **opportunities that China's national AI strategy offers to international enterprises, research structures, and entrepreneurs**, particularly in terms of funding and incentives for establishing R&D centres or start-ups in China. A few key recent examples from international enterprises will highlight China's attractiveness in terms of AI talent pool, access to restricted sectors, and permission for conducting AI experiments in areas otherwise strictly regulated.

Finally, although the purpose of this study is not to discuss the implications for Europe in the race to AI, some **reflections based on China's experience in AI** are made.

Introduction: Artificial intelligence development in China

Compared to Western countries, the development of artificial intelligence (AI) in China started relatively late, as it was mainly seen as a “revisionist pseudoscience” pursuing “extra-sensory powers” mainly for the benefit of “reactionary bourgeois”. It was only after the economic reforms and opening-up in late 1970s that the country started to attach importance to the development of AI, with the establishment of the China Association for Artificial Intelligence in 1981.

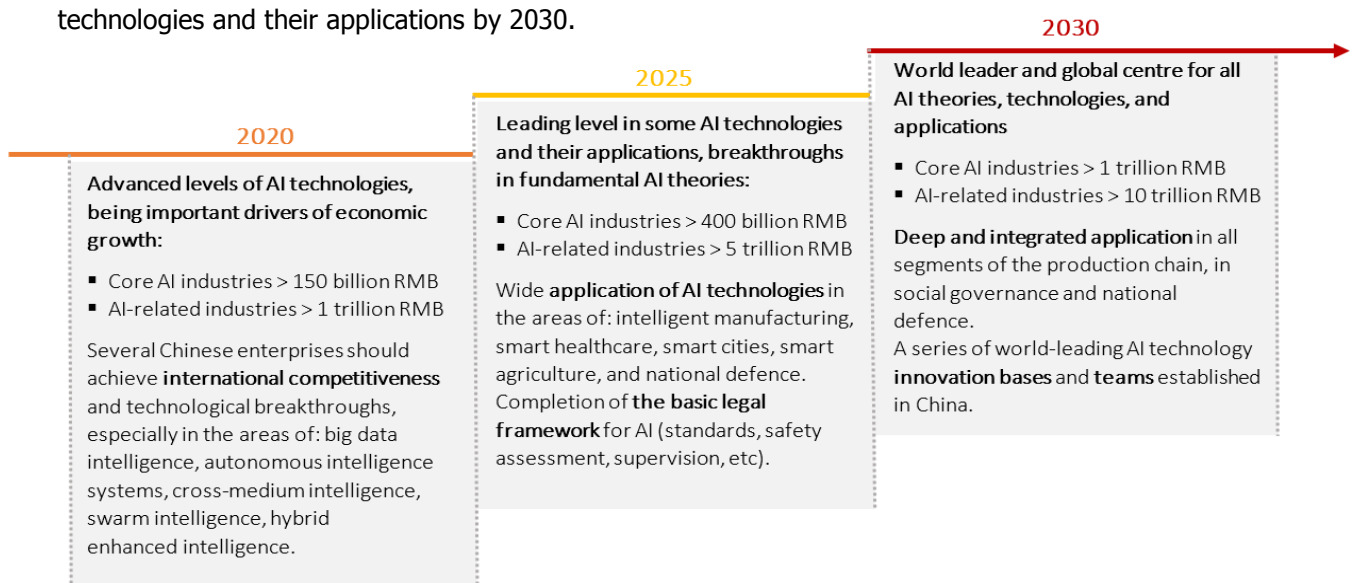
After three decades of efforts, AI started to occupy a central role in the new Chinese leadership’s agenda for development. In the 2015 Government Work Report, the “Internet+” strategy was outlined for the first time; two months later, the “**Made in China 2025**” blueprint was unveiled: although not explicitly mentioned, AI technologies are at the core of the plan – especially for achieving integration of information technologies with industry (*liang hua rong he*, i.e. one of the key areas of action). In the same year, the **China Artificial Intelligence White Paper** was released, together with several other white papers on robotics, natural language understanding, pattern recognition, intelligent driving, and machine learning. In 2016, to mark the beginning of the 13th five-year period (2016-2020), the Ministry of Industry and Information Technology with the National Development and Reform Commission and the Ministry of Science and Technology released the **13th Five-year Plan for the Development of Robotics Industry**, and the **‘Internet+’ Artificial Intelligence Three-year Action Plan**. By then, China had already started to acquire an edge in terms of AI-related academic papers and patents filled. In early 2018 China officially released its first cloud AI chip MLU100.

The above paved the way for the State Council’s release, in July 2017, of the **Plan for the Development of New Generation Artificial Intelligence** – the first of its kind to be formulated in China – with the purpose of guiding the country to become the world leader in AI.

The State Council’s Plan for the Development of New Generation Artificial Intelligence

The rationale of the Plan ¹ is to respond to the new role of AI as key focus of international competition, and thus to ensure that China firmly grasps the next stage of AI development in order to (i) generate a new international competitive advantage, (ii) stimulate the development of new industries, and (iii) enhance national security.

The Plan outlines a **three-step strategy** which will guide China to close the gap with all leading AI technologies and their applications by 2020, before reaching leading levels in a set of priority technologies and their applications by 2025, until finally becoming a world leader and global centre for all AI theories, technologies and their applications by 2030.



¹ *State Council’s Plan for the Development of New Generation Artificial Intelligence (Guo Fa [2017] No. 35)* 国务院关于印发《新一代人工智能发展规划》的通知（国发〔2017〕35号）。http://www.gov.cn/zhengce/content/2017-07/20/content_5211996.htm (accessed on 21 July 2017).

In order to fulfil these objectives, the Plan indicates **six key tasks** that the country must implement:

1	2	3	4	5	6
Establishment of an open and cooperative AI technology innovation system	Cultivation of a high-end and high-efficiency intelligent economy	Construction of an intelligent society characterised by safety and convenience	Strengthening of civil-military integration in AI	Establishment of an ubiquitous, safe, and efficient intelligence infrastructure system	Launch of forward-looking AI projects
Focusing on increasing the supply source and the openness of AI, by strengthening basic research, key technology development, infrastructures, bases and team-building	Boosting the integration of AI with industry, establishment of a data-driven, human-robot integrated, cross-cutting intelligent economy	Application of AI to achieve an ever-present smartified environment. Delegation of an increasing number of simple, complex and dangerous tasks to AI	Promotion of bidirectional transfer and flow of major technology breakthroughs between the military and civil society	Application of AI, ICT and internet technologies into national infrastructures	Launch of a “1+N funding project cluster strategy” for artificial intelligence

The line government body leading AI affairs and supervising the implementation of the Plan will be Leaders' Working Group on S&T Institutional Reforms and the Construction of an Innovation System. A **New Generation Artificial Intelligence Promotion Office**, formed by 15 government bodies including MOST, MIIT, NDRC, as well as the Central Committee on the Development of Civil-Military integration, the Central Military Commission's Equipment Development Department, the Central Military Commission's S&T Committee, etc., was formed in 2017 to coordinate and push forward the implementation of the Plan. A **New Generation Artificial Intelligence Strategic Advisory Committee**, formed by 27 renowned industry and academic experts, was also established to provide technical advises and support to relevant authorities during the implementation of the Plan. ²

The '1+N' funding strategy for artificial intelligence

The sixth key task outlined by the State Council's Plan introduces what is referred to as a forward-looking '**1+N' funding project cluster strategy** for artificial intelligence: ³

- '**1**' refers to the establishment of the “*New Generation Artificial Intelligence*” Megaproject, focusing on AI fundamental theories and key technologies in areas such as big data intelligence, cross-medium intelligence, swarm intelligence, hybrid enhanced intelligence, autonomous intelligence systems, autonomous unmanned control technologies, etc.
- '**N**' refers to the introduction of several AI-related tasks and topics within other existing national-level funding programmes – i.e. the **five pillars** of the Chinese national-level funding system for innovation. ⁴

The strategy aims to create an integrated, coordinated, and efficient public and private **funding support mechanism to AI**, government-guided but increasingly market-driven, which at the same time enhances

² Conference for the official launch of the “Plan for the Development of New Generation Artificial Intelligence”, and of the “New Generation Artificial Intelligence – 2030 Innovation Megaproject” 科技部召开新一代人工智能发展规划暨重大科技项目启动会. http://www.most.gov.cn/kjbgz/201711/t20171120_136303.htm (Accessed on 22 November 2017).

³ The official terminology in Chinese is “1+N”人工智能项目群 (‘1+N’ AI project cluster).

⁴ The Chinese national funding system for innovation is formed by **five main funding pillars**: 1) the National Natural Science Fund (administered by the Natural Science Foundation of China - NSFC); 2) S&T Megaprojects; 3) National Key R&D Programmes (NKPs); 4) the Technology Innovation Guiding Fund; and 5) the Bases and Talents programme. Detailed factsheets for each of these pillars, including an overview of the opportunities offered to international actors, are available on the official website of this project: <http://chinainnovationfunding.eu/chinese-national-innovation-funding-programmes/>. The next section of this study builds upon this structure.

the link between basic research and application/demonstration of AI technologies. Within this mechanism, each actor has a clear role: agencies responsible for the design and implementation of government funding projects should actively increase the number of AI-related topics to be funded every year (e.g. AI cross-disciplinary basic research under the National Natural Science Fund; R&D and application of AI technologies under NKPs; etc.); innovation bases such as State Key Laboratories and National Engineering Laboratories should become the core of AI clusters; backbone enterprises and industry associations should set up AI-related development and investment funds, and should lead the formulation of relevant standards; civil society actors should actively support start-ups in the field of AI through venture capital, angel and risk investments, with several open knowledge and open source platforms established. The strategy will also **actively use and absorb international resources** to promote the development of China's AI.

The **Ministry of Science and Technology**, through an inter-ministerial joint council formed by 31 government agencies, will be responsible for the implementation of the '1+N' funding strategy for AI, ensuring the coordinated integration with other existing programmes.

The Three-year Action Plan for Promoting the Development of New Generation Artificial Intelligence Industry (2018-2020)

In December 2017, the Ministry of Industry and Information Technology released the **Three-year Action Plan for Promoting the Development of New Generation Artificial Intelligence Industry (2018-2020)**.⁵ The document outlines four specific tasks that will guide China in its efforts to achieve its short-term objective as outlined by the State Council's Plan.

The first focuses on **nurturing and developing intelligent products**, especially in eight areas: intelligent and networked vehicles; intelligent service robots; intelligent unmanned aerial vehicles; medical imaging diagnostic systems; video image identification systems; intelligent voice interactive systems; intelligent translation systems; and smart home products. The second task focuses on achieving **breakthroughs on core hardware and software foundations** of AI industry, such as intelligent sensors, neural network chips, and open source platforms. The third focuses on **deepening the development of intelligent manufacturing** by introducing and applying AI technologies in all aspects of the industrial chain, both equipment and models. Finally, the last task calls for the establishment of an **integrated support system** for AI development, including for standard testing and IPR service platforms, intelligent network infrastructures, and cybersecurity.

Furthermore, starting from November 2018, MIIT started to select – through public bidding – a series of entities which will actively commit to **achieve core breakthroughs** in the major tasks outlined by the Action Plan, with the ultimate objective of nurturing **key Chinese innovation champions** in the field of AI.⁶ The tasks are divided into:

- Intelligent products (e.g. intelligent internet connected vehicles; intelligent service robots; intelligent drones; video image identification systems; medical imaging assisted diagnosis; etc.);
- Core fundamentals (e.g. intelligent sensors; neural network chips; and open source platforms);
- Key technical equipment for intelligent manufacturing (e.g. intelligent sensors and distributed control systems; programmable logic controllers; etc.); and
- Establishment of supporting systems (such as database, testing and IPR platforms, etc.). Specific objectives for 2020 are also specified for each task.

Selected entities will receive "strong support" from MIIT during their tasks.

⁵ MIIT's Three-year Action Plan for the Promotion of the Development of New Generation Artificial Intelligence Industry (2018-2020) 工业和信息化部关于印发《促进新一代人工智能产业发展三年行动计划（2018-2020年）》的通知。 <http://www.miit.gov.cn/n1146295/n1652858/n1652930/n3757016/c5960820/content.html> (Accessed 20 December 2017).

⁶ MIIT's Unveiling Work Plan of the Key Tasks for New Generation Artificial Intelligence Industry Innovation 工业和信息化部办公厅关于印发《新一代人工智能产业创新重点任务揭榜工作方案》的通知。 <http://www.miit.gov.cn/n1146295/n1652858/n1652930/n3757016/c6489400/content.html> (Accessed on 19 November 2018).

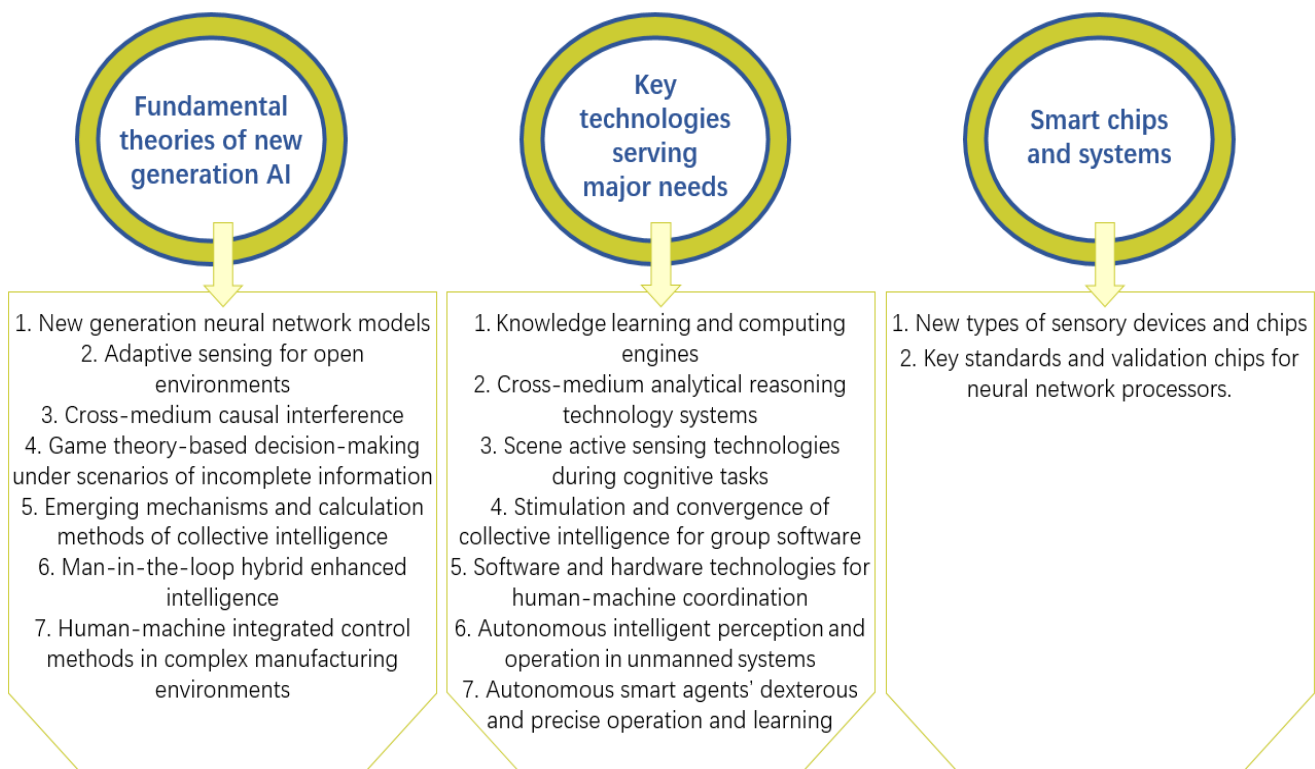
How is the AI '1+N' funding strategy being implemented?

This section provides an overview of how the 1+N strategy has been put into practice, one and a half year since its formulation by the State Council. Although the time frame is not sufficiently long to allow for a final assessment – new policies and regulations in China generally require a long period of transition before they are fully implemented and incorporated into the programmes of each government agency – noteworthy findings have nonetheless already been identified by the end of 2018 within the **five pillars** of the Chinese national funding system for innovation.

The "New Generation Artificial Intelligence" Megaproject

On 5 September 2018, the Ministry of Science and Technology officially released a call for comment on the first ever "**New Generation Artificial Intelligence**" Megaproject – the '1' in the '1+N' funding strategy. The final tender and 2018 annual call for application was then officially released on 12 October 2018 on the National S&T Information Service Platform.⁷

A total of **870 million RMB** will be allocated in 2018 only to support up to 39 projects in the areas of:



The "New Generation Artificial Intelligence" Megaproject is expected to run until 2030, with different research topics funded every year through annual calls for application (which will be preceded by calls for comments on draft versions of the tender).

National Natural Science Fund

Those familiar with the **National Natural Science Fund** have certainly noted that in the 2018 project application guidelines, two new categories and areas of projects were introduced under the Department of Information Sciences: (i) Artificial Intelligence (NSFC code: F06); and (ii) cross-disciplinary information sciences (NSFC code: F07). This means that basic and applied research proposals in the field of artificial intelligence started to be eligible for NSFC funding, mainly in the areas of:

⁷ The call was published in the **Online Programme Database** section of the official website of this project: <http://chinainnovationfunding.eu/project/2030-megaproject-new-generation-artificial-intelligence/>.

- AI fundamentals (code: F0601);
- Machine learning (F0602);
- Machine cognition and pattern recognition (F0603);
- Natural language processing (F0604);
- Knowledge representation and processing (F0605);
- Intelligent systems and applications (F0606);
- Cognitive and neurosciences-inspired AI (F0607);
- Fundamental theories and methodologies for AI-driven education (F070101); and
- AI and mathematics cross-disciplinary studies (F070204).

According to the official statistics of granted projects in 2018, the specific line department of the NSFC responsible for projects in this area funded around **1,500 projects totalling nearly 700 million RMB**, mainly through the General Programme and the Young Scientist Fund.⁸

In addition, one of the three new Major Research Plans launched in 2018 was “*Fundamental Theories and Research on Key Technologies for Coexisting-Cooperative-Cognitive Robots*” (Tri-Co Robots), focusing on explorative basic research on structures, perceptions and control mechanisms of robots for their communication and interaction with the environment, humans and other robots; as well as applied research in industries such as intelligent manufacturing, medical treatment, and national defence. Funding allocated ranges from **650,000 RMB to 3 million RMB** for projects lasting 3 to 4 years. It is noteworthy that the Plan explicitly encourages and grants priority to joint cooperation proposals submitted with internationally-leading scientists in the field of robotics.

National Key R&D Programmes

The ‘1+N’ funding strategy is also very well reflected in **National Key R&D Programmes (NKPs)**, which are aimed to support R&D of key technologies in areas of social welfare and affecting people’s livelihood. Quite a few NKPs are, in fact, directly related to AI technologies or their application:

<i>National Key R&D Programme</i>	<i>Established in</i>	<i>Funding granted since establishment (million RMB)</i>
Quantum computing	2016	1,581
Cloud computing and big data	2016	1,423
Intelligent power grid technologies	2016	1,416
Smart robotics	2017	1,220
High-performance computing	2016	1,063
Intelligent agricultural machinery	2016	980
Broadband networks	2018	820
Network manufacturing and smart factory	2018	760
Intelligent transportation	2018	436
IoT and smart cities	2018	300

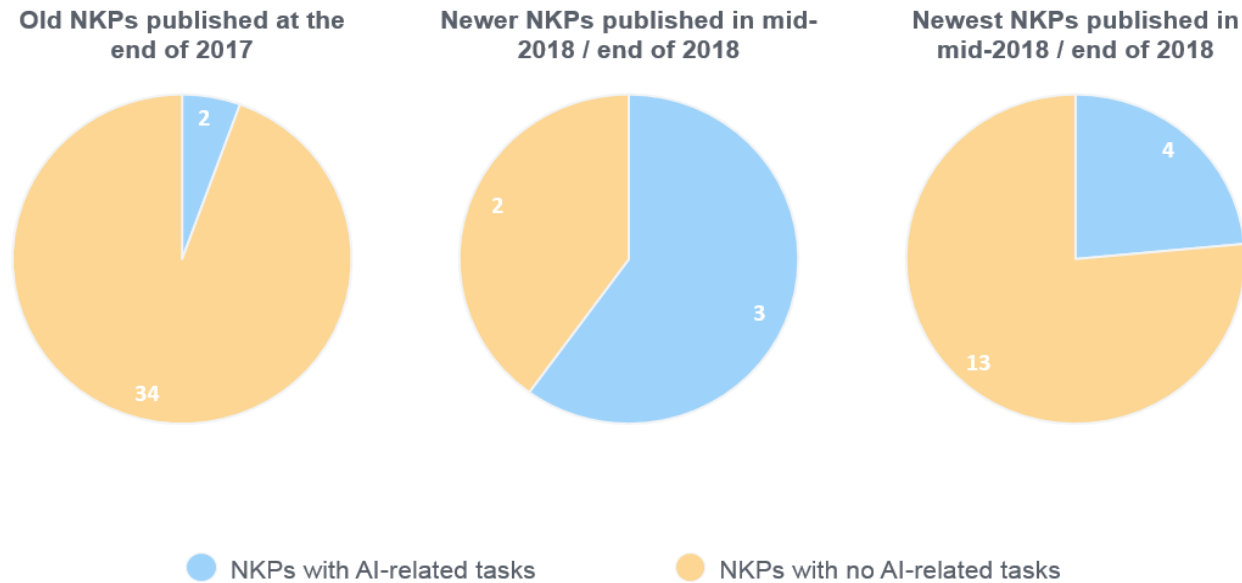
Source: data collected by the author from the National S&T Information Service Platform

Many other NKPs also feature one or more AI-related tasks, though their main focus is on other industries or applications. What is noteworthy is that a **significant increase of these ‘N’ tasks was registered** since the official release of the State Council’s *Plan for the Development of New Generation Artificial*

⁸ The specific line department for AI-related projects – the Third Office of the Department of Information Sciences – is also responsible for projects in the field of automation (NSFC code: F03). As official statistics are not divided by NSFC code, but by line department, the figures reported here therefore are not entirely accurate. See: NSFC statistics of granted projects in 2018: http://www.nsf.gov.cn/nsfc/cen/xmtj/pdf/2018_table.pdf (Accessed 3 December 2018).

Intelligence. The chart in the next page depicts this trend, based on an analysis of the tender documents of three main batches of NKPs published between the end of 2017 and the end of 2018.

The first batch consists of the 36 old NKPs (established in 2016 and already at their third annual cycle): only two of them featured AI-related tasks in their 2018 annual call (published in October 2017 – only three months after the State Council’s Plan). These were related to digital diagnosis and treatment devices (e.g. AI-based diagnostic medical imaging, AI-based physiological signal diagnosis, etc.); and to public security (e.g. R&D, application and demonstration of AI-based technologies for the informatisation of trials).



Source: data collected by the author from the National S&T Information Service Platform

Three out of five newer NKPs established in 2017 and for which the 2018 annual calls were published in mid-/late-2018, featured AI-related tasks. These were related to development of AI-based technologies for Traditional Chinese Medicine treatment; modern service technologies (e.g. AI-based algorithms for big data credit; and AI technologies for cross-model, cross-language and cross-border e-commerce platforms); and disruptive applications such as AI meta-learning, AI-based financial risk calculation methods, and AI-based seismic surveys and real-time imaging.

A large number of AI-related tasks were also identified in the tenders of the newest NKPs established in 2018, relating to solid waste recycling (e.g. AI-based garbage sorting collection and transportation); synthetic biology (e.g. AI-based principles for synthetic biological gene circuits); healthcare (e.g. AI-based customised health monitoring and imaging technologies; AI-based analysis of wearable heart-rate monitoring devices, etc.); and winter Olympics (e.g. AI-based meteorological services, artificial prosthesis based on AI and 3D printing technologies; and application of AI technologies in trainings);

National AI bases and infrastructures

Bases and talents are the focus of the fifth pillar of the Chinese national funding system for innovation. This pillar grants funding to key institutions establishing key laboratories, technology and engineering centres, generally through subsidies for operations and research results, tax deductions/exemptions for certain imports, as well as priority in applying to national and local research grants (including Megaprojects, National Natural Science Fund, and NKPs seen in the previous sections).

The '1+N' funding strategy will rely extensively on existing or newly-established infrastructures and platforms for the development of AI technologies and talents – on three main directions: **universities and research structures** (basic research); **industry-university joint structures** (applied research); and **industry bases** (demonstration and commercialisation).

University and research structures

By July 2018, a series of State Key Laboratories or other major laboratories focusing on AI-related fields were established in key academic institutions, to focus on fundamental research (see next page).

These institutions have also already launched **degree courses** for nurturing young AI talents.⁹

Host institution	Laboratory name
Tsinghua University	Intelligent Technologies and Systems State Key Laboratory
Peking University	Visual and Auditory Information Processing State Key Laboratory
Peking University	Ministry of Education Key Laboratory for Machine Cognition and Intelligence
Chinese Academy of Sciences	Pattern Recognition State Key Laboratory
Chinese Academy of Sciences	Intelligent Information Processing Key Laboratory
Nanjing University	Novel Software Technology State Key Laboratory
University of Science and Technology of China	National Engineering Laboratory for Brain-inspired Intelligence Technologies and Application
Zhejiang University	Artificial Intelligence Research Institute, Smart Healthcare Artificial Intelligence Research Centre
Fudan University	Institute of Science and Technology for Brain-inspired Intelligence
Beijing University of Posts and Telecommunications	Laboratory for Mobile Robots and Smart Technology

Industry-university cooperation

Industry-university cooperation as a means of research and technology development has also gained particular momentum after the release of the State Council's AI Plan. Chinese private enterprises have become extremely active in establishing partnerships and joint programmes with Chinese academies, with the main purpose of promoting industrial experimentation and application of fundamental theories and results. A few examples of such cooperation include:

- Establishment in 2017 of China's first university-enterprise joint research institute in AI, by **Sogou** and **Tsinghua University**: the Tiangong Institute for Intelligent Computing (180 million RMB investment);
- Establishment in April 2018 of a joint Artificial Intelligence Laboratory in **Wuhan University** in cooperation with tech giant **Xiaomi** (10 million RMB investment);
- Establishment in July 2018 of a joint laboratory between Chinese facial recognition unicorn **Face++** and **Shanghai University of Science and Technology**, to focus on machine vision and big data. This followed the establishment in December 2017 of other joint laboratories with **Xi'an Jiaotong University** and the **Hong Kong University of Science and Technology**;
- Establishment of several **industry-university joint degrees**, such as Beihang-Baidu; Beihang-Tencent; Shandong University-Baidu; Liaoning Engineering Technology College-Tencent; Sichuan University-SeetaTech; etc. The partner enterprise will fund part of the costs for running the degree programme, and will provide both human and equipment resources to the partner university; graduates from these courses will generally be hired by the enterprise upon graduation;
- Leading speech recognition company **iFLYTEK** has established joint laboratories in different AI fields with several universities in China, including the Northeast Normal University, East China Normal University, South China Normal University, Chongqing University of Posts and Telecommunications, etc.

⁹ AI-related degrees have also been established by Huazhong University of Science and Technology (pattern recognition and biological information processing); Nankai University (intelligent sciences and technologies); Sun Yat-sen University (supercomputing); Beihang University; Xi'an Jiaotong University; etc.

Enterprises

The industry sector is dominated by private tech giants: **Baidu**, **Alibaba**, **Tencent**, **JD.com** (all of which are among the world's top 10 largest internet companies by market capitalisation), and **Sogou**. But other companies such as **iFLYTEK** and facial recognition unicorn **Face++** are also rising very rapidly. Other active companies include: **Didi** (ride sharing); **Meituan** (food delivery); **ByteDance** (with its core product Toutiao, a news aggregators); **SenseTime** (considered the world's most valuable AI unicorn focused on computer vision and deep learning); **DJI** (world's largest drone producer); **iCarbonX** (health tracking); **Ainemo** and **Rokid** (smart home assistants); etc.

In a press conference held in November 2017, the Ministry of Science and Technology announced a group of **national artificial intelligence open innovation platforms** – assigned to national champions designated to lead specific segments of the artificial intelligence industry:

- **Baidu** Autonomous Driving National AI Open Innovation Platform. Over the last two years and a half, Baidu has invested over 1.5 billion USD in AI-related research, and in 2017 it established a National Engineering Laboratory on Deep Learning Technologies and Application.
- **Alibaba** Cloud (Aliyun) Urban Cognition National AI Open Innovation Platform. In October 2017 Alibaba announced a 15 billion USD investment in seven R&D labs in and outside China (Beijing, Hangzhou, San Mateo, Bellevue, Moscow, Tel Aviv, and Singapore), focusing on quantum computing and human-machine interaction.
- **Tencent** Medical Imaging National Open Innovation Platform. Tencent is aggressively investing in domestic and international start-ups focusing on AI applications in healthcare, for instance on Chinese unicorn We Doctor which provides online healthcare services.
- **iFLYTEK** Voice Intelligence National AI Open Innovation Platform. In June 2017 iFLYTEK was ranked as the 6th smartest company in the world by MIT Technology Review – the highest ranked Chinese company on the list – and in December of the same year it established a State Key Laboratory on cognitive intelligence.

These were followed around one year later by **SenseTime** Intelligent Vision National AI Open Innovation Platform. In addition to becoming beneficiaries of government funding programmes (e.g. National Engineering Laboratories receive substantial funding from the National Development and Reform Commission), the most **significant support received from the government relates to the regulatory sphere**. For instance, the Beijing local government has allowed Baidu to become the first company to test driverless cars on Beijing's streets. Alibaba was enabled to monitor and intervene in Hangzhou's traffic, taking automated decisions on road planning, bus routes, and traffic lights. Tencent received the authorisation to establish clinics and a laboratory powered by AI technologies. This kind of support results in substantial advancements for the companies vis-à-vis their competitors in pushing forward technology application/demonstration.

Funding and investment for start-ups

China's artificial intelligence strategy is backed by vast sums of capital invested in tech start-ups. As of June 2018, mainland China (excluding Hong Kong SAR, Macao SAR, and Taiwan) was hosting one-fifth of the world's total number of AI companies, ranking second after the United States (with 41% of the total), and preceding the United Kingdom (7%), Canada (6%), India (3%), and Israel (2.4% of the total).¹⁰

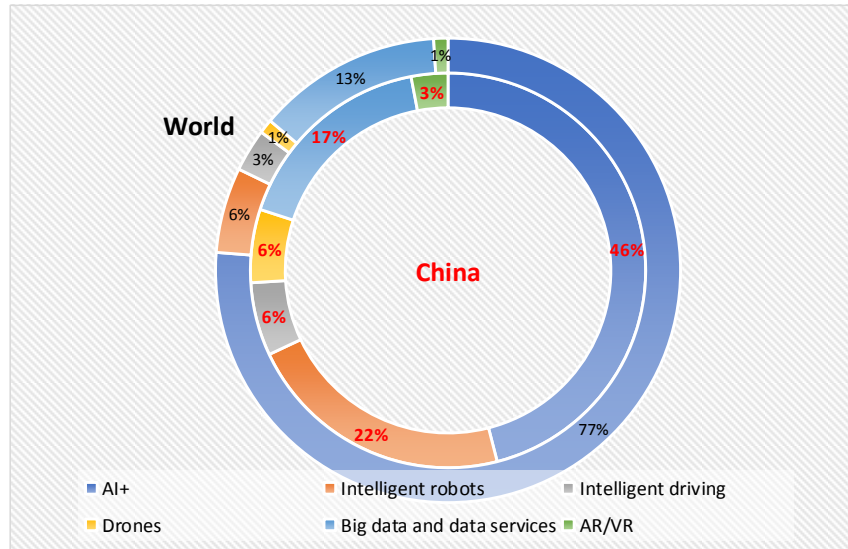
The majority of Chinese AI companies (46%) operates in what in China is known as "AI+" – i.e. the application and integration of AI technologies in other traditional industries – followed by intelligent robots (22%), big data and data-related services (17%), intelligent driving (6%), drones (6%), and augment/virtual reality (3%). This makes Chinese AI companies differ substantially from international ones, where "AI+" is the dominant segment (77%), and intelligent robots only occupy a very small proportion (6%).¹¹ The national **average age** of Chinese AI companies is 5.5 years (or even less in large innovation

¹⁰ Tsinghua University's China Institute for Science and Technology Policy, "China Artificial Intelligence Development Report 2018", p. 40: <http://aiucas.ac.cn/index.php/zh-cn/xsdt/6019-2018> (accessed on 2 November 2018).

¹¹ Ibid, p. 43.

hubs such as Beijing, Shanghai and Tianjin, thanks to more dense concentration of venture capital funding). The peak year in terms of new AI companies established in China was 2015 (228 new AI companies).¹²

Funding for AI ventures in China is carried both by **private investors** and **'government guiding funds'** – i.e. limited partnership among the central/local governments and other investors, generally state-owned enterprises, financial institutions, and other private investors.



Source: China Artificial Intelligence Development Report 2018

The **Technology Innovation Guiding Fund** is the largest government guiding fund existing in China, and it is a major pillar of the country's national funding system for innovation. It consists of a system of funds-of-funds (FOF) that invest in start-ups and SMEs in priority and strategic areas and at different stages, through venture capital funds, equity investment, and risk compensations, and according to market mechanisms. The aim is to stimulate the transfer, capitalisation and commercialisation of technology results, particularly those generated under government-funded projects.¹³

Technology Innovation Guiding Fund (As of Aug 2018)	Three main funds	FOFs	Size	- Of which invested by central government
	Venture Capital Guiding Fund for Emerging Industries	125	200 billion RMB	40 billion RMB
	National Fund for Technology Transfer and Commercialisation	21	35 billion RMB (at least)	8.5 billion RMB (at least)
	National Fund for SME Development	4	60 billion RMB	15 billion RMB
		150	290 billion RMB	62.5 billion RMB

A total of 2,004 investments on start-ups were concluded by the beginning of November 2018 by all the funds comprising the Technology Innovation Guiding Fund. Although it is not clear how many of these were conducted in the field of AI, available data shows that nearly half (962 investments, 48%) were done in the field of 'scientific research and technology services', while nearly one-fifth (373 investments, 19%)

¹² Ibid, p. 42.

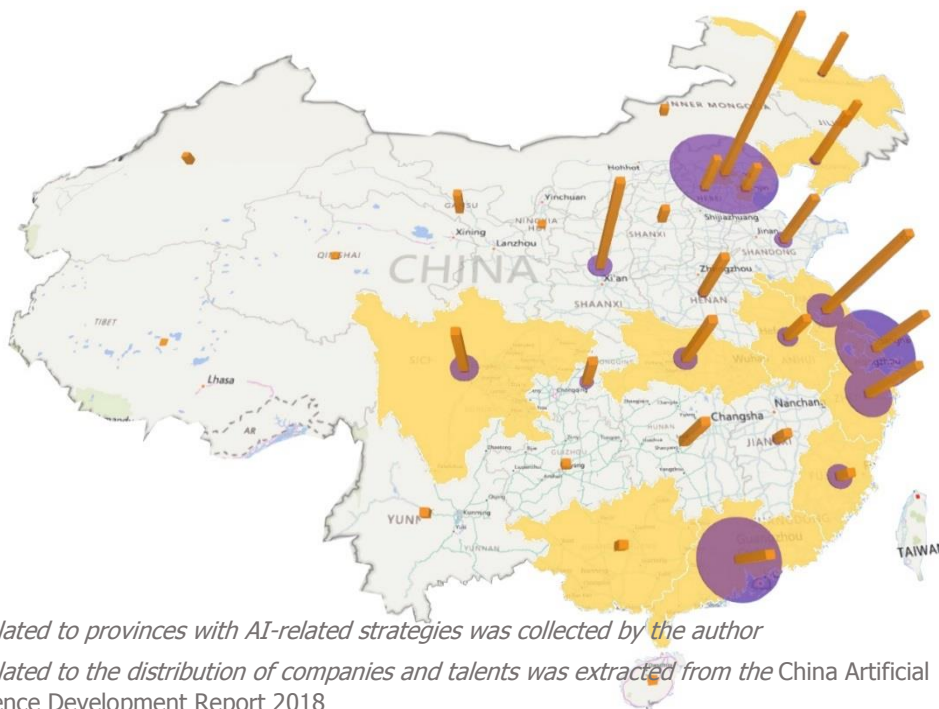
¹³ The central government generally provides around 30% of each FOF's total size, while the remaining part is provided by several other investors such as local governments, banks, enterprises, investment firms, business angels and others, rigorously selected by the central government through public bidding and according to a set of criteria specified in official regulations (mainly relating to size and sectors of specialisation). The daily operations of each FOF are managed by a professional investment management firm. More information on the Technology Innovation Guiding Fund can be found on the corresponding factsheet on the project's website: <http://chinainnovationfunding.eu/technology-innovation-guiding-fund/>. As argued in another study produced under the project, the Fund represents one of China's three systemic approaches to start-up financing. See: <http://chinainnovationfunding.eu/chinas-funding-for-innovative-start-ups/>.

were conducted in start-ups operating in 'information transmission, software and ICT services'.¹⁴ It seems reasonable to expect that AI technologies occupy at least a good part within these sectors – especially because the Fund is required to invest in areas in line with national priority and directions.

In terms of **private investment**, although existing sources and data tend to depict very different scenarios,¹⁵ there is no doubt that **China is one of the main actors of the global venture funding scene for AI**. Chinese tech giants such as **Baidu, Alibaba and Tencent (BAT)** are, unsurprisingly, among the most active investors in the area. Several PE/VC firms are also very active, with **Sinovation Ventures** (Face++; UISEE), **Cash Capital** (TMiRob; HanSight), **Legend Star** (Face++; AISpeech), **Zhenfund** (Horizon Robotics; Synyi.ai), **GGV Capital** (EHang; Deepinfar); **Volcanics Venture** (Geek+; CreditX), etc., regularly featuring among top Chinese AI investment rankings compiled by several Chinese tech information portals – such as the unicorn 36kr (a sort of Chinese TechCrunch), PEdaily.com and Lieyunwang.com. Foreign investment firms such as **Sequoia Capital** and **Intel Capital** are also frequently among these lists. Over 600 deals were concluded in China in 2017.¹⁶

AI development plans and funding strategies at the local level

Several local administrations across China have also started to replicate the efforts of the central government. By the beginning of November 2018, **13 out of 31 provinces (direct municipalities, autonomous regions) in mainland China had officially released their own strategies and policies for the development of artificial intelligence within their jurisdictions**. In most cases, such strategies outline clear objectives to be achieved in three phases by 2020, 2025, and 2030 – in line with the “three-step strategy” of the national government.



Data related to provinces with AI-related strategies was collected by the author

Data related to the distribution of companies and talents was extracted from the China Artificial Intelligence Development Report 2018

Chart created with Microsoft Excel 3D Maps

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¹⁴ These figures were extracted and analysed by the author of this study, based on data currently available from Qichacha (<https://www.qichacha.com/>) – a leading big data platform providing business and credit information in China.

¹⁵ For instance, Tsinghua University's China AI Development Report calculates the total Chinese AI investments in 2017 to have reached 27.7 billion USD, accounting to 70% of the total global AI investment – mostly in Beijing and through series A investments. Other foreign sources, on the contrary, highlight the role of the United States as the world's leader in absorbing external investment in AI.

¹⁶ Source: "Analysis of China Artificial Intelligence Venture Investment Trends (2018)", a report presented by Chinese start-up database IT Juzi during the 2018 AI Computing Conference, held in September 2018 in Beijing.

The following key findings emerge:

- The provinces which have formulated AI strategies (marked in yellow) are mainly **located along the coast**, with the major exceptions being Sichuan, Hubei, and Anhui;
- These same provinces correspond to the areas where the majority of **AI companies** (purple circles) and **talents** (orange bars) are concentrated;
- It is surprising that **Shaanxi** – the third largest province in terms of AI talents ¹⁷ and home to a good number of AI companies – does not have any official AI strategy.

Even more notably, it is clear that **three main clusters** are emerging to dominate China's AI scene: Beijing; Shanghai and the Yangtze River delta; and – although to a lesser extent – the Pearl River delta led by Shenzhen.

Beijing: China's centre for artificial intelligence

Beijing is China's undisputed leader in terms of number of AI enterprises and talents. It is home to 395 AI companies and in China (40% of the country's total), including tech giant Baidu, and to more than half AI-related State Key Laboratories and major research bases mentioned in the previous chapter. It acts as centres integrating the efforts of the industry, academia, and researchers.

According to the ***Guiding Opinions on Accelerating Science, Technology and Innovation to Nurture Artificial Intelligence Industries in Beijing*** released at the very end of 2017, by 2020 AI technologies and their application in China's capital will have reached very advanced levels globally. ¹⁸ By then, significant indigenous innovation results will have been achieved in terms of fundamental theories, and the city's role as world AI hub will have already started to emerge – with a number of leading researchers, teams and industry actors fully integrated into the local innovation ecosystem, and contributing to AI's role as a major source of economic development. The Opinions were preceded one month earlier by an AI Action Plan for 2017-2020 specific for Zhongguancun, aiming to increase the number of AI companies in Beijing to 500, with an industry scale exceeding 50 billion RMB. ¹⁹ The White Paper on AI Industry Development in Beijing – published in June 2018 – highlights **five main industries for the development for Beijing**: smart medical devices; smart home products; smart retail; self-driving vehicles; and smart city. ²⁰

Beijing is also planning to invest 13.8 billion RMB to build an **AI technology park** in its western Mentougou suburb district within the next five years, which could host up to 400 AI enterprises. In early 2018, China's capital officially established the **Beijing Frontier International AI Research Institute**, whose main task will be to establish and coordinate a series of research centres and labs focusing on specific segments, e.g. basic research, smart societal innovation, and AI patents. In November 2018, during the China Innovation Technology Transfer Convention, the **Beijing Academy of Artificial Intelligence** (BAAI) was officially announced: formed by AI leaders such as Peking University, Tsinghua University, CAS, Baidu, ByteDance, etc., the Academy will commit to the realisation of key breakthroughs in AI theories, methodologies, tools, and systems. Finally, during the same Convention, local authorities also announced that in the short-term a series of **"No Man's Lands"** in Beijing where scientists will be able to experiment, test, integrate, and apply new AI-related theories, methodologies, tools, systems and technologies – with very few restrictions.

¹⁷ More than half of these are concentrated in Xi'an, making it the second largest Chinese city in terms of AI talents – preceded by Beijing, and followed by Nanjing, Shanghai, and Wuhan.

¹⁸ *Guiding Opinions on Accelerating Science, Technology and Innovation to Cultivate Artificial Intelligence Industries in Beijing*, 北京市加快科技创新培育人工智能产业的指导意见 http://kw.beijing.gov.cn/art/2017/12/26/art_111_2149.html (Accessed on 19 November 2018).

¹⁹ *Action Plan for the Development of Artificial Intelligence in the Zhongguancun National Innovation Demonstration Zone (2017-2020)*, 《中关村人工智能产业培育行动计划（2017-2020年）》 <http://zhengce.beijing.gov.cn/library/192/33/50/438650/1291730/index.html> (Accessed on 19 November 2018).

²⁰ *White Paper on Artificial Intelligence Industry Development in Beijing (2018)*, 北京人工智能产业发展白皮书（2018年）, <http://jxw.beijing.gov.cn/docs/2018-07/20180704102639512942.pdf> (Accessed on 19 November 2018).

Shanghai and the Yangtze River delta

The Yangtze River delta region – with Shanghai at its heart – is also explicitly aiming to become a global hub for artificial intelligence. At end of 2017, the Shanghai People’s Government released the ***Implementation Opinions for Promoting the Development of New Generation Artificial Intelligence in Shanghai***.²¹ Relying on four main pillars (i.e. application of AI technologies; innovation in AI technologies; clustering of AI industry actors; and magnet for AI talents), the blueprint aims to complete – by 2020 – the transformation of Shanghai into a “highland of AI development”. The focus will be AI chips, sensors, robotics, intelligent hardware and software, and intelligent unmanned systems; as well as the application of AI technologies in the city’s key sectors such as finance, e-commerce, and modern logistics. In September 2018, two weeks after hosting the World Artificial Intelligence Conference, Shanghai’s municipal government also released the ***Implementation Measures for Accelerating the High-Quality Development of Artificial Intelligence in Shanghai***.²² The document marked the official entry of artificial intelligence among the city’s key strategic industries. It outlines a list of 22 key measures that will be implemented by the municipal government by the end of 2020 to boost the development of Shanghai as a global artificial intelligence hub, particularly by addressing industry talent, open data, and financing for start-ups and enterprises.

Shanghai’s funding and financial support to AI

The *Implementation Measures* explicitly indicate that the municipal government will significantly increase its **financial support** to enterprises – including SMEs – conducting R&D and related activities in the field of AI. This will be done mainly through the establishment of a **100 billion RMB guiding fund** by the municipal government and other investors, and of **credit loan funds** by financial institutions. AI enterprises will be also encouraged to ‘**go global**’ through mergers, acquisitions, and equity investments; municipal districts will be encouraged to grant different forms of support to local enterprises getting listed in the stock market.

These ‘N’ measures complement the **Shanghai AI Innovation Development Special Programme**, an ad hoc programme launched by the Shanghai Municipal Commission of Economy and Informatisation which every year funds several projects targeting the R&D, application and commercialisation of AI technologies (generally for up to 3 million RMB for projects <15 million RMB; and up to 20 million RMB for projects >15 million RMB). *

** Note: 308 million RMB were allocated to fund 45 AI-related projects in 2017. None of them however belonged to foreign-invested enterprises. The majority (33) were private enterprises, including well-established AI companies such as iFLYTEK, NIO, DGene, SIASUN, etc; the remaining were state-owned enterprises, one university, and one hospital. More details on the **Shanghai AI Innovation Development Special Programme** can be found on the corresponding factsheet on the project’s website at [this link](#).*

In addition to hosting the global R&D headquarters of SenseTime – one of the five national AI champions – Shanghai is also home to **210 AI companies** (the second highest number in China), as well as to the Institute of Science and Technology for Brain-inspired Intelligence of Fudan University – one of the country’s major AI research bases. Shanghai can also take advantage from its neighbouring regions: **Jiangsu and Zhejiang provinces have very good conditions for AI development**, both in terms of talents (which combined exceed those in Beijing), companies (Hangzhou is home to Alibaba, while Anhui’s Hefei is home to iFLYTEK), and infrastructures (Novel Software Technology State Key Laboratory in Nanjing University; Zhejiang University’s AI Research Institute, and Smart Healthcare AI Research Centre,

²¹ *Implementing Opinions for Promoting the Development of New Generation Artificial Intelligence in Shanghai* 上海市人民政府办公厅印发《关于本市推动新一代人工智能发展的实施意见》的通知. <http://www.shanghai.gov.cn/nw2/nw2314/nw2319/nw2404/nw42637/nw42639/u26aw54242.html> (Accessed 19 Nov 2018).

²² *Implementation Measures for Accelerating the High-Quality Development of Artificial Intelligence in Shanghai* 上海市经济信息化委、市发展改革委、市科委、市人力资源社会保障局、市财政局关于印发《加快推进上海人工智能高质量发展的实施办法》的通知. <http://www.sheitc.gov.cn/jsjb/679122.htm> (Accessed 18 September 2018). A synopsis in English is available on the project’s website: http://chinainnovationfunding.eu/dt_testimonials/shanghai-artificial-intelligence-development/.

etc.). These two provinces have also launched ambitious initiatives such as “**Jiangsu Brain Plan**”; the “**Jiangsu Brain-inspired AI Industry Alliance**”; and the **Hangzhou AI Town**.

Shenzhen and the Pearl River delta

Finally, the Pearl River delta – led by Shenzhen and to a lesser extent Guangzhou – is also emerging as a key hub for artificial intelligence in China. Although lacking the pool of talents, institutional knowledge and start-ups that characterise Beijing and the Yangtze River delta, the Pearl River delta is located at the crossroads of international trade and commerce, allowing rapid capitalisation, commercialisation and internationalisation of technology.

At the end of July 2018, the Guangdong Provincial People’s Government released the ***Plan for the Development of New Generation Artificial Intelligence in Guangdong Province***.²³ Similarly to the State Council’s Plan, the document outlines a three-step strategy guiding the province to reach a leading position in terms of AI industry scale and innovation capabilities by 2020; to reach one of the most advanced levels in the world in terms of application of selected AI technologies and fundamental theories by 2025; until establishing itself as a global AI innovation hub by 2030. The **sectors to be particularly prioritised** include: intelligent robotics; intelligent terminals; intelligent wearable devices; intelligent self-driving transport equipment; intelligent manufacturing; smart government; intelligent logistics; smart education; smart home products; intelligent healthcare; intelligent transports; intelligent finance; public security; smart agriculture; and military-civil cooperation. Other major initiatives launched by the government include: the **Guangzhou AI Consensus**, i.e. a platform for cross-sector AI cooperation; up to 10 **AI towns and villages**, i.e. ad hoc areas focusing on the experimentation and application of AI technologies; and **AI industrial parks**, i.e. up to 15 parks to be established by 2025, each focusing on specific sectors.

Guangdong’s own ‘1+N’ funding strategy for AI

According to the *Plan for the Development of New Generation AI in Guangdong province*, the provincial administration will actively support local actors to apply and implement in Guangdong the national AI Megaproject. Support will come in the form of streamlined approval procedures for endorsement, additional funds, but also facilitations in terms of utilisation of land, resources and facilities.

Furthermore, it seems that the provincial administration is also developing its own localised version of the national ‘1+N’ funding strategy for AI:

- In October 2018, the **Provincial Key R&D Programme in New Generation Artificial Intelligence** was officially launched (together with other Key R&D Programmes in quantum, brain sciences, additive and laser manufacturing, and new generation ICT). Around 20 projects will receive 5 to 10 million RMB of funding in the period 2018-2019. ([Link to official call for application](#));
- The ‘N’ is comprised by the increasing number of AI-related tasks and objectives that will be included in other existing programmes, such as the Guangdong Infrastructure Fund; the Guangdong Industry Development Fund; and the Guangdong Innovation and Entrepreneurship Fund.

These are to be added to several incentives and subsidies offered by **municipal administrations**, e.g. Shenzhen granting subsidies to enterprises replacing their equipment with robots, for certain sales revenue from AI equipment, etc.

The Pearl River delta is home to 165 AI companies. Most of them are based in Shenzhen – which is also home to national AI champion **Tencent**. Furthermore, the role of **Hong Kong SAR** and **Macao SAR** on the region’s AI development should not be neglected: Hong Kong is a global financial and trade centre, and is home to a very large pool of lawyers, appraisers and consultants from all across the globe; and of key institutions and state key laboratories attracting every year significant numbers of students and scientists (e.g. Hong Kong Polytechnic University; Hong Kong University of Science and Technology, etc.). In August 2017, Macao signed a strategic cooperation framework agreement with **Alibaba Cloud**, aiming

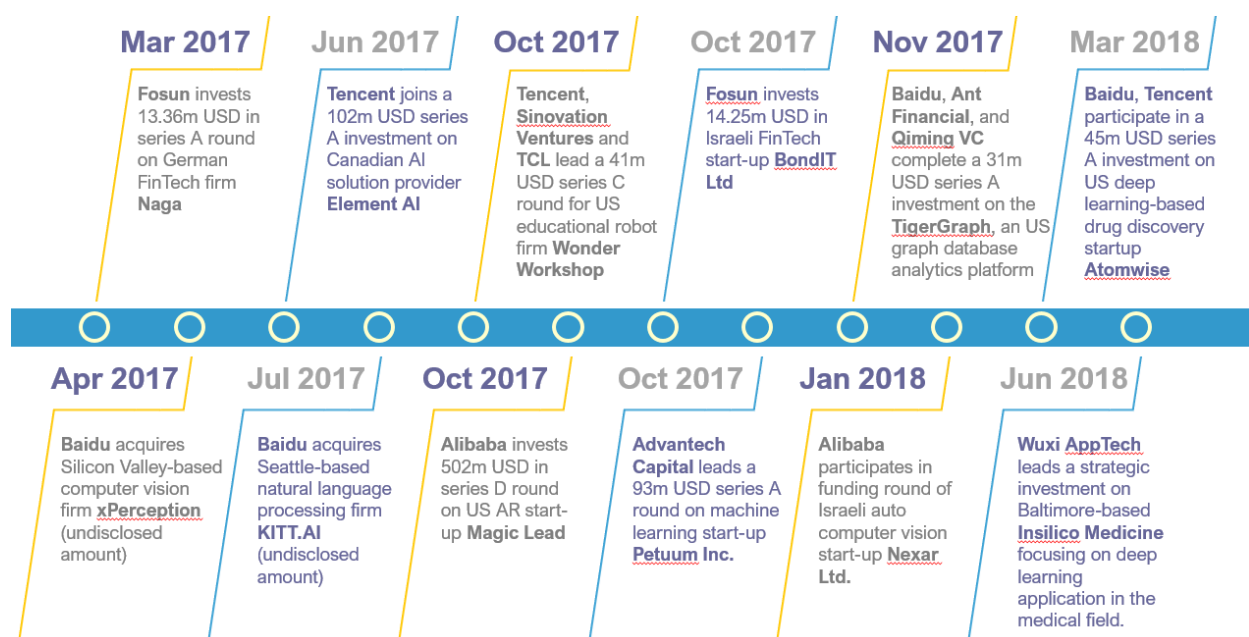
²³ *Plan for the Development of New Generation Artificial Intelligence in Guangdong Province* 广东省新一代人工智能发展规划. http://zwqk.gd.gov.cn/006939748/201808/t20180810_777229.html (Accessed 20 November 2018).

to turn the SAR into a smart city by introducing cloud computing and AI technologies in areas such as traffic control, medical services, e-government, and tourism promotion.

China's AI 'going global', and opportunities for international actors

The State Council's *Plan for the Development of New Generation Artificial Intelligence*, and its '1+N' funding strategy, also explicitly encourage Chinese domestic enterprises to 'go global' – and especially to forge partnerships with countries participating in the **Belt and Road Initiative**. This is done mainly by making capital outflows easier thanks to streamlined and faster approval procedures, and by privileged access to credit.

Despite growing trade frictions and tougher investment scrutiny,²⁴ the **United States remain the largest destination of Chinese outbound FDI in artificial intelligence** – contrarily to US equity deals in China which remain very limited. Indeed, the vast majority of the top Chinese acquisition deals of overseas AI firms in the last 1.5 years involved US firms, and were led by BAT:



In addition to M&As, Chinese companies are becoming increasingly more present abroad with their own **research facilities established in global innovation clusters**. A few examples include:

- **Baidu** operates two research centres in Silicon Valley (Sunnyvale), one of which focusing on deep learning;
- Since October 2017 **Alibaba** has been establishing, through a 15 billion USD investment, a series of "DAMO Academies" overseas – i.e. laboratories focusing on scientific and technological research and innovation, in the field of machine intelligence, data computing, robotics, FinTech, and "mysterious and unknown issues". DAMO Academies have been established in Singapore, Seattle, Sunnyvale, New York City, and Herzliya (Israel);
- **Tencent** owns a data centre in Silicon Valley, as well as an AI research lab in Bellevue (Seattle) focusing on speech recognition and natural language understanding;
- Ride-sharing unicorn **Didi Chuxing** at the beginning of 2017 opened a laboratory in Silicon Valley (Mountain View), focusing on self-driving vehicles;
- **CooTek** – a fast-growing global mobile internet company developing innovative mobile apps AI technologies, mostly known for its AI-powered mobile keyboard TouchPal – established an AI research lab in Silicon Valley (Mountain View) as early as in 2015.

²⁴ The most prominent example remains the 1.3 billion USD acquisition of US chipmaker Lattice Semiconductor by Canyon Bridge Capital Partners, blocked in September 2017 by the Committee on Foreign Investment in the United States (CFIUS).

As it was the case for outbound FDI, nearly the totality of Chinese overseas research facilities are established in the United States. The only **cases involving Europe** are an R&D centre established by consumer electronics giant **TCL Corporation** in **Warsaw**, focusing on speech recognition and image analysis to be later used in smartphones, TV sets, refrigerators and dishwashers (announced in September 2018); and Shanghai-based unicorn **DeepBlue Technology establishing three joint labs in Luxembourg** with Luxembourg LHoFT, focusing on self-driving technologies, intelligent and precise manufacturing, and data and financial security (announced in September 2018 during the World Artificial Intelligence Conference).

Opportunities for international actors

In the State Council's Plan there is **no mention of opportunities for international enterprises or research structures to participate in Chinese funding programmes**. It is therefore expected that the general conditions for international participation under each of the five funding pillars will continue to apply for enterprises and research structures.²⁵ Only world-renowned international talents and teams were explicitly mentioned to become beneficiaries of funding through the "**Thousand Talents Plan**", especially those in the fields of neurocognition, robot learning, auto-piloting vehicles and smart robotics.

What the Plan does encourage, is the **establishment by international enterprises and research structures of AI R&D facilities in China**, and the launch of cooperation with Chinese domestic actors on AI research. **Microsoft** probably offers the best example in this regard, with two joint key laboratories established with the Ministry of Education in the Harbin Institute of Technology (focusing on natural language processing and speech), and the Shanghai Jiaotong University (focusing on intelligent computing and systems). **Google** also established a joint laboratory with Fudan University in May 2018, focusing on joint research and talent exchanges in the field of artificial intelligence, data sciences, and mobile applications.

At the local level, several municipalities and provinces in China have established ad hoc funds for this purpose. One example is the **Shanghai Special Fund for Encouraging the Development of Foreign-invested R&D Centres and Regional Headquarters**, which offers several types of assistance to MNCs establishing (or upgrading) a regional headquarter or an R&D centre in Shanghai, including an initial 5 million RMB for supporting the establishment, leasing assistance for the first 3 years (30% of leasing value reimbursed), 2 to 5 million RMB awards if annual turnovers exceed certain amounts, etc. The Special Fund is open to all industries and thus also to those in the area of AI.²⁶ The **AI research lab announced by Amazon in Shanghai** has most likely benefitted from this fund.

Other financial incentives supporting foreign talents in Minhang District, Shanghai

Incentives are often also designed for individual foreign (or returnees) scientists/entrepreneurs. The Minhang District Government, for instance, has established the **Minhang District High-tech Entrepreneurship Talent Support Programme**, as well as several other funding and incentive schemes for the **recruitment of overseas and foreign talents**. These programmes offer various types of support, such as support for start-up registration (100,000 to 1,000,000 RMB), housing support (250,000 to 500,000 RMB), human resources support (250,000 to 1 million RMB), etc, as long as their activities are based within Minhang District.

** More details can be found in the corresponding factsheets on the project's website ([link](#)).*

²⁵ At the time of writing, applications for the "New Generation Artificial Intelligence" Megaproject are still ongoing and therefore it is unknown whether international actors are preparing applications. Available statistics also do not allow to see whether European or joint research structures are implementing projects under the Natural Science Fund. No evidence of international actors leading NKPs was identified. For a detailed analysis of the opportunities and challenges for international actors in China's national funding programmes, see the factsheets on the project's website: <http://chinainnovationfunding.eu/chinese-national-innovation-funding-programmes/>.

²⁶ Shanghai Special Fund for Encouraging the Development of Foreign-invested R&D Centres and Regional Headquarters (上海市鼓励跨国公司地区总部发展专项资金). More details can be found on the project's website: http://chinainnovationfunding.eu/dt_testimonials/measures-for-the-utilisation-and-management-of-the-special-fund-for-encouraging-the-development-of-multinational-companies-regional-headquarters/.

Furthermore, Chinese incubators and accelerators are starting to offer programmes targeting foreign start-ups. For instance, in December 2017, **Chinese accelerator COMB+** (already famous for its joint accelerator with Finnish Pivot5 – SinoTrack Accelerator) and the Beijing Institute of Collaborative Innovation (BICI) announced the establishment of a 65 million EUR fund to invest in AI start-ups that wish to enter China. Deal size generally ranges from 1 to 2 million EUR, with follow-on capital as well as a wide range of other supporting services available.

Recognising China's key role in the race for artificial intelligence, major international companies are also **increasing their partnerships in the country with leading Chinese AI enterprises, in order to seize China's deep and growing pool of AI talents, to gain access to restricted sectors, or to get permission for conducting AI experiments.** **Qualcomm**, in addition to being a very active investor in the Chinese VC scene, at the end of 2017 partnered with Chinese start-up ThunderSoft to establish an Internet-of-Things connected smart car innovation laboratory in Chongqing; it also announced partnerships with Baidu and NetEase to develop on-device AI applications. **Google** – whose core services are blocked in China – at the end of 2017 opened in Beijing an AI research centre in Beijing (the company's first in Asia), to focus on basic research. The US-based FinTech firm **ZestFinance** established a joint venture with JD.com – ZRobot – to provide credit risk evaluation services to lenders in China; the firm had also received invested from Baidu to develop search-powered credit scoring in China. In July 2018, **Daimler** became the first international automotive manufacturer to obtain a permission to test autonomous driving vehicles on the streets of Beijing; it was followed by **Ford** (in cooperation with Baidu) in October 2018. **Babylon**, an UK-based digital health start-up using AI algorithms to assess illness, in April 2018 partnered with Tencent in order to propel into China's strictly regulated medical market: the deal will allow WeChat's users to send messages with medical symptoms to Babylon's app, which in turn will send back healthcare advices. It is noteworthy that the partnership was announced after Babylon was struggling to penetrate more deeply into its home UK market amid a backlash from UK doctors.

Conclusions: lessons and inspirations for Europe

There are widespread concerns that Europe is lagging behind in the race to digital transformation and artificial intelligence. A closer-look analysis to China's artificial intelligence development plans may reinforce this sentiment: very few AI research facilities are established and only limited investments are conducted in Europe by Chinese actors. Europe still needs to give birth to its own global champions in many market sectors.

Although the purpose of this study is not to discuss the implications for Europe in the race to AI, there are a **few reflections that could be made based on China's experience.** Firstly, it is evident that China significantly benefits from its very centralised approach to AI, with key policy and market priorities designed by the central administration and replicated by local ones. Although the EU was a pioneer in formulating initiatives such as the *Strategic Research Agenda for Robotics in Europe, Robotics 2020 Multi-Annual Roadmap, Gauging the Future of EU Research & Innovation*, etc., an **overarching EU-level artificial intelligence strategy** started to be shaped only in 2018 – first with the *Declaration of Cooperation on Artificial Intelligence* in April; and then with the *Coordinated Plan on Artificial Intelligence* jointly released by the Commission and Member States in December.²⁷ Although only time will reveal the impact of the EU strategy, it certainly has the potential to enable the creation of an environment that could potentially give birth to European champions able to compete globally with Chinese or American competitors. It may also contribute to change China's current views on the European priorities for AI development, i.e. to focus on **data protection, privacy, and ethical concerns** – while China, the United States and Japan are concentrating on commercial and market-creating applications.²⁸

²⁷ The EU strategy outlines four specific pillars and tasks to be implemented. See: *Coordinated Plan on Artificial Intelligence* (COM(2018) 795 final): <https://ec.europa.eu/digital-single-market/en/news/coordinated-plan-artificial-intelligence> (Accessed on 11 December 2018).

²⁸ "China Artificial Intelligence Development Report 2018", p. 56.

China's '1+N' funding strategy also shows the benefits derived from a centralised approach to **AI funding**. Funding resources come from the same channel, which facilitates the traceability of how public resources are allocated. Moreover, the New Generation AI Promotion Office (formed by 15 different central government bodies including military ones), also has the potential to enhance coordination and among different links of the value chain, from basic research to applications, demonstrations, and commercialisation of AI theories and technologies – although its effectiveness in China has yet to be seen. Non-EU experts could also bring a totally new perspective to the recently-established **High-Level Expert Group on Artificial Intelligence** in Europe, in the same way that European, American and Japanese experts do, for instance, in the Shanghai Municipal AI Strategic Advisory Expert Committee. An EU-level approach to funding could also become a model and benchmark for other initiatives at the Member State-level to align with.

Another aspect on which China has been extremely successful is that of **attracting and retaining foreign top talents**. There currently are no large scale programmes in Europe specifically offering all-round support to non-EU scientists / entrepreneurs; certain barriers in fact still exist for foreign talents to come to Europe to start a business. A dedicated programme under the European Innovation Council – especially for its pathfinder tool – could for instance start to offer **diversified forms of support going beyond direct financing** and also covering living, housing, start-up registration fees, human resources, visa facilitation and family support, etc., for non-EU entrepreneurs. The European Commission's Coordinated Plan on AI positively recognises and addresses the importance of this matter.

Finally, China's **AI clusters** are very integrated and take advantage of the complementary local characteristics of their neighbours, in terms of attracting and retaining talents, knowledge, research labs, technologies, and infrastructures. This is especially the case for the Yangtze and Pearl river deltas. The Chinese administration puts a lot of emphasis on these clusters, and at the same time tries to stimulate technological spill-over flows to other areas – e.g. many National Key R&D Programmes encourage projects to be implemented in designated areas or parks, but consortium participants should include entities from several regions.