State Council Notice on the Issuance of the New Generation Artificial Intelligence Development Plan

Completed: July 8, 2017

Released: July 20, 2017

A New Generation Artificial Intelligence Development Plan

The rapid development of artificial intelligence (AI) will profoundly change human society and life and change the world. To seize the major strategic opportunity for the development of AI, to build China's first-mover advantage in the development of AI, to accelerate the construction of an innovative nation and global power in science and technology, in accordance with the requirements of the CCP Central Committee and the State Council, this plan has been formulated.

I. The Strategic Situation

The development of AI has entered a new stage. After sixty years of evolution, especially in mobile Internet, big data, supercomputing, sensor networks, brain science, and other new theories and new technologies, under the joint impetus of powerful demands of economic and social development, AI's development has accelerated, displaying deep learning, cross-domain integration, man-machine collaboration, the opening of swarm intelligence, autonomous control, and other new characteristics. Big data-driven cognitive learning, cross-media collaborative processing, and man-machine collaboration–strengthened intelligence, swarm integrated intelligence, and autonomous intelligent systems have become the focus of the development of AI. The results of brain science research inspired human-like intelligence that awaits action; the trends involving the chips, hardware, and platform have become apparent; the development of AI has entered into a new stage. At present, the development a new generation of AI and related disciplines, theoretical modeling, technological innovation, hardware and software upgrades, etc., all advance, provoking chain-style breakthroughs, promoting the acceleration of the elevation of economic and social domains from digitization and networkization to intelligentization.

AI has become a new focus of international competition. AI is a strategic technology that will lead in the future; the world's major developed countries are taking the development of AI as a major strategy to enhance national competitiveness and protect national security; intensifying the introduction of plans and strategies for this core technology, top talent, standards and regulations, etc.; and trying to seize the initiative in the new round of international science and technology competition. At present, China's situation in national security and international competition is more complex, and [China] must, looking at the world, take the development of AI to the national strategic level with systemic layout, take the initiative in planning, firmly seize the strategic initiative in the new stage of international competition in AI development, to create new competitive advantage, opening up the development of new space, and effectively protecting national security.

AI has become a new engine of economic development. AI has become the core driving force for a new round of industrial transformation, [which] will advance the release of the huge energy stored from the previous scientific and technological revolution and industrial transformation, and create a new powerful engine, reconstructing production, distribution,

exchange, consumption, etc., links in economic activities; with new demands taking shape from the macro to the micro within each domain of intelligentization; with the birth of new technologies, new products, new industries, new formats, new models; triggering significant changes in economic structure, profound changes in human modes of production, lifestyle, and thinking; and a whole leap of achieving social productivity. China's economic development enters a new normal, deepening the supply side of structural reform task is very arduous, [and China] must accelerate the rapid application of AI, cultivating and expanding AI industries to inject new kinetic energy into China's economic development.

AI brings new opportunities for social construction. China is currently in the decisive stage of comprehensively constructing a moderately prosperous society. The challenges of population aging, environmental constraints, etc., remain serious. The widespread use of AI in education, medical care, pensions, environmental protection, urban operations, judicial services, and other fields will greatly improve the level of precision in public services, comprehensively enhancing the people's quality of life. AI technologies can accurately sense, forecast, and provide early warning of major situations for infrastructure facilities and social security operations; grasp group cognition and psychological changes in a timely manner; and take the initiative in decision-making and reactions—which will significantly elevate the capability and level of social governance, playing an irreplaceable role in effectively maintaining social stability.

The uncertainties in the development of AI create new challenges. AI is a disruptive technology with widespread influence that may cause: transformation of employment structures; impact on legal and social theories; violations of personal privacy; challenges in international relations and norms; and other problems. It will have far-reaching effects on the management of government, economic security, and social stability, as well as global governance. While vigorously developing AI, we must attach great importance to the potential safety risks and challenges, strengthen the forward-looking prevention and guidance on restraint, minimize risk, and ensure the safe, reliable, and controllable development of AI.

China possesses a favorable foundation for the development of AI. The nation has: deployed the National Key Research and Development Plan's key special projects, such as intelligent manufacturing; issued and implemented the "Internet +" and AI Three-Year Activities and Implementation Program, releasing a series of measures from science and technology research and development; and promoted applications and industrial development, and other aspects. As a result of many years of continuous accumulation, China has achieved important progress in the field of AI, with the number of international scientific and technology papers published and the number of inventions patented ranked second in the world, while achieving important breakthroughs in certain domains of core crucial technologies. Leading the world in voice recognition and visual recognition technologies; initially possessing the capability for leapfrog development in adaptive autonomous learning, intuitive sensing, comprehensive reasoning, hybrid intelligence, and swarm intelligence, etc.; with Chinese information processing, intelligent monitoring, biometric identification, industrial robots, service robots, and unmanned driving gradually entering practical application; AI innovation and entrepreneurship have become increasingly active, and a number of leading enterprises have accelerated their growth, receiving widespread concern and recognition internationally. Accelerate the accumulation of technological capabilities and massive data resources, the organization integration of both the huge demand for applications and an open market environment, which together constitute China's unique advantage in AI development.

At the same time, we must also clearly see that there is still a gap between China's overall level of development of AI relative to that of developed countries—lacking major original results in the basic theory, core algorithms, key equipment, high-end chips, major products and systems, foundational materials, components, software and interfaces, etc. Scientific research institutions and enterprises do not yet possess international influence upon ecological cycles and supply chain, lacking a systematic research and development layout; cutting-edge talent for AI is far from meeting demand. Adapting to the development of AI requires the urgent improvement of basic infrastructure, policies and regulations, and standards systems.

Facing a new situation and new demands, we must take the initiative to pursue and adapt to change, firmly seize the major historic opportunity for the development of AI, stick closely to development, study and evaluate the general trends, take the initiative to plan, grasp the direction, seize the opportunity, lead the world in new trends in the development of AI, serve economic and social development, and support national security, promoting the overall elevation of the nation's competitiveness and leapfrog development.

II. The Overall Requirements(1) Guiding Ideology

Comprehensively implement the spirit of the 18th Party Congress and 18th Central Committee's Third, Fourth, Fifth, and Sixth Plenary Sessions. Thoroughly study and implement the spirit of General Secretary Xi Jinping's series of important sayings and new concepts, new ideas, and new strategy for governing the country; according to the "five in one" overall layout and "four comprehensives" strategic layout, conscientiously implement the CPC Central Committee and State Council decision-making arrangements, deeply implement the innovation-driven development strategy to accelerate the deep integration of AI with the economy, society and national defense as a primary line, to enhance: scientific and technological innovation capacity for a new generation of AI as the main direction of attack; intelligent economy development; smart society construction; protecting national security; building of knowledge clusters, technology clusters, and industry clusters mutually integrated with talent, system, and culture, for a mutually supporting ecosystem, advancing intelligentization as the center of humanity's sustainable development. Comprehensively enhance society's productive forces, comprehensive national power, and national competitiveness, in order to provide strong support to accelerate the construction of an innovative new-type nation and global science and technology power, to achieve the two centennial goals and the great rejuvenation of the Chinese nation.

(2) The Basic Principles

Technology-Led. Grasp the global development trend of AI, highlight the deployment of forward-looking research and development, explore the layout in key frontier domains, long-term support, and strive to achieve transformational and disruptive breakthroughs in theory, methods, tools, and systems; comprehensively enhance original innovation capability in AI, accelerate the construction of a first-mover advantage, to achieve high-end leading development.

Systems Layout. According to the different characteristics of foundational research, technological research and development, industrial development, and commercial applications, formulate a targeted systems development strategy. Fully give play to the advantages of the socialist system to concentrate forces to do major undertakings, promote

the planning and layout of projects, bases, and a talent pool, organically link already-deployed major projects and new missions, continue current urgent needs and long-term development echelons, construct innovation capacity, create a collaborative force for institutional reforms and the policy environment.

Market-Dominant. Follow the rules of the market, remain oriented toward application, highlight companies' choices on the technological line and primary role in the development of commercial product standards, accelerate the commercialization of AI technology and results, and create a competitive advantage. Grasp well the division of labor between government and the market, better take advantage of the government in planning and guidance, policy support, security and guarding, market regulation, environmental construction, the formulation of ethical regulations, etc.

Open-Source and Open. Advocate the concept of open-source sharing, and promote the concept of industry, academia, research, and production units each innovating and in principal pursuing joint innovation and sharing. Follow the coordinated development law for economic and national defense construction; promote two-way conversion and application for military and civilian scientific and technological achievements and co-construction and sharing of military and civilian innovation resources; form an all-element, multi-domain, highly efficient new pattern of civil-military integration. Actively participate in global research and development and management of AI, and optimize the allocation of innovative resources on a global scale.

(3) Strategic Objectives

These are divided into the following three steps:

First, by 2020, the overall technology and application of AI will be in step with globally advanced levels, the AI industry will have become a new important economic growth point, and AI technology applications will have become a new way to improve people's livelihoods, strongly supporting [China's] entrance into the ranks of innovative nations and comprehensively achieving the struggle toward the goal of a moderately prosperous society.

- By 2020 China will have achieved important progress in a new generation of AI theories and technologies. It will have actualized important progress in big data intelligence, cross-medium intelligence, swarm intelligence, hybrid enhanced intelligence, and autonomous intelligence systems, and will have achieved important progress in other foundational theories and core technologies; the country will have achieved iconic advances in AI models and methods, core devices, high-end equipment, and foundational software.
- The AI industry's competitiveness will have entered the first echelon internationally. China will have established initial AI technology standards, service systems, and industrial ecological system chains. It will have cultivated a number of the world's leading AI backbone enterprises, with the scale of AI's core industry exceeding 150 billion RMB, and exceeding 1 trillion RMB as driven by the scale of related industries.
- The AI development environment will be further optimized, opening up new applications in important domains, gathering a number of high-level personnel and innovation teams, and initially establishing AI ethical norms, policies, and regulations in some areas.

Second, by 2025, China will achieve major breakthroughs in basic theories for AI, such that some technologies and applications achieve a world-leading level and AI becomes the main driving force for China's industrial upgrading and economic transformation, while intelligent social construction has made positive progress.

- By 2025, a new generation of AI theory and technology system will be initially established, as AI with autonomous learning ability achieves breakthroughs in many areas to obtain leading research results.
- The AI industry will enter into the global high-end value chain. This new-generation AI will be widely used in intelligent manufacturing, intelligent medicine, intelligent city, intelligent agriculture, national defense construction, and other fields, while the scale of AI's core industry will be more than 400 billion RMB, and the scale of related industries will exceed 5 trillion RMB.
- By 2025 China will have seen the initial establishment of AI laws and regulations, ethical norms and policy systems, and the formation of AI security assessment and control capabilities.

Third, by 2030, China's AI theories, technologies, and applications should achieve world-leading levels, making China the world's primary AI innovation center, achieving visible results in intelligent economy and intelligent society applications, and laying an important foundation for becoming a leading innovation-style nation and an economic power.

- China will have formed a more mature new-generation AI theory and technology system. The country will achieve major breakthroughs in brain-inspired intelligence, autonomous intelligence, hybrid intelligence, swarm intelligence, and other areas, having important impact in the domain of international AI research and occupying the commanding heights of AI technology.
- AI industry competitiveness will reach the world-leading level. AI should be expansively deepened and greatly expanded into production and livelihood, social governance, national defense construction, and in all aspects of applications, will become an expansive core technology for key systems, support platforms, and the intelligent application of a complete industrial chain and high-end industrial clusters, with AI core industry scale exceeding 1 trillion RMB, and with the scale of related industries exceeding 10 trillion RMB.
- China will have established a number of world-leading AI technology innovation and personnel training centers (or bases), and will have constructed more comprehensive AI laws and regulations, and an ethical norms and policy system.

(4) Overall Deployment

The development of AI is a complex systemic project related to the overall situation, that must be arranged in accordance with "build one system, grasp the two attributes, adhere to the trinity, and strengthen the four supports" to form a strategic path for the healthy and sustainable development of AI.

Construct an open and cooperative AI technology innovation system. Target the weak foundation in original theories, and the key difficulties and deficiencies in major products and systems. Establish foundational theories and a common technology system for a new generation of AI, laying out the construction of a major scientific and technological

innovation base. Strengthen the high-end talent team in AI to promote innovation and cooperative interactions. Form a continuous innovation capability for AI.

Grasp AI's characteristic high degree of integration of technological attributes and social attributes. It is necessary not only to increase efforts in the research and development and applications of AI, maximizing the potential of AI, but also to predict AI's challenges, coordinate industrial policies, innovate in policies and social policies, achieve the coordination of encouraging development and reasonable regulation, and maximize risk prevention.

Adhere to the promotion of the trinity of breakthroughs in AI research and development, product applications, and fostering industry development. Adapt to the characteristics and trends of AI development. Strengthen the deep integration of the innovation chain and industrial chain, the interactive evolution of technology supply and market demand. Take technological breakthroughs to promote domain applications and industrial upgrading. Through application demonstrations, promote the optimization of technologies and systems. At the same time as greatly promoting technology applications and industrial development, strengthen long-term R&D layout and research. Achieve rolling development and continuous improvement. Ensure that theory is in the front, the technological commanding heights are occupied, and applications are secure and controllable.

Fully support science and technology, the economy, social development, and national security. Drive comprehensive elevation on national innovative capability with AI technological breakthroughs. Lead in the process of constructing a global science and technology power. Through strengthening intelligent industry and cultivating the intelligent economy, create a new growth cycle for China's next decade or even decades of economic prosperity. Through building an intelligent society, promote the improvement of people's livelihoods and welfare and implement people-centric development thinking. Through AI, elevate national defense strength and assure and protect national security.

III. Focus Tasks

Based on the overall picture of national development, accurately grasp the global development trends of AI, find the correct openings for breakthroughs and directions for the main thrust, comprehensively strengthen basic science and technology innovation capabilities, comprehensively expand the depth and breadth of application in focus areas, and comprehensively enhance the built-in intelligence levels of applications in economic and social development, as well as in national defence.

(1) Build open and coordinated AI science and technology innovation systems

Focus on increasing the supply of AI innovation sources; strengthen deployments in areas such as advanced basic theory, key general technologies, basic platforms, talent teams, etc.; stimulate open-source sharing; systematically enhance sustained innovation capabilities; ensure that our country's AI science and technology levels ascend to the leading global ranks; and make ever more contributions to the development of global AI.

1. Establish basic theory systems for a new generation of AI

Focus on major advanced scientific AI questions; concurrently deal with present needs and long-term developments; make breakthroughs in basic AI application theory bottlenecks; give priority to deploying basic research that may trigger paradigmatic change in AI; stimulate the intersection and convergence of disciplines; and provide powerful scientific reserves for the sustained development and profound application of AI.

Make breakthroughs in basic application theory bottlenecks. Aim at basic theoretical orientations with clear applied objectives, which promise to trigger an upgrade of AI technology, strengthen basic theoretical research on big data intelligence, cross-media sensing and computing, human-machine blended intelligence, mass intelligence, autonomous cooperation and decision-making, etc. Focus on breakthroughs in big data intelligence, unsupervised learning, comprehensive deep reasoning and other such difficult issues. Establish data-driven cognitive computing models with natural language understanding at the core, and shape capabilities to go from big data to knowledge, and from knowledge to decision-making. Focus on breakthroughs in cross-media sensing and computing theory, including theories and methods for: low-cost and low-energy smart sensing, active sensing in complex landscapes, listening comprehension in the natural environment as well as language sensing, autonomous multimedia learning, etc. Realize superhuman sensing and highly-dynamic, high-dimensional, and multi-model distributed large-landscape sensing. The focuses on breakthroughs in blended and enhanced intelligence theory are: theories on human-machine cooperative and blended environmental understanding, decision-making, and learning; intuitive reasoning and causal models, recall and knowledge evolution, etc.; realizing blended and enhanced intelligence where learning and reflection approach or exceed human intelligence levels. The focuses for breakthroughs in collective intelligence theory are: theories and methods for the organization, emergence and learning of collective intelligence; establishment of expressible and computable mass intelligence incentive algorithms and models; and shaping Internet-based collective intelligence theory systems. The focuses for breakthroughs in autonomous coordination, control and optimized decision-making theory are: theories concerning coordination sensing and interaction aimed at autonomous unmanned systems; autonomous coordination control and optimized decision-making; knowledge-driven human-machine-object triangular coordination and interoperation, etc.; and shaping novel theoretical systems and frameworks for innovation in autonomous intelligence and unmanned systems.

Arrange advanced basic theoretical research. Aim for a direction that may trigger a paradigmatic change in AI, far-sightedly arrange research on high-level machine learning, brain-inspired intelligence computing, quantum smart computing, and other such cross-domain basic theories. The focuses for breakthroughs in high-level machine learning theory are theories and methods concerning self-adaptive learning, autonomous learning, etc., and realizing AI with high interpretative and strong generalization capabilities. The focuses for breakthroughs in brain-inspired intelligence computing theory are: theories concerning brain-inspired information encoding, processing, recall, learning and reasoning; the creation of brain-inspired complex systems and brain-inspired control theories and methods; and establishment of new large-scale brain-inspired intelligence computing models and brain-inspired understanding computing models. The focuses for breakthroughs in quantum computing theory are: methods for quantum-accelerated machine learning; establishment of high-performance computing and quantum computing convergence models; and shaping high-efficiency, accurate, and autonomous quantum AI system setups.

Launch cross-disciplinary exploratory research. Promote the intersection and convergence of AI with neurology, cognitive science, quantum science, psychology, mathematics, economics, sociology and other such related basic disciplines; strengthen basic theoretical mathematical research to guide the development of AI algorithms and models; focus on researching the basic theoretical questions of AI legal principles; support exploratory research that is strongly original, and where there is no consensus; encourage scientists to explore freely; dare to overcome front-line scientific difficulties in AI; create ever more original theory; and make ever more original discoveries.

Box 1: Basic Theories

1. *Big data intelligence theory.* Research new data-driven and knowledge-driven AI methods, theories and methods for sensing computing theory with natural language understanding, images and figures at the core, comprehensive deep reasoning and creative AI theories and methods, basic theories and frameworks on smart decision-making with incomplete information, data-driven common AI data models and theories, etc.
2. *Cross-media sensing and computing theory.* Research sensing that exceeds human visual abilities, active visual sensing and computing aimed at the real world, auditory sensing and computing of natural acoustic scenes, language sensing and computing in an environment of natural interaction, human sensing and computing aimed at asynchronous orders, autonomous learning aimed at smart media sensing, and urban omnidimensional smart sensing and reasoning engines.
3. *Hybrid and enhanced intelligence theory.* Research hybridization and convergence where "the human is in the loop," behavioral strengthening through human-machine smart symbiosis and brain-machine coordination, intuitive machine reasoning and causal models, associative recall models and knowledge evolution methods, complex data and task blended and enhanced intelligence learning methods, cloud robotics coordination computing methods, and situational comprehension and human-machine group coordination in real-world environments.
4. *Swarm intelligence theory.* Research swarm intelligence structural theory and organizational methods, swarm intelligence incentive mechanisms and emergence mechanisms, swarm intelligence learning theories and methods, common swarm intelligence computing paradigms and models.
5. *Autonomous coordination and control, and optimized decision-making theory.* Research coordination sensing and interaction aimed at autonomous unmanned systems, coordination, control and optimized decision-making aimed at autonomous and unmanned systems, knowledge-driven human-machine-object triangular coordination and interoperability theories.
6. *High-level machine learning theory.* Research basic statistical learning theories, reasoning and decision-making under uncertainty, distributed learning and interaction, learning while protecting privacy, small-sample learning, deep intensive learning, unsupervised learning, semi-supervised learning, active learning and other such learning theories and efficient models.
7. *Brain-inspired intelligence computing theory.* Research theories and methods on rain-inspired sensing, brain-inspired learning, and brain-inspired recall mechanisms and computing blends, brain-inspired complex systems, brain-inspired control, etc.

8. *Quantum intelligent computing theory.* Explore cognitive quantum models and intrinsic mechanisms, research efficient quantum intelligence models and algorithms, high-performance and high-bitrate quantum AI processors, real-time quantum AI systems that can exchange information with the outside world, etc.

---

2. Build a next-generation AI key general technology system

Focusing on the urgent need to raise China's international competitiveness in AI, next-generation AI key general technology R&D and deployment should make algorithms the core; data and hardware the foundation; and upping capabilities in sensing and recognition, knowledge computing, cognitive reasoning, executing motion, and human-machine interface the emphasis; in order to form openly compatible, stable and mature technological systems.

Knowledge computing engine and knowledge service technology. Key breakthroughs in knowledge processing, deep search, and visual interactive core technology; realization of automatic acquisition of incrementally growing knowledge; possession of concept discernment, object discovery, attribute prediction, evolutionary knowledge modeling, and relationship discovery capabilities; the formation of multi-billion-scale, multi-source, multi-disciplinary, multi-data type, and cross-medium knowledge maps.

Cross-medium analytical reasoning technology. Key breakthroughs in cross-medium unified indicators; relational understanding and knowledge mining; knowledge map structure and learning; knowledge evolution and reasoning; intelligent description and generation, etc., technology. Realization of cross-medium knowledge indicators, analysis, mining, reasoning, evolution, and utilization. Construct analytic reasoning engines.

Key swarm intelligence technology. Key breakthroughs on the basis of the popularization of the internet, mass collaboration, knowledge resource management, and open sharing, etc., technologies. Building frameworks to display swarm intelligence knowledge. Realize the integration and strengthening of swarm intelligence-based knowledge acquisition and swarm intelligence under open development conditions. Support swarm perception, cooperation, and evolution at a national, tens-of-millions scale.

New architecture and new technology for hybrid and enhanced intelligence. Key breakthroughs in human-machine interaction for perception and execution integration models, new types of intelligent computing-fronted sensors, common use hybrid architecture, etc., core technologies. Build autonomous, environmentally adaptable hybrid enhanced intelligent systems, human-machine hybrid enhanced intelligent systems and support environments.

Intelligent technologies of autonomous unmanned systems. Key breakthroughs in autonomous unmanned system computing architecture, complex situational environment perception and understanding, real-time accurate positioning, adaptable, intelligent navigation in complex environments, etc., general technologies. Unmanned and autonomously controlled systems including automobiles, ships, automatic driving in traffic, etc., intelligent technologies. Develop service robots, special-purpose robots, etc., core technologies and support unmanned system application and manufacturing development.

Intelligent virtual reality modeling technology. Key breakthroughs in intelligent modeling technology for virtual counterparts. Increasing the sociality, diversity, and lifelike quality of virtual reality intelligent counterpart behavior. Realize the organic integration, high efficiency, and interactivity of virtual reality and augmented reality, etc., technologies.

Intelligent computing chips and systems. Key breakthroughs in high energy efficiency, reconfigurable brain-inspired computing chips and brain-inspired visual sensor systems with computational imaging capabilities. Research and develop high-efficiency brain-inspired neural network architectures and hardware systems with autonomous learning capabilities. Realize brain-inspired intelligent systems with multimedia sensory information understanding, intelligence growth, and common sense reasoning capabilities.

Natural language processing technology. Key breakthroughs in natural language grammar logic, word-concept symbols, and deep semantic analysis core technologies. Advance effective human-machine communication and free interaction. Realize multi-style, multi-language, multi-domain natural language intelligent understanding and automated [results] generation.

Box 2: Key General Technologies

1. *Knowledge computing engines and knowledge service technology.* Researching knowledge computing and visual interaction engines; researching innovative design, digital creation, and commercial intelligence with visual media at the core; developing large-scale organic data knowledge discovery.
2. *Cross-medium analytic reasoning technology.* Researching cross-medium unified indicators, connected understanding and knowledge mining, knowledge map building and learning, knowledge evolution and inference, intelligent description and generation, etc., technology; developing cross-medium analytic reasoning engine and verification systems.
3. *Key swarm intelligence technology.* Developing swarm intelligence's active perception and discovery, knowledge gain and generation, cooperation and sharing, evaluation and evolution, human-machine integration and enhancement, self-preservation and mutual security, etc., key technology studies; building service system architecture for the crowd intelligence space; researching mobile crowd intelligent coordinated decision making and control technologies.
4. *Hybrid enhanced intelligent new architectures and technologies.* Researching hybrid enhanced intelligent core technology and cognitive computing frameworks; new-model hybrid computing architectures, human-machine collective driving, online intelligent learning technology, and hybrid enhanced frameworks for simultaneous management and control.
5. *Autonomous unmanned systems intelligent technology.* Researching unmanned autonomous control intelligent technology for automobiles, ships, traffic, automatic driving, etc.; service, space, maritime, and polar robot technology; unmanned workshop/intelligent factory intelligent technology; high-end intelligent control technology and autonomous unmanned operating systems. Researching positioning, navigation, recognition, etc., robotic and mechanical arm autonomous control technology for visual sensing in complex environments.

6. *Virtual reality intelligent modeling technology.* Researching mathematical expression and modeling methods for virtual counterpart intelligent behavior; problems such as natural, persistent, and deep exchange between users and virtual counterparts and virtual environments; intelligent counterpart modeling technology and method systems.
7. *Intelligent computing chips and systems.* Researching neural network processors, as well as high-energy efficiency, reconfigurable brain-inspired computing chips, etc.; new-model perception chips and systems, intelligent computing system structure and systems, and AI operating systems. Researching architectures suitable for AI hybrid architectures, etc.
8. *Natural language processing technology.* Researching short text computing and analysis technology, cross-language text mining technology and turning toward semantic comprehension technology for machine cognitive intelligence, and human-machine interaction systems for multimedia information comprehension.

---

3. Coordinate the layout of AI innovation platforms

Construct AI innovation platforms. Strengthen the foundational support for AI research and development and applications. AI open-source hardware and software infrastructure platforms should focus on building and supporting unified computing frameworks for knowledge reasoning, probability statistics, depth learning, and other AI paradigms. Form and promote an ecological chain of platforms for interaction and synergies among AI software, hardware, and intelligent clouds. The group intelligent service platform should focus on the construction of knowledge resource management and the open sharing tools based on the large-scale cooperation on the Internet. Create a platform and service environment for the innovation of the industry and university. The hybrid enhanced intelligent support platforms should focus on the construction of a heterogeneous real-time computing engine supporting large-scale training and a new computing clusters, providing a service-oriented, systematic platform and solution for complex intelligent computing. Autonomous unmanned system support platform focuses on the construction of autonomous system environmental awareness, autonomous collaborative control, intelligent decision-making and other AI common core technology support systems. Create development and test environments for open, modular, reconfigurable autonomous unmanned systems. AI basic data and security detection platforms should focus on the construction of AI for the public data resource library, the standard test data set, cloud service platform, the formation of AI algorithms and platform security test evaluation methods, techniques, norms and tools, promoting the open sourcing and openness of all kinds of common software and technology platform. Promote military-civilian sharing and joint use for all kinds of platforms in accordance with the requirements of deep military-civil integration related provisions.

Box 3: Basic Support Platforms

1. *AI Open-Source Hardware and Software Infrastructure and Platforms.* Establish big data and AI open-source software platforms, terminal, and cloud collaborative AI cloud service platforms, new multi-intelligent sensor and integrated platforms, new

product design platforms based on AI hardware, and future network, big data intelligent service platforms.

2. *Group Intelligent Service Platforms.* Establish group knowledge-based computing and support platforms, science and technology public service systems, group intelligent software development and verification automation systems, group intelligent software learning and innovation systems, open environment cluster decision-making systems, and group-sharing economic service systems.
3. *Hybrid Enhanced Intelligent Support Platforms.* Establish AI supercomputing centers, large-scale super intelligent computing support environments, online intelligent education platforms, "human-in-the-loop" driving brains, intelligent platforms for complexity analyses and risk assessment in industrial development, intelligent security platforms to support nuclear power security operations, and research and development and testing platforms for human-machine joint driving technology.
4. *Autonomous Unmanned System Support Platforms.* Establish common core technology and support platforms, independent unmanned systems, independent control of unmanned aerial vehicles, and automatic driving support platforms for auto, ship and rail traffic, service robots, space robots, marine robots, polar robot support platforms, technical support platforms for intelligent factory and intelligent control equipment, etc.
5. *AI Basic Data and Security Detection Platforms.* Construct artificial data-oriented public data resource libraries, standard test data sets, and cloud service platforms. Establish test models and evaluation models for the security of AI algorithms and platforms. Research and develop security evaluation tools for AI algorithms and platforms.

---

4. Accelerate the training and gathering of high-end AI talent

Make the construction of a high-end talent team of the utmost importance in the development of AI. Adhere to the combination of training and introduction. Improve the AI education system, strengthen the construction of a talent pool and echelons, especially accelerate the introduction of the world's top talent and young talent, forming China's AI top talent base.

Cultivate high-level of AI innovative talents and teams. Support and cultivate the development potential of leading AI talent. Strengthen professional and technical personnel training for basic research, applied research, operations and maintenance aspects of AI. Pay attention to the training of compound talents, focusing on cultivating vertical composite talents for AI theory, methods, technology, products, and application, and compound talents who master the "AI +" economy, society, management, standards, law, and other horizontal areas. Through major research and development tasks and base and platform construction, converge high-end talents in AI. Create high-level innovation teams in a number of AI key domains. Encourage and guide domestic innovative talents and the teams to strengthen cooperation with the world's top AI research institutions.

Increase the introduction of high-end AI talent. Open up specialized channels and implement special policies to achieve the precise introduction of peak AI talent. Focus on the introduction of international top scientists and high-level innovation teams in neural awareness, machine learning, automatic driving, intelligent robots, and other areas. Encourage the use of flexible introduction of AI talent through project cooperation, technical

advice, etc. Coordinate the use of the "Thousands Talents" plan and other existing talent plans to strengthen the field of AI talents, especially through the introduction of outstanding young talent. Improve enterprise human capital cost accounting and related policies. Encourage enterprises and scientific research institutions to introduce AI talent.

Construct an AI academic discipline. Improve the disciplinary layout of the AI domain. Establish AI majors. Promote the construction of a discipline in the domain of AI. Establish AI institutes as soon as possible in pilot institutions. Increase the enrollment places for masters and PhDs in working in AI and related disciplines. Encourage colleges and universities to broaden the content of AI professional education on an original basis. Create a new model of "AI + X" compound professional training, attaching importance to cross-integration of professional education for AI and mathematics, computer science, physics, biology, psychology, sociology, law, and other disciplines. Strengthen cooperation in production and research. Encourage universities, research institutes, enterprises and other institutions to carry out the construction of an AI discipline.

(2) Fostering a high-end, highly efficient smart economy

Accelerate the fostering of an AI industry with a major leading and driving effect, stimulate the profound convergence of AI and all industrial areas, and create data-driven smart economic patterns with human-machine coordination, cross-sectoral convergence, and joint creation and sharing. Data and knowledge will become the first factor for economic growth; human-machine coordination will become the mainstream method of production and service; cross-sectoral convergence will become an important economic model; joint creation and sharing will become basic characteristics of the economic ecology; individualized demands and made-to-order will become new consumption trends; and productivity will increase substantially, drive industries to migrate towards the high end of value chains, powerfully support the development of the real economy, and comprehensively increase the quality and efficiency of economic development.

1. Forcefully develop new AI industries

Accelerate the transformation and application of key AI technologies, stimulate the integration of technologies with commercial model innovation, promote the innovation of smart products in focus areas, vigorously foster new AI business models, compose high-end industry chains, and forge AI industry groups with international competitiveness.

Smart software and hardware. Develop operating systems, databases, intermediary devices, development tools, and other such key software and hardware aimed at AI; make breakthroughs in graphic processing and other such core hardware; research solution plans for smart systems in pattern recognition, voice understanding, machine translation, smart interaction, knowledge processing, control and decision-making, etc.; and foster and expand basic software and hardware industries aimed at AI.

Smart robots. Tackle core components and special sensors for smart robots, perfect hardware interface standards, software interface standards, and safe usage standards for smart robots. Research and develop smart industrial robots and smart service robots, realize large-scale application, and enter into global markets. Research, produce, and popularize space robots, maritime robots, polar robots, and other such special kinds of smart robots. Establish smart robot standard systems and security norms.

Smart delivery tools. Develop self-driving vehicles and rail traffic systems; strengthen the integration and coordination of vehicle load sensing, automatic driving, the Internet of cars, the Internet of Things, and other such technologies; develop smart traffic sensing systems, create national indigenous automatic driving platform technology systems and industrial assembly capabilities; and explore self-driving vehicle sharing models. Develop consumer and commercial unmanned aircraft and unmanned ships, and establish and trial specialized service systems for authentication, monitoring, technology competition, etc., perfect management measures for the space and maritime areas.

Virtual reality and augmented reality. Make breakthroughs in key technologies such as high-performance software modelling, content capturing and generation, augmented reality and human-machine interaction, integrated environments and tools, etc. Research and create virtual display devices, optical devices, high-performance three-dimensional display devices, development engines, and other such products. Establish standards and evaluation systems for virtual reality and augmented reality technologies, products, and services, and promote their converged application in focus sectors.

Smart terminals. Accelerate the research and development of smart terminal core technologies and products, develop new-generation smart phones, on-board smart terminals for cars, and other such mobile smart terminal products and equipment. Encourage the research and development of smart watches, smart earpieces, smart glasses, and other such wearable terminal products, and expand product forms and application services.

Basic Internet of Things devices. Develop high-sensitivity and highly reliable smart sensors and chips supporting the new-generation Internet of Things. Make progress in core Internet of Things technologies such as RFID and short-distance machine communications, as well as key components such as low-power processors.

2. Accelerate and promote the upgrade of industrial intelligentization

Promote the converged innovation of AI in all sectors. Launch AI application demonstrations and trials in focus sectors and areas such as manufacturing, agriculture, logistics, finance, commerce, household goods, etc. Promote the application of AI at scale, and comprehensively upgrade the smartness level of industrial development.

Smart manufacturing. Focus on the major demands for building a strong manufacturing country, move forward the integrated application of systems such as key technologies and equipment for smart manufacturing, core supporting software, the industrial internet, etc. Research and develop smart products and smart connected products, tools and systems that can be used in smart manufacturing, and smart manufacturing cloud service platforms. Popularize smart manufacturing processes, distributed smart manufacturing, networked coordinated manufacturing, long-distance diagnosis and operational services, and other such novel manufacturing models. Establish smart manufacturing standard systems, and move forward with the intelligentization of manufacturing activities across the entire lifecycle.

Smart agriculture. Research and formulate smart agricultural sensing and control systems, smart agricultural equipment, autonomous tasking systems for farming equipment across fields, etc. Establish and complete smart agriculture information remote sensing and monitoring networks integrating air, space, and land components. Establish model agriculture big data smart decision-making and analysis systems, launch trials of smart farms, smart

plant factories, smart pastures, smart fisheries, smart orchards, smart farm produce processing workshops, green and smart farm product supply chains and other such integrated applications.

Smart logistics. Strengthen research, development and broad use of smart logistics equipment for smart loading, unloading, and transportation; parcel sorting, processing and delivery; etc. Establish smart deep-sensing storage systems, and enhance storage and operational management levels and efficiency. Perfect smart logistics public information platforms and command systems, product quality authentication and tracing systems, smart distribution and dispatch systems, etc.

Smart finance. Establish big data systems for finance, and enhance multimedia data processing and comprehension capabilities for finance. Innovate smart financial products and services, develop new financial business models. Encourage the financial sector to use smart customer service, smart inspection, and other such technologies and equipment. Build smart warning and prevention systems for financial risk.

Smart commerce. Encourage the application of cross-media analysis and reasoning, knowledge computing engines and knowledge services, and other such new technologies in the commercial area, and popularize AI-based novel commercial services and decision-making systems. Build cross-medium data platforms covering geographic positioning, online media, urban basic data, etc., and support enterprises' launching smart services. Encourage the provision of made-to-order commercial smart decision-making services focusing on individual demands and enterprise management.

Smart household goods. Strengthen the converged application of AI technology and household and building systems, and enhance the smartness levels of building facilities and household goods. Research, develop, and use household connection and interactivity agreements, as well as interface standards suited for different application settings. Enhance sensing and connection capabilities of household electrical appliances, durable goods and other such household products. Support smart household enterprises in innovating new service models, and promote interactive and sharing solutions and plans.

3. Forcefully develop smart enterprises

Promote the upgrading of enterprises' smartness levels on a large scale. Support and guide enterprises to use new AI technologies in core operational segments such as design, production, management, logistics, sales, etc. Build novel enterprise organization structures and operational models; create smart and converged business models for manufacturing, services, and finance; and develop individualized made-to-order; and broaden smart product supply. Encourage large-scale Internet enterprises to build cloud manufacturing platforms and service platforms, and provide online key industry software and model databases aimed at manufacturing enterprises. Launch outsourcing services for manufacturing capacity, and promote the development of smartness among small and mid-size enterprises.

Popularize the use of smart factories. Strengthen the application and demonstration of key technologies and system methods for smart factories. Focus on popularizing production line reconstruction and dynamic smart control, production faculty smart interconnection and cloud data collection, multi-dimensional human-machine-object coordination, interoperability, and other such technologies. Encourage and guide enterprises to build

factory big data systems, networked distributed production facilities, etc. Realize the networking of production equipment, the visualization of production data, the transparency of production processes, and the automation of production sites; and enhance the smartness levels of factory operational management.

Accelerate the fostering of AI industry-leading enterprises. Accelerate the creation of global leading AI enterprises and brands in advantageous areas such as unmanned aircraft, speech recognition, pattern recognition, etc. Accelerate the fostering of a batch of key enterprises in novel areas such as smart robots, smart cars, wearable equipment, virtual reality, etc. Support AI enterprises to strengthen their patent structures, and take the lead in or participate in the formulation of international standards. Promote domestic advantageous enterprises, sectoral organizations, scientific research bodies, higher education institutes, etc., to jointly establish the AI Industry and Technology Innovation Alliance of China. Support key backbone enterprises to build open source hardware factories, open source software platforms, create innovative ecologies integrating all kinds of resources, stimulate small and mid-size AI enterprises to develop and to be used in all areas. Support all kinds of bodies and platforms to provide specialized services aimed at AI enterprises.

4. Create AI innovation heights

Combined with each locality's foundation and advantages, according to the field of AI applications classifications, advance the layout of the relevant industries. Encourage local industry chains and innovation chains around AI. Gather high-end factors, high-end enterprises, and high-end talent. Build AI industry clusters and heights of innovation.

Launch AI innovation application pilot demonstrations. In areas where the AI foundation is favorable and its development potential bigger, organize and launch national AI innovation experiments. Explore systems and mechanisms, policy and regulation, the cultivation of talent, and other major reforms. Promote the transformation of the AI achievements, major product integrated innovation, and demonstration of applications. Form replicable, promotable experience, leading to the promotion of intelligent economy and intelligent social development.

Construct national AI industrial parks. Rely upon national independent innovation demonstration areas and the national high-tech industry development zone and other innovative vectors. Strengthen science and technology talent, finance, policy, and other elements of the optimal allocation and combination. Accelerate the construction of AI industry innovation cluster.

Construct national AI mass innovation bases. Relying on colleges and universities and scientific research institutes concentrated in localities, build AI field professionalized innovation platforms and other new entrepreneurial service agencies. Construct a number of low-cost, convenient, all-factor, open-style AI 'hackerspaces.' Improve incubation services system, promote the transformation of AI scientific and technological achievements, and support AI innovation and entrepreneurship.

(3) Construct a safe and convenient intelligent society

Based on the goal of improving people's living standards and quality, speed up and deepen the applications of AI, increase the level of intelligentization of the whole society to form an

all-encompassing and ubiquitous intelligent environment. Increasingly, repetitive, dangerous tasks will be completed by AI, while individual creativity will play a greater role. Form more high-quality and high comfort jobs; make precision intelligent services more diverse, such that people can maximize their enjoyment of high quality services and convenient life. Through a substantial increase in the level of intelligentization of social governance, make social operations more safe and efficient.

1. Develop convenient and efficient intelligent services

Accelerate the application of innovative AI throughout education, health care, pension and other urgent needs involving people's livelihood, to provide for the public personalized, diversified, high-quality services.

Intelligent Education. Utilize intelligent technology to accelerate and promote a personnel training model and reform to teaching methods; establish new-type education systems, including intelligent learning and interactive learning. Launch the construction of intelligent campuses; promote AI in teaching, management, resource construction, and other full-scale applications. Develop three-dimensional integrated teaching field, based on big data intelligent online learning and education platforms. Develop intelligent educational assistants; establish intelligent, fast and comprehensive education analysis system. Establish a learner-centered educational environment, and provide precision-deployed education services, achieve daily education and lifelong education.

Intelligent Medical Care. Promote the use of new models and new methods of AI treatment, establish a rapid, accurate intelligent medical system. Explore intelligent hospital construction, develop human-machine coordinated surgical robots and intelligent clinic assistants. Pursue research and development on flexible wearable, biologically compatible physiological monitoring systems, research and development of human-computer collaboration intelligent clinical diagnosis and treatment programs. Achieve intelligent image recognition, pathology classification, and intelligent multi-disciplinary consultation. Carry out large-scale genome recognition, proteomics, metabolomics, and other research and development of new drugs based on AI, promote intelligent pharmaceutical regulation. Strengthen epidemic intelligence monitoring, prevention, and control.

Intelligent Health and Elder Care Systems. Strengthen community intelligent health management, achieve breakthroughs in big data analysis, Internet of Things, and other key technologies. Research and develop health management wearable equipment and home intelligent health testing and monitoring equipment. Promote changes in health management from point-like monitoring to continuous monitoring, from short process management to long process management. Construct intelligent elder care communities and institutions; build a safe and convenient intelligent pension infrastructure system. Strengthen the intelligentization of products for elderly persons and intelligent products suitable for the aged. Develop audio-visual aid equipment, physical auxiliary equipment, and other intelligent home care equipment, expanding the elderly's activity space. Develop mobile social and service platform for the elderly and emotional escort assistant to enhance the quality of life of the elderly.

2. Promote the intelligentization of social governance

Promote the application of AI technology for administrative management, judicial management, urban management, environmental protection, and other hot and difficult issues in social governance, to promote the modernization of social governance.

Intelligent Government. Develop an AI platform for government services and decision-making. Develop a decision-making engine for the open environment. Promote applications in research on complex social problems, policy assessment, risk warning, emergency response, and other major matters of strategic decision-making. Strengthen the integration of government information resources and accurate forecasting of public demands, and smooth communication channels between the government and the public.

Smart Courts. Construct a set of trial, personnel, data applications, judicial disclosure, and dynamic monitoring into an integrated court data platform. Promote AI applications for applications including evidence collection, case analysis, and legal document reading and analysis. Achieve the intelligentization of courts and trial systems and trial capacity.

Smart Cities. Build an intelligentized city infrastructure, develop intelligent buildings, and promote the intelligentization, transformation, and upgrading of underground corridors and other municipal infrastructure. Construct urban big data platforms to build a heterogeneous, integrated data system for urban operations and management. Achieve comprehensive perception and deep understanding of the operation of complex urban systems for urban infrastructure and urban green space, wetlands, and other important ecological elements. Research and develop to build community public service information systems. Promote community service system and residents' intelligent home system collaboration. Promote the intelligentization of the full lifecycle of urban planning, construction, and management.

Smart Transportation. Research, establish, and operate vehicle automatic driving and road coordination technology systems. Research and develop information and integrated data platforms for transportation under complex multi-dimensional conditions. Establish intelligentized transportation command, control, and integrated operations. Actualize intelligent transportation obstacle removal and integrated management and coordination and command. Build intelligent transportation monitoring, management, and service systems covering the ground, tracks, low altitude, and the sea.

Intelligent Environmental Protection. Establish an intelligent monitoring large data platforms and systems covering the atmosphere, water, soil, and other environmental areas. Build information-sharing and intelligent environmental monitoring networks and service platforms for coordination of land and sea, integration of atmosphere and earth, and upwards and downwards synergies. Research and develop intelligent forecasting models and method and early warning programs for energy resource consumption and environmental pollutant discharge. Strengthen the Beijing-Tianjin-Hebei, Yangtze River Economic Zone, and other major national strategic regions' construction of intelligent prevention and control system for environmental protection and sudden environmental events.

3. Use AI to enhance public safety and security capabilities

Advance the deepening of AI applications in the field of public safety. Promote the construction of public safety and intelligent monitoring and early warning and control systems. Research and develop a variety of detection sensor technology, video image information analysis and identification technology, biometric identification technology,

intelligent security and police products. Establish intelligent monitoring platform for comprehensive community management, new criminal investigations, anti-terrorism, and other urgent needs. Strengthen the upgrading and intelligentization of security equipment for key public areas. Support carrying out public security regional demonstrations based on AI according to the conditions of the community or the city. Strengthen the use of AI for food safety protection, food classification, warning level, food safety risks and assessment, and the establishment of intelligent food safety early warning system. Strengthen the effective monitoring of natural disasters, natural disasters, around the earthquake disaster, geological disasters, meteorological disasters, floods and disasters and marine disasters and other major natural disasters, to build an intelligent monitoring and early warning and comprehensive response platform.

4. Promote social interaction and mutual trust

Give full play to the role of AI technology in enhancing social interaction and promoting credible communication. Strengthen the next generation of social network research and development, accelerate innovation in augmented reality, virtual reality, and other technologies to promote the integrative use of virtual environments and physical environments to meet personal perception, analysis, judgment and decision-making real-time information needs, and to achieve the smooth transition of different scenes of work, study, life, and entertainment. In order to improve the interpersonal communication needs, develop intelligent assistant products with the ability to accurately understand the needs of emotional interaction. Promote the integration of blockchain technology and AI, establish a new social credit system, and minimize the cost and risks of interpersonal communication.

(4) Strengthen military-civilian integration in the AI domain

Deepen implementation of military-civilian integration development strategy, to promote the formation of an all-element, multi-field, high efficiency AI military-civilian integration pattern. Build new generation AI based on research and development in the common theory and critical common technology. Establish mechanisms to normalize communication and coordination among scientific research institutes, universities, enterprises and military industry units. Promote military-civilian two-way transformation of AI technology. Strengthen a new generation of AI technology as a strong support to command and decision-making, military deduction, defense equipment, and other applications. Guide defense domain AI technology toward civilian applications. Encourage and advantage people's scientific research forces to participate in the domain of national defense for major scientific and technological innovation tasks in AI. Promote all kinds of AI technology to become quickly embedded in the field of national defense innovation. Strengthen the construction of military and civilian AI technology standard systems. Promote the overall layout and open sharing of science and technology innovation platforms and bases.

(5) Build a safe and efficient intelligent infrastructure system

Vigorously promote the construction of intelligent information infrastructure. Enhance the traditional level of intelligent infrastructure to form a smart economy, intelligent society and national defense needs of the infrastructure system. Speed up the promotion of information transmission as the core of the digital, network information infrastructure. Take integration awareness, transmission, storage, computing, and processing in intelligent information infrastructure changes. Optimize network infrastructure, research and develop the layout of

fifth generation mobile communication (5G) systems. Improve the Internet of Things infrastructure. Accelerate the integration of information network construction. Improve low-latency, high-throughput transmission capacity. Coordinate the use of big data infrastructure, strengthen data security and privacy protection, to provide massive data support for AI research and development and extensive applications. Build high-performance computing infrastructure, and enhance the service support capabilities of supercomputing centers for AI applications. Construct distributed and efficient energy Internet, form multi-energy support complementary, timely, and effective access to new energy networks. Promote intelligent energy storage facilities, intelligent electricity facilities, energy supply and demand information to achieve real-time matching and intelligent response.

Box 4 Intelligentized Infrastructure

1. *Network Infrastructure.* Speed up the layout of real-time collaborative AI 5G enhanced technology research and the development and application of space-oriented collaborative AI for the construction of high-precision navigation and positioning networks to strengthen the core of intelligent sensing technology research and key facilities. Develop intelligent industrial support, driving networks, etc., to study the intelligent network security architecture. Speed up the construction of integrated information network for space and earth, promoting a space-based information network, the future of the Internet, mobile communication network of the full integration.
2. *Big Data Infrastructure.* Rely on a national data sharing exchange platform, open data platform and other public infrastructure. Construct governance, public services, industrial development, technology research and development, and other fields of big data information databases Support the implementation of national governance data applications. Integrate various types of social data platforms and data center resources. Create nationwide integrated service capabilities with reasonable layout and linkages.
3. *High-performance computing infrastructure.* Continue to strengthen the supercomputing infrastructure, distributed computing infrastructure and cloud computing center construction. Build sustainable development of high-performance computing application for the ecological environment. Promote the next generation of supercomputer research and development and applications.

---

(6) Plan a new generation of AI major science and technology projects

For the development of China's AI needs and weak links, establish of a new generation of AI major scientific and technological projects. Strengthen the overall co-ordination, clear the boundaries of the tasks and the focus of research and development. Form a new generation of AI major scientific and technological projects as the core, and use existing R&D layout to support the "1 + N" AI program.

"1" refers to a new generation of AI scientific and technological mega-projects, focusing on forward-looking layout for basic theories and key common technologies, including the study of big data intelligence, cross-media perception and computing, hybrid enhanced intelligence,

group intelligence, autonomous collaborative control, and decision-making theory. Research knowledge computing engines and knowledge service technologies, cross-medium analysis reasoning technology, key swarm intelligence technologies, new architecture and new technology for hybrid enhanced intelligent, autonomous unmanned control technology, and basic theory and common technology for open-source shared AI. Continue to carry out the development of AI prediction and research, strengthening the economic and social impact of and countermeasures for AI.

"N" refers to the national planning and deployment of AI research and development projects. Focusing on strengthening the new generation of AI with the convergence major scientific and technological projects, collaborative impetus for research, technological breakthroughs and product development applications. Strengthen the convergence of major national science and technology projects. Support AI hardware and software development in the "*Hegaoji*" Megaproject,[1] integrated circuit equipment and other national science and technology major projects. Strengthen mutual support for AI and other "Technological Innovation 2030 – Mega-Projects." Accelerate the use of AI to provide support for major technical breakthroughs in brain science and brain computing, quantum information and quantum computing, intelligent manufacturing and robotics, and big data research. The National Key Research and Development Plan will continue to promote high-performance computing and other key special applications, while increasing support for AI-related technology research and development and application; the National Natural Science Foundation will strengthen cross-disciplinary research and support for free exploration in the field of AI. Focus on special deployment and strengthen the application of AI technology demonstrations to the deep sea space station, health protection, and other major projects, smart cities, intelligent agricultural equipment and other Key National R&D Projects. Support the openness and sharing of research results on basic theory of AI and common technology through other basic science and technology plans.

Innovate in the organization and implementation of models for new generation AI major scientific and technological projects. Adhere to focus on doing things, focusing on the principle of breakthrough. Give full play to the role of market mechanisms to mobilize departments, local, business and social forces to promote the implementation of all aspects. Pursue clear management responsibility, regular assessments, to strengthen the dynamic adjustments and improve management efficiency.

IV. Resource Allocation

Fully use existing finances, bases and other such stored resources, comprehensively plan the allocation of international and domestic innovation resources, give rein to the guiding role of finance administration input and policy incentives, and the dominant role of the market in allocating resources, impel enterprises and society to expand input, and create a new pattern of multi-sided support through finance administration funding, financial capital, and social capital.

(1) Establish financial support mechanisms guided by the financial administration and dominated by the market

Comprehensively plan multiple-channel financial input by government and markets, strengthen support through finance administration funding, enliven existing resources, and provide support for fundamental and advanced AI research, critical public technology

breakthroughs, result transformation, base and platform construction, innovative application demonstrations, etc. Use existing policy input funds to support AI programs to meet conditions, encourage leading and backbone enterprises and industrial innovation alliances to take the lead in establishing marketized AI development bases. Use angel investment, risk investment, start-up investment funds, financial market funding and many other such channels to guide social capital to support AI development. Vigorously use governmental and social capital cooperation and other such models and guide social capital to participate in the implementation of major AI programmes and the transformation and application of scientific and technological achievements.

(2) Optimize arrangements to build AI innovation bases

According to the national-level science and technology innovation base arrangements and frameworks, comprehensively promote a few internationally advanced innovation bases in the area of AI construction. Guide existing AI-related national focus laboratories, corporate national focus laboratories, national engineering laboratories, and other such bases, and conduct research focused on an advanced direction of a new generation of AI. According to regulatory procedure, build technological and industrial innovation bases related to the AI area with enterprises in the lead, and in cooperation between industry, scholarship, and research. Give rein to the driving role of leading and backbone enterprises concerning technological innovation demonstrations. Develop specialized public maker spaces in the AI area, stimulate the precise linkage of the newest technological achievements, resources and services. Fully give rein to the role of all kinds of innovation bases in concentrating talent, finance, and other such innovation resources; make breakthroughs in basic and advanced AI theory and key common technologies; and launch application demonstrations.

(3) Comprehensively plan international and domestic innovation resources

Support domestic AI enterprises to cooperate with international leading AI schools, scientific research institutes and teams. Encourage domestic AI enterprises to “go out,” and provide conveniences and services to powerful AI enterprises conducting foreign mergers or acquisitions, share investment, start-up investment, establishing foreign research centres, etc. Encourage foreign AI enterprises and research institutes to establish research and development centers in China. With the support of the “One Belt, One Road” strategy, promote the construction of international AI science and technology cooperation bases, joint research centres, etc.; accelerate the broad application of AI technologies in countries along the “One Belt, One Road.” Promote the establishment of international AI organizations, jointly formulate related international standards. Support related sectoral associations, alliances, and service bodies to build globalized service platforms aimed at AI enterprises.

V. Guarantee measures

Aiming at the realistic requirements of promoting the healthy and rapid development of AI in China, it is necessary to deal with the possible challenges of AI, form an institutional arrangement to adapt to the development of AI, build an open and inclusive international environment, and reinforce the social foundation of AI development.

(1) Develop laws, regulations, and ethical norms that promote the development of AI

Strengthen research on legal, ethical, and social issues related to AI, and establish laws, regulations and ethical frameworks to ensure the healthy development of AI. Conduct research on legal issues such as civil and criminal responsibility confirmation, proteciton of privacy and property, and information security utilization related to AI applications. Establish a traceability and accountability system, and clarify the main body of AI and related rights, obligations, and responsibilities. Focus on autonomous driving, service robots, and other application subsectors with a comparatively good usage foundation, and speed up the study and development of relevant safety management laws and regulations, to lay a legal foundation for the rapid application of new technology. Launch research on AI behavior science and ethics and other issues, establish an ethical and moral multi-level judgment structure and human-computer collaboration ethical framework. Develop an ethical code of conduct and R&D design for AI products, strengthen the assessment of the potential hazards and benefits of AI, and build solutions for emergencies in complex AI scenarios. China will actively participate in global governance of AI, strengthen the study of major international common problems such as robot alienation and safety supervision, deepen international cooperation on AI laws and regulations, international rules and so on, and jointly cope with global challenges.

(2) Improve key policies for the support of AI development

Implement tax incentives for small and mid-sized enterprise and startup AI development, and, using high-tech enterprises, tax incentives, R&D cost deductions, and other policies, support the development of AI enterprises. Improve the implementation of open data and protection-related policies, launch open public data reform pilots to support the public and enterprises in fully tapping the commercial value of public data, and promote the application of AI innovation. China will study the policy system of education, medical care, insurance, and social assistance to adapt to AI, and effectively deal with the social problems brought by AI.

(3) Establish an AI technology standards and intellectual property system

Conduct research on strengthening the AI standards framework system. Adhere to the principles of security, availability, interoperability, and traceability; and gradually establish and improve the basic basis of AI, interoperability, industry applications, network security, privacy protection, and other technical standards. Speed up the promotion of autonomous driving, service robot, and other application sector industry associations in developing relevant standards. Encourage AI enterprises to participate in or lead the development of international standards, and a technical standards “going out” approach to promote AI products and services in overseas applications. Strengthen the protection of intellectual property in the field of AI, improve the field of AI technology innovation, patent protection, and standardization of interactive support mechanisms to promote the innovation of AI intellectual property rights. Establish AI public patent pools to promote the use of AI and the spread of new technologies.

(4) Establish an AI security supervision and evaluation system

Strengthen research and evaluation of the influence of AI on national security and secrecy protection; improve the security protection system of human, technology, material, and management support; and construct an early warning mechanism of AI security monitoring. Strengthen the development of AI technology prediction, research and follow-up research, adhere to a problem-oriented, accurate grasping of technology and industry trends. Enhance

the awareness of risk, pay attention to risk assessment and prevention and control, and strengthen prospective prevention and restraint guidance. In the near term focus on the impact on employment, with a long-term focus on the impact on social ethics, to ensure that the development of AI falls with the sphere of secure and controllable. Establish and improve an open and transparent AI supervision system, the implementation of design accountability, and application of the supervision of a two-tiered regulatory structure, to achieve management of the whole process of AI algorithm design, product development and results application. Promote AI industry and enterprise self-discipline, and earnestly strengthen management, increase disciplinary efforts aimed at the abuse of data, violations of personal privacy, and actions contrary to moral ethics. Strengthen AI cybersecurity technology research and development, strengthen AI products and systems cybersecurity protection. Develop dynamic AI research and development evaluation mechanisms, focus on AI design, product and system complexity, risk, uncertainty, interpretability, potential economic impact, and other issues. Develop a systematic testing methods and indicators system. Construct a cross-domain AI test platform to promote AI security certification, and assessment of AI products and systems key performance.

(5) Vigorously strengthen the training of an AI labor force

Accelerate the study of the employment structure brought on by AI, changes in employment methods, and the skills demand of new occupations and jobs, establish a lifelong learning and employment training system to meet the needs of the intelligent economy and intelligent society, and support institutions of higher learning, vocational schools and socialization training Institutions to carry out AI skills training. Substantially increase the professional skills of workers to meet the development requirements of China's AI to bring high-quality jobs. Encourage enterprises and organizations to provide AI skills training for employees. Strengthen the re-employment training and guidance of workers to ensure the smooth transfer of simple and repetitive workers due to AI.

(6) Carry out a wide range of AI scientific activities

Support the development of a variety of AI scientific activities, encourage the broad masses of scientific and technological workers to join the promotion of AI popular science, and comprehensively improve the level of the whole society on the application of AI. Implement a universal intelligence education project. In the primary and secondary schools, set up AI-related courses, and gradually promote programming education to encourage social forces to participate in the promotion and development of educational programming software and games. Construct and improve the AI science infrastructure, give full play to all kinds of AI innovation base platforms and other popular science roles, encourage AI enterprises, and research institutions to build open source platforms for public open AI research and development, plus production facilities or exhibition halls. Support the development of AI competitions, encourage the formation of a variety of AI science creational work efforts. Encourage scientists to participate in AI science.

VI. Organization and Implementation

The development plan for a new generation of AI is a far-sighted scheme affecting the overall picture and the long term. We must strengthen organizational leadership, complete mechanisms, take aim at objectives, keep tasks closely in view, realistically grasp implementation with a spirit of hammering nails, and carry out the blueprint to the end.

(1) Organizational leadership

According to the unified deployment of the Party Center and the State Council, the National Science and Technology Structural Reform and Innovation System Construction Leading Small Group will take the lead in comprehensive planning and coordination, it will deliberate major tasks, major policies, major questions, and major work arrangements. Promote AI-related legal and regulatory construction. Guide, coordinate and supervise relevant departments in carrying out the deployment and implementation of tasks from the plan. With the support of the interministerial joint conferences for national science and technology planning (earmarks, funding, etc.) management, the Ministry of Science and Technology will, together with relevant departments, be responsible for moving forward the implementation of major science and technology programmes for a new generation of AI, and strengthen linkages and coordination with other programmatic tasks. Establish an AI Plan Implementation Office. This office will be part of the Ministry of Science and Technology and will be concretely responsible for moving the implementation of the plan forward. Establish an AI Strategy Advisory Committee, to research major far-sighted and strategic questions concerning AI and to provide advice and assessment concerning major policy decisions on AI. Move forward with the construction of an AI think tank, support all kinds of think tanks to launch research on major AI questions, and provide strong and powerful support for the development of AI.

(2) Guarantee implementation

Strengthen the deconstruction of plan tasks, clarify responsible work units, schedules and arrangements, formulate annual and phase-type implementation plans. Establish monitoring and evaluation mechanisms for the implementation situation of the plan, such as annual assessment and intermediate evaluation. Adapt to the characteristics of the rapid development of AI, and strengthen dynamic adjustment of plans and programs on the basis of the progress of tasks, the completion of intermediate objectives, new trends in technological development, etc.

(3) Trials and demonstrations

We must formulate concrete plans for major AI tasks and focus policy measures, and launch trials and demonstrations. Strengthen comprehensive guidance over trials and demonstrations in all departments and all localities, quickly summarize and disseminate replicable experiences and methods. Advance the healthy and orderly development of AI through advance trials and guiding demonstrations.

(4) Public opinion guidance

Fully use all kinds of traditional media and new media to quickly propagate new progress and new achievements in AI, to let the healthy development of AI become a consensus in all of society, and muster the vigor of all of society to participate in and support the development of AI. Conduct timely public opinion guidance, and respond even better to social, theoretical, and legal challenges that may be brought about by the development of AI.