

# China Science & Technology

# NEWSLETTER

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***Next Generation Artificial Intelligence Development Plan  
Issued by State Council***

**China's Strengths Creates Innovation Miracles**

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# Next Generation Artificial Intelligence Development Plan Issued by State Council

Over 60 years of progress has witnessed booming of new theories and new technologies including mobile Internet, big data, super computing, sensor network and brain science. Driven both by the new theories and technologies and strong demand for socioeconomic development, artificial intelligence (AI) has developed rapidly. A set of new features such as deep learning, cross-border integration, human-computer cooperation, group intelligence sharing and free manoeuvre have emerged. The general advancement of AI-related disciplines, theoretical modeling, technological innovation and software and hardware update is triggering a chain of breakthroughs, boosting transformation from digitization and Internetization to intelligentization in all aspects of social and economic sphere. In light of new circumstances and demands, we need to take proactive approaches to meet changes, seize the historical opportunity of AI development and take stock of the current situation and make proactive plans to serve socioeconomic development and national security and to lead leapfrog advancement of national competitiveness. To this end, the State Council has issued *Next Generation Artificial Intelligence Development Plan*. This is a major event in the history of science and technology (S&T) advancement in China and the first systemic and strategic plan in AI sphere. It mainly plans for the overall thinking, strategic goals, main tasks and supporting measures for AI development before 2030.

## Next Generation Artificial Intelligence Development Plan

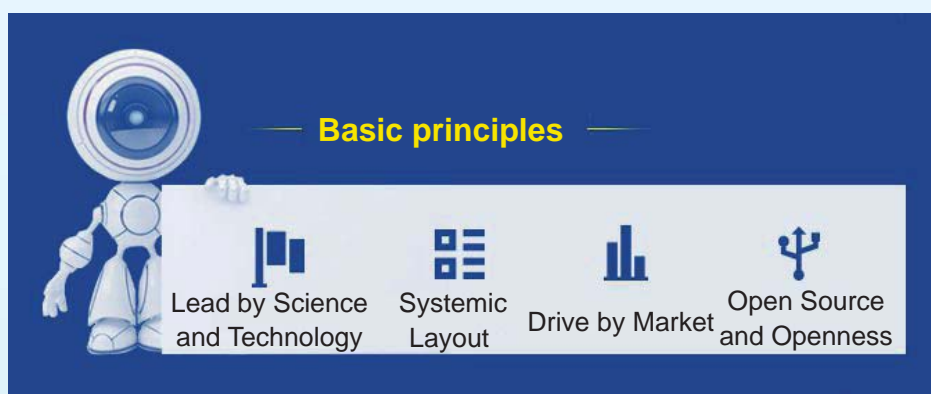
### Introduction

Artificial intelligence (AI) has become new focus of international economy, new engine of economic development and new opportunity of social development. To seize the major strategic opportunity brought by AI development, build up our AI first mover advantage and speed up building innovation-driven and globally advanced science and technology country, we formulated this plan according to deployment requirements of the Central Government and the State Council.

# Next Generation Artificial Intelligence Development Plan Issued by State Council

As a core driving force for next round of industrial transformation, artificial intelligence will further release the huge energy accumulated over the previous technological and industrial transformation, create new engine for restructuring production, distribution, exchanges and consumption, build up new demand for intelligentization in both macro and micro sense, create new technology, products, industries, dynamics and models, trigger major transformation of economic structure, deeply alter human life and thinking and realize advancement of social productivity.

Artificial intelligence (AI) brings new opportunities for social development. China is now at a critical juncture of building a relatively well-off society in an all-round way while it is facing severe challenges like aging population and resource and environment restraint. AI boasts broad applications in education, medical care, provision for the aged, environmental protection, urban operation and judicial service, which will markedly improve targeted public service and people's livelihood. AI technology is able to accurately perceive, predict and offer early warning for major circumstances in infrastructure and social security, timely seize group cognition and psychological changes so that proactive measures are taken to improve social management capacity, which plays an irreplaceable role in stabilizing the society.



China boasts sound foundation for developing AI. The Chinese government has planned for major national R&D projects including AI projects. It has issued a three-year implementation plan for Internet+AI, putting forward a series of measures for technology R&D, application and industrial development. After years of efforts, we have made major progress in AI area, ranking the second in the number of published technology papers and patents and making important breakthroughs in the core technology of some areas. We lead the world in voice and visual recognition, have capacity for rapid development in adaptive self-learning, intuitive awareness, comprehensive reasoning, hybrid intelligence and group intelligence and have entered practical application of Chinese information processing, intelligence monitoring, biometric recognition, industrial robots, service robots and unmanned driving. AI innovation and entrepreneurship are growing rapidly with a group of leading businesses gaining wide international awareness and recognition. Growing technological capacity, massive data resource, huge application demand and open market environment have created a unique advantage for China to develop AI.

# Next Generation Artificial Intelligence Development Plan Issued by State Council

## Strategic Goals



**Step 1** By 2020 overall AI technology and application reach globally advanced level. AI industry becomes new economic growth point. AI technological application becomes new approach to improving people's livelihood to support our goal in becoming an innovation-driven country and building a moderately prosperous society in all respects.



**Step 2** By 2025 AI basic theory makes breakthroughs. AI technology and application reach globally advanced level. AI becomes a major driving force for industrial upgrade and economic restructuring. Building an intelligence society makes progress.



**Step 3** By 2030 AI theory, technology and application reach globally advanced level. China becomes global AI innovation center. Intelligence economy and society make marked progress, laying a solid foundation for becoming an innovation-driven and economically powerful country.

Uncertainty in AI development brings new challenges. AI is a revolutionary and widely influential technology which may bring about issues like changing employment structure, impacting law and social ethnics, infringing personal privacy and challenging international relations. It will deeply influence government management, economic security, social stability and global governance. While robustly developing AI, we must highlight the potential safety risks, enhance early prevention and guidance, reduce risks to a maximum degree and ensure the safe, reliable and manageable development of AI.

## Major Task

### Set up a system

Open and coordinated AI science and technology innovation system

### Stick to Three in One

R&D, product application and industrial cultivation

### Seize double nature

Highly integrate technical nature and social nature

### Enhance Four Supports

Support technology, economy, social development and national security

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We must take into account the overall situation of national development, grasp global AI development trend, find the breaking point and priority, enhance basic capacity for technological innovation, expand the depth and scope for application of major areas and improve intelligence level of social and economic development and national defense application.

## 1. Set up open and coordinated AI science and technology innovation system

### Set up basic theory system of next generation AI

- (1) big data intelligence theory
- (2) cross-media perceptual computing theory
- (3) hybrid augmented intelligence theory
- (4) group intelligence basic theory
- (5) coordinated control and decision-making theory
- (6) advanced machine learning theory
- (7) brain-like intelligence computing theory
- (8) quantum intelligence computing theory

### Set up next generation key AI generic technology system

- (1) knowledge computing engine and knowledge service technology
- (2) cross-media analytic reasoning technology
- (3) key group intelligence technology
- (4) new structure and new technology of hybrid augmented intelligence
- (5) autonomous man-less system technology
- (6) virtual reality intelligence modeling technology
- (7) intelligence computing chip and system
- (8) natural language processing technology

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## Coordinate the set-up of AI innovation platform

- (1) basic platform for AI open source software and hardware
- (2) group intelligence service platform
- (3) hybrid augmented intelligence support platform
- (4) independent man-less system support platform
- (5) AI basic data and safety assessment platform

## Accelerate the cultivation of high-level AI talents

- (1) cultivate high-level AI innovation talents and team
- (2) Make more efforts to bring in high-level AI talents
- (3) Set up AI discipline

## 2. Cultivate high-end and highly efficient intelligent economy

### Vigorously develop AI emerging industry

Intelligent software and hardware, intelligent robot, intelligent launch vehicle, virtual reality and augmented reality, intelligent terminal, Internet of Things basic device.

### Accelerate industrial intelligent upgrading

Intelligent manufacturing, intelligent agriculture, intelligent logistics, intelligent finance, intelligent business, intelligent house.

### Vigorously develop AI enterprise

Promote large-scale intelligent upgrading of business, promote AI application factory and cultivate speedily leading businesses of AI industry.

### Set up AI innovation highland

Carry out demonstration for AI application, build national AI industrial park and national maker space for AI.

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## 3. Build safe and convenient intelligent society

### Develop convenient and efficient intelligent service

Intelligent education, intelligent medical care, intelligent health and aged care.

### Promote intelligent social governance

Intelligent business, intelligent court, intelligent city, intelligent transportation, intelligent environmental protection.

### Use AI to improve capacity to protect public security

### Promote mutual trust and sharing in society

## 4. Enhance AI civil-military integration

Deploy next generation AI basic theory and key generic technology R&D oriented toward civil-military sharing, set up regular communication and coordination mechanism like higher education and research institutions, companies and military institutes.



## 5. Build safe and efficient AI infrastructure system

Upgrade network infrastructure, coordinate and use big data infrastructure, build efficient computing infrastructure and distributed and efficient energy Internet.



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## 6. Make forward-looking plans for major science and technology programs of next generation AI



“1+N”AI program group with major S&T programs of next generation AI as the core and supported by existing R&D.

- ① refers to major S&T programs of next generation AI
- ② refers to major national special S&T programs, S&T innovation 2030 and National Key R&D program

“1” refers to major technology projects of next generation AI. It focuses on basic theory and forward-thinking planning of key generic technology, including research on theories related to big data intelligence, cross-media perceptual computing, hybrid augmented intelligence, group intelligence, coordinated control and decision-making. And it focuses on studying knowledge computing engine and knowledge service technology, cross-media analytic reasoning technology, key group intelligence technology, new structure and new technology of hybrid augmented intelligence, autonomous control technology, basic theory and generic technology of open-sourced AI sharing. We continuously predict and analyze AI development and study the socioeconomic influence and solutions provided by strengthening AI.

“N” refers to AI R&D projects deployed by related national plans. Its focus is to enhance its link with major technology project of next generation AI and to coordinate theory research, technology breakthrough and product research application of AI. In terms of its link with major national special projects of technology, it supports software and hardware of AI development in the special projects in core electronic devices, high-end universal chips, basic software and integrated circuit equipment. It enhances its mutual support with other “technology innovation 2030--major projects”, speeds up research on brain science and brain-like computing, quantum information and quantum computing, intelligent manufacturing and robots and big data, providing support for technological breakthroughs in AI. National key R&D Projects continue to promote major special projects like high-performance computing and provide more support for related technological R&D and application of AI. National Natural Science Foundation of China (NSFC) provides continuous support for cutting-edge interdisciplinary research and free exploration. In the deployment of major projects like deep underwater space station and health security and national key R&D plan for major special projects, we will enhance application demonstration of AI technology. Other AI related basic theory and generic technology research findings supported by various technology plans should be shared openly.



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## Resource distribution

Fully capitalize on existing resources like capital and base, holistically allocate domestic and international innovation resource, prioritize the set-up of AI innovation base, give play to the guiding role played by fiscal revenue and policy incentives and dominant role played by market to distribute resource, build a new pattern supported by fiscal, financial and social capital.

## Supporting measures

1. Formulate laws and regulations and ethical norms related to AI development.
2. Improve major policies for AI development.
3. Set up AI technology standard and intellectual property system.
4. Set up AI safety regulation and assessment system.
5. Enhance AI labor force training.
6. Carry out extensive activities to popularize AI.



# **Next Generation Artificial Intelligence Development Plan Issued by State Council** >>>

## **1. Formulate laws and regulations and ethical norms related to promoting AI development.**

We need to carry out research on legal issues of AI application-related civil and criminal liability confirmation, privacy and intellectual property protection and safe use of information, set up traceability and accountability system and identify AI legal entity and related rights, obligations and responsibilities. We will carry out AI behavior science and ethics research, set up multilevel assessment structure for ethics and morals and ethic framework for human-machine coordination, formulate moral standard and behavior code for AI product research designers, enhance assessment for potential AI risks and benefits and build up emergency solutions for complicated AI scenarios, participate in AI global governance, strengthen research into major international common problems like robot alienation and safety regulation, further international cooperation in AI laws and regulations and international rules and jointly meet global challenges.

## **2. Improve major policies for AI development.**

We need to put in place financial and tax preferential policies for small and medium sized and start-up enterprises, support AI business development by policies like tax breaks for hi-tech business and weighted deduction for R&D, improve data sharing and protection policies, carry out pilot program for public statistics sharing, support general public and business to fully capitalize on the commercial value of public data, promote innovative AI application, improve policy system that is adjusted to AI-related education, medical care, insurance and social assistance and effectively handle social issues brought by AI.

## **3. Set up AI technology standard and intellectual property system.**

We need to enhance research into AI standard framework, stick to principles of safety, usability, interoperability and traceability, progressively set up and improve AI generics, connectivity, industrial application, network safety and privacy protection standards, encourage AI business to participate in or formulate international standards, lead overseas AI products and service application with technological standard, enhance IPR protection in AI area, set up AI public patent pool and promote the use and dissemination of AI.

## **4. Set up AI safety regulation and assessment system.**

We need to enhance research and assessment of AI influence on national security and confidentiality, improve safety prevention and protection system featuring human, technology, product and management, build up warning mechanism for AI safety monitoring, enhance research into prediction, assessment and trace of AI technology development, stick to problem-oriented approach and grasp technological and industrial development trend, pay attention to risk assessment and prevention, strengthen forward-thinking prevention and guidance, set up open and transparent AI monitoring system, carry out two-level monitoring structure with accountability and monitoring for application, promote AI industrial and business discipline, enhance management and punish data abuse, privacy infringement and unethical behavior.

# Next Generation Artificial Intelligence Development Plan Issued by State Council

## 5. Enhance AI labor force training.

We need to speed up research into employment structure and mode change brought by AI and new type of employment and work skills required, set up lifelong learning and employment training system demanded by intelligence economy and society, support higher education institutions, vocational schools and social training institutions to carry out AI skills training, dramatically improve employees' skill set to meet demands of highly-skilled and high quality work brought by AI.

## 6. Carry out extensive activities to popularize AI.

We need to support various forms of activities to popularize AI, encourage science and technology workers to popularize AI, improve general public's awareness and application of AI, carry out AI education programs, set up AI-related courses in elementary and middle schools, disseminate progressively programming education, encourage social force to participate in developing and disseminating educational programming software, open AI R&D platform, production facilities or exhibitions to the general public, encourage AI competition, encourage various forms of creation to popularize AI and encourage scientists to take part in popularizing AI.

### Organization and implementation

#### 1. Organization and leadership

According to the deployment of the Central Government and the State Council and coordinated by Steering Group for National Science and Technology System Reform and Innovation System Building, we examine and deliberate on major tasks, policies, issues and work arrangement, promote AI-related laws and regulations, guide, coordinate and supervise related departments to make related plans. Supported by Inter-ministerial Joint Conference on National Science and Technology Program (special program and fund etc.) Management, Ministry of Science and Technology (MOST) and related departments will carry out major science and technology programs of next generation AI, enhance its link with other plans and tasks, set up AI Plan Promotion Office in MOST to facilitate the implementation, set up AI Strategy Consultancy Committee to study forward-looking and strategic issues and assess major AI policies, facilitate AI think tank building, support various think tanks to study major AI issues and provide strong intellectual support for AI development.

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## 2. Guarantee of implementation

We need to disintegrate plans and tasks, clarify responsible departments and work schedule, formulate annual and periodical implementation plan and enhance dynamic adjustment of plans and programs.

## 3. Pilot Demonstration

We need to disintegrate plans and tasks, clarify responsible departments and work schedule, formulate annual and periodical implementation plan and enhance dynamic adjustment of plans and programs.

## 4. Public Opinion Guidance

We need to fully capitalize on various traditional and emerging media, timely publicize AI progress and achievement, make sound AI development a social consensus, mobilize social initiative to participate in and support AI development and timely guide public opinion to meet social, ethical and legal challenges brought by AI development.

(Source: website of the State Council, July 20, 2017)

# China's Strengths Creates Innovation Miracles >>>

**The previous 5 years has witnessed the Chinese people making great endeavors under the leadership of the Communist Party of China for STI miracles. All this was achieved by China's strengths.**

For the past 5 years, China has achieved all-around scientific and technological breakthroughs, standing on the summit of cutting-edge technologies. For the past 5 years, China has transformed from relying on resource and labor force dividend to "Lead by Innovation" mode, becoming increasingly important in global innovation pattern.

## **China's Strengths: "5 Golden Years" Creates Innovation Miracles**

China, the largest developing country in the world, places great emphasis on science and technology innovation, sounding the horn of building a global science and technology power.

- Over the past year alone, "transcript" of innovation in China is great enough for national pride and global applause:

The first independently-manufactured aircraft carrier makes its debut

New type 10,000-ton destroyer enters the water

First self-developed bullet train Fuxing makes its debut

Quantum Space Satellite Mozi shines in outer space

Extracted combustible ice for 60 days, setting two world records of longest extract time and largest gas volume.

# China's Strengths Creates Innovation Miracles >>>



## Report shows:

*2017 World Competitiveness Yearbook* published by Swiss-based International Institute for Management Development

In ranking of the most competitive global economies, Chinese mainland has elevated to No.18 and ranked the 2<sup>nd</sup> in global Economic Performance.

- The past 5 years has witnessed historical leap in China's dream to "Overtake the World" and become a powerhouse:



Mileage of high-speed trains in China exceeded 20,000 km, the longest in the world.

China has made increasing breakthroughs in cutting-edge areas with S&T achievement that caught the world's attention.



The number of Fortune Global 500 Chinese companies has been increasing. China's international competitiveness has ranked among the top of all developing countries.



## Report shows:

*Global Innovation Index 2017 Report*

China has climbed from No.25 last year to No.22 this year and was the only medium income country that entered top 25.

China power: independent innovation reshapes world science and technology pattern

How far is 380,000 km? On 14<sup>th</sup> December 2013, Yutu lunar rover left its footprint on the moon with Chinese flag.

From high-speed rail to super computing

From space flight to aviation

Core technology cannot be bought. Only by innovation can we master our own fate.

# China's Strengths Creates Innovation Miracles >>>

## ● Why is China's innovation rise possible?

Talents breed the soil for innovation and are our inexhaustible rich ore.




**81 million** science workers



**170 million**

highly educated or skilled talents

Sustainable input is like flowing water, irrigating prosperous China's Innovation Era.

In 2016 the  national technical contract transaction volume

**increased by 15.97%**

year on year, exceeding **gone trillion yuan** for the first time.

national technical contract transaction volume

The national R&D expenditure reached **1,544 billion yuan**, accounting for **2.1%** of GDP, among which **78%** came from businesses.

National Science Foundation (NSF) says

“China is undoubtedly the 2<sup>nd</sup> largest R&D country in the world. China's R&D expenditure is approaching that of the whole EU.”

# China's Strengths Creates Innovation Miracles >>>

Good policy is like sunshine. Furthered S&T reform solves innovation formula.

1

To consolidate national core competitiveness, important plans like *National Guideline for Innovation-Driven Development Strategy* and *National Science and Technology Innovation Plan for 13<sup>th</sup> Five-Year Plan Period* have been issued to enhance S&T supply, consolidate its foundation, boost strategy orientation, deepen innovation reform and clarify positioning of S&T innovation.

2

Streamline administration and increase innovation and business, carry out distribution policy that is knowledge- and value-oriented to mobilize mass innovation and entrepreneurship.

## **Innovation Confidence: look forward to reaching innovation summit**



In 2018, Beidou Navigation Satellite System will cover major countries along the Belt and Road.

China, boasting splendid S&T history, is producing more intellectual achievements for the world.



# China's Strengths Creates Innovation Miracles >>>

- Climb to science and technology summit with steadfast steps of Chinese characteristics.

## 1 > Asymmetrical overtaking

Quantum communication and quantum computer, brain science and brain-like research, deep underwater space station, space ground integration...

On the journey to build a global science and technology power, China will create a tiered systematic pattern with major S&T programs for 2030 and major national S&T special projects already started in 2006.

## 2 > Innovation creates China Heart

We will continue to carry out the special project of core electronic component, high-end common chip and basic software, set up Aero Engine Corporation of China (AECC), mobilize our strengths to make breakthroughs in integrated circuit, engine and gas turbine to get the "Pearl of Industrial Crown" as soon as possible.

## 3 > Further reform, consolidate foundation and highlight environment

About 90% of modern technology innovation findings stem from basic research. China lags behind in basic research, so core technology are controlled by others. We need to make more efforts into basic research and make more innovations and create flexible innovation environment.

# China's Strengths Creates Innovation Miracles >>>



**Innovation** is “**flowing water**”,

making China's seed of advanced ideas into towering trees.

**Innovation** is “**perpetual motion machine**”

advancing our development boldly.

Growing from a poor country to a rich and strong one, China is now emerging as an innovative country. The gate for the rejuvenation of the Chinese nation is already open.

(Source: Xinhua Net, August 18 2017)