"Robot +" application action implementation program

At present, the robotics industry is booming, greatly changing the way of human production and life, and injecting strong kinetic energy into economic and social development. In accordance with the overall deployment of the Outline of the Fourteenth Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Vision 2035, to implement the key tasks of the Fourteenth Five-Year Plan for the Development of the Robotics Industry, and to accelerate the expansion of the application of robots, it was decided to carry out the "Robot+" application action. It is decided to carry out the "Robot+" application action. In order to ensure that the action is carried out in an orderly manner, this implementation plan is formulated.

I. General requirements

(i) Guiding philosophy

Guided by Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, comprehensively implement the spirit of the 20th CPC National Congress,

fully, accurately and comprehensively carry out the new development concept, accelerate the construction of a new development pattern, focus on promoting high-quality development, coordinate development and safety, face the people's aspirations to a better life and the needs of economic and social digitalization, adhere to the application of traction, typical leadership, and basic support, and give full play to the roles of the departments, localities, industries and other parties. It will play the roles of departments, localities, industries, etc., take product innovation and scene promotion as the focus point, adopt classified measures to expand the depth and breadth of robot application, cultivate the ecology of robot development and application, enhance the competitiveness of independent brand robots in the market, push forward the self-reliance of China's robotics industry, and provide powerful support for accelerating the construction of a strong manufacturing country, digital China, and advancing the modernization of the Chinese style.

(ii) Main objectives

By 2025, the density of robots in manufacturing will double from 2020, and the density of robots in services will double from 2020.

The depth and breadth of industrial applications of service robots and special robots have been significantly enhanced, and the ability of robots to promote high-quality economic and social development has been significantly strengthened. Focus 10 should

To break through more than 100 kinds of innovative application technologies and solutions for robots in key areas of application.

It will promote more than 200 typical robot application scenarios with high technology level, innovative application mode and significant application results, create a number of "Robot+" application benchmark enterprises, and build a number of application experience centers and experimental verification centers. Promote various industries and localities to carry out "Robot+" application innovation and practice by combining the development stage of the industry and the characteristics of regional development. Build an international and domestic exchange platform to form a strong atmosphere for comprehensively promoting the application of robots.

II. Deepening the application of "Robot+" in key areas

Facing the improvement of society and people's livelihood and the needs of economic development, selecting key areas with a certain foundation, wide application coverage and strong radiation-driven effect, focusing on typical application scenarios and user needs, and carrying out systematic promotion work from the development of robotic products, technological innovations, scenarios of application to the promotion of the model. Support some emerging fields to explore the application of robotics.

(i) In the area of economic development

1. service industry

Developing new robot products such as welding, assembly, spraying, handling, grinding and polishing, and accelerating the expansion of robotized production equipment into related fields of application. Develop specialized and customized solutions and software and hardware products, accumulate model libraries, process software packages and other empirical knowledge, deeply integrate robot control software and integrated application systems, and promote the development of robotics in automotive, electronics, machinery, light industry, textile, building materials, medicine and other fields that have already been formed.

Larger-scale application of the industry, sanitary ware, ceramics, photovoltaic, smelting, casting, sheet metal Gold, hardware, furniture and other segments, spray glaze, trimming, polishing, grinding, welding, spraying, handling, palletizing and other key aspects of the application. Promote the construction of intelligent manufacturing demonstration factories and create typical application scenarios for industrial robots. Develop the intelligent manufacturing system based on industrial robots, and help the manufacturing industry in digital transformation and intelligent change.

2. agriculture

Develop operational robots for ploughing, seeding, sowing, irrigation, plant protection, picking and harvesting, sorting, inspection and milking, as well as robotic products for feeding, cleaning, disinfecting, disease prevention and control, environmental control, and collection of livestock products in livestock and poultry aquaculture. The development of special control systems, autonomous intelligent mobile platforms and operational components, promote robotics and farmland, agronomy, variety compatible, to achieve information online sensing, fine production control, unmanned autonomous operations, efficient operation and maintenance management. Create agricultural robot application

scenarios in hilly and mountainous areas, large fields, facility horticulture, animal husbandry and aquaculture, storage and transportation processing. Accelerate the intelligent transformation of agriculture, forestry, animal husbandry and fishery infrastructure and production equipment, promote the deep integration of robots with agricultural planting, breeding, forestry and fishery production, and support the development of intelligent agriculture.

3. constructions

Developing robotic products for surveying, material distribution, steel processing, concrete pouring, floor and wall decoration, component installation and welding, and electromechanical installation. Enhance the adaptability of robots to infrastructure construction and maintenance under special natural conditions such as high plateau and high temperature, bad weather, special geology, and large and complex infrastructure construction and maintenance such as long-distance tunnels through mountains, large-span bridges, and deep-water navigation channels. Promote the use of robots in the production of precast concrete components, steel component welding, wall panels and integrated kitchen and bathroom processing.

and other building parts and components production processes, as well as building safety monitoring and security patrols,

Innovative application of high-rise building cleaning and other operation and maintenance links. Promote construction robots to expand the application space and help the synergistic development of intelligent construction and new building industrialization.

4. **renewable energy**

Develop robotic products for energy infrastructure construction, inspection, operation, maintenance and emergency disposal. Promote enterprises to break through the key technologies of movement, perception and operation in complex environments such as high altitude, narrow space and strong electromagnetic fields. Promote the application of robots in wind farms, photovoltaic power plants, hydropower plants, nuclear power plants, oil and gas pipeline networks, hub substations, important converter stations, backbone power grids, important transmission channels and other energy infrastructure scenarios. Promote the deep integration of robotics and the energy sector to help build a modern energy system.

5. **Business Logistics**

Develop automatic guided vehicles, autonomous

mobile robots, distribution robots, automatic palletizers, intelligent sorters, logistics drones and other products. Promote the integration and application of 5G, machine vision, navigation, sensing, motion control, machine learning, big data and other technologies. Support the intelligent transformation of traditional logistics facilities to improve the efficiency and management level of warehousing, loading and unloading, handling, sorting, packaging, distribution and other links. Encourage robotics companies to develop overall solutions for end-to-end distribution, and promote the popularization and promotion of robot distribution, intelligent mailboxes (intelligent express boxes) and other multimodal instant delivery scenarios. Create a smart logistics system focusing on robots, and improve the digitalization level of commerce and logistics.

(ii) Social and livelihood areas

6. healthcare

Research consulting services, surgery, ancillary tests, ancillary rounds, critical care,

First aid, life support, rehabilitation, testing and sampling, sterilization and cleaning and other medical robot products. Focusing on neurological injuries, post-injury brain cognitive dysfunction, paralysis and mobility aids and other rehabilitation needs, breakthroughs in brain-machine interaction and other technologies, and the development of assistive robotic products for injury rehabilitation. Accelerate breakthroughs in basic theories, common key technologies and innovative applications of robotics and medical artificial intelligence, and promote the accelerated application of new technologies and products such as artificial intelligence-assisted diagnostic systems, robotic 5G telesurgery, and brain-computer interface-assisted rehabilitation systems. Promote the application of robots in hospital rehabilitation, telemedicine, health and epidemic prevention and other scenarios. Encourage hospitals with conditions and needs to use robots to carry out precise and minimally invasive surgeries, build standardized operating rooms for robotic applications, and study the standard specifications for the clinical application of surgical robots. Strengthen the

application of robots in pre-hospital management, in-hospital diagnosis and treatment and post-hospital rehabilitation tracking of the overall disease service system, and help the construction of intelligent medical care.

7. Elderly services

Develop robotic products to assist the elderly and the disabled, such as disability assistance, bathing assistance, ambulatory care, rehabilitation training, housework, emotional companionship, entertainment and leisure, and security monitoring. Accelerate the application of new technologies such as multi-modal quantitative assessment, multi-information fusion and emotion recognition, flexible and adaptive human-machine interaction, and artificial intelligence assistance in the field of senior care services, and actively promote the application and verification of exoskeleton robots and senior care robots in senior care service scenarios. Encourage relevant experimental bases in the field of elderly care to take the application of robots as an important part of experimental demonstration, and research and develop and popularize new technologies and new products and new modes of scientific and technological assistance for the elderly. Researching and

formulating standards and specifications for the application of robots in assisting the elderly and the disabled, promoting the integration of robots into different scenarios and key areas of senior care services, and enhancing the wisdom of senior care services.

Level.

8. teach

Developing educational robot products and programming systems for interaction, teaching and competition, and building robot service platforms by category. Increase the guidance of robotics education, improve the robotics teaching content and practice environment in colleges and universities at all levels, and develop more functions and supporting course content for teaching, practical training, competitions and other scenarios. Strengthen the construction of robotics engineering-related specialties, enhance the level of experimental robotics products and platforms, and strengthen standardized management. Promote the integration and application of 5G, artificial intelligence, intelligent voice, machine vision, big data, digital twin and other technologies with robotics, actively cultivate new modes and forms of robotic campus services, and deepen the application of robots in teaching and research, skills training, campus security and other scenarios.

9. Business community services

Develop commercial robots for catering, distribution, welcoming, guiding, consulting, cleaning and mobility, as well as household robots for cooking,

cleaning, guardianship and companionship, strengthen the exploration of application scenarios and innovation in product forms, improve the level of interaction between intelligent hardware and users, and enhance the value of robotic services. Promote the integration of robot technology with 5G, cloud computing, intelligent sensing and other new technologies to realize autonomous navigation, automatic obstacle avoidance, human-machine interaction, voice and visual recognition, data analysis and other functions. Actively promote the integration of robots into service scenarios such as hotels, restaurants, superstores, communities and families to meet the demand for upgraded commercial and community consumption experience and to enhance the level of intelligence in commercial services and living services.

10. **Safety Emergency and Extreme Environment Applications**

Research and development in the fields of mining, civil explosives, social security, emergency rescue, extreme environment and so on.

Domain Robotics Products. Enhanced robot stereo vision, outdoor navigation and localization, multi-dimensional Information perception, disaster remote warning, robot authentication control and other functions, the development of robot on extreme cold, open fire, high temperature and high pressure, flammable and explosive, high altitude and low air pressure, toxic, high humidity, water, high dust, radiation, large changes in the flow of people, such as the complexity of non-structured operating environment adaptability technology. Promote the application of mining scenarios such as intelligent mining, disaster prevention and control, inspection and guarding, underground rescue, intelligent cleaning, unmanned transportation, geological detection, and dangerous operations. Promote the application of safety production scenarios such as on-site inspections of hazardous chemical production devices and storage facilities, duty guarding, and special operations. Promote the application of explosives loading, production preparation, packaging, loading, unloading and transportation, online testing and other civil explosive industry scenarios. Promote security patrols, anti-smuggling security checks, anti-terrorism and riot control, investigation and forensics, traffic and border control, public security control, special operations, service management and

other social security scenarios. Strengthen the application of hazardous environments such as explosion-proofing and detonation, fire inspection, engineering rescue, marine fishing, rescue of oil spills and hazardous chemical ships at sea, natural disaster rescue, rescue of safety production accidents, and nuclear emergency safety rescue. Promote the application of extreme environmental scenarios such as space, underwater and deep ground.

III. Enhancement of the basic support capacity for the application of "Robotics +"

(i) Building a collaborative innovation system for robot production and utilization

Encourage the industry and users to jointly build innovation consortiums, innovation centers and other innovation institutions in the field of robot applications. Support user units to participate in the core technologies of the robot industry chain, such as high torque density servo motors, high dynamic motion planning and control, human-machine interaction, etc., to deeply explore and release the potential application demand, and jointly develop advanced and applicable robot products and system solutions. Carry out "one-stop" application innovation covering the whole process of product design, technology development,

process optimization, mass production and demonstration and promotion.

Encourage production and use of joint participation in the special robotics industry chain "list" to promote activities, with the

The robotics enterprises will collaborate in the research and transformation of achievements. Improve the robot technology support services, and actively promote the production and financing docking, business incubation, technology transfer and transformation, spare parts services, technical after-sales service.

(ii) Construction of "Robot+" Application Experience and Test Verification Centers

Relying on users, robotics enterprises and system integration enterprises, build scenario-based application experience centers for household, business, education, medical care and elderly care, etc., to enhance user experience and expand product consumption and promotion. Relying on users, robotics enterprises and third-party public service organizations, build test and verification centers with the ability to test and verify robotics application technology standards, quality testing, innovation incubation, etc., increase the accumulation of application data, and improve the safety, stability, reliability, and ease of use of robotics products.

(iii) Accelerating the development and promotion

of standards for robot applications

Relying on relevant standardization technology organizations, establish a cross-industry cooperation mechanism for robotics standardization, strengthen the coordination of cross-industry standardization work in application fields, and promote cross-industry standard mutual adoption. Carry out the development and promotion of standards for robot application processes and special algorithm models in key industries, fusion device interfaces, application data security, human-robot interaction security, etc. In view of the access requirements of specific industries, strengthen the research on special safety requirements and testing method standards for robots. Carry out the standardization of general technical specifications for new robot products, modular design and manufacturing, application safety and reliability. Promote the standardization of proprietary safety foundation standards, product standards, method standards and other standardization work in the field of emerging robot technology. Research and formulate robot ethics-related standards and specifications. Strengthen the application and implementation of standards. Promote international cooperation on robot application standards.

(iv) Development of industry and regional "Robot+" application innovation and practice

Encourage industry authorities to carry out product innovation and application demonstration and promotion of robots in various industries, in conjunction with the development planning, scientific and technological research and construction of key projects in the application industries. Guiding and supporting regions with conditions and needs to carry out "Robot+" application actions in their own regions, centering on industries with special advantages. Relying on leading enterprises and industrial clusters, develop and open up mature, emerging and potential application scenarios for robots, and carry out "Robot+" application innovation practices with active collaborative innovation, remarkable application results and high promotion value.

(✉) Building a Supply and Demand Matchmaking Platform for Robotics+ Applications

To build a supply and demand docking platform for "Robotics+" applications, and to carry out supply and demand docking activities for resource sharing, information interoperability and complementary advantages. In mature applications, select a number of benchmark enterprises and typical scenarios with

outstanding application results and strong influence, strengthen the supply of high-end robotic products, and enhance the depth and breadth of robotic applications. In the field of emerging applications and potential demand, the company will explore the use of "unveiling the list of commanders" and other ways of soliciting robotic application solutions, so as to promote supply innovation through demand traction. The company will publish a catalog of key robotics technologies and products, and promote online application demonstration model rooms.

Fourth, strengthen the "robot +" application of organizational security

(i) Strengthening organizational leadership

Playing the role of the National Leading Group for the Construction of a Strong Manufacturing Country, it has established a working mechanism of multi-sectoral coordination and central and local linkage, and set up a coordinated promotional square, and set up joint working groups composed of the competent departments, industrial organizations, backbone enterprises, scientific research institutes and the governments of key regions in different industries and fields. Strengthening of machines in key industries

Research on regulations and ethics related to human applications, and the normalization of robotic applications Monitoring and tracking, and promoting the construction of a regulatory system adapted to the characteristics of robot applications in various industries.

(ii) Improving policy support

All relevant departments and localities will promote the application of robots as the key direction of science and technology innovation, industry planning and industrial policy, and coordinate policies, funds and resources to support and increase investment in the innovation and application of robots. Science and technology departments in conjunction with the robot development and application of the joint promotion of national science and technology programs to transform the results of innovation, guiding robotics enterprises to increase investment in research and development, and strengthen the protection of intellectual property rights. The departments of human resources and social welfare, together with the robot development and application departments, will carry out timely assessment of the impact of robots on employment, and promote the transfer of affected workers to new jobs in a timely manner. Encourage central enterprises

and state-owned enterprises to open up robot application scenarios, establish a fault-tolerance mechanism, and support the first purchase and first use of enterprises.

(iii) Deepening advocacy and communication

Localities, relevant enterprises and industrial organizations should timely track, summarize and assess the new situation, new problems and new experiences in the process of application actions, summarize the effective practices that have strong demonstration-driven effects and can be replicated and promoted, and publicize the application of good typical experiences. Relying on relevant conferences and exhibitions of various industries, the organization will strengthen the exchange and display of robot application results. It will guide relevant organizations to prepare annual reports on "Robot+" applications and release innovative application cases. Make full use of the multi- and bilateral cooperation mechanism to promote the "going out" of robot products and solutions in different fields, so as to realize win-win cooperation.

(iv) Strengthening talent development

Cultivate and introduce high-end R&D talents and standardization talents in robotics applications,

strengthen international exchange of talents, and create leading talents and innovation teams. Encourage robotics enterprises,

User units cooperate with general institutions of higher learning, research institutes, vocational colleges and universities, and so on, to co

Build internship and training bases for talents, jointly develop robot application talents training, and provide more employment channels. Organize robotics application skill competitions in niche industries to discover and cultivate more robotics high-quality technical skill talents.

“机器人+”应用行动实施方案

当前，机器人产业蓬勃发展，正极大改变着人类生产和生活方式，为经济社会发展注入强劲动能。按照《中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要》总体部署，落实《“十四五”机器人产业发展规划》重点任务，加快推进机器人应用拓展，决定开展“机器人+”应用行动。为保证行动有序开展，特制定本实施方案。

一、总体要求

（一）指导思想

以习近平新时代中国特色社会主义思想为指导，全面贯彻党的二十大精神，完整、准确、全面贯彻新发展理念，加快构建新发展格局，着力推动高质量发展，统筹发展和安全，面向人民对美好生活向往以及经济社会数字化发展需要，坚持应用牵引、典型引领、基础支撑，发挥部门、地方、行业等多方作用，以产品创新和场景推广为着力点，分类施策拓展机器人应用深度和广度，培育机器人发展和应用生态，增强自主品牌机器人市场竞争力，推进我国机器人产业自立自强，为加快建设制造强国、数字中国，推进中国式现代化提供有力支撑。

（二）主要目标

到2025年，制造业机器人密度较2020年实现翻番，服务机器人、特种机器人行业应用深度和广度显著提升，机器人促进经济社会高质量发展的能力明显增强。聚焦10大应用重点领域，突破100种以上机器人创新应用技术及解决方案，推广200个以上具有较高技术水平、创新应用模式和显著应用成效的机器人典型应用场景，打造一批“机器人+”应用标杆企业，建设一批应用体验中心和试验验证中心。推动各行业、各地方结合行业发展阶段和区域发展特色，开展“机器人+”应用创新实践。搭建国际国内交流平台，形成全面推进机器人应用的浓厚氛围。

二、深化重点领域“机器人+”应用

面向社会民生改善和经济发展需求，遴选有一定基础、应用覆盖面广、辐射带动作用强的重点领域，聚焦典型应用场景和用户使用需求，开展从机器人产品研制、技术创新、场景应用到模式推广的系统推进工作。支持一些新兴领域探索开展机器人应用。

（一）经济发展领域

1. 制造业

研制焊接、装配、喷涂、搬运、磨抛等机器人新产品，加快机器人化生产装备向相关领域应用拓展。开发专业化、定制化的解决方案和软硬件产品，积累模型库、工艺软件包等经验知识，深度融合机器人控制软件和集成应用系统，推动在汽车、电子、机械、轻工、纺织、建材、医药等已形成

较大规模应用的行业，卫浴、陶瓷、光伏、冶炼、铸造、钣金、五金、家具等细分领域，喷釉、修胚、抛光、打磨、焊接、喷涂、搬运、码垛等关键环节应用。推进智能制造示范工厂建设，打造工业机器人典型应用场景。发展基于工业机器人的智能制造系统，助力制造业数字化转型、智能化变革。

2. 农业

研制耕整地、育种育苗、播种、灌溉、植保、采摘收获、分选、巡检、挤奶等作业机器人，以及畜禽水产养殖的喂料、清污、消毒、疫病防治、环境控制、畜产品采集等机器人产品。开发专用操控系统、自主智能移动平台及作业部件，推动机器人与农田、农艺、品种相适应，实现信息在线感知、精细生产管控、无人自主作业、高效运维管理。打造丘陵山区、大田、设施园艺、畜牧水产、贮运加工等农业机器人应用场景。加快农林牧渔业基础设施和生产装备智能化改造，推动机器人与农业种植、养殖、林业、渔业生产深度融合，支撑智慧农业发展。

3. 建筑

研制测量、材料配送、钢筋加工、混凝土浇筑、楼面墙面装饰装修、构部件安装和焊接、机电安装等机器人产品。提升机器人对高原高寒、恶劣天气、特殊地质等特殊自然条件下基础设施建养以及长大穿山隧道、超大跨径桥梁、深水航道等大型复杂基础设施建养的适应性。推动机器人在混凝土预制构件制作、钢构件下料焊接、隔墙板和集成厨卫加工

等建筑部品部件生产环节，以及建筑安全监测、安防巡检、高层建筑清洁等运维环节的创新应用。推进建筑机器人拓展应用空间，助力智能建造与新型建筑工业化协同发展。

4. 能源

研制能源基础设施建设、巡检、操作、维护、应急处置等机器人产品。推动企业突破高空、狭窄空间、强电磁场等复杂环境下的运动、感知、作业关键技术。推广机器人在风电场、光伏电站、水电站、核电站、油气管网、枢纽变电站、重要换流站、主干电网、重要输电通道等能源基础设施场景应用。推进机器人与能源领域深度融合，助力构建现代能源体系。

5. 商贸物流

研制自动导引车、自主移动机器人、配送机器人、自动码垛机、智能分拣机、物流无人机等产品。推动 5G、机器视觉、导航、传感、运动控制、机器学习、大数据等技术融合应用。支持传统物流设施智能化改造，提升仓储、装卸、搬运、分拣、包装、配送等环节的工作效率和管理水平。鼓励机器人企业开发末端配送整体解决方案，促进机器人配送、智能信包箱（智能快件箱）等多式联动的即时配送场景普及推广。打造以机器人为重点的智慧物流系统，提升商贸物流数字化水平。

（二）社会民生领域

6. 医疗健康

研制咨询服务、手术、辅助检查、辅助巡诊、重症护理、急救、生命支持、康复、检验采样、消毒清洁等医疗机器人产品。围绕神经系统损伤、损伤后脑认知功能障碍、瘫痪助行等康复治疗需求，突破脑机交互等技术，开发用于损伤康复的辅助机器人产品。加快推进机器人和医学人工智能在基础理论、共性关键技术、创新应用等方面的突破，推动人工智能辅助诊断系统、机器人 5G 远程手术、脑机接口辅助康复系统等新技术新产品加速应用。推动机器人在医院康复、远程医疗、卫生防疫等场景应用。鼓励有条件有需求的医院使用机器人实施精准微创手术，建设机器人应用标准化手术室，研究手术机器人临床应用标准规范。加强机器人在患者院前管理、院内诊疗及院后康复追踪整体病程服务体系中的应用，助力智慧医疗建设。

7. 养老服务

研制残障辅助、助浴、二便护理、康复训练、家务、情感陪护、娱乐休闲、安防监控等助老助残机器人产品。加快推动多模态量化评估、多信息融合情感识别、柔顺自适应人机交互、人工智能辅助等新技术在养老服务领域中的应用，积极推动外骨骼机器人、养老护理机器人等在养老服务场景的应用验证。鼓励养老领域相关实验基地把机器人应用作为实验示范重要内容，研发推广科技助老新技术新产品新模式。研究制定机器人助老助残技术应用标准规范，推动机器人融入养老服务不同场景和关键领域，提升养老服务智慧化

水平。

8. 教育

研制交互、教学、竞赛等教育机器人产品及编程系统，分类建设机器人服务平台。加大机器人教育引导，完善各级院校机器人教学内容和实践环境，针对教学、实训、竞赛等场景开发更多功能和配套课程内容。强化机器人工程相关专业建设，提升实验机器人产品及平台水平，加强规范管理。推进 5G、人工智能、智能语音、机器视觉、大数据、数字孪生等技术与机器人技术融合应用，积极培育机器人校园服务新模式和新形态，深化机器人在教学科研、技能培训、校园安全等场景应用。

9. 商业社区服务

研制餐饮、配送、迎宾、导览、咨询、清洁、代步等商用机器人，以及烹饪、清洗、监护、陪伴等家用机器人，加强应用场景探索和产品形态创新，提高智能硬件与用户交互水平，增强机器人服务价值。推动机器人技术与 5G、云计算、智能传感等新技术融合，实现自主导航、自动避障、人机交互、语音及视觉识别、数据分析等功能。积极推动机器人融入酒店、餐厅、商超、社区、家庭等服务场景，满足商业及社区消费体验升级需求，提升商业服务与生活服务的智慧化水平。

10. 安全应急和极限环境应用

研制矿山、民爆、社会安全、应急救援、极限环境等领

域机器人产品。增强机器人立体视觉、室外导航定位、多维信息感知、灾害远程警示、机器人鉴权管控等功能，开发机器人对极寒、明火、高温高压、易燃易爆、高海拔低气压、有毒、高湿、积水、高粉尘、辐射、人流多变化大等复杂非结构化作业环境的适应性技术。推进智能采掘、灾害防治、巡检值守、井下救援、智能清理、无人化运输、地质探测、危险作业等矿山场景应用。推进危险化学品生产装置和储存设施现场巡回检查、值班值守、特殊作业等安全生产场景应用。推广炸药装药、生产制备、包装、装卸运输、在线检测等民爆行业场景应用。推动安保巡逻、缉私安检、反恐防暴、勘查取证、交通边防、治安管控、特战处置、服务管理等社会安全场景应用。加强防爆排爆、消防巡检、工程抢险、海洋捕捞、海上溢油及危化品船舶救援、自然灾害救援、安全生产事故救援、核应急安全救援等危险环境应用。推动空间、水下、深地等极限环境场景应用。

三、增强“机器人+”应用基础支撑能力

（一）构建机器人产用协同创新体系

鼓励产用共建机器人应用领域创新联合体、创新中心等创新机构。支持用户单位参与高转矩密度伺服电机、高动态运动规划与控制、人机交互等机器人产业链核心技术攻关，深入挖掘和释放潜在应用需求，共同开发先进适用的机器人产品和系统解决方案。开展覆盖产品设计、技术开发、工艺优化、批量生产和示范推广全过程的“一条龙”应用创新。

鼓励产用共同参与特种机器人产业链“揭榜”推进活动，带动机器人企业协同攻关和成果转化。完善机器人技术支撑服务，积极推动产融对接、企业孵化、技术转移转化、备品备件服务、技术售后服务等。

（二）建设“机器人+”应用体验和试验验证中心

依托用户、机器人企业和系统集成企业，建设家用、商业、教育、医疗、养老等场景化应用体验中心，提升用户体验，扩大产品消费和推广。依托用户、机器人企业和第三方公共服务机构，建设具备机器人应用技术标准试验验证、质量检测、创新孵化等能力的试验验证中心，加大应用数据积累，提升机器人产品的安全性、稳定性、可靠性、易用性等水平。

（三）加快机器人应用标准研制与推广

依托有关标准化技术组织，建立跨行业机器人标准化工作合作机制，加强跨行业应用领域标准化工作的协调，推动跨行业标准互采。开展重点行业机器人应用工艺流程和专用算法模型、融合设备接口、应用数据安全、人机交互安全等标准的研制与推广。针对特定行业准入要求，加强机器人特殊安全要求和检测方法标准研究。开展机器人新产品通用技术规范、模块化设计与制造、应用安全与可靠性等标准化工作。推进机器人新兴技术领域专有安全基础标准、产品标准、方法标准等标准化工作。研究制定机器人伦理相关标准规范。加强标准应用实施。推动机器人应用标准国际化合作。

（四）开展行业和区域“机器人+”应用创新实践

鼓励行业主管部门结合应用行业发展规划、科技攻关和重点项目建设，开展各行业机器人产品创新和应用示范推广。指导和支持有条件、有需求的地区围绕特色优势产业，开展本地区“机器人+”应用行动。依托龙头企业和产业集群，开发开放机器人成熟、新兴和潜在应用场景，开展协同创新活跃、应用成效显著、推广价值较高的“机器人+”应用创新实践。

（五）搭建“机器人+”应用供需对接平台

建设“机器人+”应用供需对接平台，开展资源共享、信息互通、优势互补的供需对接活动。在成熟应用领域，遴选一批应用成效突出、具有较强影响力的标杆企业和典型场景，加强机器人高端产品供给，提升机器人应用深度和广度。在新兴应用和潜在需求领域，探索采用“揭榜挂帅”等方式征集机器人应用解决方案，以需求牵引促进供给创新。发布机器人重点技术和产品推广目录，推广线上应用展示样板间。

四、强化“机器人+”应用组织保障

（一）强化组织领导

发挥国家制造强国建设领导小组作用，建立多部门协同、央地联动的工作机制，成立协同推进方阵，分行业、分领域成立由主管部门、行业组织、骨干企业、科研院所以及重点地区政府共同组成的联合工作组。加强对重点行业机器

人应用相关规章制度和伦理的研究，开展机器人应用常态化监测跟踪，推动构建适应各行业机器人应用特点的监管体系。

（二）完善政策支持

各相关部门、各地方将机器人应用推广作为科技创新、行业规划、产业政策重点方向，统筹政策、资金、资源予以支持，加大对机器人创新应用的投入力度。科技部门会同机器人发展应用部门联合推动国家科技计划创新成果转化，引导机器人企业加大研发投入，加强知识产权保护。人社部门会同机器人发展应用部门适时开展机器人对就业影响的评估，及时促进受影响劳动者转岗就业。鼓励央企、国企开放机器人应用场景，建立容错机制，支持企业首购首用。

（三）深化宣传交流

各地方、有关企业和行业组织要及时跟踪、总结、评估应用行动过程中的新情况、新问题和新经验，总结示范带动作用强、可复制可推广的有效做法，宣传应用好典型经验。依托各行业相关大会展会，加强机器人应用成果交流与展示。指导相关单位编写“机器人+”应用年度报告，发布创新应用案例集。充分利用多双边合作机制，推进不同领域机器人产品和解决方案“走出去”，实现合作共赢。

（四）加强人才培养

培养引进机器人应用高端研发人才和标准化人才，加强人才国际交流，打造领军人才和创新团队。鼓励机器人企业、

用户单位与普通高等院校、科研院所、职业院校等合作，共建人才实习实训基地，联合开展机器人应用人才培养，提供更多就业渠道。组织细分行业机器人应用技能竞赛，发现和培养更多机器人高素质技术技能人才。