中国新一代人工智能科技产业发展报告·2019

开放和协同：

中国智能经济发展的动力和机制

Openness and Coordination:the Impetus and Mechanism of China’s AI Economy

内容概要

中国人工智能科技产业的兴起和发展内生于经济转型升级中所创造的智能化需求。2017 年 7 月以来，国家战略的前瞻引领、需求的强力牵引、产学研用的协同创新、创新生态系统的高度开放性和政府的积极响应，共同构成了中国人工智能科技产业发展的协同创新推动机制。随着核心产业部门和融合产业部门互动过程中报酬递增效应的出现，中国的智能经济即将迎来黄金发展时期。

基于连续 5 年的追踪调查数据和大数据分析，本报告构建了包括 745 家人工智能企业、94 所 AI 大学和 75 家非大学科研机构、1780 家投资者（投资机构、非投资机构和个人投资者）、823 场在中国境内召开的人工智能会议和 117 家产业联盟、31 个省市自治区出台的 301 项政策、规划建设的 163 家产业园区在内的中国智能经济样本数据库。与 2018 年发布的报告相比，人工智能企业样本数量从 408 家增加到 745 家，总样本量从 1741 增加到 4098。基于中国智能经济样本数据库的属性和关系数据分析，本报告将真实刻画中国人工智能科技产业基本形态和内在结构，揭示中国智能经济发展的内在动力机制和发展模式，评价中国人工智能科技产业发展的区域竞争力水平。

截至 2019 年 2 月 28 日，本报告共检测到 745 家人工智能企业，大约占世界人工智能企业总数 3438 家的 21.67%，仅次于排名第一的美国（1446 家,占比 42.06%）。中国的人工智能企业主要分布在北京市、广东省、上海市和浙江省，占比分别为 43.2%、16.9%、14.9%和 8.3%。中国人工智能企业的创建集中分布在 2010 年至 2016 年之间，占比为 67.3%，峰值出现在 2015 年，占比为 16.8%。虽然 2016 年之后，中国人工智能企业的创建数量出现显著下降，但是无论从融资额还是从应用领域的拓展看，都表现出良好的成长性。

中国人工智能科技产业的发展是需求牵引的。在 745 家人工智能企业中，应用层企业占比高达 75.2%,广泛分布在包括智能制造、科技金融、数字内容和新媒

体、新零售和智能安防在内的 18 个应用领域。人工智能与传统产业的融合发展，正在成为中国经济转型升级的重要驱动力量。

从 745 家人工智能企业的核心技术分布看，大数据和云计算占比最高，为 21.3%，其次是机器学习和推荐、语音识别和自然语言处理、人脸和步态及表情识别，占比分别为 17.2%、9.4%、8.6%。同时，排在前列的还包括硬件、服务机器人、工业机器人和图形图像识别技术，占比分别为 8.1%、6.4%、5.8%和 5.1%。

在可获得研发强度数据的 113 家人工智能企业中，平均研发强度为 9.14%，远高于 2018 年国内企业的平均研发强度。2018 年，全球人工智能领域专利申请量达到 13 万余件。中国、美国和日本三国的人工智能累计专利占比超过全球 80%。从专利的技术层次分布看，在基础层美国拥有专利控制力，在技术层则呈现中美双寡头竞争格局，在应用层中国的专利布局更加领先。从专利布局的热点领域看，基础层的智能芯片和智能传感器、技术层的语音识别和机器视觉、应用层的智能驾驶是全球人工智能专利申请热度最高的领域。

2018 年，在 745 家人工智能企业中，能够检测到发生融资事件的企业为 577 家，融资总额为 3832.22 亿元，是 2017 年的 2.04 倍，排名全球第一。2018 年最为重要的融资事件均发生在人工智能独角兽公司，其中商汤科技共获得 16.2 亿美元融资，估值达到 60 亿美元，成为全球融资额和估值最高的人工智能独角兽公司。旷视科技在 2018 年融资 6 亿美元，打破了全球人脸识别领域独角兽公司的融资记录。

中国的人工智能学术生态是人工智能科技产业发展的重要支撑。截至 2019 年 2 月 28 日，本报告共检测到从事人工智能基础研究、技术开发和人才培养的 94 所中国 AI 大学和 75 家非大学科研机构。为了响应产业发展的需求，2018 年 94 所 AI 大学共创建 40 家人工智能学院和研究院。2018 年，中国 AI 大学共发表国内论文 19374 篇。同时，对 Scopus 数据库的检索表明，截至 2019 年 2 月 28 日，共检测到 141 所中国大学和 12 家非大学科研机构的科研工作者在国际上发表人工智能领域的学术论文 45913 篇。其中，国际论文发表数量排名前列的大学是清华大学、上海交通大学、浙江大学、哈尔滨工业大学、北京航空航天大学和北京大学。在非大学科研机构中，人工智能领域国际论文发表单位主要是中国科学院的相关研究院所。在国际论文发表上，有超过 20 个国家与中国学术界展开合作。

地方政府通过相关政策的出台和人工智能园区的规划建设，不仅响应国家人工智能发展战略的实施，而且响应本地人工智能科技产业发展的迫切需求。从 2018 年 1 月 1 日至 2018 年 12 月 31 日，本报告共检测到在中国境内召开的人工智能会议 823 场，远高于 2017 年的 138 场。与 2017 年相比，会议的主题词开始向人工智能各专业和应用领域细化延伸。截至 2018 年 12 月 31 日，共检测到 117

家人工智能领域的产业联盟，其中 2018 年新创建的人工智能产业联盟为 34 家。2018 年，中国 31 个省市自治区共出台人工智能相关政策文件 259 件，远高于 2017 年的 42 件。在各省市自治区规划建设的 163 家人工智能产业园区中，2018 年新增 56 家。在人工智能产业园区的地域分布中，广东省以 33 家位列第一。

基于 745 家人工智能企业关系数据的价值网络分析表明，中国人工智能科技产业的创新生态系统是高度开放的。从人力资本关系看，745 家中国人工智能企业核心人力资本的 24.22%拥有在国外著名高校和研究机构学习的经历，19.80%拥有在国外企业和科研机构工作的经历。从技术关系看，17.83%的技术输入关系来自国外企业和研究机构，对国外企业的赋能关系占赋能关系总数的 9.49%。

从 745 家中国人工智能企业关系数据的分类统计看，在技术关系中的技术输入和技术赋能关系数占比分别为 30.86%和 69.14%，投融资关系中融资关系和投资关系数占比分别为 44.22%和 55.78%。总体看，人工智能企业以技术赋能和投资为主，说明中国人工智能企业具有很强的辐射和带动作用。

从 745 家人工智能企业的价值网络结构看，中国人工智能科技产业的创新生态系统是“极核”状的，包括腾讯、百度、阿里巴巴、科大讯飞和商汤科技在内的平台企业成为关键主导者。五大开放创新平台仅占 745 家人工智能企业的 0.6%，但是关联节点数和关系数占比分别高达 13.7%和 11.3%。从关系分类和占比看，开放创新平台不仅是智能经济的主要技术赋能者和人力资本的重要供应方，而且是关键投资者。“平台+赋能+中小微和新创企业+开发者”成为中国智能经济发展的基本组织形态。

人工智能科技产业作为第四次工业革命的引擎，其发展受到国家高度重视。如何推动人工智能核心技术研发、应用场景进一步开放、数据生态优势提升、技术平台体系创新、核心产业部门和融合产业部门良性互动、高效人才培养机制形成，是今后人工智能科技产业持续发展的关键。

Abstract

The emergence and development of China’s AI Technology Industry is generated endogenously from intelligent demand as created in the economic transformation and upgrading. Since July 2017, thanks to the prophetic guidance of the national strategies, strong and boosting demand, cooperative innovation of industry-university-research, highly openness of innovative ecosystem and proactive responses from the government, mechanism of cooperative innovation for China AI Technology Industry had been established. With the turning up of Increasing Returns Effect in the interaction between core industrial sectors and integrative industrial sectors, the golden development period of China's Intelligent Economy will soon usher in.

Based on 5-year consecutive survey data tracking and big data analysis, this Report has constructed China Intelligent Economy Sample Database which covers 745 AI enterprises, 94 universities and 75 non-university scientific research institutions, 1780 Investors (institutional investors, non-institutional Investors and individual Investors), 823 AI conferences held within China, 117 industrial alliances, 301 policies promulgated by 31 provinces, cities and autonomous regions, and 163 industrial parks under planning or construction. Compared with the data in the 2018 report, the quantity of the samples of AI enterprises in this report has increased from 408 to 745, and the total sample size has enlarged from 1741 to 4098. Based on the analysis of the attributes and relational data of China Intelligent Economy Sample Database, this Report will objectively portray the present conditions, basic form and intrinsic structure of the development of China AI Technology Industry, and uncover the impetus mechanism and development route of China's Intelligent Economy.

As of February 28, 2019, 745 Chinese AI enterprises have been detected and listed in this Report, approximately accounting for 21.67% of the total amount (3438 AI enterprises) in the world, only next to the United States of America (1446 AI enterprises, accounting for 42.06%). These Chinese AI enterprises are mainly distributed in Beijing, Guangdong Province, Shanghai and Zhejiang Province, respectively accounting for 43.2%, 16.9%, 14.9% and 8.3%. China's AI enterprises were mainly established between 2010 and 2016, accounting for 67.3% of the total. The peak time was 2015when 16.8% of China's AI enterprises were established.

Though the quantity of establishment of AI enterprises had decreased remarkably since 2016, China’s AI enterprises have become more promising in terms of the amount of financing and expansion of application domains.

The development of China AI Technology Industry is boosted by demand. Among the 745 AI enterprises, enterprises at application layer account for as much as 75.2%, extensively distributed in 18 application domains including intelligent manufacturing, technology finance, digital content and new media, new retail and intelligent security. Integration and development of AI and traditional industries are becoming an important driving force to motivate the transformation and upgrading of China's economy.

As for the distribution of core technologies among the 745 AI enterprises, big data and Cloud Computing takes up the highest proportion of 21.3%. Machine learning and recommendation, speech recognition and natural language processing, and face, gait, and expression recognition, respectively account for 17.2%, 9.4% and 8.6%. For the 113 AI enterprises whose R&D intensity data can be obtained, the average R&D intensity is 9.14%, much higher than the average R&D intensity of Chinese enterprise in 2018. As for the quantity distribution of AI patents, China, ahead of USA and Japan, has the biggest AI patent layout. China, USA and Japan account for 74% of the quantity of the worldwide patents.

In 2018, 577 out of the 745 AI enterprises were detected to have had financed 383,222 million Yuan, 2.04 times of the total amount of 2017 and ranking first in the world. Important financing events in 2008 occurred to AI unicorn companies. Among others, SenseTime financed 1.62 billion U.S. dollars and was valued at 6 billion USD, making it become the AI unicorn company that has the biggest financing amount and highest valuation. Megvii Technology, also as a unicorn company, raised 600 million USD in 2018 and set a new financing record in facial recognition sector.

The development of AI Technology Industry received support from China's academic ecology. As of February 28, 2019, 94 AI universities and 75 non-university scientific research institutions had been detected to have engaged in AI basic research, technology development and talent cultivation. To meet the demand for AI industrial development, universities in China established 40 AI schools and research institutes in 2018. 94 AI universities published 19374 papers in China in 2018. Retrieval of Scopus database showed that scientific research workers from 141 Chinese

universities and 12 non-university scientific research institutions had published AI dissertations in the international academia as of February 28, 2019. In terms of the publication of international dissertations, more than 20countries have started cooperation with China's academia.

During the development of China AI Technology Industry, linkers including conferences and industrial alliances have promoted the accumulative process of AI technology. From January 1, 2018, to December 31, 2018, this Report had detected that 823 AI conferences had been held within China, much more than the amount of 138 in 2017. Compared with 2017, the keywords of 2018 AI domain conferences become even more refined in terms of disciplines and application domains. Up to December 31, 2018, 117 AI industrial alliances were detected to have been established in China and 34 new AI industrial alliances were established in 2018.

By promulgating related policies, planning and constructing AI Parks, local governments not only response to national strategies but also meet the urgent demand for intelligent technology development. China's 31 provinces, cities and autonomous regions promulgated 259 AI policies in 2018, a sharp increase from 42 in the year 2017. Up to December 31, 2018, it is found in this Report that China's provinces, cities and autonomous regions had planned and built 163 AI industrial parks, an increase of 56 compared with last year. Among others, Guangdong Province ranked first in this regard.

Based on the analysis of Value Network of 745 AI enterprises' relational data, it is showed that the innovative ecosystem of China AI Technology Industry is highly open. 24.22% of the core human capital of China’s 745 AI enterprises has the experiences of studying in overseas universities and research institutions, and 19.80% has the experiences of working in overseas enterprises and research institutions. Meanwhile, 17.83% of technology input relations come from overseas enterprises and research institutions. Overseas enterprises and organizations, as technology empowerment parties, only accounted for 9.49%. As for investment relation data, institutional investors from international institutions took the first two places.

Based on the classification statistics of relational data of China's 745 AI enterprises, technology input and technology empowerment respectively accounted for 30.86% and 69.14%. In general, the high ratio of technology empowerment and investment relations showed that China's AI enterprises had taken very influencing

and motivating roles.

From the structure of Value Network of 745 AI enterprises, it is showed that the innovative ecosystem of China AI Technology Industry is in the shape of core-agglomeration. Platform enterprises including Tencent, Baidu, Alibaba Group, iFLYTEK and SenseTime are the dominators of industrial development of China's intelligent technology. These five open AI innovation platforms only accounted for 0.6% of the 745 AI enterprises, but they accounted for 13.7% and 11.3% in terms of the number of nodes and number of relations. From relations classification and ratio, AI innovation platforms are not only the major technology empowerment parties of AI enterprises, but also important suppliers of human capital and key investors. "Platform+empowerment+ small &medium sized, and new &innovative enterprises" become the basic organizational formation of the development of China's Intelligent Economy.

China attaches great importance to AI Technology Industry and regards it as the engine of the fourth industrial revolution. The promotion of research and development of core AI technologies, the opening-up of application scenarios, the enhancement of the advantages of data ecology, the independent innovation of technology platform systems, the benign interactions among core industrial sectors, and the formation of highly efficient mechanism of talent cultivation are the essential factors for the sustainable development of AI Technology Industry.

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