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Artificial Intelligence Applications of Telecom Operators White Paper

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Contents

AI Enters a Stage of Explosive Development

Explosion of AI (2000-now)

2016:Google DeepMind developed AlphaGo
2012:Deep learning algorithm is widely used
2006:Geoffrey Hinton proposed deep learning algorithm

Development of AI (1980s-late 1990s)

1997: Deep Blue developed by IBM won the chess champion
1986:Multilayer neural network and back propagation arithmetic appeared

Birth of AI (1950s-1980s)

1969:IJCAI was established
1956:Dartmouth Conference

All countries in the world attach great importance to AI and issue a series of policies to promote the development of AI.

- Development Plan of the new generation of Artificial Intelligence (2017.7)
- Three-year(2018-2020) Action Plan for the development of the new generation of Artificial Intelligence (2017.12)

- The American AI Initiative （2019.2）
- SUMMARY OF THE 2018 DEPARTMENT OF DEFENSE ARTIFICIAL INTELLIGENCE STRATEGY (2019.2)

- The Age of Artificial Intelligence: Towards a European Strategy for Human-Centric Machines (2018.3)
- Artificial Intelligence for Europe (2018.4)

- Artificial Intelligence Technology Strategy (2017.3)

Status and Trends of AI Technology

Algorithm: AI algorithm continuously break through

Current Status

- Deep learning drives the speech recognition, machine vision, NLP to reach the level of practicality
- Other scenarios mainly use classical machine learning

Trends

- Deep learning algorithms continuously develop
- Other AI algorithms continue to break through

Chips: Computing power continuously improves

Current Status

- CPU, GPU and FPGA are the main chips in AI field at present.
- ASIC chips for neural network algorithms are being launched

Trends

- Brain-like chips are still at the stage of laboratory research and development

Data: Public data sets are continuously enriched

Current Status

AI public data sets are constantly enriched.AI public data sets are mainly focus on the fields:

- NLP
- Speech Recognition
- Machine Vision

Trends

- Every industry is building its own AI data set
- Building AI data set drives the industrial development of data service

Platform: Build AI platform and develop AI Ecology

Current Status

- The open source AI framework (TensorFlow, Caffe...) has become the focus of AI layout for technology companies

Trends

- Technology companies build AI platform, develop AI capability and build AI ecology

Status and Trends of AI Products

Classification	Typical Product	
Intelligent Robot	Industrial Robot	Welding Robot, Spraying Robot Processing Robot, Assembly Robot, Cleaning Robot and Other Industrial Robots
	Service Robot	Home Service Robot, Education and Entertainment Service Robot, Old-age and Disabled Service Robot, Personal Transportation Service Robot, Security Monitoring Service Robot
		Hotel Service Robot, Bank Service Robot, Venue Service Robot, Catering Service Robot
	Special Robot	Special Extreme Robots, Rehabilitation Assistant Robots, Agricultural Robots, Underwater Robots, Military and Police Robots, Electric Power Robots, Petrochemical Robots, Mining Robots, Construction Robots, Logistics Robots, Security Robots, Medical Service Robots and Other Special Robots
Intelligent Carrier	Self-Driving Car，Rail Transit System，Unmanned Vessel	
	UAV	Unmanned helicopters, fixed-wing aircraft, multi-rotor aircraft, unmanned airships, unmanned parafoil aircraft
Intelligent Terminal	Smartphone, Vehicle-borne Intelligent Terminal，Wearable terminal	
Speech	Machine Translation, Machine Reading Comprehension, Question Answering System, Intelligent Search	
Image and Video	Image analyzer and video surveillance system	
Biometric Recognition	Fingerprint recognition system, face recognition system, iris recognition system, finger vein recognition system, DNA/gait/palmprint/voiceprint and other biometric recognition systems	
VR/AR	PC VR, Integrated VR	
Human-Computer Interaction	Voice interaction	
	Emotional Interaction，Somatosensory Interaction，Brain-computer Interaction	

Current Status

- ✓ **Focus on a specific scenario to provide services for users**
- ✓ **AI products' user experience in complex scenarios is not good**
- ✓ **AI products focus on picture, character and speech fields**

Trends

- ✓ **Intelligent products will support more and more scenarios**
- ✓ **continuous improvement of user experience**
- ✓ **The products for vertical industry are gradually enriched**

Status and Trends of AI industry

Industry scale

Current Status:

By June 2018, the total number of AI enterprises in the world was 4925. In 2017, the global AI investment and financing scale reached 39.5 billion US dollars.

Trends:

Statista predicts that the global AI market will grow at an average annual rate of 50.7% over the next 10 years.

Industry direction

Current Status:

The application fields of AI are mostly for one scenario, such as the face recognition, the video surveillance, the speech recognition, and so on.

Trends:

In the future, AI is adaptable to multiple and complex scenarios with the introduction of new AI products like that of the smart home and the intelligent logistics.

Industry Talents

Current Status:

There are about 300,000 talents in the global AI field. At present, the demand for AI talents in the market is millions, the gap of AI talents is huge, and professional and compound talents are more scarce.

Trends:

The gap of AI talents will be further expanded. The global competition for talents will become increasingly fierce.

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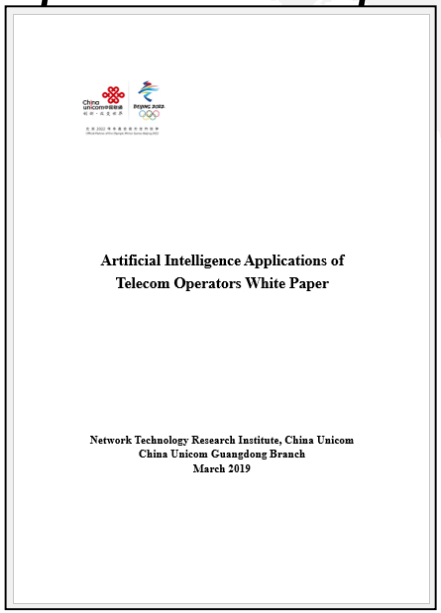
Overview of the White Paper

Artificial Intelligence Applications of Telecom Operators White Paper



The impact of AI on telecom operators

Introduce the impact of AI on telecom operators' network, customer service and vertical industries.

Typical applications of AI in telecom operators

Introduce the typical applications of AI in 14 telecom operators' network, customer service and vertical industries.

Discussions about AI Applications in Telecom Operators

Discuss the applications of AI in telecom operators in respects of networks, customer services and vertical industries.

Suggestions for Applying AI to Telecom Operators

Offer the suggestions for applying AI to telecom operators in terms of networks, customer services and vertical industries.

Contents

AI + Telecom Operators（1/3）

AI enhances the intellective level of network

AI technologies empowers the network with capabilities to analyze, judge and predict based on massive data, promoting the development of network planning, construction, operation and optimization.

Current Network

Planning
Performance Analysis
Deployment Suggestion

Construction
Big Data Analysis
Intelligent Design

Operation Maintenance
Root-tracing of Alarm

Optimization
RF Self-Optimization
Automatic Correction

With the evolution of the next generation network such as SDN/NFV and 5G, AI also provides training and inference capabilities in the infrastructure layer, network and business layer, management and orchestration layer.

Future Network

1 SDN closed-loop management
2 Fault detection and self-healing
3 Network slicing and beam management
4 Cloud data center management
5 Edge services management

AI + Telecom Operators(2/3)

AI enhances the service level for customers

With the help of AI underlying technologies such as speech recognition, natural language understanding, telecom operators have considered the customer service and family business as an important entrance.

Smart Home

Voice assistant
Smart speaker
Set-top box
……


Customer Service

Call center
Service robot
Chatbot
……


AI + Telecom Operators(3/3)

AI expands the business areas to many industries

With AI technologies , telecom operators are no longer confined to traditional network communication services, but expand business areas to multiple vertical industries. It is an important opportunity to complete the digital transformation.

AI Platform

Networks
+
Industries
↓
Overall management

corevo

灯塔大数据

Acumos AI

Industrial Applications

Smart cities
Smart retail
Smart government
Smart transportation
……

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Typical Cases of AI in Telecom Operators-China

	China Mobile	China Unicom	China Telecom
Networks	Network architecture “NovoNet” ACOS, APOS, AIOps for network optimization and operation Intelligent Quality Inspection System	Network architecture “CUBE-Net 2.0+ ” Awareness & Analysis system intelligent NFV operation and maintenance platform Intelligent IPTV set-top box	Network architecture “CTNet2025” Business-driven adaptive network Intelligent data center
Services	Intelligent watch and earphone Voice assistant “Lingxi” Interactive robot “Yiwa”	Smart home platform “Steward of Wo Jia” Intelligent online customer service robot “Wobao” "Smart Blue Sky" air pollution prevention and control platform	Smart speaker “Xiaoyi” Smart customers service robot “Xiaozhi” Smart customers service cloud platform
Industries	“Super-brain” plan for Xiongan smart city Smart vehicle terminal “Helutong”	“AI+ Teachers' Ability Development Joint Laboratory ” Cloud platform “Tian Gong”	Smart government platform “Ma Shang Ban” Smart police product “Zhi Cha” Medical image cloud
Platform	AI platform “Jiu Tian”	Intelligent network platform	AI platform “Deng Ta”

Typical Cases of AI in Telecom Operators-America

	AT&T	verizon
Networks	▪ Disaggregated Network Operating System (dNOS) ▪ Threat Intellect platform for network security ▪ Open Networking Automation Platform (ONAP) ▪ UAV for cell tower inspections	▪ SD-WLAN service based on AI system Mist for network faults automatic prediction, self-healing and illegal access prevention ▪ Network stability surveillance in the fiber optic broadband service
Services	▪ Smart home product “Digital Life” ▪ AI chatbot for contract center	▪ Smart home automation system ▪ End-to-end service Digital Customer Experience (CX)
Industries	▪ Smart city framework ▪ Smart glasses and “Hey Chloe” medical platform for people with poor vision	▪ Video nodes for smart city
Platform	▪ Open source AI platform “Acumos” ▪ Edge computing platform “Akraino Edge Stack”	▪ A portfolio of platforms “Exponent”

Typical Cases of AI in Telecom Operators-Europe (1/2)

	vodafone	Telefónica
Networks	☐ Centralized Self-Organizing Network (C-SON) ☐ Apply AI technology to improve the performance of its mobile network in Spain	☐ Use AI to improve network operations ☐ Research on the self-driving network with self-configuration, self-monitoring and self-diagnosis function
Services	☐ Smart home service “V-Home” ☐ Intelligent customer service robot “TOBi”, ”Hani”, and “Vodafone Bot”	☐ Smart home equipment “Movistar Home” ☐ Intelligent assistant “Aura” ☐ Notification platform “Smart Notifications”
Industries	☐ “Ready City” project ☐ Radio Positioning System (RPS) for UAVs	☐ Transportation service “Smart Mobility” ☐ Smart retail business ☐ Smart energy business ☐ Smart city business
Platform		☐ Fourth Platform

Typical Cases of AI in Telecom Operators-Europe (2/2)

	Orange	Deutsche Telekom
Networks	AI research project to predict demand patterns in 5G networks Introduction of AI technology to the network optimization, SND/NFV, etc. Security and anti-fraud solution based on AI technology	AI technology in the network optimization, the fault detection, SDN/NFV, etc. Application " CONNECT" to find the best available Internet connection AI in planning for expansion of the fiber-optic network
Services	Smart home solution "Homelive" Smart home service "Connected Home " Intelligent assistant "Djingo"	Smart home platform "Qivicon" Intelligent assistant "Tinka", "Sophie" and "Vanda" Intelligent assistant " Magenta" Smart speaker
Industries	Smart agriculture solution for pig farms and wineries Virtual tour service " Look Around" AR/VR product "Holotenins"	AI project " eLIZA" AI-supported chatbot for interview Smart city app

Typical Cases of AI in Telecom Operators-Japan and Korea

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	docomo	SoftBank	SK telecom
Networks	AI technology in network planning, operation and maintenance	Improvement of the RAN design by using a network automation service	T Advanced Next Generation Operational Supporting System (TANGO)
Services	Smart robot “OHaNAS” Service robot “Sota” Smart home service “D Life”	Interactive robot “Pepper” Internal Question Answering System AI-Q	Voice assistant “NUGU” Family housekeeping intelligent robot “Vyo”
Industries	Smart city initiatives AI engine for the shelf allocation analysis Security camera “AI Guardsman”	The electric concept car called “NeuV” Intelligent robots layout Investment in the smart city, autopilot, intelligent logistics, etc.	Intelligent building management service "GiGA eyes" In-car virtual assistant “T Map×NUGU” AI Hotel
Platform	AI platform “Corevo”		

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Discussions About Applications of AI in Telecom Operators

Intelligent networks

Intelligence is more and more urgent for the development of network. Following this tendency, operators conduct researches and cooperation to make networks intelligent.

01. Current network

Telecom operators' concentrations mainly are the intelligent operation and maintenance, and the intelligent optimization.

02. Future network

The introduction of AI will probably solve many problems for the future networks like reconfiguration. The exploration for application of applying AI in the future networks such as SDN/NFV and 5G is under way.

03. Cooperation ecosystem

Telecom operators also cooperate to take their own advantages, and form numbers of alliances like O-RAN Aliance or groups to research the intelligent network.

Intelligent services

Telecom operators are actively promoting intelligent services.

01. Smart home

Telecom operators develop and promote smart terminals based on AI technologies since they have advantages of accessing home customers. The products such as the smart speaker and the smart set-top box are considered as the entrance of the smart home for telecom operators.

02. Intelligent customer service

Telecom operators use AI technologies such as speech recognition and NLP to develop voice assistant, achieving the interaction between customers and chatbots. The voice assistant saves a great deal of human labor costs.

Discussions About Applications of AI in Telecom Operators

Intelligent industries

Telecom operators seize their opportunities to expand industrial applications.

01. AI platform

Telecom operators develop platforms to integrate their network capability and AI applications in order to comprehensively enhance the management ability and the service ability.

02. Vertical industrial applications

Telecom operators set to develop core technologies of AI and extend their business field to numbers of vertical industries such as transportation, security and retail.

Suggestions About the Application of AI to Telecom Operators

1 Build AI Platforms

Telecom operators could integrate their data with computing capabilities and introduce AI technologies to build an open platform and form an integrated service capability.

2 Develop Intelligent Networks

In current networks, AI is used for the network planning, design, construction, maintenance, and optimization. For future network, AI is used to cope with the challenge of increasing network complexity

3 Enhance Service Level

To reduce labor costs and improve user experience, telecom operators could build various AI systems such as the intelligent customer service system, the smart business hall and the smart home.

4 Expand Diversified Businesses

Telecom operators should pay attention to scenario-driven applications, explore AI applications in the medical industry, the financial industry, the retail industry, etc., and launch AI solutions in various fields.

THANKS

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