

未来机场与机场的未来

The Airport in the Future and the Future of the Airport

——基于人工智能的智慧机场建设之路

Road of Smart Airport Construction Based on Artificial Intelligence

北京首都国际机场股份有限公司

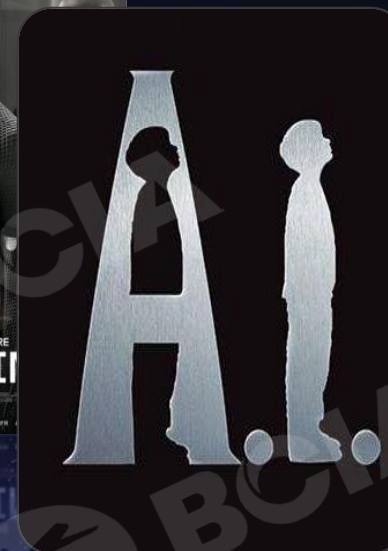
Beijing Capital International Airport Co., Ltd.

王瀚林

Wang Hanlin

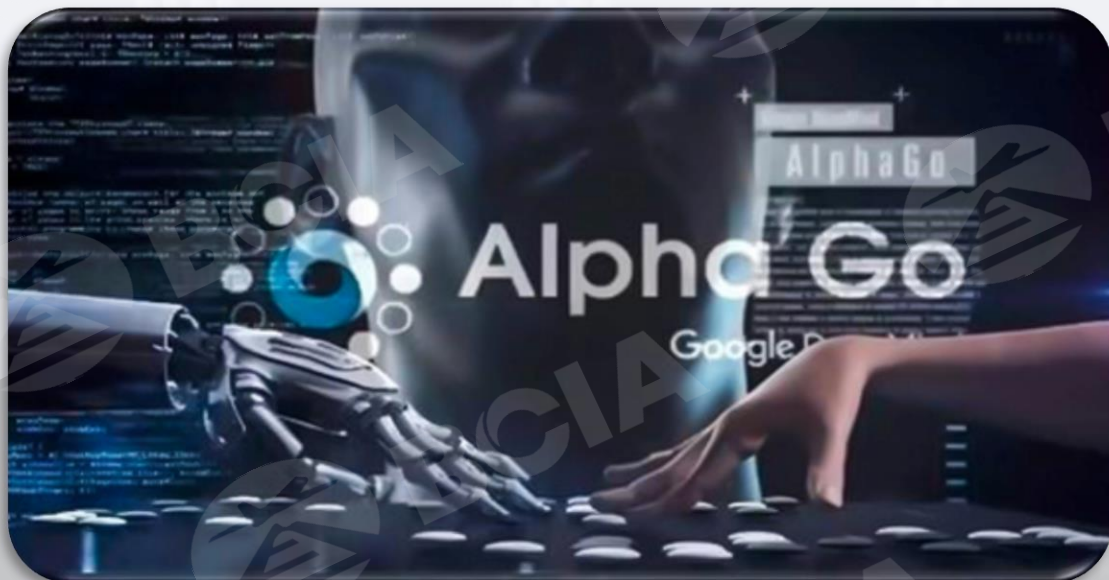
电影中的人工智能

Artificial Intelligence in Movies



人机对弈

Human-Computer Game



Alpha Go战绩

Alpha Go Records

- | | |
|--|--|
| 2015年10月
October 2015 | AlphaGo击败樊麾
AlphaGo defeated Fan Hui |
| 2016年3月
March 2016 | 击败棋手李世石
AlphaGo defeated Lee Se-dol |
| 2017年乌镇围棋峰会
2017 Wuzhen Weiqi
Summit | 击败世界第一棋手柯洁
AlphaGo defeated Ke Jie,
No.1 player in world |



AlphaGo Zero战绩

AlphaGo Zero Records

- | | |
|---------------------------|--|
| 2017年10月
October 2017 | 以100:0击败了AlphaGo
AlphaGo Zero defeated AlphaGo in 100:0 |
| 2017年12月
December 2017 | 从零自学4小时, 打败顶级国际象棋引擎Stockfish
AlphaGo Zero defeated top chess player
Engine Stockfish after 4-hour self-study |



基于模式识别的医疗诊断
*Medical diagnosis based on
mode recognition*



**基于人脸识别技术的
面部解锁、安防布控**
*Face unlocking and
security control based
on face recognition
technology*



自动工程 *Automatic Engineering*



自动驾驶汽车
Self-driving automobile



无人机
UAV



人工智能机械手臂

Artificial intelligence manipulator arm

机械手是最早出现的工业机器人，
也是最早出现的现代机器人。
The manipulator arm is the first industrial robot,
and also the first modern robot.



人形机器人

Humanoid robot

“阿特拉斯”是美国波士顿动力公司研发的人形机器人，
身高近1.5米，体重近75千克，像人一样有头部、躯干和四肢，
“双眼”是两个立体传感器。

"Atlas" is a humanoid robot developed by Boston Dynamics. It is nearly 1.5 meters tall and weighs nearly 75 kilograms. It has a head, trunk and limbs like a human. The "two eyes" are two stereo sensors.

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Development Trend of Artificial Intelligence Technology

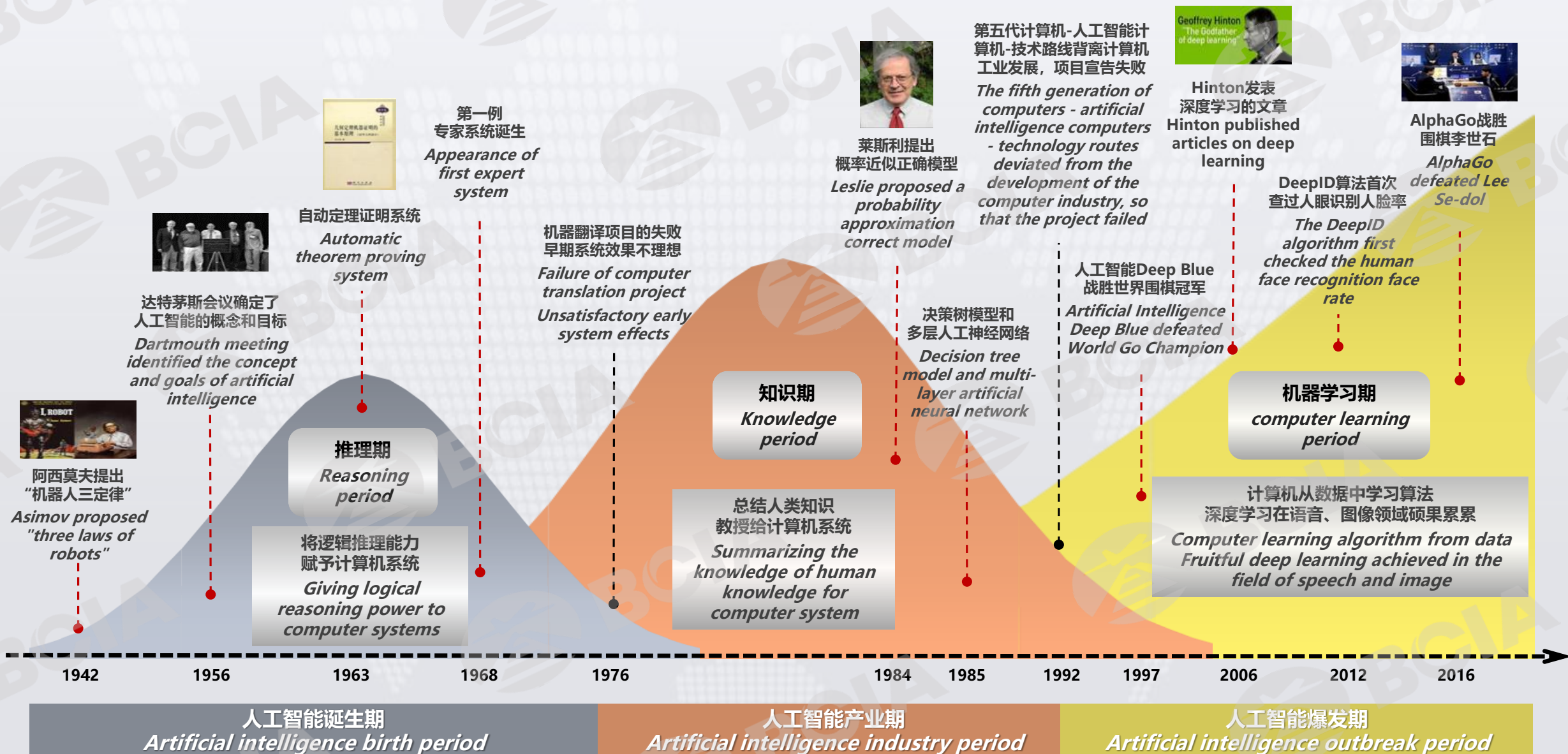
3 智慧机场人工智能应用规划设计
Artificial Intelligence Application Planning and Design of Smart Airport

2 智慧机场数字化转型
Digital Transformation of Smart Airport

4 智慧机场人工智能进阶实施路线
Artificial Intelligence Advancement Implementation Route of Smart Airport

人工智能的发展阶段

Development Stages of Artificial Intelligence



人工智能的定义

Definition of Artificial Intelligence



感知智能

Perceptual intelligence

主动感知视觉、听觉、触觉等环境的能力，
转为结构化的数据，以人类的沟通方式进行人机互动

It is to actively perceive the ability of visual, auditory, tactile and other environments, transform into structured data, and achieve the human-computer interaction through human communication.



认知智能

Cognitive intelligence

类似人类的思维模式，
借助生成假设和推理引擎等技术，
实现对环境的多种方式推理和预测结果

It is similar to the human mindset, using techniques such as generating hypotheses and inference engines to achieve multiple ways of reasoning and predicting the environment



人工智能

Artificial Intelligence

根据数据和分析赋予计算机做出类似人类思维方式与判断的能力，
包括语音识别、机器人、图像识别、自然语音处理和专家系统等

It is to provide computers with the ability to make human-like thinking and judgment based on data and analysis, including speech recognition, robotics, image recognition, natural speech processing, and expert systems.

超强的记忆和超快的计算能力，
从海量数据中进行深度学习与积累，将历史经验智能化应用于当前环境

With super memory and ultra-fast computing ability, it is for deep learning and accumulation from massive data, to achieve the intelligent application of historical experience to the current environment

计算智能

Computing intelligence

人工智能技术总体地图

Overall Map of Artificial Intelligence Technology



未来5年人工智能技术发展的趋势

Trend of Artificial Intelligence Technology Development in Next 5 Years



人工智能技术发展

Artificial intelligence technology development



技术应用成熟期 Maturity of technology application

人工智能发展规划

Artificial Intelligence Development Plan



中共中央 国务院

The CPC Central Committee and the State Council

于2017年印发《新一代人工智能发展规划》
"Development Plan for New Generation of Artificial Intelligence" issued in 2017

中共中央政治局

Political Bureau of the CPC Central Committee

于2018年10月31日就人工智能发展现状和趋势举行第九次集体学习
9th collective study on the status quo and trends of artificial intelligence development on Oct 31, 2018

首都机场集团公司

Capital Airports Holding Company

一核 One core

机场群智慧云平台

Airport group intelligent cloud platform

成员机场及保障性专业公司

Member airports and operation-supporting professional companies

第一翼 First wing

机场群智慧运行服务体系

Airport group intelligent operation service system

经营性专业公司

Business-oriented professional companies

第二翼 Second wing

机场群智慧商业服务体系

Airport group intelligent commerce service system

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智慧机场的数字化转型

Digital Transformation of Smart Airport



智慧机场数字化转型 Digital Transformation of Smart Airport

智能创新
Intelligent & Innovative

领导力数字化转型
Leadership digital transformation

大众化战略
Popularization strategy

运营模式数字化转型
Digital transformation of operating model

主动安全
Active security

流程数字化转型
Process digital transformation

人财物智能管理
Intelligent management of personnel, finance and property

智能服务
Intelligent service

全球化战略
Globalization strategy

资源数字化转型
Digital transformation of resources

全方位
无缝体验
All-round
seamless
experience

融合商业
Integrated
business

人工智能
Artificial intelligence

大数据
Big data

云计算
Cloud computing

下一代安全
Next generation
security

信息技术数字化转型
Digital transformation of
Information technology

移动互联网
Mobile Internet

物联网
Internet of Things

协同高效
Collaborative & Efficient

拓展共享
Expanding & Sharing

持续安全战略
Continuous
security
strategy

智能物流
Intelligent
logistics

协同运行
Collaborative
operation

端到端
智能流程
End-to-end
intelligent
process

持续安全战略
Continuous security strategy

智能物流
Intelligent logistics

协同运行
Collaborative operation

端到端
智能流程
End-to-end
intelligent
process

智能服务
Intelligent service

全球化战略
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全方位
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All-round
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experience

融合商业
Integrated
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人工智能
Artificial intelligence

大数据
Big data

云计算
Cloud computing

下一代安全
Next generation
security

信息技术数字化转型
Digital transformation of
Information technology

移动互联网
Mobile Internet

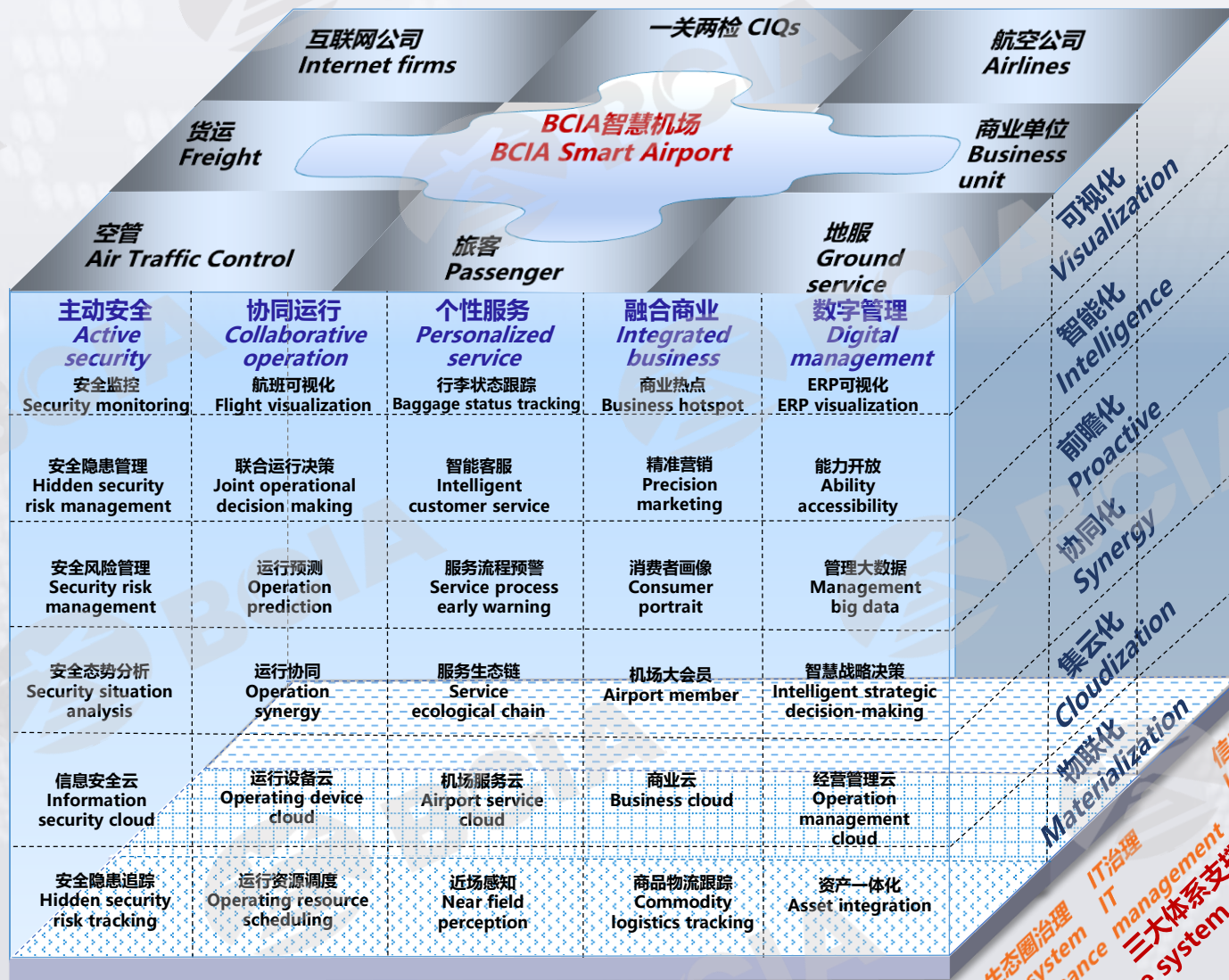
物联网
Internet of Things

协同高效
Collaborative & Efficient

拓展共享
Expanding & Sharing

智慧机场1563战略模型

1563 Strategic Model for Smart Airport



六大信息化策略
Six information strategies

五大智慧业务
Five intelligent businesses

生态图治理 IT治理
Ecosystem governance IT governance
三大体系支撑
Three system supports
信息安全
Information security

智慧机场的数字化转型目标实现

Realization of Digital Transformation Goal for Smart Airport



智慧机场数字化转型

Digital Transformation for Smart Airport

体验 Experience

- AR/VR技术
- 数据可视化
- 全息技术

- AR/VR technology
- Data visualization
- Holographic technology

可视化
Visualization



场景 Scenario

- 智能机器人
- 数据可视化
- 全流程自助

- Intelligent robot
- Data visualization
- Full process self service

智能化
Intelligence

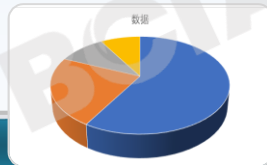


融合 Convergence

- 大数据预测
- 预测性分析
- 个性化需求

- Big data forecast
- Predictive analysis
- Personalized needs

前瞻化
Proactive



创新 Innovation

- 移动化
- 虚拟化技术
- 海量数据管理

- Mobile
- Virtualization technology
- Massive data management

集云化
Cloudization



- iBeacon
- 无线传感网络
- RFID技术

- iBeacon
- Wireless sensor network
- RFID technology

物联化
Materialization



人工智能
Artificial Intelligence

智慧机场的数字化转型的最佳实践

Best Practices for Digital Transformation of Smart Airport



AGV自动引导车
AGV automatic guided vehicle



服务机器人
Service robot



安全监控
Security monitoring



精准营销
Precision marketing



财务管理
Financial management



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智慧机场人工智能总体规划模型

Master Planning Model for Artificial Intelligence in Smart Airport



人工智能在智慧机场航班流应用设计

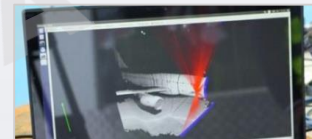
Application Design of Artificial Intelligence in Flight Flow of Smart Airport



滑行 (TAX)
机位智能分配
Taxiing (TAX)
Intelligent stand allocation



智能资源分配
Intelligent resource allocation



智能机务
Intelligent maintenance work



旅客中转连接时间预测
Passenger transit connection time prediction

空中飞行
Inbound

进近/
Approach

降落
Landing

滑行/停靠
Taxi/dock

上轮档
In block

下机
Deplaning



ACDM智能协同/数字运行决策
ACDM intelligent collaboration / digital operation decision-making



智能运行预测
Intelligent operation prediction

地面服务
Ground service



机器人清洁
Robot cleaning

无人驾驶接驳
Driverless connection

本场起飞
Take off

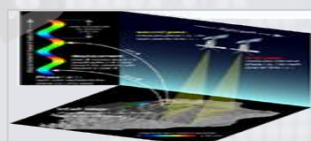
滑行/推出
Taxi/push out

撤轮档
Off block

关舱门
Cabin door closed

登机
Boarding

利用人工智能对航班恢复进行分析预测，智能动态调整航班运行，部署资源分配方案
Artificial intelligence is used to analyze and predict the flight recovery, intelligently adjust the flight operations, and deploy the resource allocation plans



智能航班恢复
Intelligent flight recovery



无人驾驶摆渡
Unmanned shuttle

生物识别登机
登机口开放时间预测
登机开始时间
登机结束时间预测
Biometric recognition boarding
Gate opening time forecast
Boarding start time
Boarding end time prediction

人工智能在智慧机场旅客流的应用设计

Application Design of Artificial Intelligence in Passenger Flow of Smart Airport



出行前
Pre-travel



1. 智能客服

1. Intelligent customer service

抵达机场后

After arrival at the airport



2. 机器人泊车

2. Robot parking



3. 机器人行李托运

3. Robot baggage check-in



4. 虚拟迎宾

4. Virtual reception

人工智能感知的全流程信息服务

Artificial intelligence-aware full-process information service

- ✓ 公共交通信息 Public transportation information
- ✓ 航班信息 Flight information
- ✓ 旅客定位和导航 Passenger positioning and navigation
- ✓ 停车收费信息 Parking charge information
- ✓ 行李信息 Baggage information
- ✓ 餐饮、商业信息 Catering, business information
- ✓ 安检排队信息 Security inspection queuing information
- ✓



登机

Boarding

8. AR体验、精准营销

8. AR experience, precision marketing



7. 人机交互服务

7. Human-computer interaction service



6. 生物识别值机、通关、登机

6. Biometric check-in, customs clearance, boarding



候机

Waiting

5. 智能向导

5. Intelligent guide



办理手续

Handling formalities

人工智能在智慧机场行李流的应用设计

Application Design of Artificial Intelligence in Baggage Flow of Smart Airport



6.行李自动分拣, 装载, 卸载
6. Automatic sorting, loading and unloading of baggage



装载/卸载机器人
Loading/unloading robot

7.无人牵引器运输行李至指定机位
7. Unmanned tractor transporting baggage to designated aircraft



5.行李自动导引运输
5. Automatic guided transportation of baggage

中转行李
Transit baggage

4.RFID跟踪行李处理全程
4.RFID tracking baggage handling

RFID识别与跟踪
RFID identification and tracking

行李智能安检
Intelligent security inspection of baggage

行李智能安检
Intelligent security inspection of baggage

RFID识别与跟踪
RFID identification and tracking

2.行李智能辨认识别
2. Intelligent identification of baggage

3.RFID粘贴机器人
3.RFID paste robot

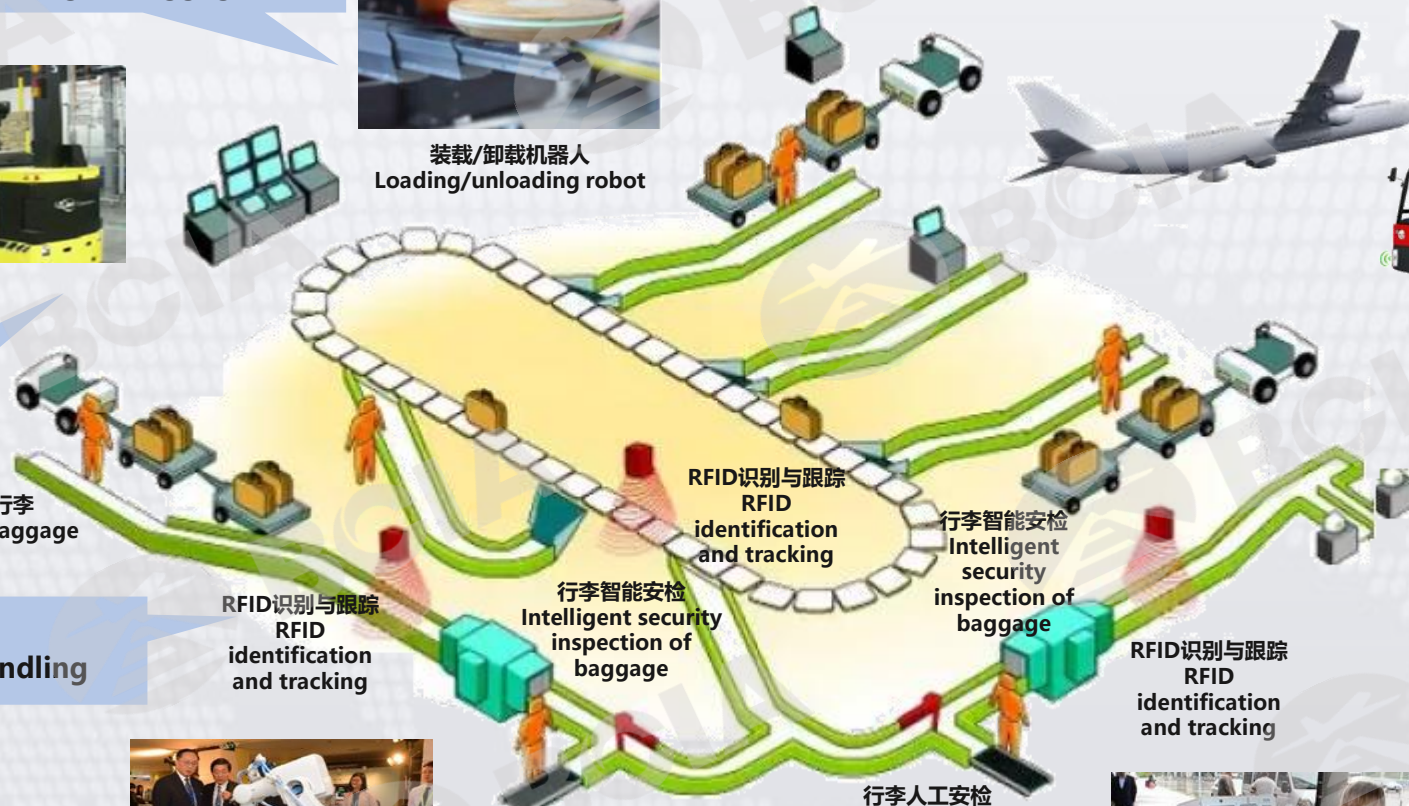


行李人工安检
Manual security inspection of baggage

行李人工安检
Manual security inspection of baggage

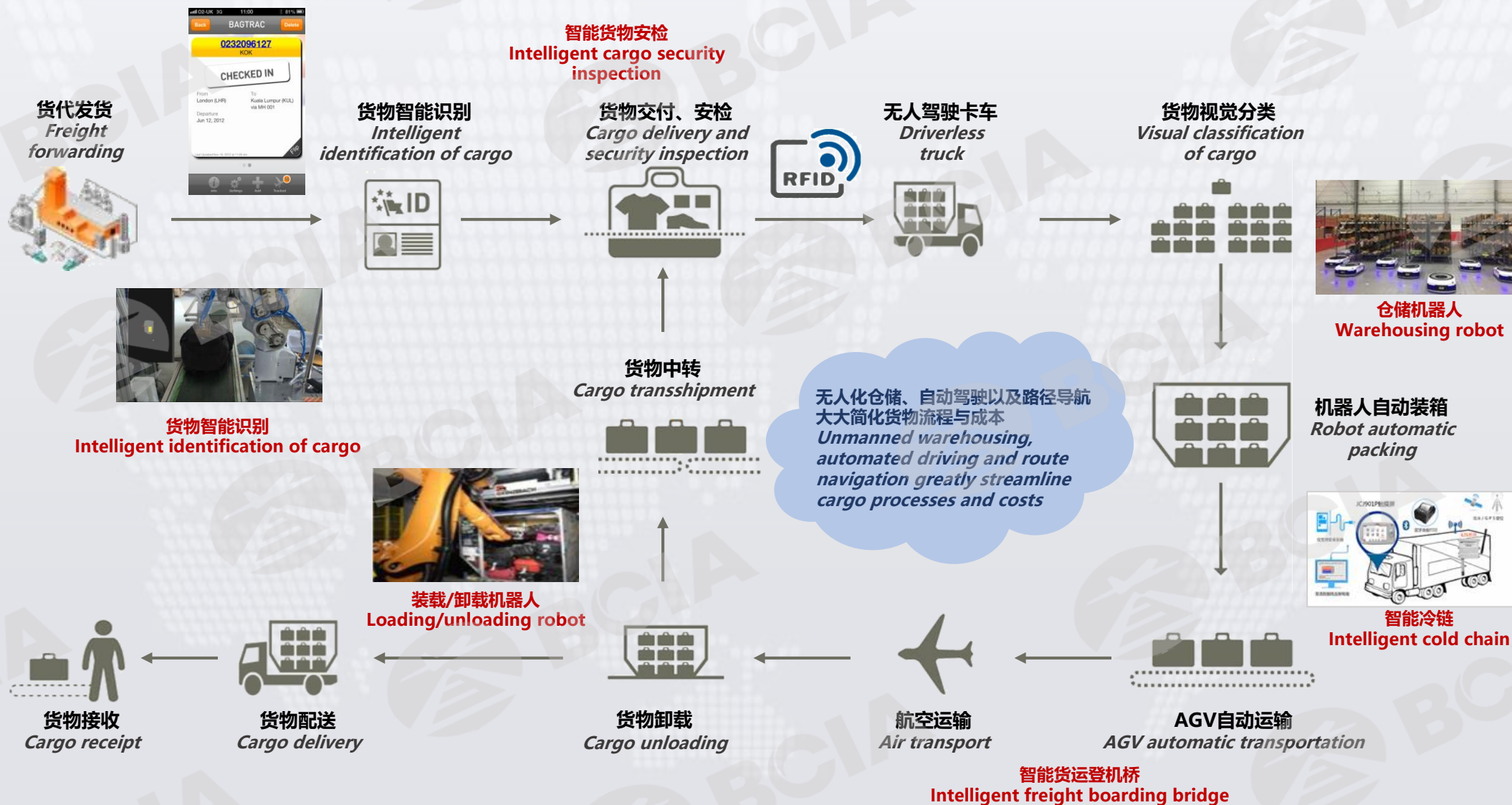


1.行李搬运机器人自动跟随旅客
1. Baggage handling robot automatically following the passengers



人工智能在智慧机场物流的应用设计

Application Design of Artificial Intelligence in Logistics of Smart Airport



人工智能在智慧机场交通流的应用设计

Application Design of Artificial Intelligence in Traffic Flow of Smart Airport



BIM/GIS定位
BIM/GIS positioning

2. 智能道路交通管理
2. Intelligent road traffic management

1. 智能导航
1. Intelligent navigation



AR/VR虚拟化导航
AR/VR virtualized navigation



3. 智能行人管理
3. Intelligent pedestrian management

4. 智能公共交通
4. Intelligent public transportation



智能交通优化
Intelligent traffic optimization

5. 场道交通管理
5. Airfield traffic management

摆渡车、客梯车、行李传送车、飞机牵引车、加油车等
Shuttle bus, passenger boarding stairs, self-propelled conveyer-belt loader, aircraft tractor, fuel truck, etc.



无人驾驶车辆
Driverless vehicle

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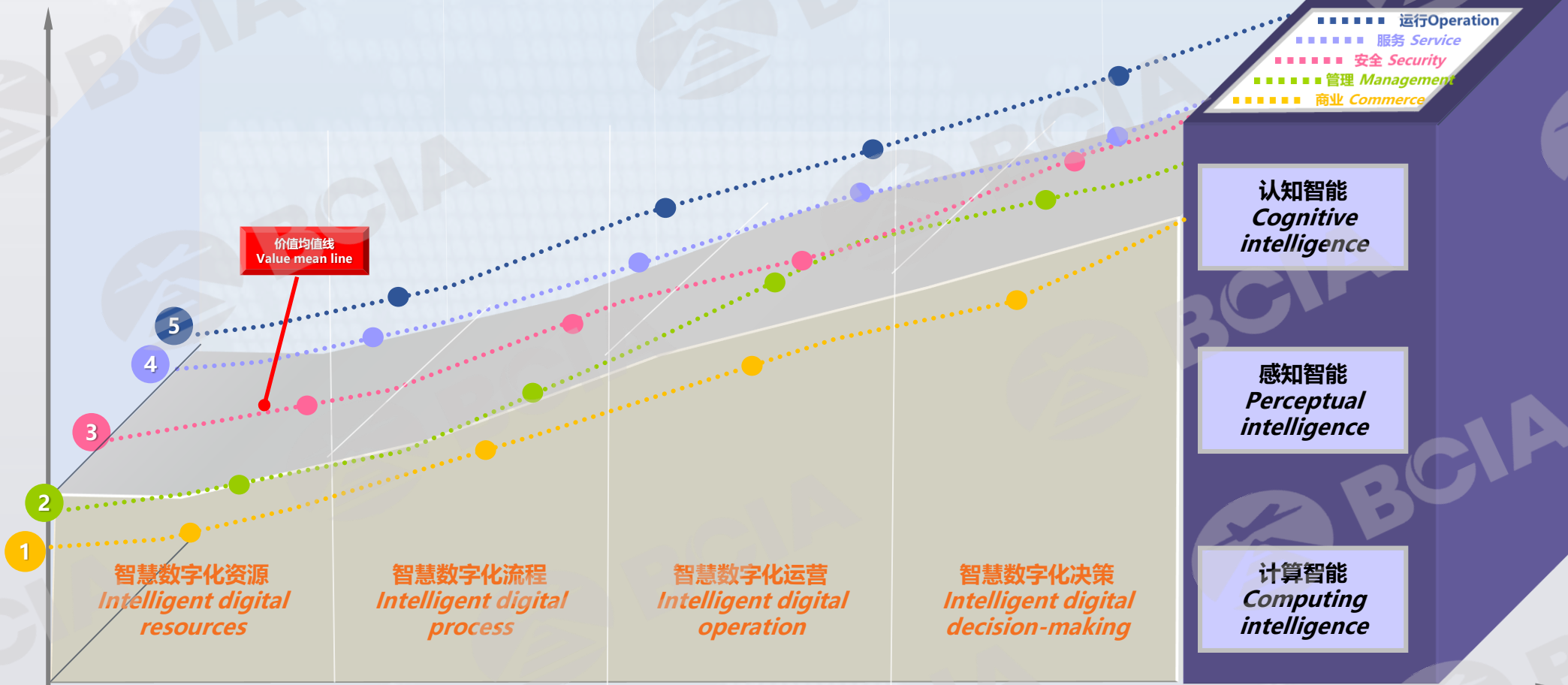
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Artificial Intelligence Advancement Implementation Route of Smart Airport

人工智能驱动下的智慧机场进阶阶段

Artificial Intelligence Advancement Implementation Route of Smart Airport



业务价值
Business value



低 Low

高 High

人工智能成熟度
Artificial intelligence maturity

智慧机场人工智能实施路线图

Artificial Intelligence Implementation Roadmap of Smart Airport





谢谢!
Thanks!

北京首都国际机场股份有限公司
Beijing Capital International Airport Co., Ltd.