Ping An's AI + Financial Service

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Talk： S9863

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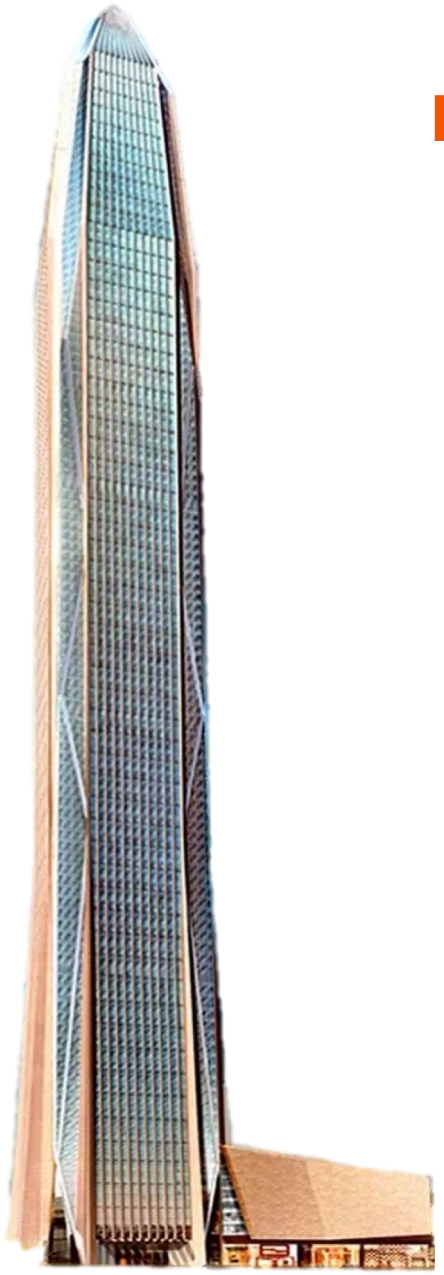
Ping An's Development and Strategy
Corporate Introduction



Rising on Fortune's List

2018 No.29

2017 No.39

2016 No.41

2015 No.96

2014 No,128

2013 No.181

2012 No.242

2011 No.328

2010 No.383

2008 No.462

1988 Officially Established

Domestic and Foreign

- No.16 in 2017 **Forbes** Top 2000 companies
- No.1 in global insurance companies

- No.61 in 2017 Top 100 global most valuable brands
- No.1 in global Insurance companies

- No.79 in **Brand Finance** 2017 Top 500 global most valuable brands
- No.1 in global Insurance companies

- China's most respected company for 16 years
- Best corporate citizen for 12 times

- Asian excellence awards, Best CEO, Best CFO for years.

One-Day Snapshot of Ping An

Clients

150 million clients

one Ping An client for every 10 Chinese

Research Expenditure

1% of revenue

over 1 billion RMB in 2017

Insurance Cases

31,000 cases per day

98.7% cases compensated in one day

Call Center

96 thousand calls per day

350 million calls per year

Market size

No.7 in global listed financial companies

No.1 in global Insurance companies

Revenue

2.6 billion RMB per day

970 billion RMB per year

Net Profit

270 million RMB per day

almost 90 billion RMB per year

Taxes

300 million RMB per day

almost 100 billions in 2017

Insurance Claims

384 million RMB per day

almost 140 billion RMB per year

Employees

1.8 million internal and external employees

one Ping An-er in every 800 Chinese

over 22 thousand IT and research experts

Strategic Objectives

中国平安 PING AN
金融 · 科技

World-leading technology-powered personal financial services provider

Industry Focuses

Pan Financial Assets | **Pan Health Care**

Development Models

Finance + Technology | Finance + Ecosystem

N Pillars

Insurance	Banking	Asset Management	Financial Services Ecosystem	Health Care Services Ecosystem	Auto Services Ecosystem	Real Estate Finance Ecosystem	Smart Cities Ecosystem

Tech platform

Group Technology Platform AI - Block Chain – Cloud - Big Data - Security

Deep Learning Heterogeneous Computing Platform

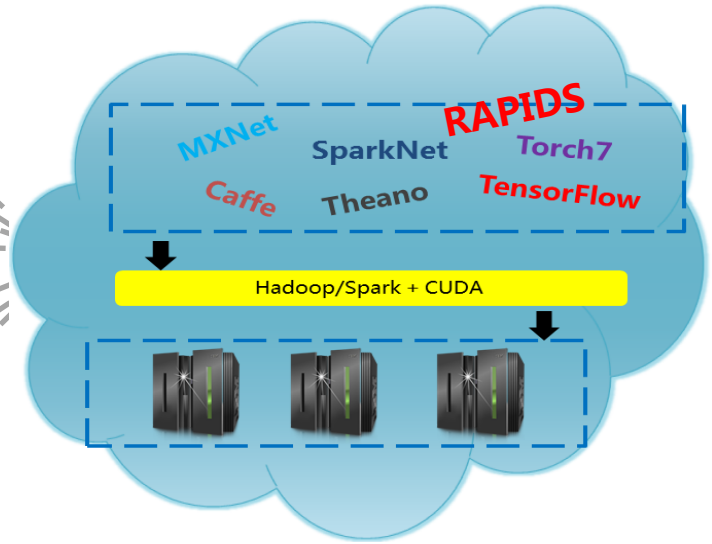
Unstructured data

- Images
- Audio
- Video
- Text

Structured dada

- User data
- Transaction data
- Geograph data

Deep Learning Service



Heterogeneous Computing Platform Service

Application Scenarios

- Vehicle Damage Estimation
- License Plate Recognition
- Healthcare
- Voiceprint Recognition
- Outbound Robot
- OCR Recognition

Empower financial and insurance technology

Ping An Advantages on AI + Finance

All Licenses
integrated
finance company

30 Years
Financial industry
experiences

400+
AI application
scenarios

99.84%
Face recognition
accuracy

99%+
Voiceprint
recognition
accuracy

400+
Technology patents

8
Data centers

Deep Learning
Cloud platform

Million+
Samples
Parallel computing
speed

Finance data

Healthcare data

Service data

Ping An Brain AI Engine

Applications

Risk Control	Fraud Detection	Precision Marketing	Health Management
Risk pricing Credit investigation	Claims fraud identification Network fraud identification	Data management platform LBS analysis	Intelligent health assistant Disease prediction

Reports	Operation Optimization	Intelligent Finance	Robotics
Statistical analysis Data visualization	Service flow optimization Salesman training optimization	Program trading Volatility analysis	Robot server Voice recognition Knowledge graph

Ping An Brain

AI Engine

BI	Structured	Unstructured	Prediction	Detection	Deep AI
Statistical Clustering Rules Engine Report visualization	Feature extraction/ selection Categorical regression	Text Mining Knowledge Graph Image Recognition	Classification Topic Identification Expert system	Time series analysis Relational network	Deep Learning Reinforcement learning Transfer learning

Profiling

User	Product	Channel
Basic, wealth, credit, spending, health, …	Function, business, cycle, price, profit	Types, user behaviors

Data

Data Storage	Data Processing and Management
Compression, Distribution	Cleaning, masking, integration, security, monitoring

Data Acquisition

Various data sources

2 Ping An's Smart Car Insurance Claims Solution

Introduction of Car Insurance Claims

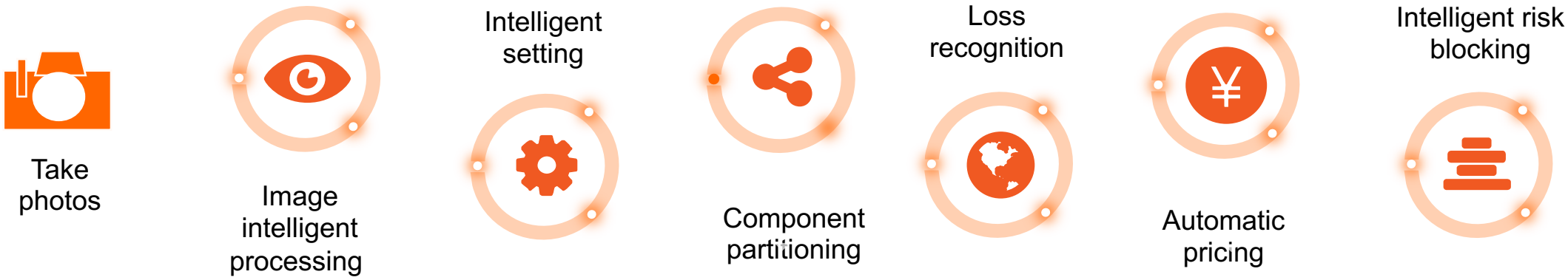
Pain points of traditional car insurance claims

- Car insurance claims process is lengthy and complicated
- The duration from accident occurrence to insurance compensation is long
- Owner's claim experience needs to be improved

Ping An's solution of smart car insurance

- Construct Deep Neural Network for vehicle detection and damage classification
- Achieve over 90% classification and detection accuracy
- Finish model training and inference on NVIDIA GPUs
- Use TensorRT for fast network optimizing and inference accelerating

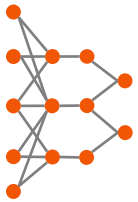
The process of Ping An's smart car insurance solution



Techniques of Car Insurance Claims

x 12

12 NVIDIA Tesla V100 for model training



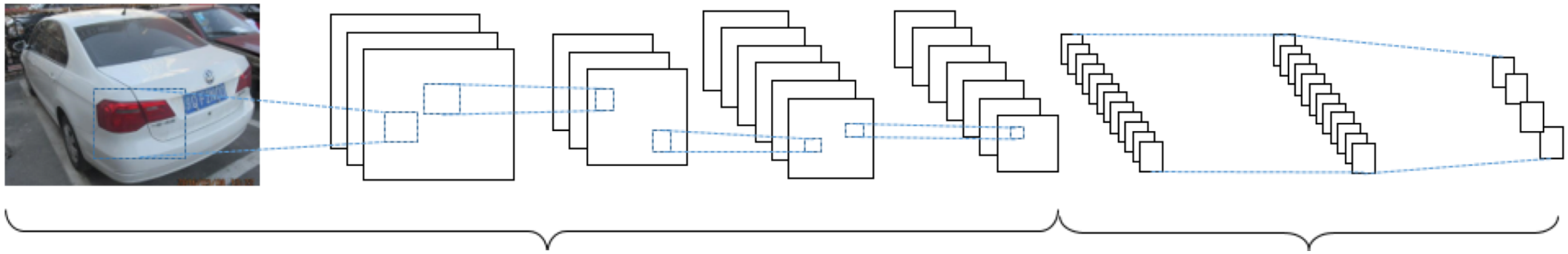
Trained Neural Networks

TensorRT Optimizer

TensorRT is used to:

- optimize the vehicle detection and damage classification models
- deliver low latency and high-throughput for the application
- provide a real time smart car insurance claim service

Car Image Classification



Feature extraction

Car model classification

Actual Case

Whole Car Image

(640*360 pixels)

Claim images from client A

Local contour features

30 convolution layers

Local part features

8 fully-connected layers

Combination feature

Car type classification

BMW 320

TOYOTA PRIUS

Audi A6

Past:5s (Human judge) | Now: 0.15s (AI Algorithm)

Over 90% acurracy

10 million compensation cases per year
Over 40 million vehicle images
Over 10 thousand car insurance investigators

38 layers Deep Neural Network

Intelligent Vehicle Damage Assessment & Claim

- Are the pictures acceptable?

Image Enhancement

Image Alignment

De-Noising

Image Editing Detection

Intelligent Vehicle Damage Assessment & Claim

- Part Segmentation and Recognition:

Intelligent Classification

Rearview mirror(right)	**Right front leaf**
Part number 13328534	**Part number 25886816**
Steel ring	**Right headlight**
Part number 9598038	**Part number 13354818**
Front bumper	**Front glass**
Part number 20827116	**Part number 20864731**

Smart Accessory Model Selection

Image Recognition

Car Model Library

FAW Audi A6L C7 (2012)

Number	Name
ADD1279YQA	Audi FV7201BACWG
ADD1280YQA	Audi FV7201BACWG
ADD1309YQA	Audi FV7201BACWG
ADD1310YQA	Audi FV7201BACWG
ADD1276YQA	Audi FV7251BBCWG
.....	

Connect

Accessory Library

Standard Name	Original Code	Originial Cost (CNY)
Engine Cover	L4GD823029	4007
Engine Cover	8R0823029H	12222
Front Bumper	L4B0807103BN7DL	2397
Front Bumper	L4GD807065AGRU	2860
Left Headlight	L4GD941005A	8421
Left Headlight	4F0941029DH	7036
Left Front Fender	L4GD821101A	1950
Left Front Fender	L4FD821103A	2127
.....		

Adding VIN Code

The Chosen Car Model

Lock

The Chosen Accessory Library

Intelligent Risk Blocking

8 Core Risks

Case Risk

- Online case risk
- Regional difference risk

Group Risk

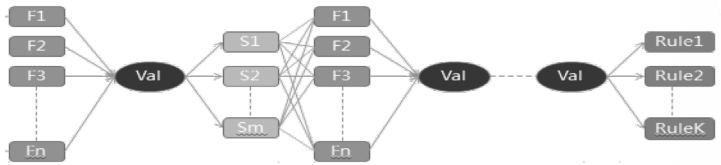
- Used car risk
- Risk of previously-damaged cars
- Risk of fake injury

Moral Hazard

- Repair factory and personnel risk
- Hospital and personnel risk
- Moral quality risk

Machine Learning

67 Risk Rules



- Online risk, regional institutional risk
- Risk of previously-damaged cars and fake injury
- Third party and claims personnel associated risk

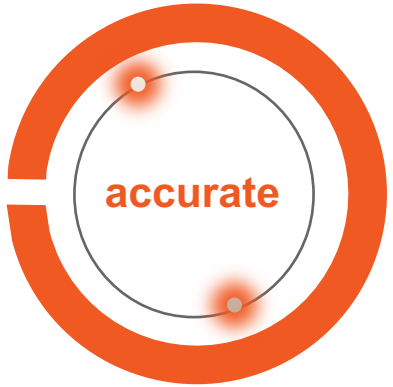
7 Risk Models

- Online risk, regional institutional risk
- Group risk
- Cost indicator data model

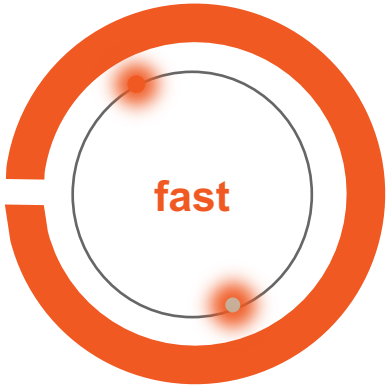
Production Efficiency

Loss Reduction

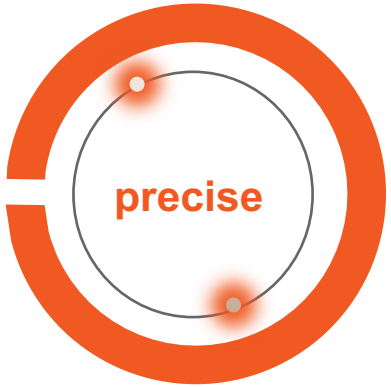
Intelligent Vehicle Damage Assessment & Claim



90%+ Accuracy



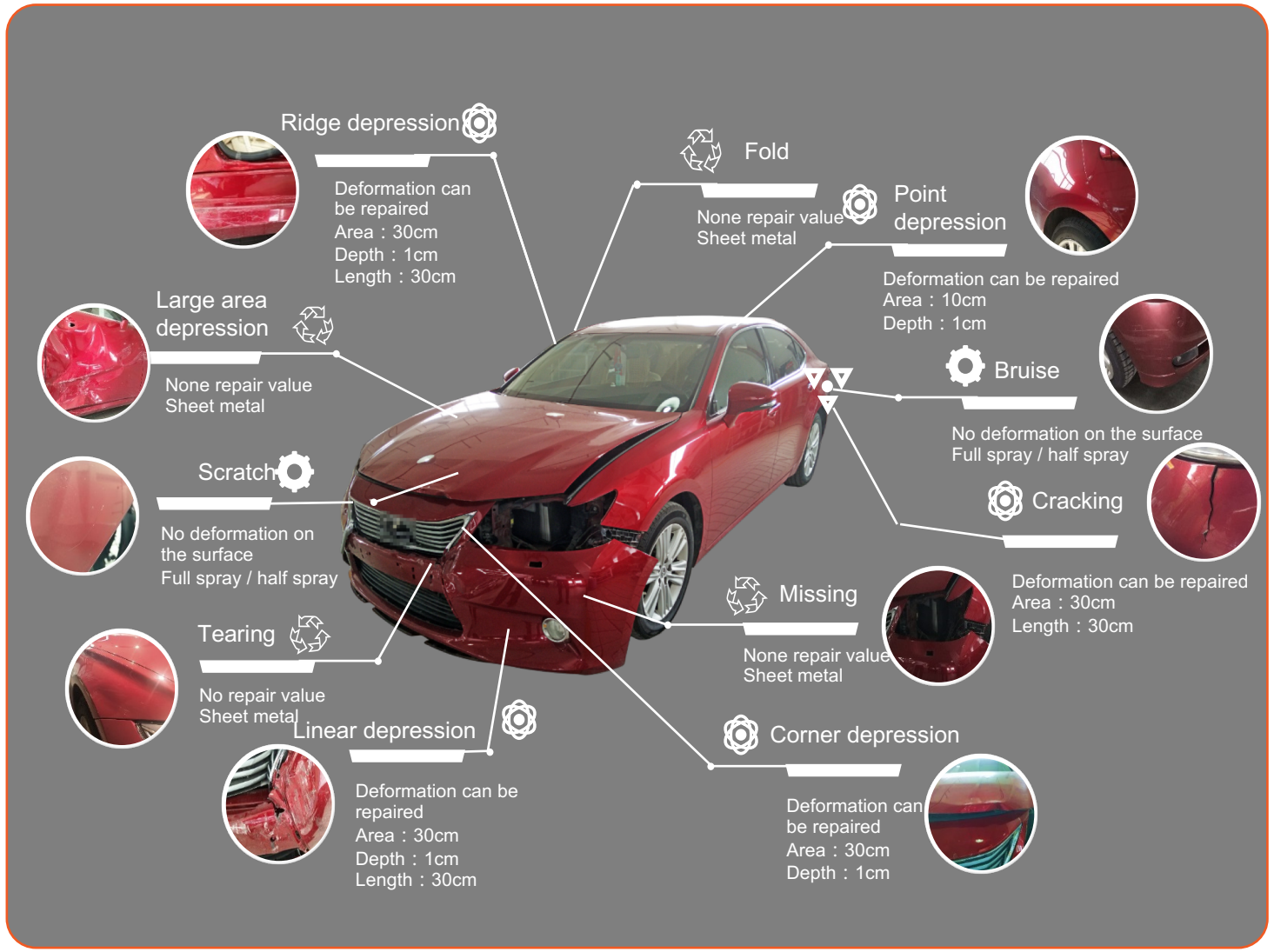
Done in Seconds



Precise Claim

Effective Risk Control

Intelligent Vehicle Damage Assessment & Claim



3 Ping An's AI and Financial Service

Ping An Voiceprint Recognition

Intelligent customer service uses voiceprint recognition technology to effectively enhance customer experiences

Credit card customer service | Half of the 40 million calls per year require customer service to verify the identity of the caller

Past

- Identity confirmation with 4-5 questions
- Takes about **1~4** minutes

Future

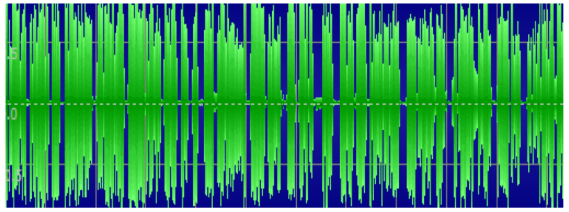
5s

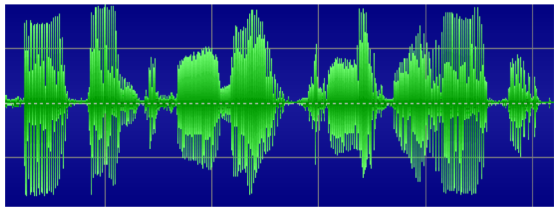
Save 500+ manpower Customer service cost annually

Speaker Verification

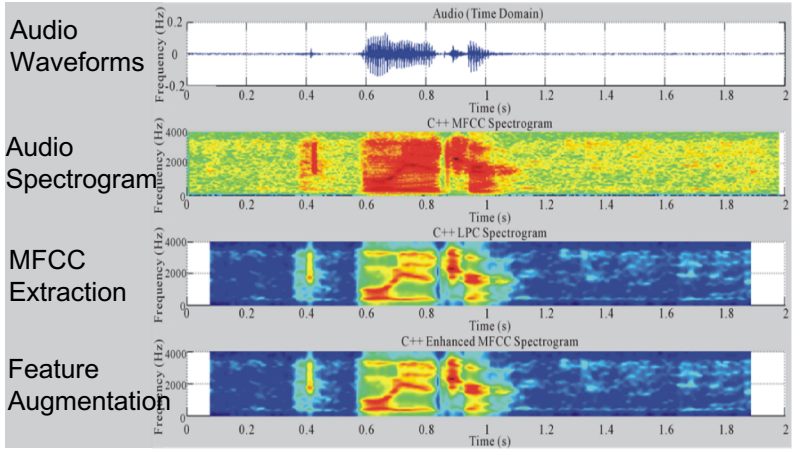
1 Channel extraction and waveform preparation

Channel that contains the customer's voice is extracted from phone conversations in call-center.
PCM waveforms are created for speaker verification.



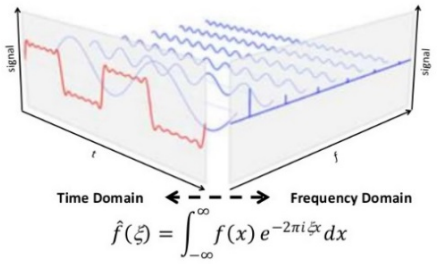


2 Extract MFCC features

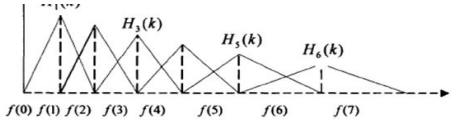


MFCC(Mel-frequency cepstral coefficients) is a representation of the short-term power spectrum
of a sound.

Fast Fourier Transforms



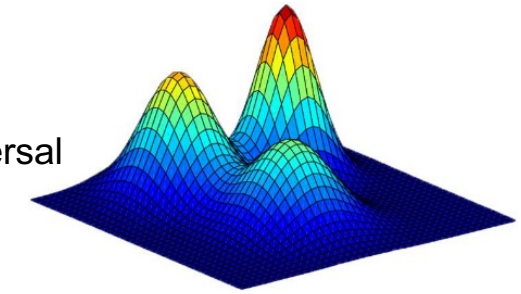
Triangular Hamming Window



3 Speaker Verification using i-vectors

3.1

Train GMM-based Universal Background Model



3.2

Train i-vector Extractor

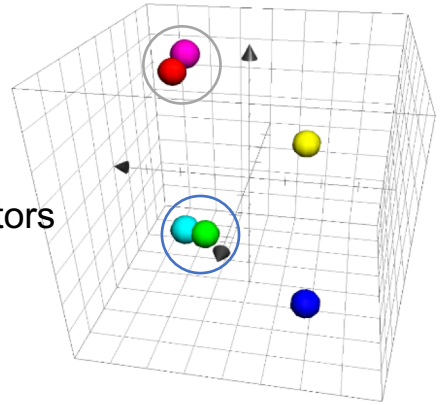
$$\mu_c = m_c + V_c y.$$

$$\mathrm{Cov}(y,y) = \left(I + \sum_c N_c V_c^* \Sigma_c^{-1} V_c\right)^{-1}$$

$$\langle y \rangle = \mathrm{Cov}(y,y) \sum V_c^* \Sigma_c^{-1} (F_c - N_c m_c)$$

3.3

Compare i-vectors

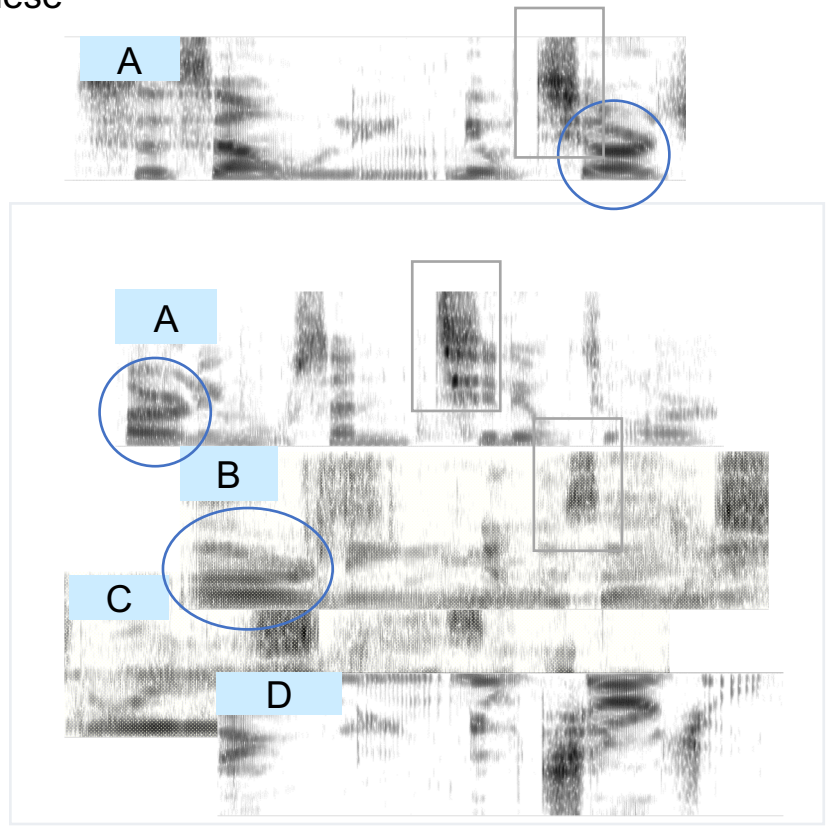


Speaker Verification

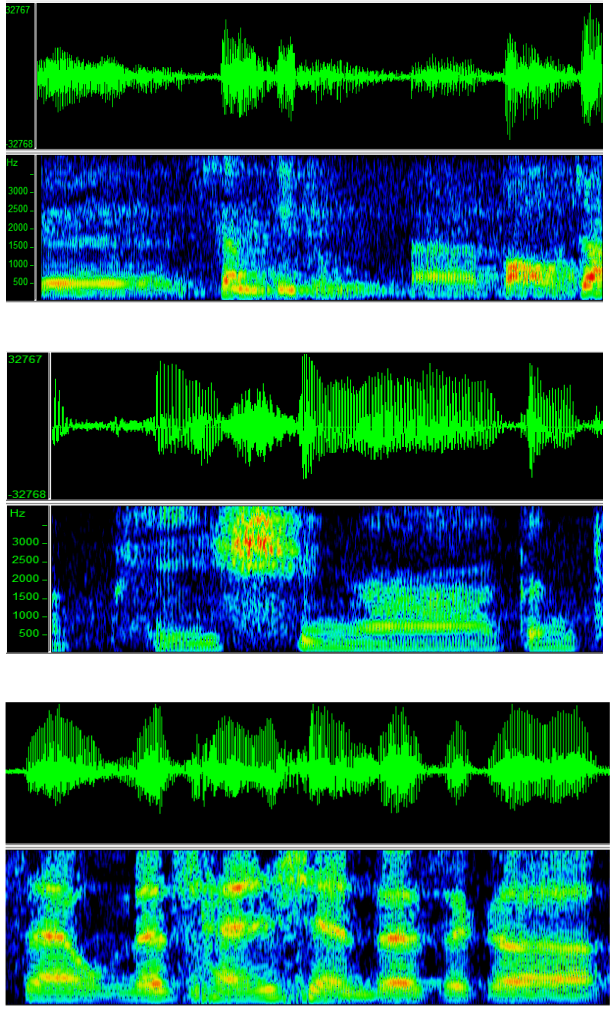
1 Text Dependent Speaker Verification

The spectrogram of 4 different speakers

Blue circles: when they pronounced “2” in mandarin Chinese



2 Text Independent Speaker Verification



Speaker A

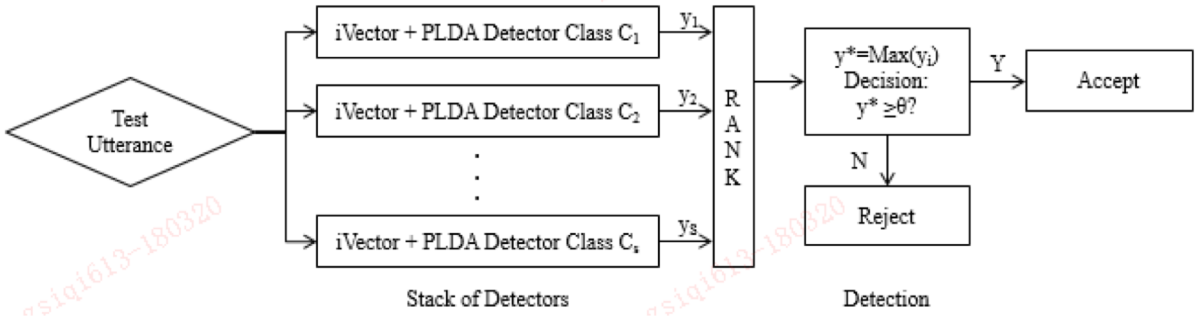
Speaker B

Speaker C

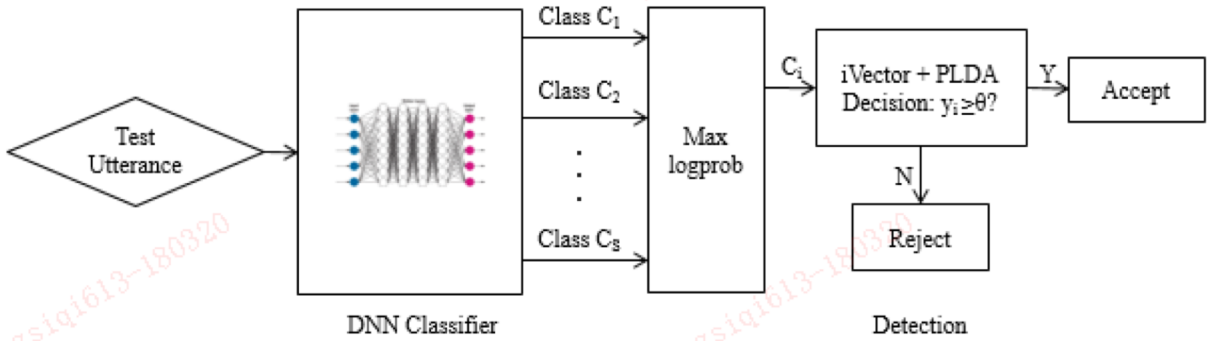
Multitarget Speaker Detector：Improve performance using DNN classifier

Multitarget Speaker Detection has been a challenging problem but has huge potential in applpications.

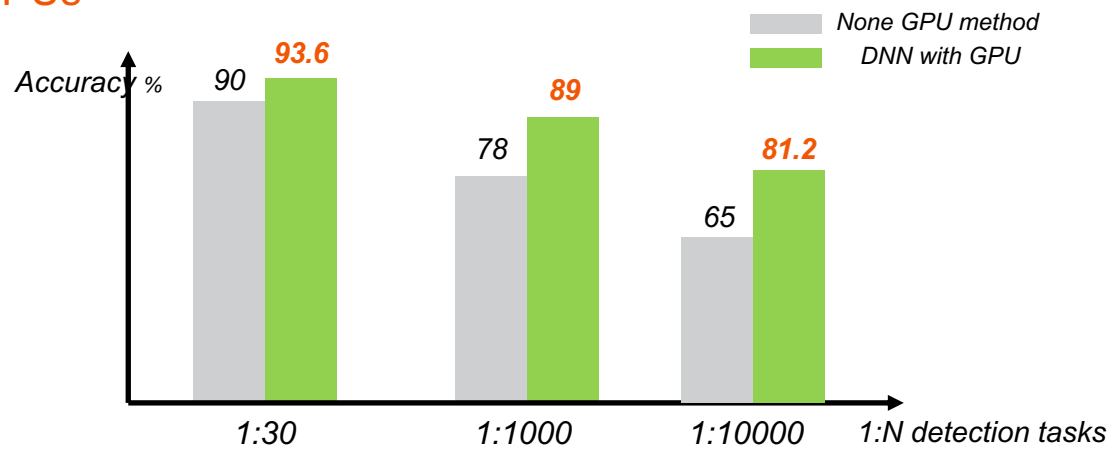
Traditional i-vector multitarget detector



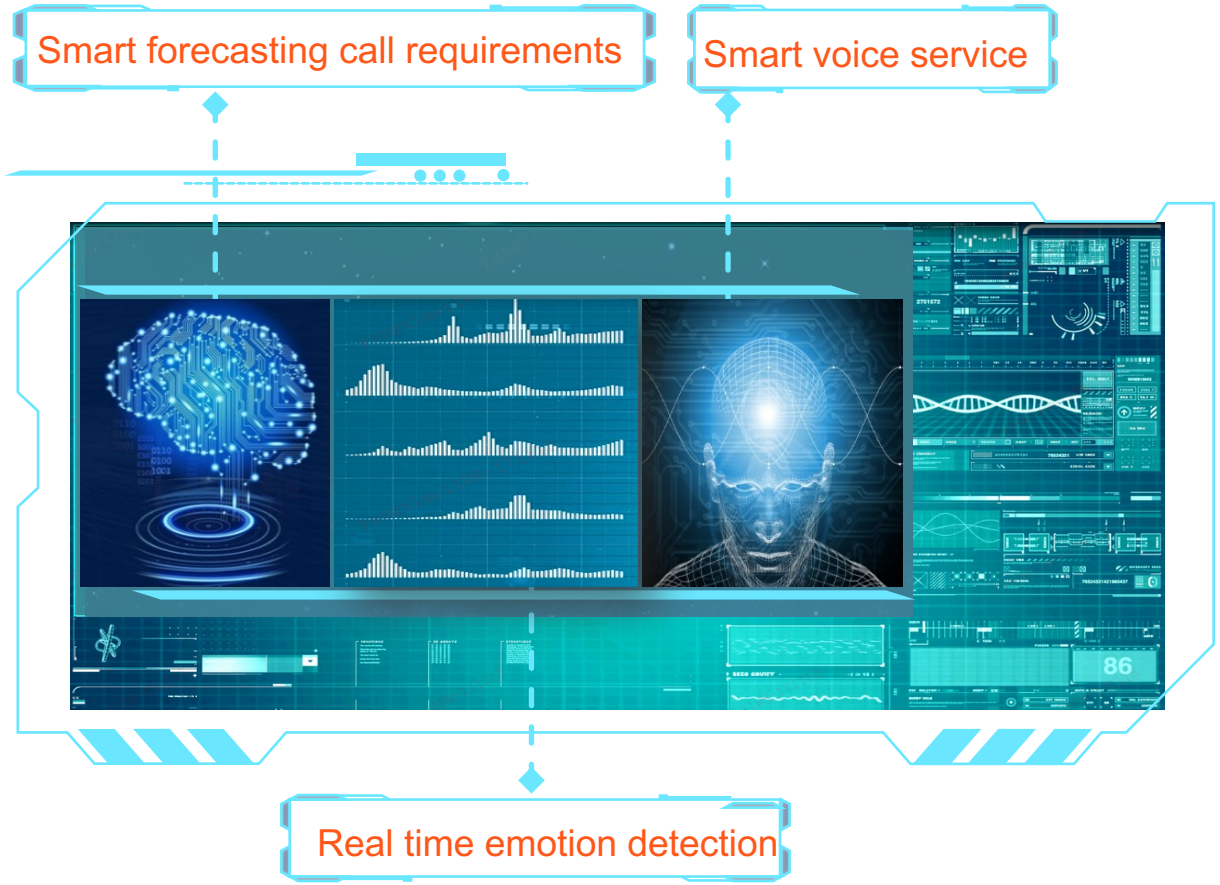
A novel multitarget detector using DNN classifier



Multitarget speaker detection Accuracy with the help of GPUs



Outbound Service Sales Robot: Text to Speech and NLP



Pain points

- Traditional insurance labor consumption is huge
- Unable to guarantee customer service attitude and quality
- Low insurance sales rate

Technique advantages

- Human-like vocal effects and dialogue rhythm
- Fast response with less than 1 second feedback
- Never with a bad temper
- High sale efficiency and reduction of human resources
- Better marketing effects

Outbound Service Sales Robot: Text to Speech and NLP

Personal information

Account information

Type of transaction

History record

.....

Ping An TTS engine

Prompt user information

.....

IVR

.....

Automatic call

Telephone system platform

User Text

Pre-processing

Lexical analysis

Phoneme analysis

Duration model

Acoustic characteristics

Baseband Model

Spectrum characteristics

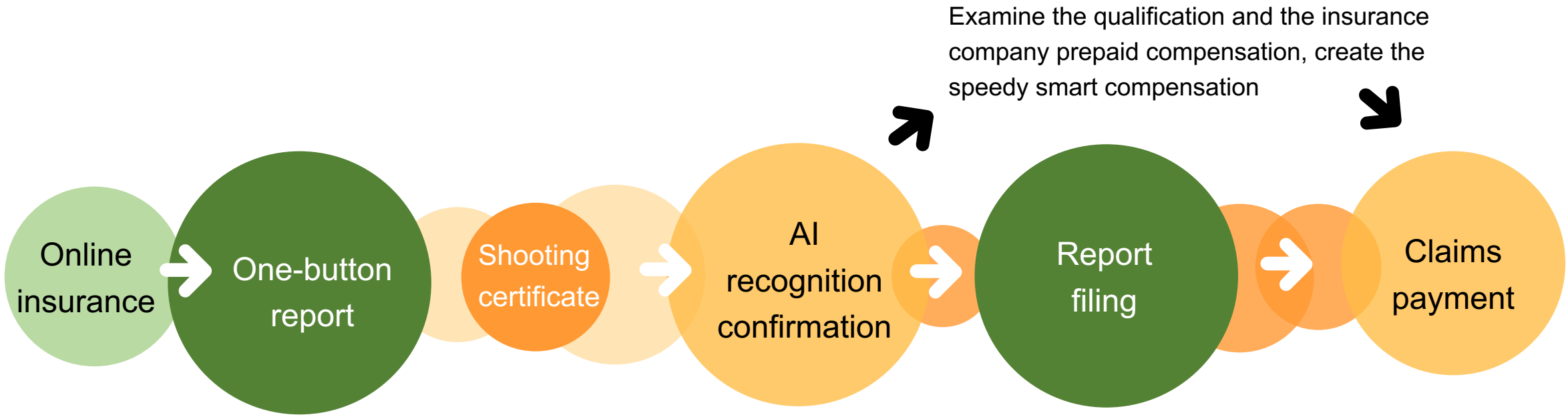
HMM model

MLSA vocoder

Synthesized speech

Broadcast

Livestock Identification for Agriculture Livestock Insurance



Fast

Farmers quickly receive the response of the corresponding department and obtain the compensation.

Efficient

The linkage mechanism between animal husbandry insurance and harmless treatment of dead animals is accelerated.

Visible

Farmers can be informed about the claims progress and amounts, and the transparent process is traceable.

Secure

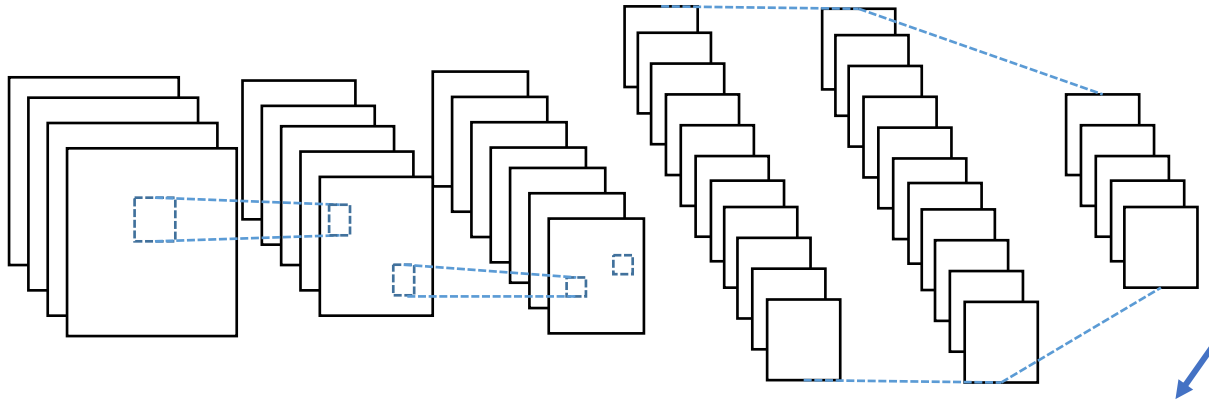
Pig’s identity is detected with an approach non-intrusive to the pig's body.

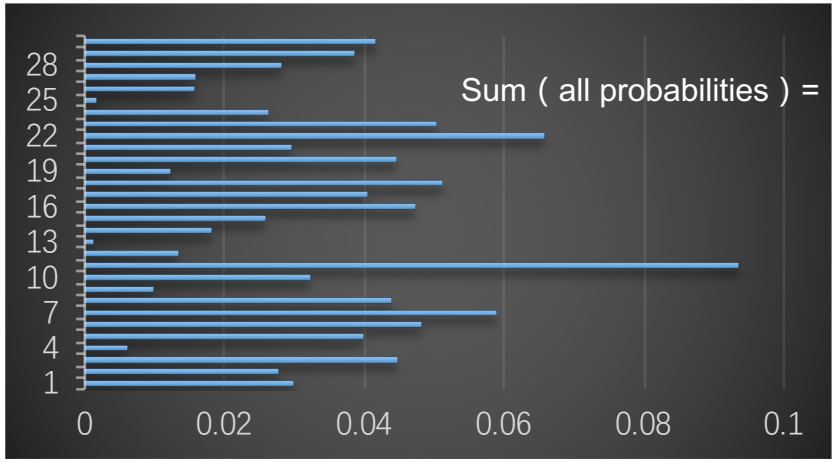
The Principle of Livestock Identification

No.1

Take pig identification as an example:

convolution down sample convolution Full connection Full connection Full connection output





Select value

Max (all prob.)

corresponding identity tag

11

Ears
Nose

Trotters

tail

get the probability distribution

compare database

"Livestock Identification" Application Case: Farm Information Management System

Environmental monitoring

The system will return real-time temperature, humidity, and harmful gas concentrations to sensors based on agriculture production to provide early warning of extreme environments, safeguard the health of livestock and help managers make accurate management decisions.

Green traceability

For livestock within the system coverage, the entire process from birth to death can be fully recorded and monitored. Through database and blockchain technology, tools for quality and safety traceability can be provided to effectively enhance the farm brand image.

One-click insurance

For animals that have registered their identity information, the system provides a one-button insurance function, eliminating the need for cumbersome data submission and qualification audits, and enjoying swift claims privilege when submitting claims, making farming easier and safer.

Employee information

Combined with multimodal recognition technology, employee identity information can be entered after successful identification. In addition, the face attendance system can be embedded to complete employee information management. Moreover, it also provides reminders of farming schedules and becomes the intimate housekeeper.

Culture records

After each animal is individually scanned for identity, it jumps to the information record interface and can record the animal's age, feeding status, health status, presence of health risks, etc. anytime anywhere.

Agriculture planning

The management system and camera monitoring can dynamically determine the number of livestock, and achieve self-planning of livestock breeding progress, aquaculture methods, according to market demand and current aquaculture conditions, and cage efficient scheduling.

Anti-fraud in Healthcare Insurance

Medicine fraud

Share medical insurance card

Clinic fraud

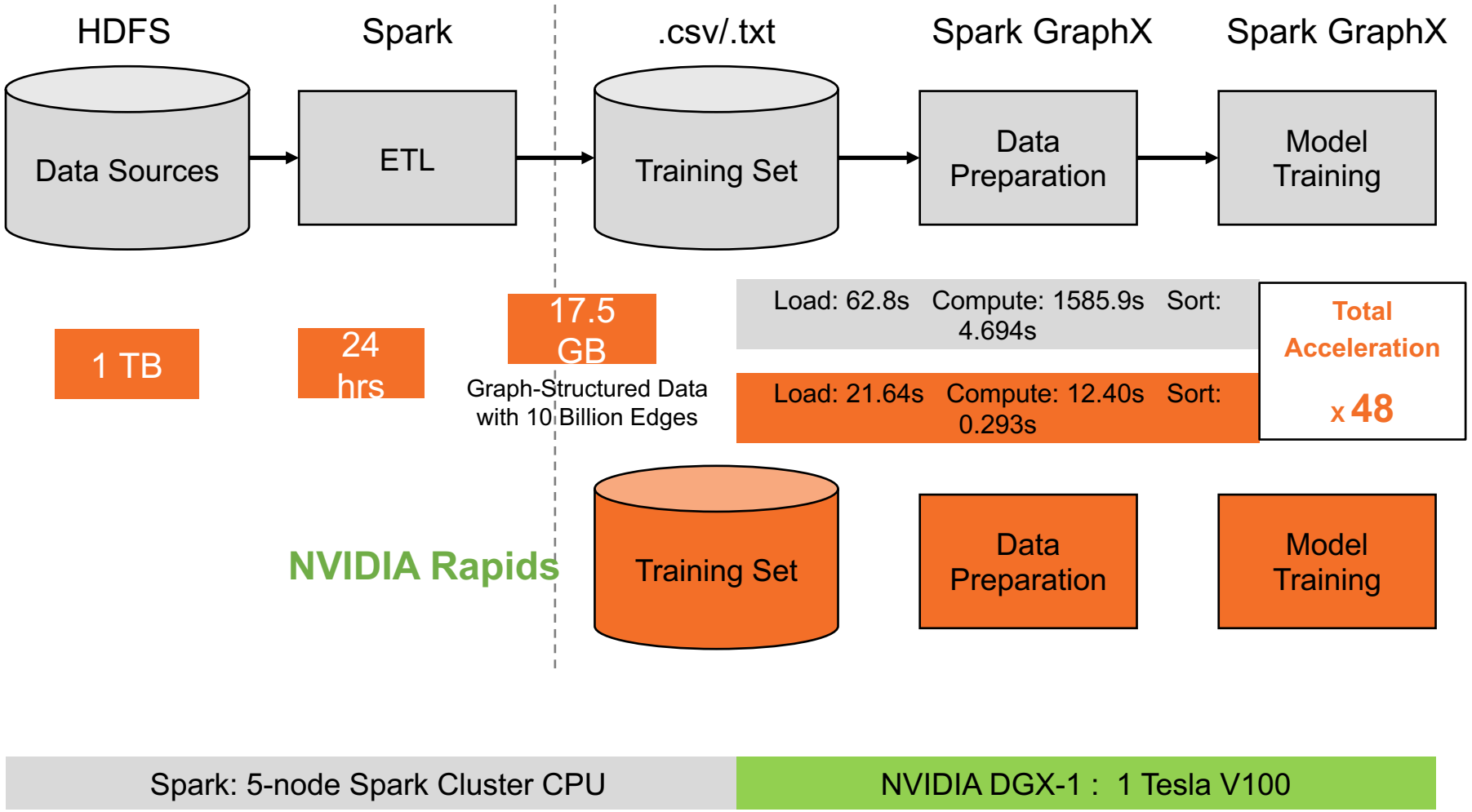
Hospital stay fraud

Over treatment

Constructing Transaction Graph for Fraud Detection

Prescription Anti-fraud Using cuGraph

The whole progress of PageRank



Comparison of Graph Algorithm PageRank between GraphX on CPU and Rapids on GPU

Before:

We deploy fraud detection algorithms like PageRank on CPU cluster servers using Spark GraphX platform.

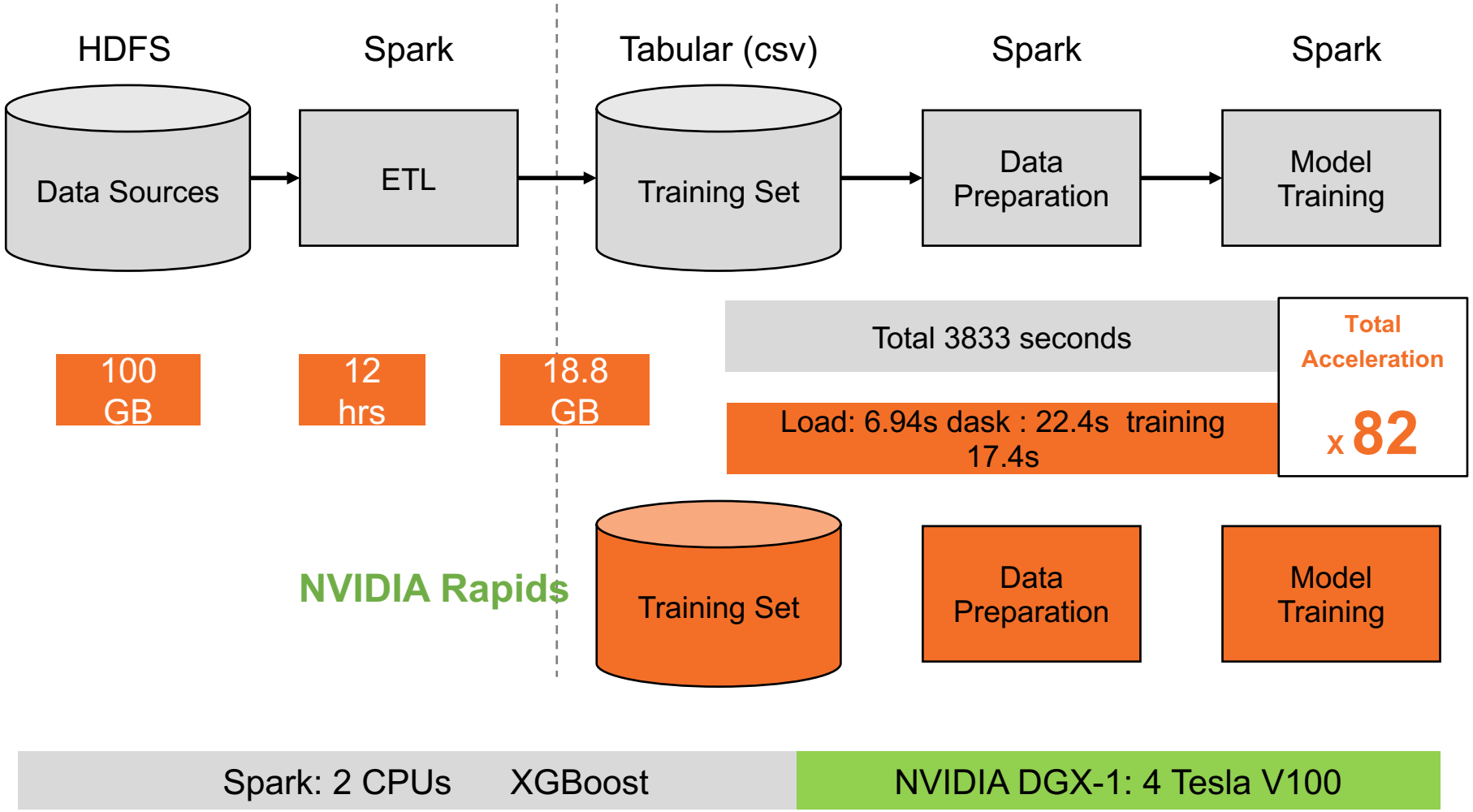
Now:

With the support of Rapids, we can deploy PageRank on our DGX-1 GPU server using cuGraph, the computation and data loading time is much less.

Model iteration time:

The model iteration time can be reduced from weeks to days which helps to detect up-to-date fraud behaviors and reduce loss.

Public Health Disease Prediction



Comparison of Machine Learning Algorithm XGBoost between Spark on CPU and Rapids on GPU

Before:

We deploy disease prediction algorithms like XGBoost on CPU cluster servers using Spark platform.

Now:

With the support of Rapids, GPU can run XGBoost with a faster loading and training which can help iterate the prediction model for better performance.

Model iteration time:

The model iteration time can be reduced from weeks to hours by implementing algorithms on Rapids instead of Spark.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