Global and China L4 Autonomous Driving Industry Report, 2019-2020

May 2020

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STUDY GOAL AND OBJECTIVES

This report provides the industry executives with strategically significant competitor information, analysis, insight and projection on the competitive pattern and key companies in the industry, crucial to the development and implementation of effective business, marketing and R&D programs.

REPORT OBJECTIVES

- To establish a comprehensive, factual, annually updated and cost-effective information base on market size, competition patterns, market segments, goals and strategies of the leading players in the market, reviews and forecasts.
- To assist potential market entrants in evaluating prospective acquisition and joint venture candidates.
- To complement the organizations' internal competitor information gathering efforts with strategic analysis, data interpretation and insight.
- To suggest for concerned investors in line with the current development of this industry as well as the development tendency.
- To help company to succeed in a competitive market, and

METHODOLOGY

Both primary and secondary research methodologies were used in preparing this study. Initially, a comprehensive and exhaustive search of the literature on this industry was conducted. These sources included related books and journals, trade literature, marketing literature, other product/promotional literature, annual reports, security analyst reports, and other publications. Subsequently, telephone interviews or email correspondence was conducted with marketing executives etc. Other sources included related magazines, academics, and consulting companies.

INFORMATION SOURCES

The primary information sources include Company Reports, and National Bureau of Statistics of China etc.

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Abstract

Giants gain high finance. Progress of L4 autonomous driving is greatly hampered over the recent two years, causing OEMs' and Tier 1 suppliers' delay in L4 launches. Yet, the top L4 companies still raised huge funds in the past year.

Companies	Financing	Investor (s)
Waymo	USD 2.25 bn	Invested by Silver Lake, Canada Pension Plan Investment Board and Mubalada with the participation of Magna, AutoNation and Alphabet
Argo AI	USD 2.6 bn from VW in July 2019	VW, Ford
Uber ATG	USD 1 bn in 2019	Toyota, SoftBank and Denso
Aurora	USD 530 mln in Feb. 2019	Amazon, Sequoia Capital and Shell
Voyage Auto	USD 31 mln in B round in Sept. 2019	Invested by Franklin Templeton with the participation of Khosla Ventures, InMotion Ventures (under Jaguar Land Rover) and Chevron Technology Ventures
Pony.ai	USD 500 mln in Feb. 2020	Invested by Toyota with the participation of existing investors
WeRide	Tens of millions of dollars in early 2019	SenseTime and ABC International
UISEE	Financing in early 2020	Bosch, Shenzhen Capital Group, China Capital Investment Group, Xiamen Septwolves
DeepRoute.ai	USD 50 mln in Feb. 2019	Invested by FOSUN RZ Capital with the participation of GoldenSand Capital, Yunqi Partners, Ventech China, Green Pine Capital Partners
AutoX	USD 100 mln in Sept. 2019 Tens of millions of dollars in Dec. 2019	Dongfeng Motor, Shenzhen Qianhai Hongzhao Fund
Didi Woya	USD 300 mln in Mar. 2020	SoftBank
QCraft	Tens of millions of dollars in Mar. 2020	IDG Capital, Vision Plus Capital, Tide Capital

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In 2019, Baidu, Pony.ai and WeRide succeeded in commercial pilot of Robotaxi on complex urban roads in limited areas, a crucial step for L4 autonomous driving in China.

L4 autonomous driving technologies starts to find real application but gets deployed by most players first in one scenario or two as the current L4 cannot be perfectly suited to all driving scenarios.

It is shown from the planning of the OEMs and the providers of technical solutions for autonomous driving that L4 autonomous driving will be commercialized in limited scenarios ahead of open scenarios in the following three to five years.
Baidu, UISEE, DeepBlue and Trunk Tech all have conducted L4 trials in limited scenarios such as parks, ports, and airports. Besides, Baidu, Momenta, Bosch, ZongMu and UISEE are vigorously deploying in the parking lot scenario.

Deployments in open scenarios cover Robotaxi on urban roads and autonomous trucks on the expressways. In the Robotaxi field, Waymo, Baidu, Pony.ai, and WeRide have carried out pilot projects in both China and the U.S. in specific areas of a city, manned by safety officers, and WeRide is already open to the public in Nov.2019. Software & hardware technology iteration and larger-scale tests are essential for open Robotaxi in wider areas.

Scenarios Where L4 Autonomous Driving Get Applied

Scenario	Scenario Features	Players
Automated Parking	The closed scenario poses requirements on parking facilities	Bosch, Baidu, ZongMu, HoloMatic, etc.
Cargo Transportation in Closed Areas	Closed scenario; unified scheduling; low complexity of roads	Trunk Tech, UISEE, etc.
Trunk Logistics	Fixed route; driving on highway; mild complexity of roads	TuSimple, Volvo, Suning Logistics
Last-mile Delivery	Low speed; low risk; high complexity of roads	Meituan, JD, Cainiao Network, etc.
Commuting in Parks	Semi-closed scenario; low speed; low risk	UISEE, ZMP, Baidu, etc.
Autonomous Bus	Public scenario; fixed route; low speed; complex road conditions	Yutong Bus, DeepBlue, etc.
RoboTaxi	Higher operation cost of shared mobility and lower labor cost; run mainly on complex urban roads; a high demanding on autonomous driving technology	Waymo, Uber, NuTonomy, Ford, Cruise, Baidu, Pony.ai, WeRide, Voyag, etc.

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Technically, the current L4 autonomous vehicles for tests (or trial operation) are largely provided with the single-car intelligence solution. For safer autonomous driving, solution providers make vehicle's environment perception capability optimized ever. For instance, Voyage's G2 autonomous vehicle carries Velodyne's VLS-128 LiDAR system with a detection range up to 300 meters, tripling the capability of the 64-channel LiDAR installed on the 1st-Gen autonomous vehicle. Boasting 29 cameras, Waymo's next-generation autonomous driving system enables a detection range of 500 meters whist improving LiDARs' performance significantly.

Also, it is of vital importance to enhance vehicle's motion perception competence. High-precision positioning can be realized by integrating high-precision positioning modules (composed of 5G modules, IMU and HD maps).

L4 Autonomous Driving Hardware Configuration of Some Solution Providers

Company	Baidu	NuTonomy	Wayve	Voyage		DeepRoute.ai	AutoX
Vehicle Model	Hongqi EV	Renault Zoe	Jaguar I-PACE	Ford Fusion	Chrysler Pacifica	Dongfeng Motor	Chrysler
Camera	9	6		4	4	8	12
LiDAR	A 40-channel LiDAR	A LiDAR		A 64-channel LiDAR	A 128-channel LiDAR and 4 low-beam LiDARs	3	6 LiDARs
MMW Radar	1	5		5	5		6
Compute Unit	-	-	-	NVIDIA Titan X			
Others	2 high-precision positioning modules	GPS and IMU modules	GPS			GNSS	2 GPS/IMUs

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In the short term, either single-car intelligence solution or strong field terminal solution fulfills L4 autonomous driving in the confined areas, but in the long run, collaborative vehicle infrastructure system (CVIS) is the mainstream technology roadmap for L4 autonomous driving. Through CVIS, the vehicle is fully connected to the “X” as spatiotemporal dynamic traffic information are collected and integrated whilst the active safety control of vehicle and the collaborative management on roads are done for safer running of autonomous vehicle.

By analyzing the test data, Baidu concludes that CVIS can solve 54% of the problems encountered in road tests and 62% of the takeovers incurred by single-car intelligence, adding redundancy for autonomous driving safety.

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