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GLOBAL AUTONOMOUS VEHICLE MARKET 2021-2030

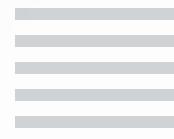
INTRODUCTION



- An autonomous vehicle or driverless vehicle can operate and perform critical activities without the need for human interaction. Owing to its ability to sense its surroundings. It senses the surroundings and navigates by generating a dynamic 3D map of that environment using artificial intelligence (AI) software, light detection and ranging (LiDAR), radio detection and range (RADAR), and cameras.
- The Society of Automotive Engineers (SAE) has defined six stages of driving automation, ranging from level 0 (completely manual) to level 5 (totally automated) (fully autonomous). The United States Department of Transportation has implemented these standards.
- Many automobile manufacturers, such as Ford, Volvo, and Tesla, have made leaps and bounds with self-driving technology, and many contemporary automobiles are equipped with a variety of autonomous technologies. Additionally, these vehicles have various advantages over traditional vehicles, including increased safety, reduced fuel consumption, and reduced traffic congestion and emissions due to lower gas use and battery capacity, resulting in less pollution. These aspects help to make it environmentally sustainable.
- The Global Autonomous Vehicle Market is valued at **24.36** Billion USD.
- The worldwide self-driving vehicle market is growing at a rate of **16 %** each year.
- In 2030, the autonomous vehicle market is expected to be worth **\$60** billion.

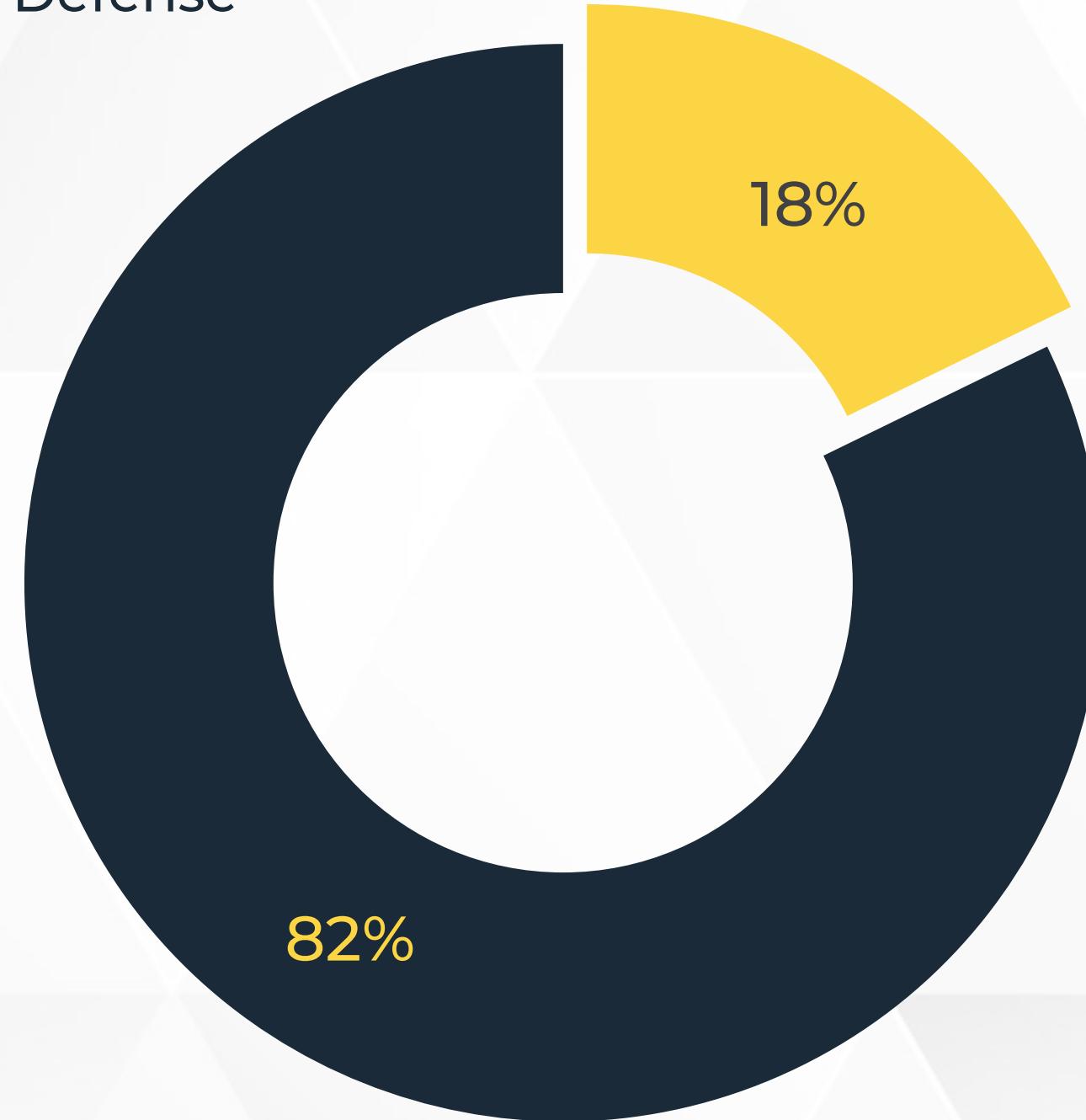
Market size 2020	24.36 Billion	20.3 Million Units
Market size 2030	75.98 Billion	64.7 Million Units

GLOBAL AUTONOMOUS VEHICLE SHARE BY APPLICATION



Global autonomous vehicle share by application

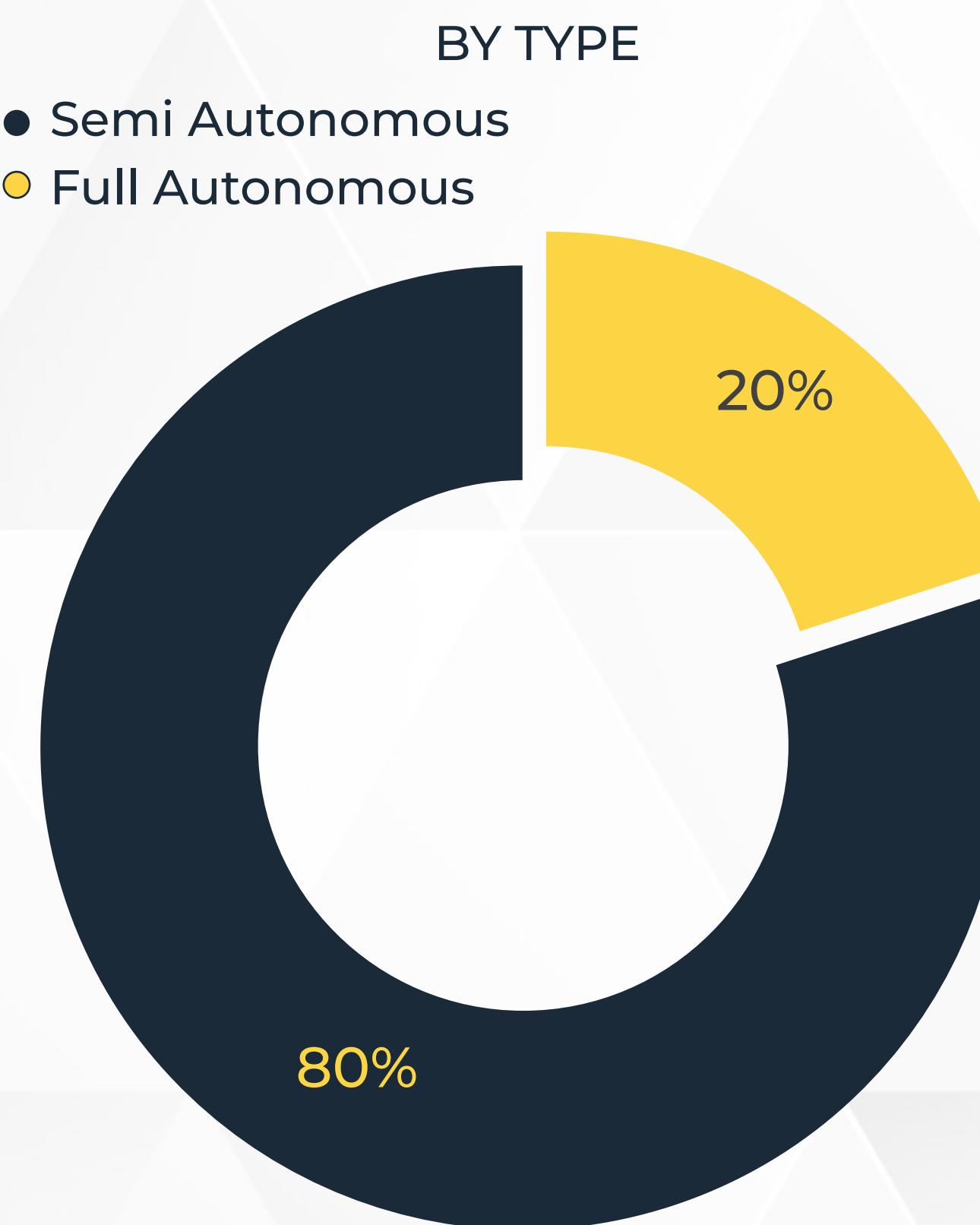
- Transportation
- Defense



The worldwide autonomous vehicles market is divided into two areas based on application: defense and transportation. The transportation category, for example, is expected to account for approximately 82 % of the market value share in 2020 and to continue to expand throughout the analysis period. The growing popularity of electric and hybrid vehicles with varying levels of automation has sparked a surge in demand for autonomous vehicles in transportation. Furthermore, public awareness of shared mobility in the business sector, as well as government assistance, has encouraged the trend of autonomous vehicles in the segment. However, the defense sector accounts for 18% of the market share and is predicted to emerge as one of the most important applications over the projection period as a result of numerous projects across various regions.

Source : KYM Global

GLOBAL AUTONOMOUS VEHICLE SHARE BY TYPE

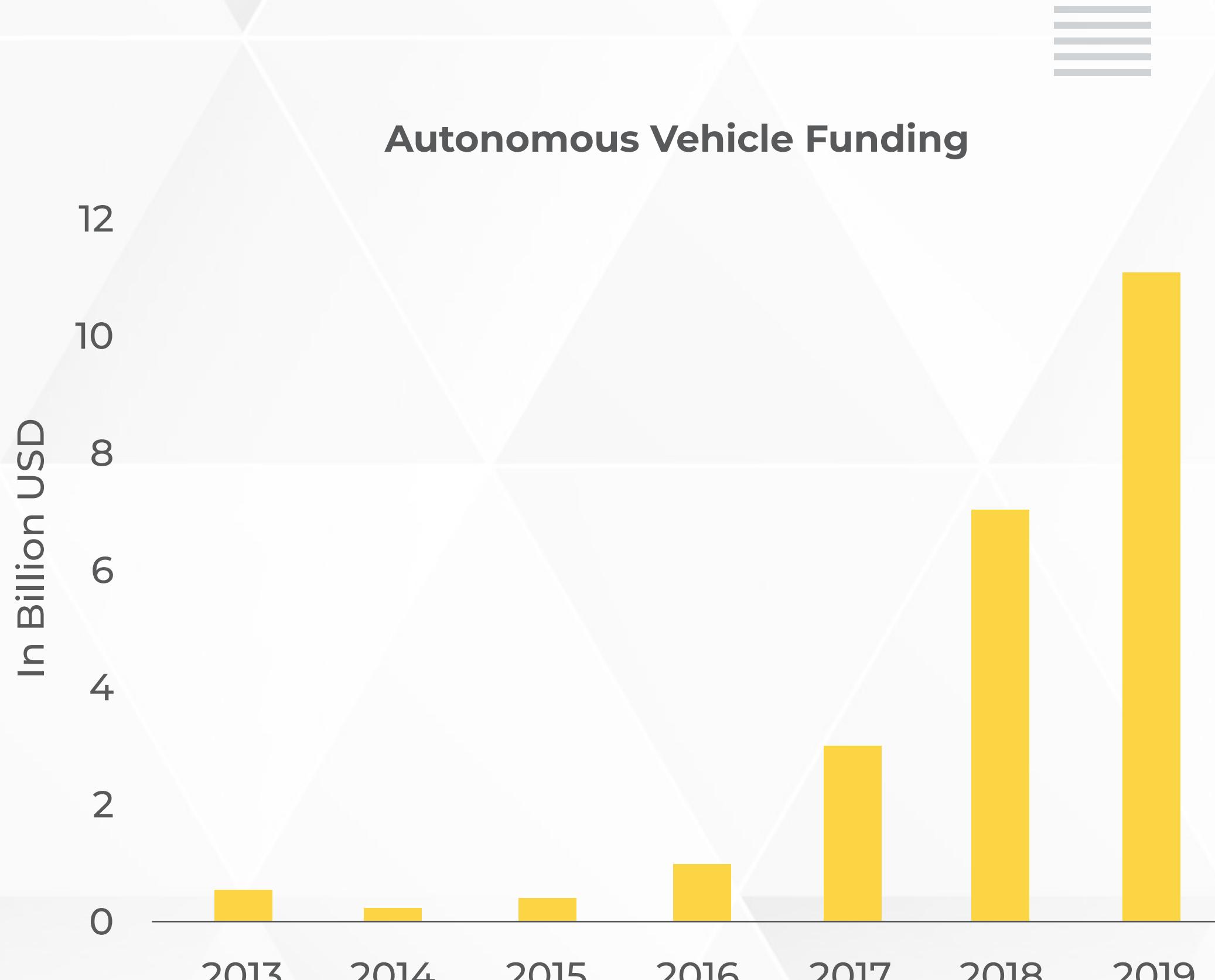


Source : KYM Global



The global Autonomous Vehicle Market is divided into two areas based on type: semi-autonomous, Fully Autonomous. Semiautonomous hold 80% of the market share and fully autonomous vehicles hold 20% of the market share. Cars having level 1-3 automation capabilities have been classified as semi-autonomous vehicles, according to SAE (Society of Automotive Engineers) International automated driving guidelines. Semi-autonomous vehicles are being developed and adopted in response to a growing demand for safer and more efficient driving technologies. Furthermore, numerous regional governments have enacted strict driving and safety legislation, further incentivizing automakers to include these features in their vehicles. Several technological advances have contributed to the market's expansion. Furthermore, the growing number of passenger cars on the road has heightened the desire to improve the driving experience, which encourages the use of semi-automated vehicles. Even during the pandemic, this can be seen in sales.

INVESTMENT IN AUTONOMOUS VEHICLE



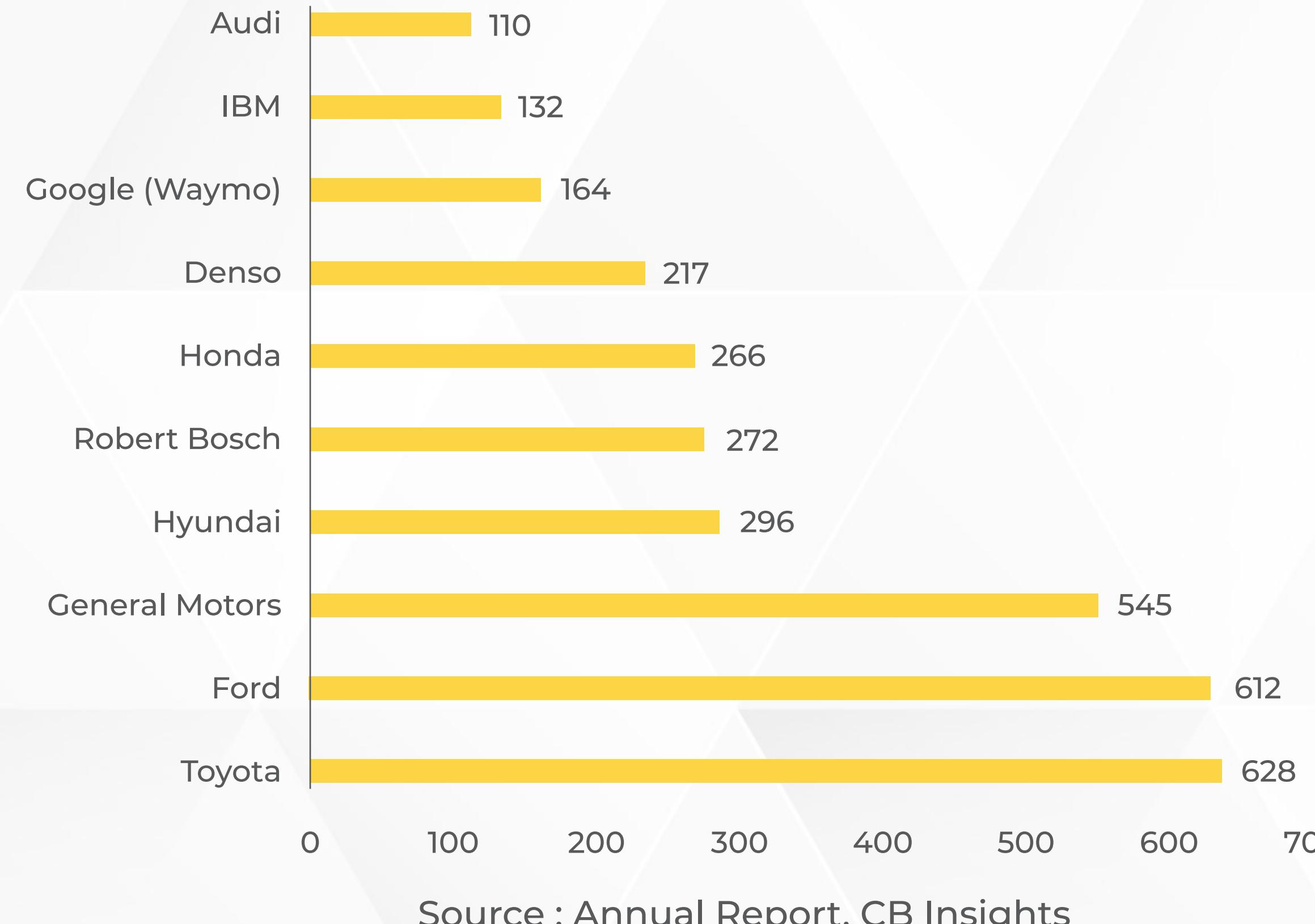
Source- Annual Report, Whitepapers, CB

Autonomous vehicles (AVs) hold the potential to be a disruptive change in the automotive industry. The Funding and investment in autonomous vehicles have been increased over time. From 2013- to 2019 the funding has been quadrupled showing 4X growth in the sector.

- In 2019, 30 businesses invested a total of \$16 billion in self-driving cars.
- Ford expects to invest \$4 billion in self-driving cars by 2023.
- Google raised \$2.25 billion from outside investors to fund the development of self-driving cars.
- Tesla's self-driving cars are expected to generate \$9 billion in sales revenue by 2020.
- Since 2015, Uber has spent \$20 million on its automated car effort, bringing its total investment to over \$1 billion.
- Apple has spent more than \$16 billion on autonomous vehicle research and development.
- Between 2021 and 2025, General Motors (GM) plans to spend \$35 billion on electric vehicles and self-driving cars.
- Tesla has raised \$20.2 billion in 35 fundraising rounds.
- Audi plans to spend \$16 billion on self-driving cars by 2023.

GLOBAL AUTONOMOUS VEHICLE SHARE BY APPLICATION

Top Companies with the most autonomous vehicle patent



Toyota and Ford are in a tight race, with GM trailing them by a hair. The top three corporations have a large patent portfolio, but the other top ten companies lag far behind. Only two technology companies appear on the list: Google (Waymo) and IBM. While Google's inclusion on the list makes sense, IBM doesn't seem to be making much news in the autonomous vehicle space. However, as a pioneer in AI, it's safe to presume that IBM has the resources to explore the technology and has thus won several patents linked to driverless vehicles. However, it is safe to say that the patent landscape is mostly dominated by automobile manufacturers, with tech businesses battling to get a foothold.

MAJOR KEY PLAYERS

 **General Motors**

 **DAIMLER**

 **Ford**

 **Autoliv**

 **TOYOTA**

 **HARMAN**

 **ZF**

 **BOSCH**

 **FICOSA**

 **GENTEX
CORPORATION**

 **WAYMO**

 **Valeo**

 **HYUNDAI
MOBIS**

 **AISIN**

 **HELLA**
 **MOBILEYE®**

 **TEXAS
INSTRUMENTS**

 **VOLVO**

 **Visteon**

- Many internet companies, manufacturers, research institutions, software start-ups, telecom providers, insurance companies, and others have banded together in recent years to speed the growth and development of autonomous vehicles and extend the market. General Motors, Ford Motor Company, Nissan Motor Company Ltd., Toyota Motor Corporation, Bayerische Motoren Werke AG (BMW), and Volkswagen AG are prominent automakers in the global autonomous vehicle industry, while Google Inc, Intel Corporation, and Apple Inc. are major technology providers.
- Major participants in the worldwide autonomous vehicle market are concentrating on increasing their market share through collaborations, partnerships, and mergers and acquisitions. Honda Motor Co., Ltd. began testing autonomous vehicles in September 2021 as a step toward launching an autonomous vehicle mobility service (MaaS) business in Japan, which Honda plans to do in conjunction with Cruise and General Motors.

KEY MARKET DEVELOPMENT



- Toyota Motor Corp. unveiled new versions of the Lexus LS and Toyota Mirai in Japan in April 2021, both equipped with Advanced Drive, a Level 2 autonomous system that assists with lane changes and advanced-driver assistance and helps keep the car in its lane, maintain the distance from other vehicles, and assists with lane changes and advanced-driver assistance.
- Volvo Group and NVIDIA struck an agreement in March 2021 to collaborate on the decision-making system for autonomous commercial vehicles and machines. The final system will be intended to manage completely autonomous driving on public roads and highways securely, thanks to NVIDIA's end-to-end artificial intelligence platform for training, simulation, and in-vehicle computing.
- Aurora stated in February 2021 that it had formed a strategic partnership with Toyota and Denso to develop and deploy self-driving cars on a broad scale. Starting with the Toyota Sienna, the cooperation will build and test driverless vehicles outfitted with the Aurora Driver. Companies plan to start testing an initial fleet of Siennas by the end of 2021.
- Microsoft teamed with General Motors in January 2021 to assist deliver GM's robotaxi startup - Cruise's self-driving vehicles to the road. Microsoft, Honda, and other investors have collectively invested over USD 2 billion in the company.
- Baidu Apollo stated in January 2021 that the California Department of Motor Vehicles (DMV) has granted Baidu a permit. The permission will allow the business to test self-driving cars on public roads throughout the state.
- Aicas, AVL, and Citos were named as new bronze members of Automotive Grade Linux in January 2021. AGL is a Linux Foundation open-source project that brings together automakers, suppliers, and technology companies to expedite the development of all vehicle technologies, including autonomous driving.
- Veoneer, Inc., an automobile technology firm and Qualcomm Technologies, Inc. struck a deal in January 2021 under which the two companies will collaborate on scalable Advanced Driver Assistance Systems (ADAS), Collaborative, and Autonomous Driving (AD) solutions.

MARKET DRIVERS



- **Reduced Traffic Congestion and Improved Safety**

Existing road systems have benefited greatly from the introduction of autonomous vehicles. These vehicles have several advantages over traditional automobiles, including increased safety, lower fuel consumption, and reduced traffic congestion and pollutants. A self-driving car is equipped with a variety of sensors, including LiDAR, RADAR, camera, and GPS, to aid in the fast analysis of traffic data and to reduce M2M latency. Furthermore, smart streets that connect to sensors in autonomous vehicles, optimized traffic lights, predictive merging, and slowdowns are all enabled and incorporated by this superior connectivity. Furthermore, as traffic became more orderly and lane shifts became less frequent, safety improved. As a result of such technological developments in the automobile sector in terms of connectivity and security, demand for autonomous vehicles has surged dramatically.

- **Market expansion is fueled by strict regulations and increased government backing.**

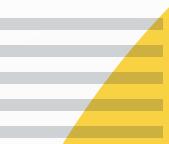
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- **The rise in Connected Infrastructure Development**

Routine task automation is now a notion that many sectors are interested in. The worldwide transportation infrastructure is rapidly evolving as a result of the increasing adoption of the Internet of Things (IoT). Cisco and IBM have developed digital platforms to automate street and traffic signals, improve waste collection, and enhance surveillance. Car parks, toll booths, and intelligent street and traffic signals are all examples of connected infrastructure. Smart city lights and autonomous vehicles can work together to eliminate traffic congestion. As a result, the demand for autonomous vehicles is expected to rise as connected infrastructure expands.

- **ADAS Implementation on a Large Scale to Boost Market Growth**

Advanced driver assistance systems (ADAS) support drivers with artificial intelligence (AI) and other novel features, avoiding disruptions and reducing the driver's workload. The rapid use of advanced technology in software algorithms, cameras, sensors, CPUs, and maps has improved the ADAS application procedure in cars. Furthermore, to address growing concerns about the safety and security of automobiles, residents, and walkers, as well as to reduce the rate of road fatalities, automobile manufacturers are incorporating ADAS into vehicles, boosting the market for autonomous vehicles.



MARKET RESTRAINTS



- **Data Management Barriers**

Autonomous vehicles contain numerous components, each with its own data management requirements, which interact with other intelligent transportation systems and generate enormous amounts of data, necessitating the use of a data storage and processing system. Furthermore, because the amount of data created by autonomous vehicles is immense, they demand a lot of computational power. They also necessitate a huge number of datasets for training. Autonomous vehicle neural networks must be trained on representative datasets that include examples of all potential driving, weather, road, and other situational conditions.

- **In emerging countries, there is a lack of necessary infrastructure.**

For self-driving cars to work properly, they need fundamental infrastructures like well-organized roads, lane markings, and GPS connectivity. V2V and V2X communications also necessitate a strong network architecture. In semi-autonomous and autonomous vehicles operating on roads, data such as lane change, object recognition, vehicle distance, traffic, and services such as navigation and connectivity are crucial. Due to restricted network connectivity on highways, however, vehicles are not connected to cloud data. In comparison to industrialized economies, the development of IT infrastructure on highways in rising economies like Mexico, Brazil, and India is gradual. Connectivity requires 5G and 4G-LTE communication networks, which are only available in metropolitan and semi-urban areas. As a result, in emerging nations, a lack of information technology communication infrastructure and government laws are important roadblocks to the emergence of self-driving vehicles.

- **High initial costs and the possibility of failure limit the market's expansion.**

In both the communication and automobile industries, autonomous car technology is gaining traction. It gives their car and components a variety of technologically advanced features, increased comfort, and security. However, the increased costs connected with telecommunication services, connection solution charges, and hardware systems for in-vehicle services may limit market expansion. This high-tech system also presents numerous obstacles and complications, such as malfunctions and failures. Furthermore, the considerable risk of hackers analyzing system data and gaining unauthorized access to car functions may stymie industry growth.

CONCLUSION AND RECOMMENDATION

- Autonomous vehicles (AVs) have the potential to be a game-changer in the automotive industry, radically altering vehicle operation to enable new use cases in commercial applications such as ride-hailing (so-called robotaxis) and haulage, not just for personal vehicle ownership.
- People have conflicting feelings about self-driving cars. Some feel they are the future of the industry and will make roads safer; others believe they are harmful and will simply increase the number of accidents on the road. At the end of the day, it's reasonable to say that self-driving cars are here to stay and that they will open up a slew of new opportunities in the not-too-distant future.
- One thing is certain: all of this will help businesses, and there's a chance that individuals will be significantly safer on the road as a result of it. Some even argue that drunk driving fatalities could be nearly eliminated because autonomous cars (at the highest level) do not require any human input and thus may prevent people from driving while inebriated.

