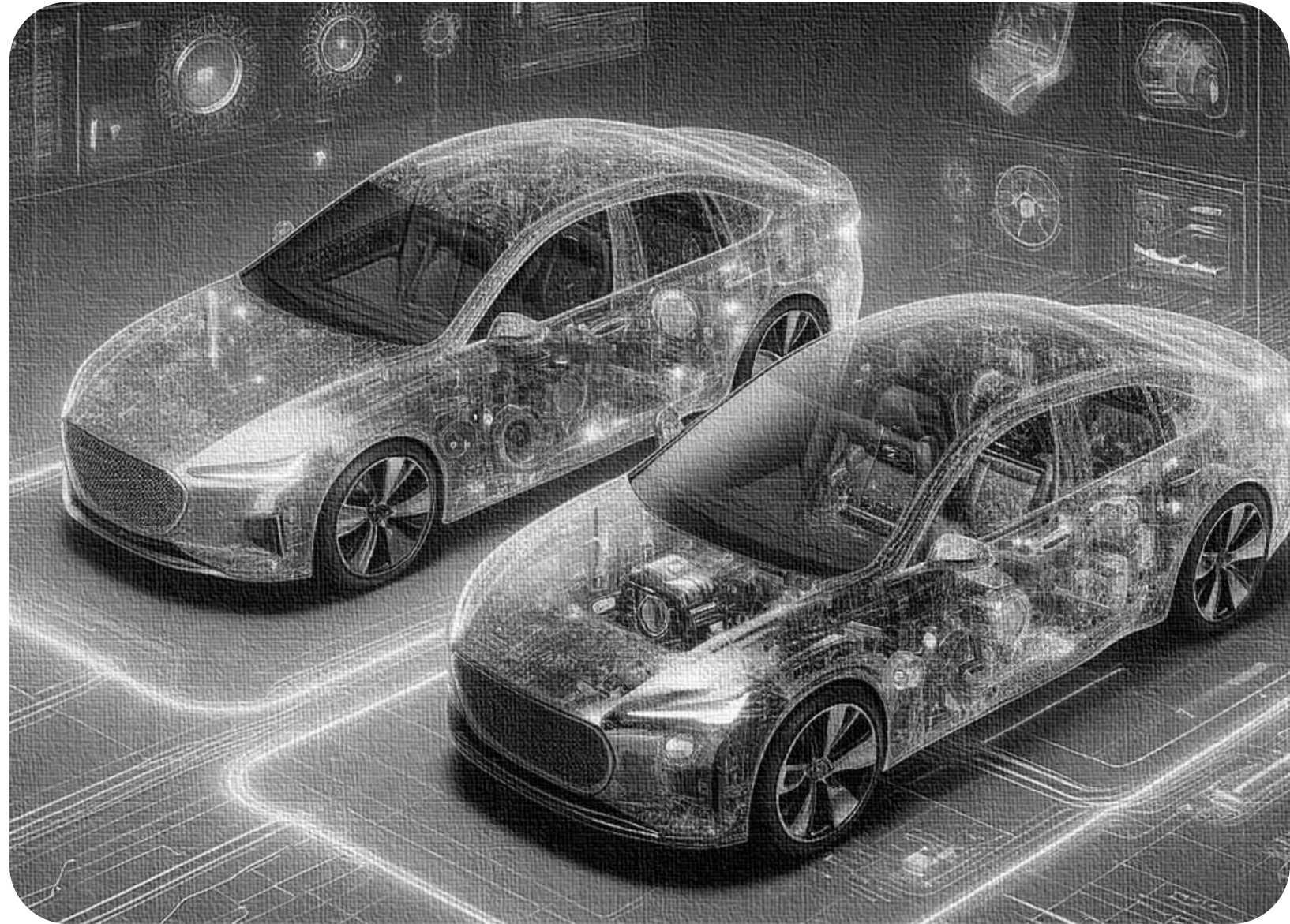


Digital Twins in Software- Defined Vehicles



How does an SDV Ecosystem look like?

6. Digital Twins

5. SDV System Architecture

7. Real-Time Data Processing

4. Connected and Intelligent Cabin

8. Predictive Fault Diagnosis

3. Vehicle-to-Everything (V2X) Communication

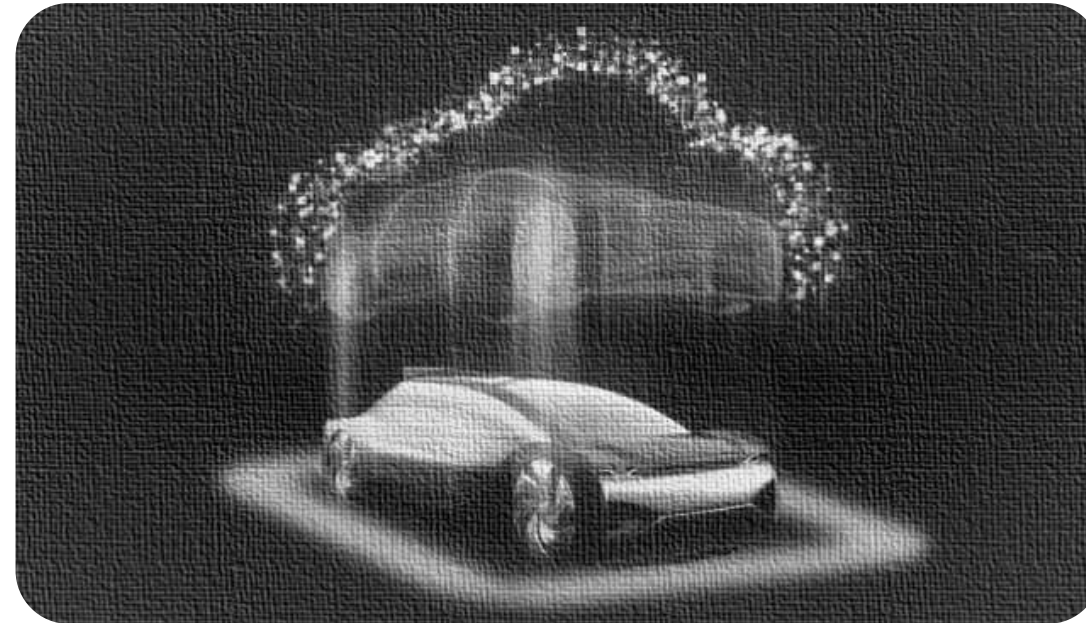
9. Cybersecurity in SDVs

2. User Personalization

10. AI-Driven Features in Vehicles

1. OTA Software Upgrades

11. Software-Controlled Powertrain Systems



12. Software-Defined Digital Chassis



What Are Digital Twins in SDVs?

A **Digital Twin** is a **dynamic, data-driven computerized**
model of a real vehicle, **enabling:**

What Are Digital Twins in SDVs?



Initial Design & Testing

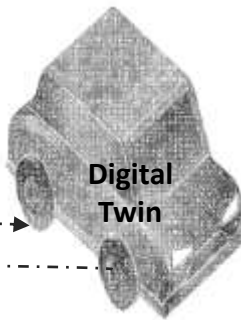
Virtual prototyping, simulating software updates, and optimization

Predictive Maintenance

Proactive issue detection and improvements

Lifecycle Management

Continuous refinement and enhanced functionality



Digital Twin

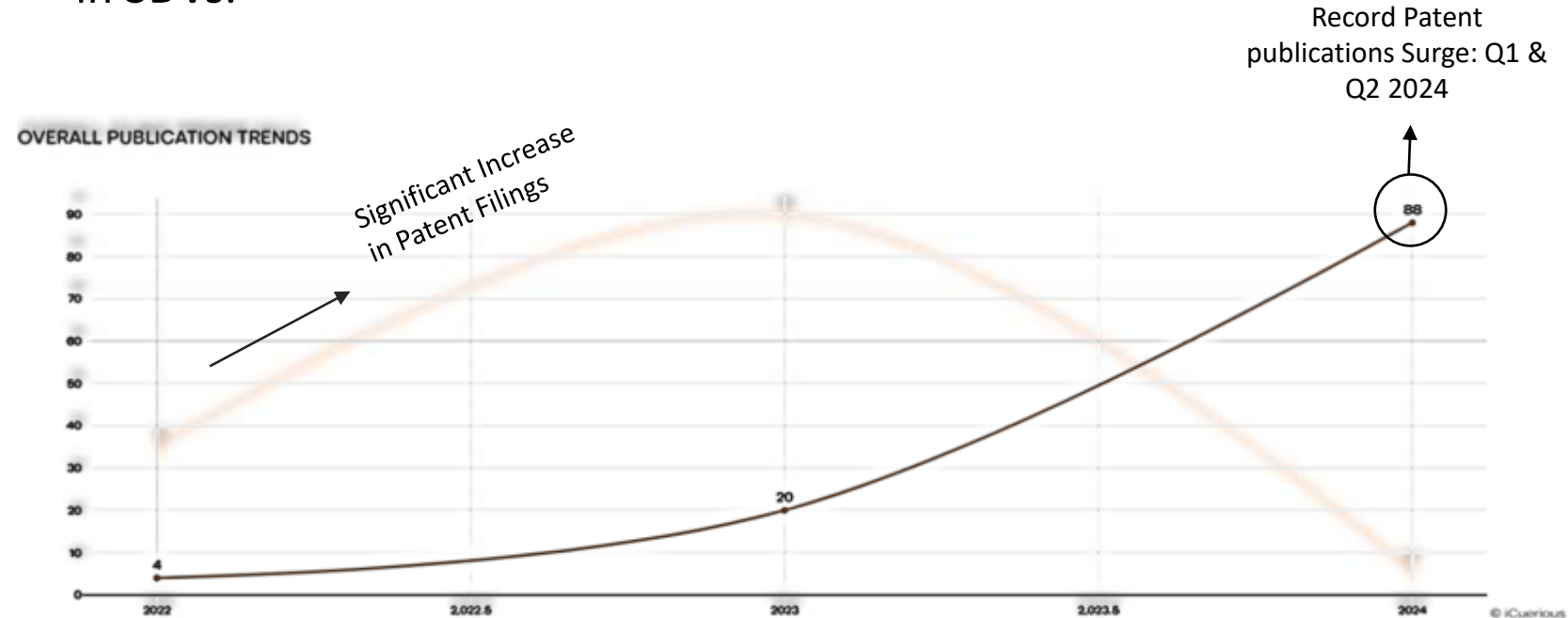


Is the Use of Digital Twins in SDVs Evolving?

Yes!!

Patent data from the last two years shows a significant uptick in filing and new publications, reflecting significant progress in Digital Twins in SDVs.

Is the Use of Digital Twins in SDVs Evolving?



Who are majorly innovation in this area?

OEMs (Passengers and heavy-duty vehicles), Chip Manufacturers, IT and Software providers, Suppliers, universities, all of them are innovating. **The major ones are:**



Who are majorly innovating in Digital Twins?



What the top patents related to Digital Twins?

What are the top patents related to Digital Twins?

Here are the standout patents related to Digital Twins in the automotive industry, with Nvidia owning several of these key innovations:

1. [WO2024124564A1](#) (Vehicle maintenance prompting method, apparatus and device)
2. [CN116980424A](#) (Vehicle digital twin body edge deployment method used in Internet of vehicles scene)
3. [CN115782782A](#) (Mirror image digital twinning device and method for intelligent networking automobile dynamic behavior)
4. [DE102022207085A1](#) (Method for generating a digital twin of an autonomous motor vehicle)
5. [CN116279583A](#) (Automatic driving path planning method and system based on digital twin DaaS platform)



What are the fundamental technologies related to Digital Twins?

What are the fundamental technologies related to Digital Twins?

Predictive Maintenance

Timely maintenance through digital models

Edge Computing for Vehicle Twins

Efficient data sync at network edges

Real-Time Vehicle Dynamics Simulation

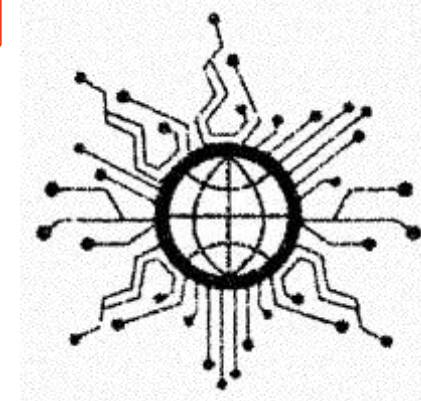
Accurate virtual models for vehicle behavior

Autonomous Vehicle Digital Twins

Integrated models for precise autonomous control

Automated Driving Path Planning

Dynamic route adjustment with real-time data



What are the recently filed patents in Digital Twins?

What are the recently filed patents in Digital Twins?

Here are the top five Digital Twin patents in the automotive industry filed in the past 3-4 months:

1. [CN118011235A](#) (Vehicle battery endurance detection method based on digital twin technology)
2. [US20240211659A1](#) (Classification-based product design using virtual digital twin models)
3. [WO2024124564A1](#) (Vehicle maintenance prompting method, apparatus and device)
4. [FR3143157A1](#) (Method and device for determining a state of aging of a part of a vehicle)
5. [CN118261048A](#) (Unmanned equipment digital twin instant generation simulation system framework)



What's recent Innovation Focus in the Digital Twins?

What's recent Innovation Focus in the Digital Twins?

AI Integration

Enhanced traffic control, simulations, and fault diagnostics with AI integration

Advanced Simulation Techniques

Improved battery management, driving tests, and hybrid scenarios

Real-Time Synchronization

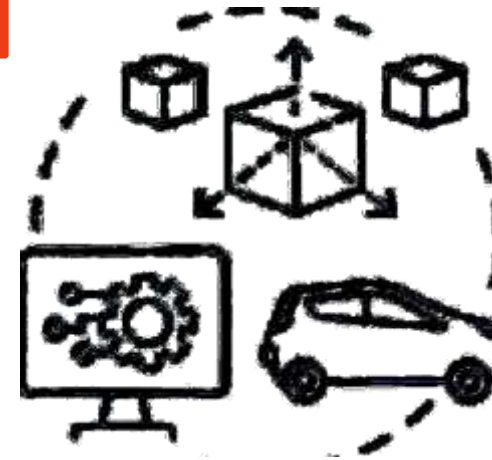
Synchronization between vehicle data and their digital twins, resulting accurate, dynamic updates for simulations and diagnostics

Safety and Risk Management

Enhanced risk assessment and safety optimization

Data-Driven Insights

Big data for logistics and performance optimization



Are Digital Twins currently used in the market?

Are Digital Twins currently used in the market?

Yes!!

several OEMs have started using digital twin technology. Here are a few OEMs who are using digital twin technology :



What are the latest collaborations in Digital Twins?

Recent key collaborations highlight the future potential of Digital Twin technology:

What are the latest collaborations in Digital Twins?



Advancing automotive tech with Digital Twin solutions and AI-driven engineering.



Offering a Digital Twin platform for ADAS sensor simulation.



Developed 'cabin digital twin' for rapid deployment of connected vehicle services.



Designing Digital Twins for efficient real-life factory manufacturing.



How will Digital Twins evolve in the coming years?

How will Digital Twins evolve in the coming years?

According to Allied Market Research, the global automotive digital twin market, valued at \$2.2 billion in 2022, is projected to reach \$34.6 billion by 2032, with an impressive CAGR of 32.6% from 2023 to 2032.



Wants to have conclusive insights on the topic?

**Wants to have
conclusive
insights on the
topic?**

For more in-depth insights into Digital Twins including technology ecosystem in context of IP and market, please reach out for further information.

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