

20.07.2022 | Hamburg, QUareer Night

Digitale Schiene Deutschland – Dr. Milena Quittnat

From CERN to Deutsche Bahn via McKinsey & Company

- 1 Who am I
- 2 **Digitale Schiene Deutschland (DSD) – an introduction**
- 3 Exemplary Data Scientist profiles at DSD

Government and society expectations require profound technological innovations of the railway system

Expectations on the railway system

Modal shift to railway is key to **reduce CO₂** emissions in traffic sector

Amount of **rail passengers** expected to **double** by 2030

Share of **freight transport** by rail will **increase** up to 25 %



- We need to **to increase rail capacity by up to 35%**
- Along with the physical expansion, **technological innovation and digitalization** are the game changers to increase capacity
- Making this lever **available to the rail system** is the mission of **Digitale Schiene Deutschland**

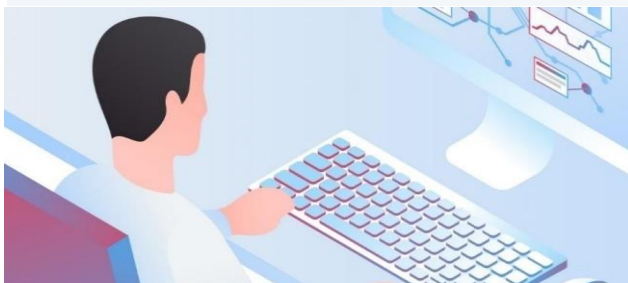
Key innovations are being implemented in all main areas of the rail system and create new opportunities



DIGITALIZED INFRASTRUCTURE



FULLY AUTOMATED VEHICLES



SMART CONTROL

Target picture for the entire rail system

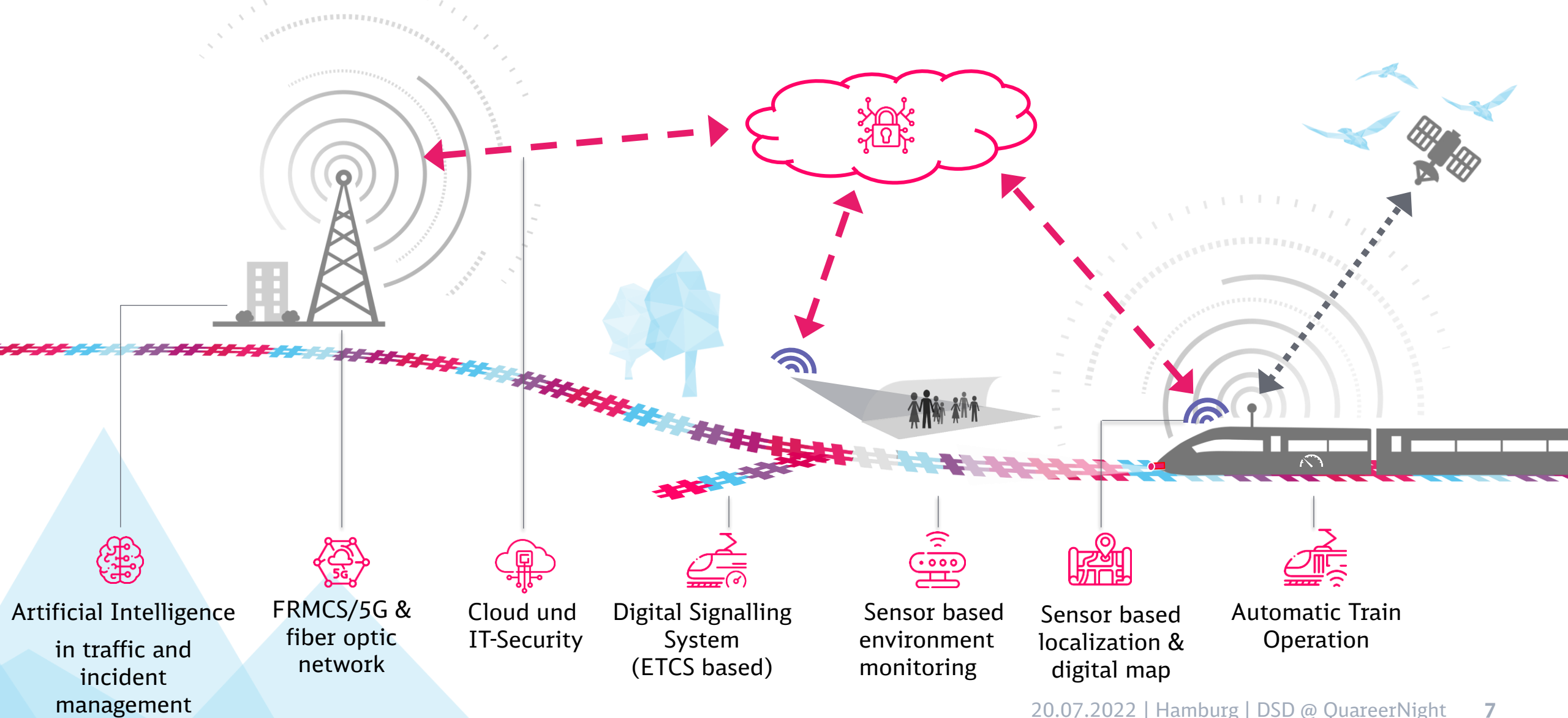
Trains run **automatically**

Trains driving at **optimal headway**

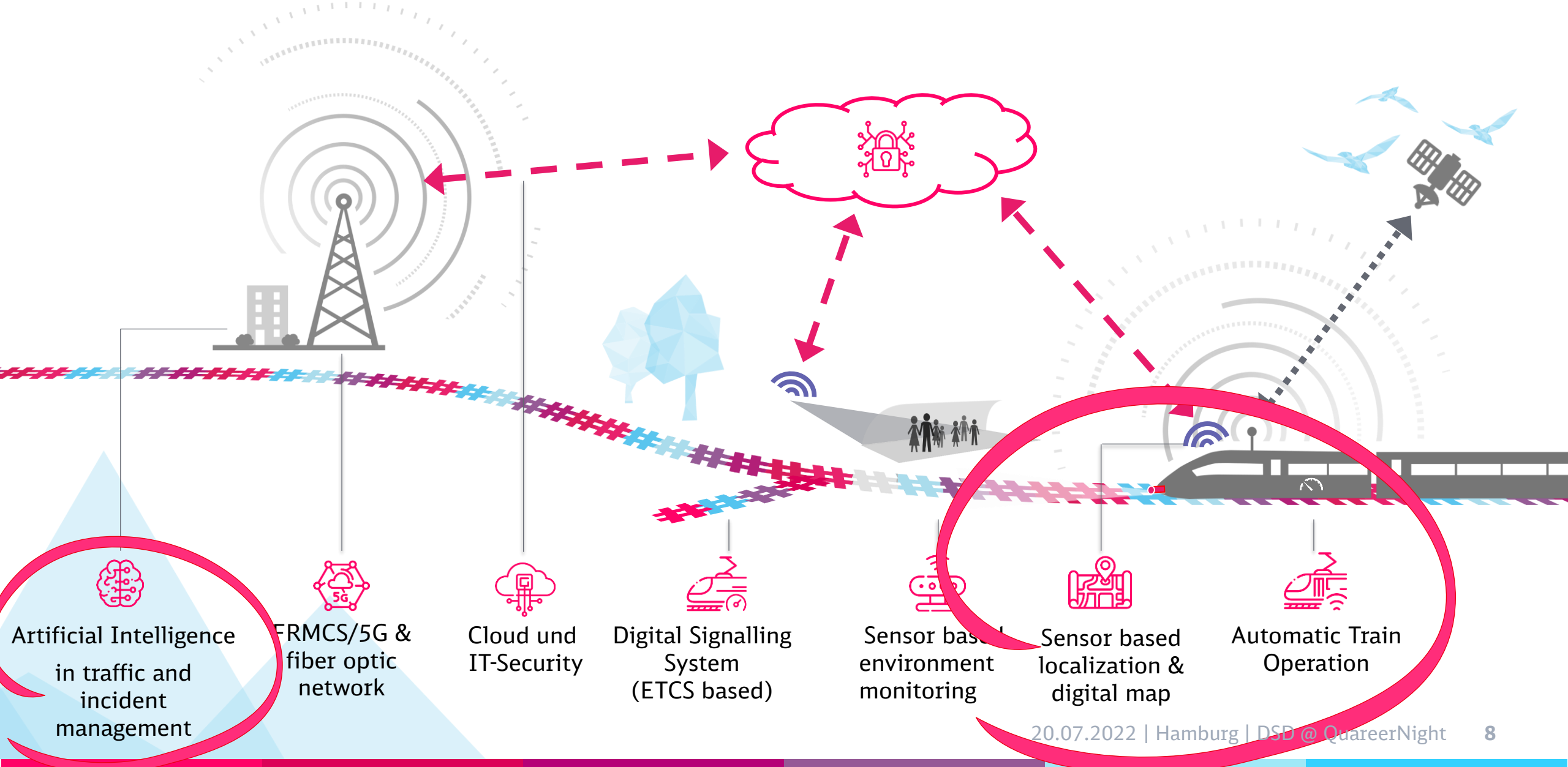
Intelligent **Traffic management** plans and dispatches trains and routes

Interruptions are **automatically detected** and managed

Major challenge is the development and interaction of the essential future technologies



Where do we need Data Scientists? Two examples!



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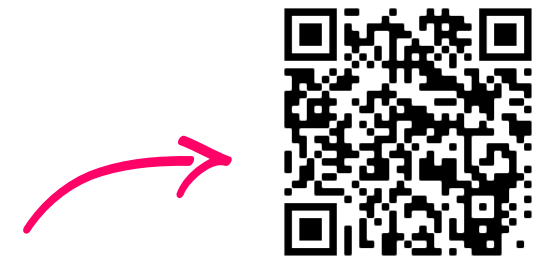
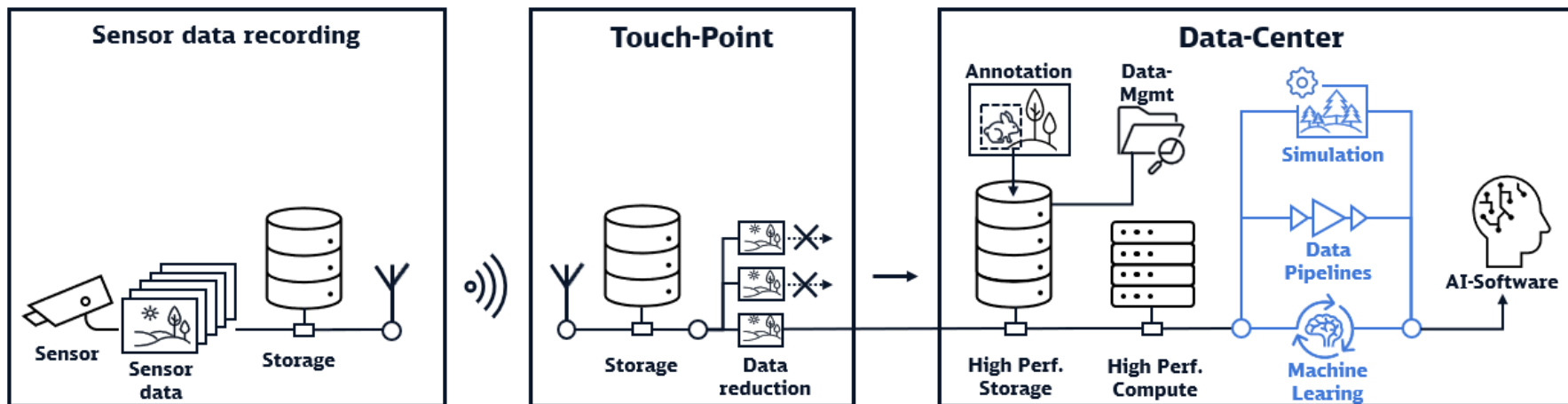
Laying of the land: Sensor4Rail – digital eyes for intelligent trains

For **automatic train operation**, a **sensor-based localization and digital map** is needed
→ this is tested in project **Sensors4Rail**



1st example “Data factory” – enabling training of AI software with data, an important step to automated driving

To train the **object detection AI software** a “data factory” is needed



If you want to learn more

Data architect for the data factory – what are we looking for (exemplary)

Potential tasks

- You create the **data architecture** and **data model** and build a **new data management & storage system for machine learning data** with us
- Our focus is on **sensor data and annotations** for the **development of automated driving functions**
- You will **specify the data architecture, flows, and life cycle**, and **provide data quality specifications**
- You specify the hardware of the data storage and data management
- You are also responsible for the storage, management and scaling of large amounts of data
- You define requirements for storage concepts and manage stakeholders

Potential profile

- Completed **technical degree**
- **Experience in database design for high-performance database queries**, worked with **different databases**, make well-founded decisions regarding the respective application
- **Experience in handling large amounts of sensor data with high data volume**
- **Programming experience** in C++ and Python and experience **developing high-performance, containerized applications**
- Ideally worked with sensor data and annotations that form the basis for developing automated driving features
- Ability to **reduce complexity** and work in an **agile work context**
- You have **excellent problem solving skills**, take responsibility to drive your topic forward independently
- Good German, fluent English

Computer vision engineer for the data factory – what are we looking for (exemplary)

Potential tasks

- Development of **object detection pipelines based on camera data**
- **Training and retraining of detection models and their deployment**
- Automated (pre-)processing of image data for object detection
- Quality control and assessment of annotation data (camera, lidar, radar)
- Containerization of data pipelines
- Structuring of data

Potential profile

- Completed **technical degree**
- **Experience with handling large amounts of sensor data as well as annotations**
- **Programming experience** in C++, Python, ROS and experience in **developing high-performance, containerized applications, as well as neural networks for object recognition**
- Experience with object tracking and Kalmann filters, as well as mid-level sensor fusion
- **Ability to reduce complexity** and work in an **agile work context**
- You have **excellent problem solving skills**, take responsibility to drive your topic forward independently
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2nd example Artificial Intelligence in traffic and incident management – the optimized railway operation of the future

Need

Rail operations need forward-looking, 24/7 dispatching and control

Solution

- Automated real-time traffic planning and dispatching
- Automated capacity management and scheduling

Way forward

- Simulation environment digitally represents railway world
- Use 'deep reinforcement learning' to develop AI algorithms
 - reacting flexibly to complex, unknown challenges
 - weighing up different scenarios based on successfully solved journey planning and dispatching problems
 - type of algorithm is scalable and can be parallelised on mainframe computers



If you want to learn more



What else can you do as a data scientist at Digitale Schiene Deutschland or DB in general?

Further positions at Digitale Schiene
Deutschland



DB Systel



Data
Intelligence
Center at DB
Konzern

DB Analytics

Many more...



If you want to learn more