

In July of this year, dSPACE acquired understand.ai (UAI). The start-up is an artificial intelligence (AI) technology leader with a focus on automated data analysis, data annotation, and extraction of simulation scenarios for autonomous vehicles. These key technologies have strategically added to the dSPACE portfolio and now offer customers a unique, integrated development and test solution for autonomous driving. In an interview, the two UAI founders, Marc Mengler and Philip Kessler, explain the added value of this cooperation and describe how customer projects typically work.

Making an Intelligent Addition

Quality equals precision, correctness, coverage, and consistency

AI is used in many areas, for example, in the medical industry. Why are you focusing on the automotive industry?

Marc Mengler: At the beginning, our focus was not strictly on traffic. When we started out, we also collaborated with the German Cancer Research Center and together published a large set of data for training and testing medical AI. However, the problem with medicine is that our bodies are not very standardized. Cells, diseases, and tumors follow only very few rules.

If you look at the traffic situation in a metropolis during rush hour, you might doubt that order and rules exist...

Philip Kessler: Some traffic situations are really complex. However, traffic

generally follows standardized rules. The most common traffic objects look quite similar or have similar dimensions. And once you have trained and optimized AI algorithms, they can ideally be used for the most common object classes around the world. This is a decisive factor in creating a scalable and increasingly precise product. Precision is crucial for our first product, which creates training and test data for AI algorithms. This is why we decided to focus on one domain. There was another reason for this decision: We at understand.ai are convinced that our generation will be measured by whether we can make autonomous driving possible or whether we will postpone it further. We are determined to become key enablers.

In the automotive industry, the term data-driven development process is often used. What is your role in this?

Philip Kessler: We walk the talk: Our product portfolio is based on identifying the correct measurement data; enhance it to the appropriate quality level, meaning we annotate it; and extract the result to a simulation environment. In the simulation, the recorded real-world scenarios, for example, passing a parked car, are enhanced with relevant variants. This enables us to simulate critical scenarios in the right quantity. Hence, our products play a major role in the data-driven development and validation of autonomous vehicles.

How does the UAI product range fit into the dSPACE family of products? >>

Marc Mengler: We complement each other perfectly. The UAI portfolio covers data selection, anonymization, annotation, and scenario generation, and integrates seamlessly into the dSPACE data logging as well as the data replay and simulation products. The combination of both product portfolios lets us map the data-driven process in a single comprehensive tool chain. A common vision regarding data- and scenario-driven development and validation of autonomous driving was the deciding factor for our team to partner with dSPACE.

How would you describe a typical UAI customer project?

Marc Mengler: All our customer projects are based on raw data, meaning measurement data, which the customer records with several vehicle cameras, lidar, and radar sensors and then provides to us via API. However, raw data can be used only to a very limited extent for training and testing AI algorithms and can become substantially usable only when it is enhanced, for example, by bounding boxes around objects or by assigning each pixel to the relevant object (semantic segmentation). This sounds easier than it is. In the end, we must reach an accuracy of

98% and the devil is in the details. For example, there are dozens of ways to place a two-dimensional rectangular box around a car in a two-dimensional camera image.

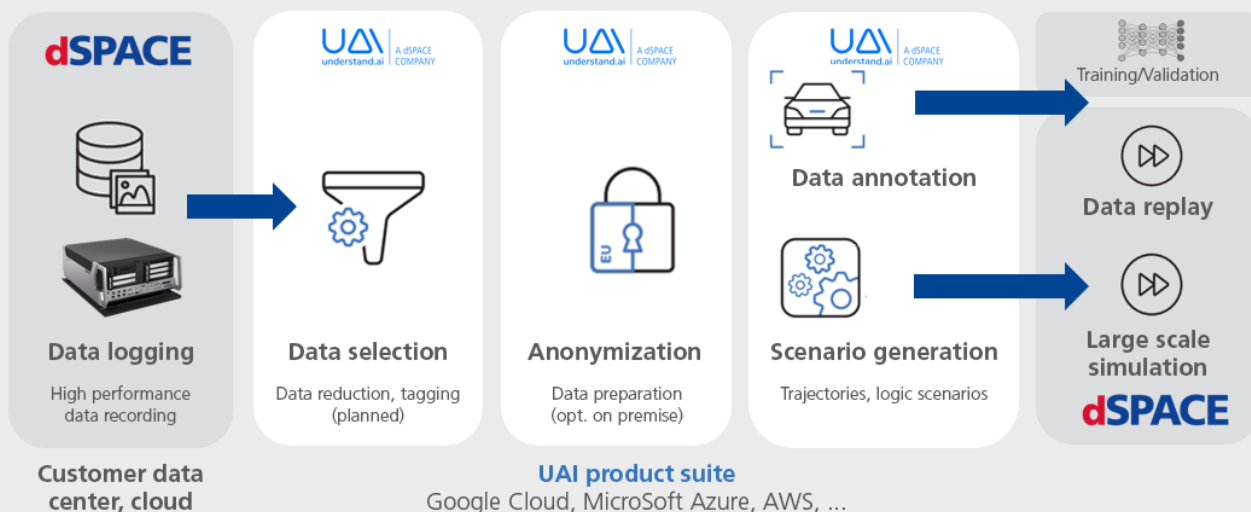
And customers do not always define the dimensions of a vehicle in the same way?

Philip Kessler: This is true: Some customers require a box that includes the side mirrors, vehicle antennas, roof rack, etc. and others do not. Some customers want an extrapolated box that includes the non-visible parts of the car, which might be covered or not included in the camera image. To find the right specification for each of the often more than 50 different object classes, which are also used in marginal cases, we work very closely with the customer, especially in the initial phase, and support them in finding the right specifications. We then demonstrate these on a significant subset of the data set. For this purpose, we use highly automated processes and expert algorithms which, in combination with human validation, allow for an almost pixel-perfect enhancement of the sensor data. Once this subset has been tested and approved by the customer, we optimize our algorithms,

and processes according to the respective specifications and can scale very well to higher volumes within these specifications. However, autonomous driving is a very dynamic field with ever changing specifications. Often, the specifications in a customer project change, sensors are switched or installed in a different location in the vehicle. Thanks to our close cooperation with dSPACE, we can now respond faster and more customer-centrally.

What distinguishes your product portfolio from other competitors?

Marc Mengler: The main difference is that understand.ai aims for high automation and high quality and is able to achieve them both. The more we automate, the fewer people will be required for automation and the higher the achievable consistency. Usually it is like this: The more people work on a problem, the more disagreements there are. The cooperation with dSPACE makes a huge difference. dSPACE provides us with global sales teams that can respond to the specific customer requirements and changes in project specifications in the individual countries because they speak the local language. This works throughout the



End-to-end solution chain: The understand.ai (UAI) product suite completes dSPACE's portfolio for autonomous driving.



Marc Mengler (CEO) and Philip Kessler (CTO) are the founders of understand.ai.

entire tool and value chain of dSPACE and understand.ai.

How do you define quality?

Philip Kessler: The quality of annotations and extracted scenarios consists of four criteria: Precision, correctness, coverage, and consistency. For each quality criterion, we define in a contract which measured values must be achieved. It is always our goal to exceed our customers' expectations. After all, providing the highest possible quality of training and test data was one of our founding goals and is still our mission, because every data error leads to an error in the algorithm.

How does the cooperation with dSPACE affect your relationship with international customers?

Marc Mengler: In collaboration with dSPACE, we can provide better customer and consultancy services as well training for customers world-

wide. OEMs receive a unique, integrated development and test solution for autonomous driving from a single source.

What innovations are you working on at the moment?

Philip Kessler: Our customers always have the same rule of three: the right data in the right quality and right quantity. We are already covering the aspect of quality with our annotation and scenario generation solutions. We will launch a new solution for quantity at the beginning of 2020 – the continuously growing Scenario Library. This leaves us with the aspect

of the 'right' data. In mid-2020, we will launch a product to also cover this aspect, which will help customers pick the right data for the annotation and scenario generation from data volumes in the petabyte range.

Who can customers contact if they want to avail of your services or purchase your products?

Marc Mengler: dSPACE sales staff and key account managers worldwide are trained in our products and available as contact persons for customers. If customers require more expert knowledge, our UAI experts will gladly support them.

About understand.ai

understand.ai has special expertise in the area of training and validation data, with which algorithms for autonomous driving can be efficiently trained and tested. For example, the company uses self-learning algorithms to process sensor data recorded during measurement runs and prepares them for simulation. The underlying key technology is based on artificial intelligence and ensures an efficient and precise evaluation, which contributes to the high accuracy of the driving algorithms used by customers. understand.ai was founded in 2017 and has 55 employees. The head office of the company is in Karlsruhe.

For more Information, see www.understand.ai.