Quality Control Patrol: Startup Builds Models for Detecting Vehicle Failure Patterns

Viaduct is helping vehicle and parts manufacturers reduce warranty claims and defects.

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When it comes to preserving profit margins, data scientists for vehicle and parts manufacturers are sitting in the driver's seat.

Viaduct, which develops models for time-series inference, is helping enterprises harvest failure insights from the data captured on today's connected cars. It does so by tapping into sensor data and making correlations.

The four-year-old startup, based in Menlo Park, Calif., offers a platform to detect anomalous patterns, track issues, and deploy failure predictions. This enables automakers and parts suppliers to get in front of problems with real-time data to reduce warranty claims, recalls and defects, said David Hallac, the founder and CEO of Viaduct.

"Viaduct has deployed on more than 2 million vehicles, helped avoid 500,000 hours of downtime and saved hundreds of millions of dollars in warranty costs across the industry," he said.

The company relies on NVIDIA A100 Tensor Core GPUs and the NVIDIA Time Series Prediction Platform (TSPP) framework for training, tuning and deploying time-series models, which are used to forecast data.

Viaduct has deployed with more than five major manufacturers of passenger cars and commercial trucks, according to the company.

"Customers see it as a huge savings — the things that we are affecting are big in terms of profitability," said Hallac. "It's downtime impact, it's warranty impact and it's product development inefficiency."

Viaduct is a member of NVIDIA Inception , a program that provides companies with technology support and AI platforms guidance.

Hallac's path to Viaduct began at Stanford University. While he was a Ph.D. student there, Volkswagen came to the lab he was at with sensor data collected from more than 60 drivers over the course of several months and a research grant to explore uses.

The question the researchers delved into was how to understand the patterns and trends in the sizable body of vehicle data collected over months.

The Stanford researchers in coordination with Volkswagen Electronics Research Laboratory released a paper on the work, which highlighted Drive2Vec, a deep learning method for embedding sensor data.

"We developed a bunch of algorithms focused on structural inference from high-dimensional time-series data. We were discovering useful insights, and we were able to help companies train and deploy predictive algorithms at scale," he said.

Viaduct handles time-series analytics with its TSI engine, which aggregates manufacturing, telematics and service data. Its model was trained with A100 GPUs tapping into NVIDIA TSPP.

"We describe it as a knowledge graph — we're building this knowledge graph of all the different sensors and signals and how they correlate with each other," Hallac said.

Several key features are generated using the Drive2Vec autoencoder for embedding sensor data. Correlations are learned via a Markov random field inference process, and the time series predictions

tap into the NVIDIA TSPP framework.

NVIDIA GPUs on this platform enable Viaduct to achieve as much as a 30x better inference accuracy compared with CPU systems running logistics regression and gradient boosting algorithms, Hallac said.

One vehicle maker using Viaduct's platform was able to handle some of its issues proactively, fix them and then identify which vehicles were at risk of those issues and only request owners to bring those in for service. This not only affects the warranty claims but also the service desks, which get more visibility into the types of vehicle repairs coming in.

Also, as vehicle and parts manufacturers are partnered on warranties, the results matter for both.

Viaduct reduced warranty costs for one customer by more than $50 million on five issues, according to the startup.

"Everyone wants the information, everyone feels the pain and everyone benefits when the system is optimized," Hallac said of the potential for cost-savings.

Viaduct began working with a major automaker last year to help with quality-control issues. The partnership aimed to improve its time-to-identify and time-to-fix post-production quality issues.

The automaker's JD Power IQS (Initial Quality Study) score had been falling while its warranty costs were climbing, and the company sought to reverse the situation. So, the automaker began using Viaduct's platform and its TSI engine.

In A/B testing Viaduct's platform against traditional reactive approaches to quality control, the automaker was able to identify issues on average 53 days earlier during the first year of a vehicle launch. The results saved "tens of millions" in warranty costs and the vehicle's JD Power quality and reliability score increased "multiple points" compared with the previous model year, according to Hallac.

And Viaduct is getting customer traction that reflects the value of its AI to businesses, he said.

Learn more about NVIDIA A100 and NVIDIA TSPP .

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