SHYENA TECH YARNS

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Success Story

Deployment of Deep Learning Model of Edge Device for Autonomous Vehicle

Overview

A prominent Technology University in Singapore, recognized for its innovation-driven approach and pioneering research initiatives.

Business Challenge

The university embarked on the journey of developing an autonomous vehicle solution, with a critical focus on the Perception module. This module, despite initial development, fell short of the required performance and accuracy benchmarks. Furthermore, integration hurdles emerged when attempting to fuse the perception module's output with localization and control units. The complex challenge encompassed four distinct models, each needing to operate seamlessly on edge devices equipped with dual NVIDIA GPUs.

Solution: Elevating Perception & Integration for Autonomous Vehicles

Drawing upon our expertise, we devised a multifaceted solution strategy to address both the performance and integration challenges:

- **Advanced Model Development:** To meet the demanding criteria, we embarked on enhancing the Perception module. We introduced custom models for Person, Vehicle, and Traffic Signal detection. Additional models were engineered for Lane Detection, Traffic Symbol Recognition, and State of Traffic Light assessment.
- **Integration with Lidar Data:** Leveraging Lidar data, we fused the AI model output with the Lidar system to extract invaluable insights about the speed, direction, and proximity of the vehicle in relation to surrounding objects.
- **Robotic Operating System (ROS) Integration:** To ensure seamless interaction between diverse modules, we harnessed the power of ROS. This allowed us to create a unified platform that seamlessly integrated the varied AI-driven components.
- **Model Optimization with TensorRT:** We quantized the custom models using the TensorRT framework, significantly reducing memory and GPU consumption. Additionally, we transformed pretrained models from ONNX format to TensorRT, optimizing their performance for edge deployment.
- **Streamlined Deployment:** After initial containerization of the models, we observed a performance delay due to web service calls. In response, we made the strategic decision to run models natively on the platform. This yielded a remarkable improvement in real-time processing speed.

Outcome

Our collaborative efforts resulted in transformative outcomes for the university's autonomous vehicle initiative:

- **Enhanced Performance:** The custom models, optimized with TensorRT, delivered superior accuracy and efficiency, meeting the required performance thresholds.
- **Precise Insights:** By integrating Lidar data, we augmented AI-driven outputs with real-time insights about vehicle positioning and dynamics, fostering safe and informed decision-making.
- **Seamless Integration:** The ROS-powered platform seamlessly integrated the diverse AI-driven modules, harmonizing perception, localization, and control functionalities.
- **Real-Time Processing:** The strategic shift to native model deployment significantly improved processing speed, ensuring real-time responsiveness critical for autonomous vehicles.

Technology Landscape

- Our solution harnessed an array of advanced technologies, including Python, Deep Learning, Lidar, ROS, TensorRT, and NVIDIA GPUs.

Through our strategic collaboration, the university achieved a ground-breaking solution that elevated the perception capabilities of autonomous vehicles. This not only showcased the potential of cutting-edge AI but also underlined the power of seamless integration and optimization in revolutionizing the future of transportation.

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