(idw)

Press release

Technische Universität Darmstadt
Claudia Staub

12/10/2019

http://idw-online.de/en/news728793

Contests / awards, Research projects
Information technology
transregional, national

TECHNISCHE
UNIVERSITÄT
DARMSTADT

TU Darmstadt: ERC Consolidator Grant for Research on deep neural networks in computer vision

Darmstadt, 10 December 2019. Stefan Roth, Professor of Computer Science at TU Darmstadt, will receive a highly prestigious Consolidator Grant from the European Research Council (ERC). His project „RED – Robust, Explainable Deep Networks in Computer Vision" will support his research with almost two million Euros over a period of five years. This award further broadens the numerous activities of TU Darmstadt in the area of artificial intelligence (AI).

The goal of his project is to develop methods that make artificial neural networks in computer vision, particularly so-called deep networks, more robust and more explainable. One particular aim is to increase user trust in machine learning approaches to computer vision, for example in the context of autonomous vehicles.

Robust image understanding for autonomous driving

Autonomous vehicles need to assess and understand their surroundings based on camera and sensor data within fractions of a second in order to be able to react correctly. In this context, not only is the tolerance for errors very small, but computer vision methods also need to yield reliable results even in adverse viewing conditions such as in bad weather. To reach such levels of robustness, enormous amounts of training data would be currently needed, which have to be painstakingly annotated by hand. Furthermore, autonomous vehicles will also have to be able to cope with rare situations, which may not have been foreseen during their development.

„Current machine learning approaches to computer vision are optimized to yield fast and accurate results in relatively constrained settings. In practice, it is often necessary to obtain reliable results even when the approaches are taken outside of the originally envisioned settings. Moreover, they need to be applicable when only small amounts of training data are available", explains Stefan Roth, Professor of Computer Science and head of the Visual Inference Lab at TU Darmstadt. In addition, current deep learning approaches rarely quantify how reliable their predictions are. Yet this is an important prerequisite for gaining the trust of future users.

Using artificial neural networks

With his research in the RED project, Stefan Roth aims to improve the use of artificial neural networks in computer vision significantly. He and his team want to increase the robustness of these methods, thereby broadening their applicability. At the same time, they will research which parts of the deployed networks take what role in their final output. The goal is to improve the understanding of such deep networks and enable the reliable quantification of the uncertainty of their predictions.

The project's work program is based on a number of concrete problems from various areas of computer vision, with a focus on 3D scene analysis from images and videos, including tasks such as semantic segmentation, 3D reconstruction,

and motion estimation.

Perspectives for machine learning and AI

The project ultimately aims to create a toolbox with architectures, algorithms, and best practices for deep neural networks that enable their use in computer vision applications in which robustness is key, data is limited, and user trust is paramount.

„We research foundational aspects of neural architectures in computer vision. It is quite possible that our results can be transferred to other application areas of machine learning and AI", says Roth.

About TU Darmstadt
The Technische Universität (TU) Darmstadt is one of Germany's leading technical universities. TU Darmstadt incorporates diverse science cultures to create its characteristic profile. The focus is set on engineering and natural sciences, which cooperate closely with outstanding humanities and social sciences. We are enjoying a worldwide reputation for excellent research in our highly-relevant, focused profile areas: cybersecurity, internet and digitalisation, nuclear physics, fluid dynamics and heat- and mass transfer, energy systems and new materials for product innovation. We dynamically develop our portfolio of research and teaching, innovation and transfer, in order to continue opening up important opportunities for the future of society. Our 308 professors, 4,500 scientific and administrative employees and about to 25,200 students devote their talents and best efforts to this goal. Together with Goethe University Frankfurt and Johannes Gutenberg University Mainz, TU Darmstadt has formed the strategic Rhine-Main Universities alliance.

MI No 84e/2019, Roth/agr