IMAGING & machine vision europe

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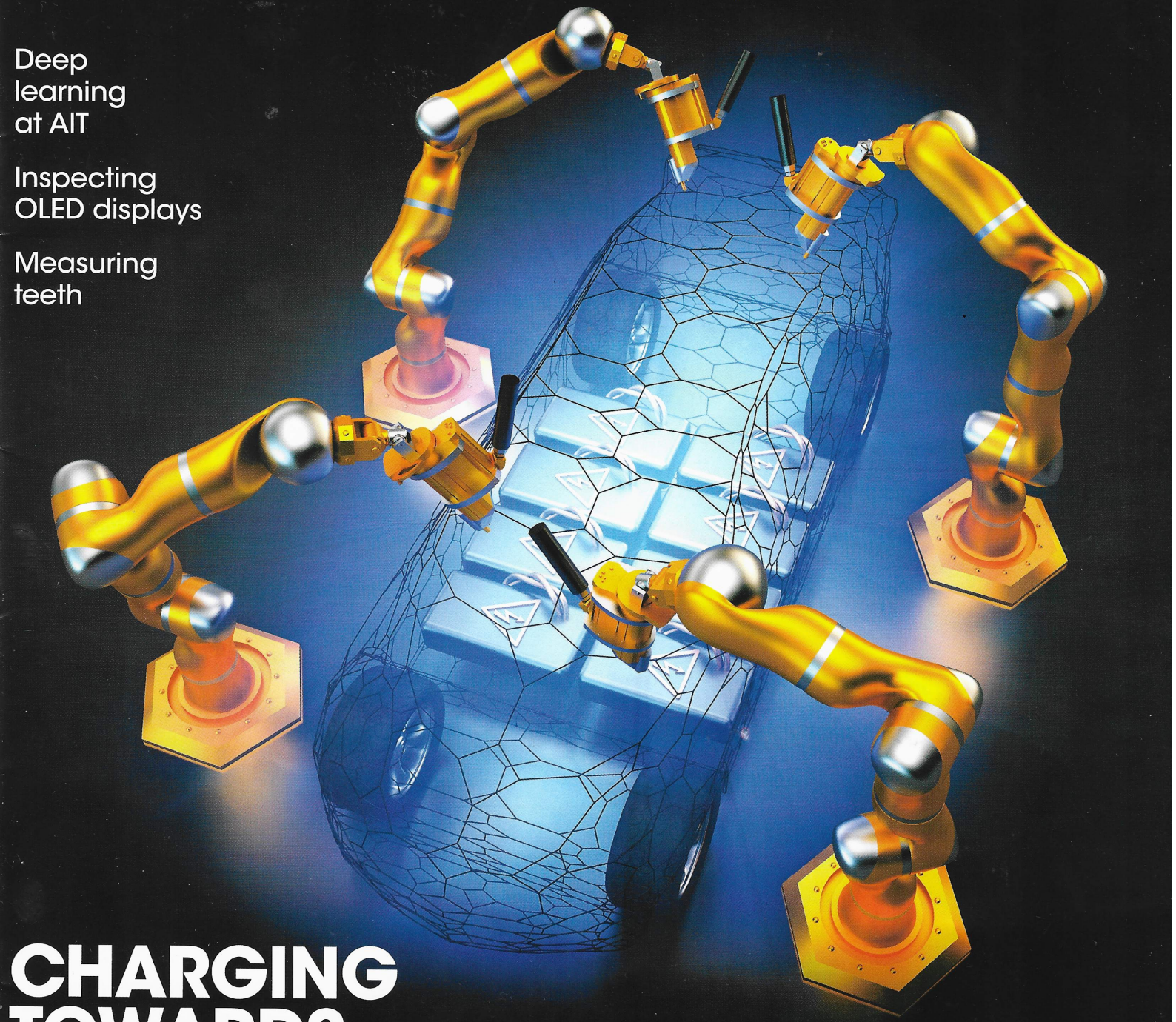
Deep learning at AIT

Inspecting OLED displays

Measuring teeth



CHARGING TOWARDS ELECTRIC CARS

Automation inside future auto factories

For suppliers, integrators and OEMs of imaging and machine vision technologies in Europe

quality of a training dataset. We ask users to integrate deep learning cautiously into diligent data acquisition and image-processing pipelines, potentially using neural networks only in sub-parts, keeping conventional image processing methods whenever they work satisfactorily. For example, modern photometric and multi-view acquisitions, together with computational imaging, might be a valuably enriched input for a CNN to infer with. In that manner, one can exploit the controllability of data quality and information content with image processing, together with the ability to reveal complex, high-dimensional interdependencies, which no other method can grasp like deep learning.

The effort of developing and maintaining a reliable inspection system has not diminished. However, the bulk of the work is now managing and acquiring data instead of designing models: the better the training data, the better the predicted results. With a good representative training database – optimally real, not artificially generated data – deep learning methods are capable of surpassing conventional image processing-based systems by far. Reliably integrating deep learning into an actual industrial visual inspection process requires a lot of experience in deep learning, plus image acquisition and processing.

The high-performance imaging processing group at Austrian Institute of Technology works on industrial inspection aspects of deep learning, with methods such as one-class learning and data augmentation to solve challenges with training neural networks when data is limited. Petra Thanner is senior research engineer, Daniel Soukup is a scientist in the group.

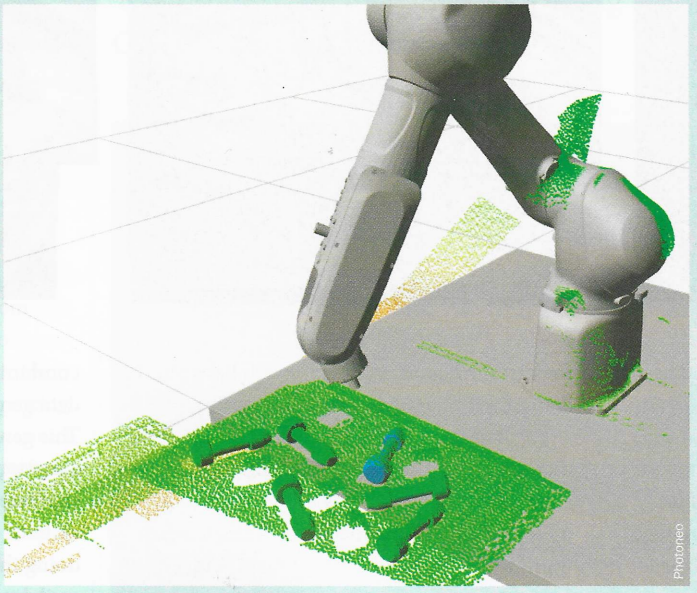
COMMERCIAL PRODUCTS

Deep learning is now part of several industrial imaging software packages. MVTec Software has enhanced its deep learning technologies in the latest version (v19.05) of Halcon, including deep learning inference that can be executed on CPUs with Arm processor architectures. This allows customers to use deep learning on standard embedded devices.

Deep learning-based object detection has also been improved on Halcon 19.05. The method, which locates and identifies objects by their surrounding rectangles, so-called bounding boxes, now detects the orientation of objects.

Matrox Imaging's Design Assistant X, the latest edition of the company's flowchart-based vision application software, includes image classification using deep learning. The classification tool makes use of a convolutional neural network to categorise images of highly textured, naturally varying, and acceptably deformed goods. All inference is performed on a mainstream CPU, eliminating the dependence on third-party neural network libraries and the need for specialised GPU hardware.

Adaptive Vision has released version 4.12 of its software products: Studio, Library and Deep Learning add-on. According to Adaptive Vision's CEO Michał Czardybon, the most intensive development the company is working on is in the area of deep learning, with a notable change being a three times increase of inference speed in the software's feature detection tool. There is also the possibility of working with more flexible regions-of-interest in the object classification tool; support for Nvidia RTX cards; and a new method of anomaly detection.



Adaptive Vision is also developing traditional tools and the rapid development environment itself. It has redesigned its minimal program view, where instead of a 'blocks and connections' model, the user gets a simplified view with tools connected using named data sources.

Korean firm, Sualab, has upgraded its deep learning software, SuaKit, to version 2.1. SuaKit is a deep learning machine vision library specialising in manufacturing industries.

Four functions have been upgraded or added in SuaKit v2.1: continual learning, using the same model to train for a new object; uncertainty data value provision, which shows the difference between normal and defect images; multi-image analysis, for inspecting various images in a bundle to increase the speed; and one-class learning, for when there is limited images of defects.

Open eVision, from Euresys, now includes a convolutional neural network-based image classification library called EasyDeepLearning. The library has a simple API and the user can benefit from deep learning, with only a few lines of code.

EVT's EyeVision software now has a deep learning surface inspector, for detecting flaws, damage and impurities on complex functional and aesthetic technical surfaces. The self-learning algorithm works directly on live images. Local training of an undefined number of classifications is used for evaluation of the image.

Processing in 3D

Along with improvements in deep learning algorithms, the new Halcon release from MVTec offers several enhancements for surface-based 3D matching. This means that additional parameters can be used to better inspect the quality of 3D edges, resulting in more robust matching – especially in the case of noisy 3D data.

Matrox Design Assistant X now also includes a photometric stereo tool, which creates a composite image from a series of images taken with light coming in from different directions.

Meanwhile, Photoneo has released its Bin Picking Studio 1.2.0, which can configure multiple vision systems and up to four picking objects in a single solution. The software also integrates a localisation configurator for configuring and verifying Photoneo's localisation parameters. There is a new 3D visualisation tool on the deployment page. Besides the robot with its environment and point cloud representing the scene, the localised parts are present, including a colour code and related statutes.

Finally, Opto Engineering has released Fabimage Studio, a software tool to assist machine vision engineers when creating an application. It follows a natural logic flow – from input to output – combined with a powerful library. Opto Engineering supports engineers in low-level programming with general purpose libraries (FabImage Library Suite) and specific, application-related libraries: TCLIB Suite, dedicated to setup and optimisation of telecentric systems (alignment of lens and light, alignment of object plane, focusing and distortion removal), and 360LIB Suite, developed to suit all needs of 360° lenses for single-camera inspection of cavities and lateral surfaces.