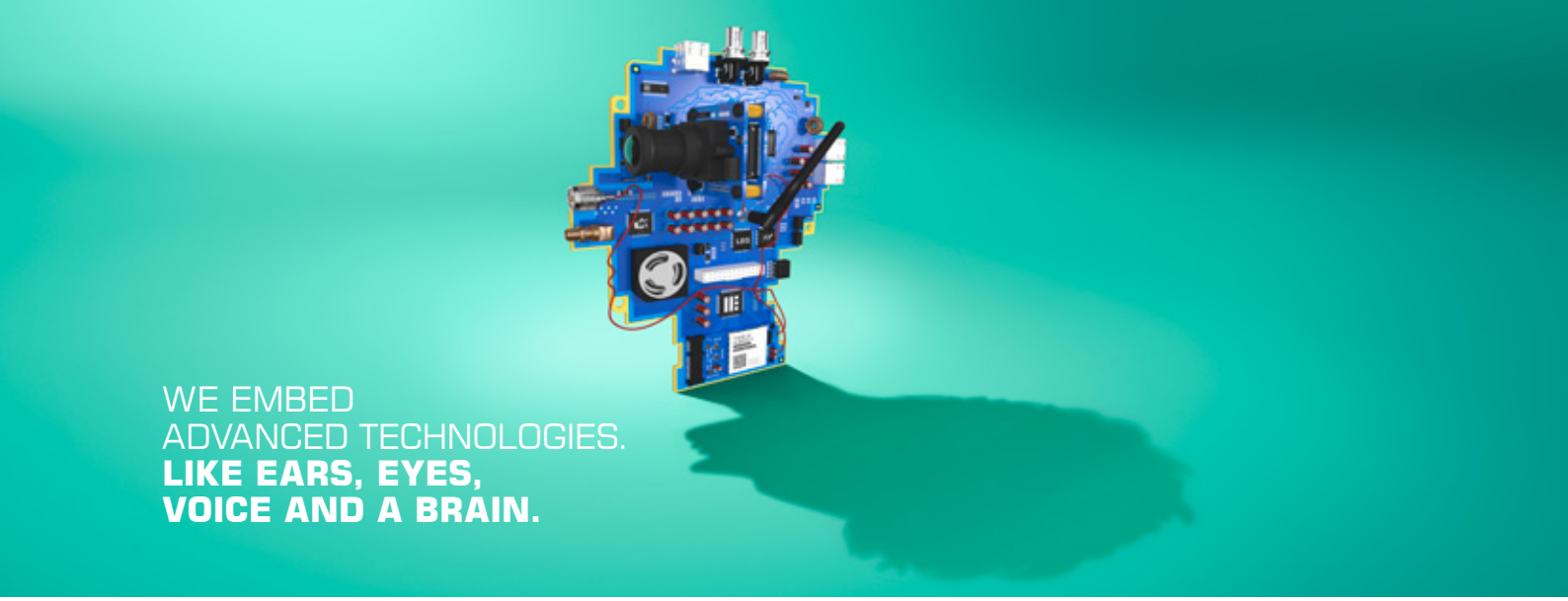

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Mission Embedded develops and supplies high-reliability embedded systems for professional applications in safety-critical environments such as special vehicles, transportation/railway, industry, medical technology, or air traffic control.

Together with the *Christian Doppler Laboratory Embedded Machine Learning* at Vienna University of Technology, we offer a research opportunity for the following Master thesis topic. We are also open for cooperation with other universities and institutes.

MACHINE LEARNING ON EMBEDDED SYSTEMS:

OPTIMIZING FEATURE DETECTION FOR DISPARATE LENS STICHING

The Christian Doppler Laboratory Embedded Machine Learning does research on Deep Neural Networks (DNN) in resource constrained embedded devices. It studies how energy consumption and resource usage can be minimized while keeping high accuracy. The solution space is characterized by architecture parameters, DNN optimization and transformations, implementation platform configurations, and mapping options. This design space is huge, poorly understood, and it is rapidly evolving.

Feature detection and matching is a key step for stitching different images and videos to increase field of view (FoV). Usually, the images and videos are captured either using a single camera with a fixed FoV or multiple cameras with the same or slightly different FoVs, ensuring significant overlap between two consecutive images. However, when the FoVs of two cameras are significantly different, state-of-the-art feature detection and matching algorithms fail. The major reasons of this failure are:

(1) the overlapping region is very small,

(2) the overlapping region has high resolution in one view, while it is very low resolution in other view, and

(3) the overlapping region may be rotated and translated with respect to each other.

The objective of this thesis project is to use a state-of-the-art feature detector, e. g. SIFT, SURF or ORB and optimize it for disparate lens stitching scenario. This thesis project consists of the following steps:

- Select one of the state-of-the-art feature detectors, e. g. ORB
- Select a range of different FoVs between two cameras from slight to significant (1:7)
- Benchmark the feature detector for the selected FoVs range
- For the significant difference case, select manually few key points and fine tune
- (or) transform both views into another domain, e.g. Bird Eye View and fine tune

This thesis offers you an excellent opportunity to get into the hot topic of deep learning.

It allows you to become an expert in configuring neural networks. Moreover, you acquire critical skills in using neural networks in embedded systems und resource constraints.

Some of the M.Sc. projects may be combined with a part time position.

Are you ready for your New Mission?
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