TECHNISCHE UNIVERSITÄT DRESDEN

IFA LS-AT

Fakultät Elektrotechnik und Informationstechnik ● Institut für Automatisierungstechnik

AUFGABENSTELLUNG FÜR DIE DIPLOMARBEIT

Für: #TBD Matrikelnr.: #TBD
Studiengang: #TBD
Thema: **Development of a runtime-optimized alternative for a 2D Convolutional Layer with advanced signal processing methods**

Convolutional Neural Networks (CNNs) attained 2D image processing as one of the most important tasks for AI algorithms. The time- and resource-efficient implementation of increasingly complex state-of-the-art CNNs became essential for deployments of CNNs in dedicated systems. From previous works, 2D Convolutional Layer approaches for feature extraction applications exist, but they do not satisfy the required real-time properties.

Signal processing theorems and algorithms from related disciplines and research fields, such as the Fast Fourier Transformation (FFT), can significantly support or completely replace convolutional operations (Convolutional Layer) in CNNs. Plug&Place advanced signal processing-based alternatives for Convolutional Layer have use cases in different AI-processed object classification and semantic segmentation tasks.

The student thesis objective is to develop and test a solution for a runtime-optimized alternative to Convolutional Layer, based on signal-theoretic analysis algorithms.

The following tasks should be accomplished:

1. State-of-the-art review of alternatives to 2D convolution algorithms, based on signal processing methods,
2. Structured requirements definition,
3. Design and software implementation of runtime-optimized alternatives to 2D Convolution Layer as Plug&Place solution in Python 3 and TensorFlow 2,
4. Testing of the developed algorithms with simulated data (provided by the supervisor), verification, and performance assessment,
5. Documentation.

The relevant results of other works that will be used in the student thesis shall be clearly and fully stated in the written part using appropriate citations. The guidelines for scientific and student works shall be followed.

The student thesis will be written in German/English.

Betreuer: Dipl.-Ing. Patrick Suwinski
Prüfer: PD Dr.-Ing. Annerose Braune
Ausgehändigt: #TBD Einzureichen: #TBD

PD Dr.-Ing. Annerose Braune
Verantwortlicher Hochschullehrer

Vorname Nachname
Student