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ANDANTE

AI for New Devices And Technologies at the Edge

D1.2 Requirements of self-learning and online learning on the edge

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Description	Requirements of self-learning and online learning on the edge		
Work Package	WP1 – Use case system architectures description and application Requirements		

Abstract (Published Summary)

This document provides a system level description of all ANDANTE use cases. It also This document provides a description of the online learning process on the edge in ANDANTE. It describes the motivation for this deliverable and presents some of the current challenges associated with training Artificial Neural Networks (ANN) using FPGAs. This deliverable also defines the requirements for the ANN and hardware to be used for online learning on the edge' functionality of the embedded AI algorithms associated with runway relative localization with the Robust Autonomous Landing use case (UC3.4).

UC3.4 “Robust autonomous landing” is the smart mobility use case under consideration for developing AI learning on the edge techniques. Small, unmanned aircraft are particularly sensitive to SWaP (size, weight? and power) restrictions, more so than almost any other mobility application. These aircrafts are subject to highly challenging perception, localization, and navigation tasks, which they must resolve with extremely high confidence and performance. AI algorithms have been demonstrated to satisfy the algorithmic needs for these tasks, yet traditional hardware implementations can typically not meet the SWaP restrictions. This gap promotes the investigation of embedding these algorithms into energy-efficient, high performing, neuromorphic hardware. An example of an onboard embedded AI algorithm is aircraft localization relative to runways, which consists of identifying a runway in view within images obtained by a forward-looking camera. UC3.4 is the only ANDANTE use case with requirements for online learning on the edge.

In top of the rationale for implementing online learning for the runway identification use case, the rest of the deliverable is structured as follows: It gives an overview of the current challenges in ANN training on the proposed FPGA system. It describes the autonomous landing system and focuses on how the ‘learning on the edge’ capabilities interfaces with the rest of the design. The online labeling system and the input/output data interfaces are also described.

Finally, it provides ways of measuring online learning performance in combination with the ANN and hardware requirements