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AI for New Devices And Technologies at the Edge

D5.2 Specifications of the use cases of the domain "Transport and Smart Mobility"

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Abstract (Published Summary)

This document defines the specifications of the use-cases in the “Transport and Smart Mobility” domain, in the context of WP5 Task 5.3 of the ANDANTE project.

For each use case, there is a section describing:

- The problematic.
- The neural network solution to be used.
- The processing flow identifying the key demonstrator components and their relations with each other.

Performance characteristics are also provided. These performances will be carefully analysed and tracked in the following phases of ANDANTE.

The use case addressed in this deliverable are the following:

- **Drones/USV**: It aims to compare different approach in developing neural network solutions (CNN topologies executed on an ASIC or FPGA accelerator, and Hybrid formal-spiking topologies executed on an FPGA accelerator) compatible with drone timing and accuracy critical missions.
- **Underwater Acoustic Signal Classification**: it aims to provide a solution that computes in real time an accurate detection and classification of underwater sound events with very low power consumption for a wide range of applications such as marine traffic monitoring for maritime services, ambient noise monitoring, classification for submarine warfare or even marine mammals/fishes classification and inventory.
- **3D Object Detection and Classification of Road Users based on LiDAR and camera**: it aims to study the sensor fusion task between LiDAR and Camera to achieve a higher accuracy vision system. In autonomous driving systems, usually this task is done on very powerful GPUs, which are used in a general-purpose computation configuration mode. However, this type of solution is very power consuming solution, very expensive, and in addition not optimized for the neural networks behaviour. By using solutions developed in ANDANTE, the aim is to find a power efficient and cost-effective solution that can be used to replace traditional design options in the market for sensor fusion functions and for future functions like Path planning and vehicle control.
- **Robust Autonomous Landing**: It aims to improve the communication, navigation, and surveillance (CNS) capabilities of low size, wight, and power (SWaP) aircraft by implementing a set of technologies that leverage the power and capabilities of state-of-the-art machine learning algorithms, mainly artificial neural networks. Four main onboard technology developments tasks are considered: one communications task consisting of link assurance and monitoring technologies, and three navigation tasks consisting of runway relative navigation, obstacle detection and image registration.
- **Path planning for autonomous steering**: It deals with dynamic path planning of vehicles, in the presence of other users, unforeseen obstacles, and changes in trajectory conditions. It can be compared to a highly dynamic and detailed short-range navigation system, however with constant updates to its local map of the environment, and constantly updating the vehicle's planned trajectory among other vehicles and objects. The scope of this use case is to develop dataflow networks for the sets of differential equations or other neural networks that govern the paths of vehicles and

other objects. As part of this scope, GML will study the execution requirements for such networks, and to optimize their operation on neuromorphic processing systems.