Improved localization with radar through neuromorphic computing

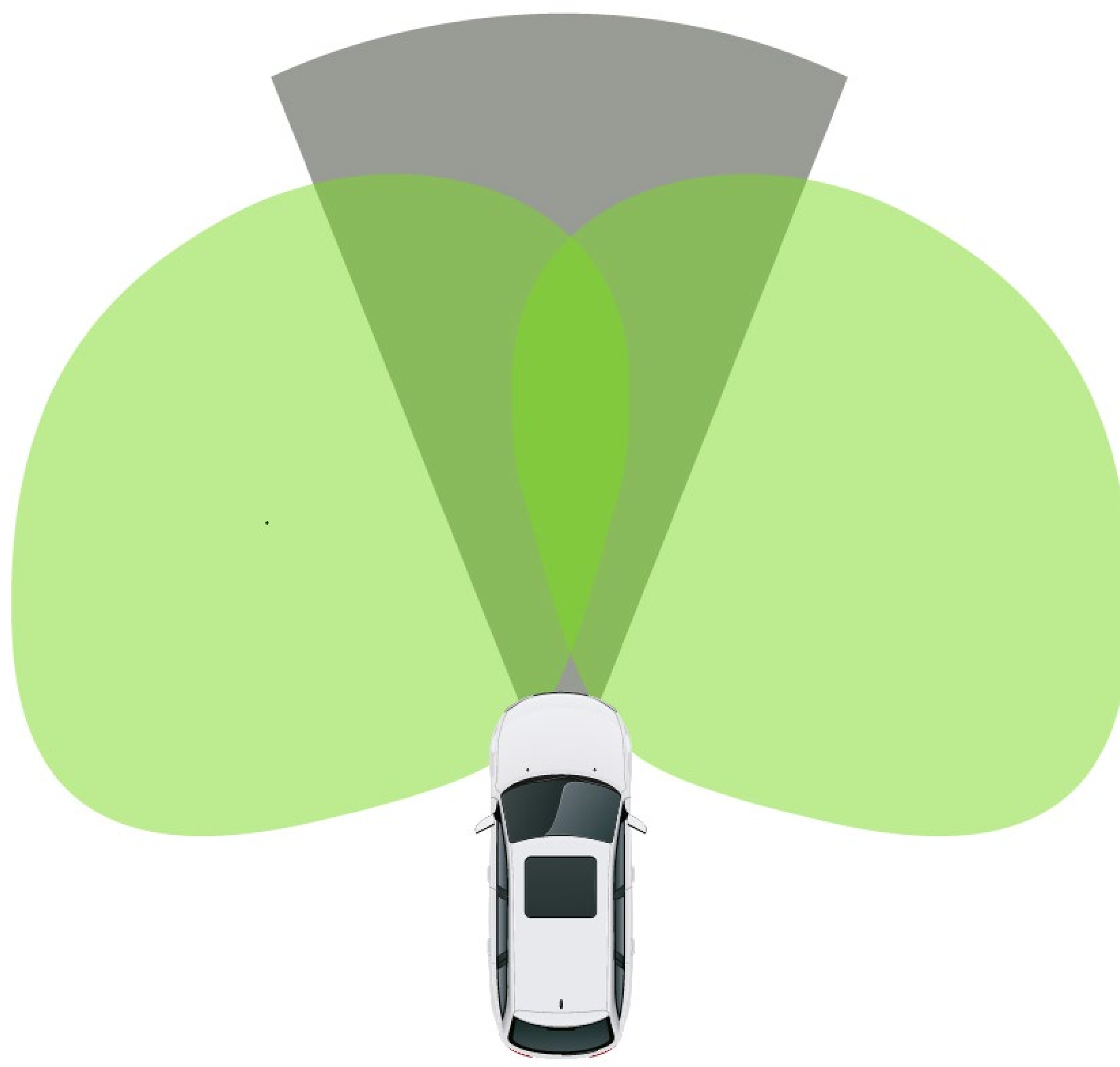
TEMPO

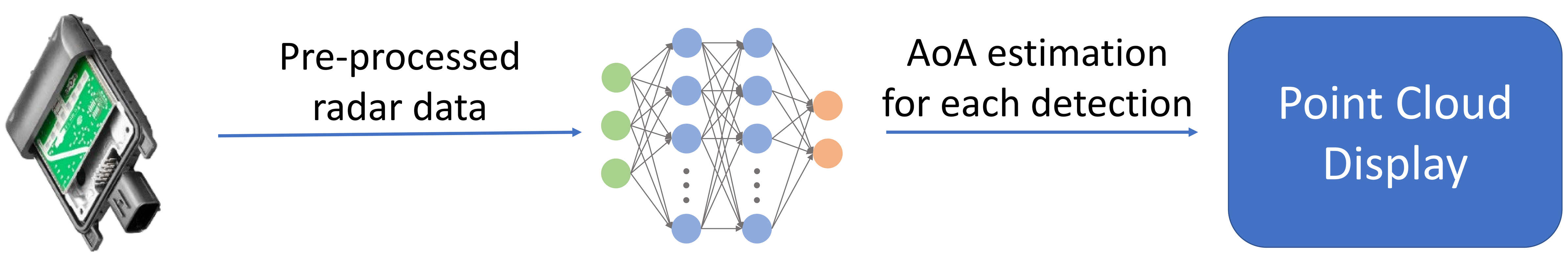
obtain enhanced angular positioning without increasing the # antennas

Automotive

Radar is one of the key surround sensing technologies for automotive. This technology, however, comes with a challenge: the angular sensing resolution is related to the number of antennas. More antennas result in larger and more expensive sensors which consume more power. In the TEMPO project, however, we improve the angular resolution by means of enhanced data processing. This can be achieved in an efficient way by using neural networks in combination with neuromorphic hardware. For this activity, we consider real-time capabilities needed for automotive, and we showcase the resulting system through a vehicle demonstrator.

This activity uses deep learning in early stages of the radar signal processing chain and achieves an improved angular resolution on an embedded real-time system. In terms of neuromorphic hardware, a voltage divider approach is used for the multiply and accumulate (MAC) operations, and a current-steering-based SRAM crossbar and a calibratable FeFET crossbar with adjustable output precision for accelerating MAC operations is developed.





Two deep learning inference accelerator ASICS are pursued. The **digital accelerator** is based on videantis' next generation of deep-learning enabled processor architecture, implementing a 22nm SRAM based architecture supporting Deep Compression approaches. The **analog accelerator** implements a low-power and low-leakage crossbar architecture implemented in 28nm using SRAM and FeFETs in-memory computing cells for 3-bit and 1-bit quantized weights. To allow FeFET programming using compatible low-voltage devices, innovative programming schemes and corresponding auxiliary circuits are developed.

Demonstrator partners

InnoSenT Fraunhofer videantis

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TEMPO

Technologies and hardware for neuromorphic computing

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