



We are the link
between the real and
the digital world.

Accurate AI-models with limited edge
hardware for automotive applications

TERAKI™



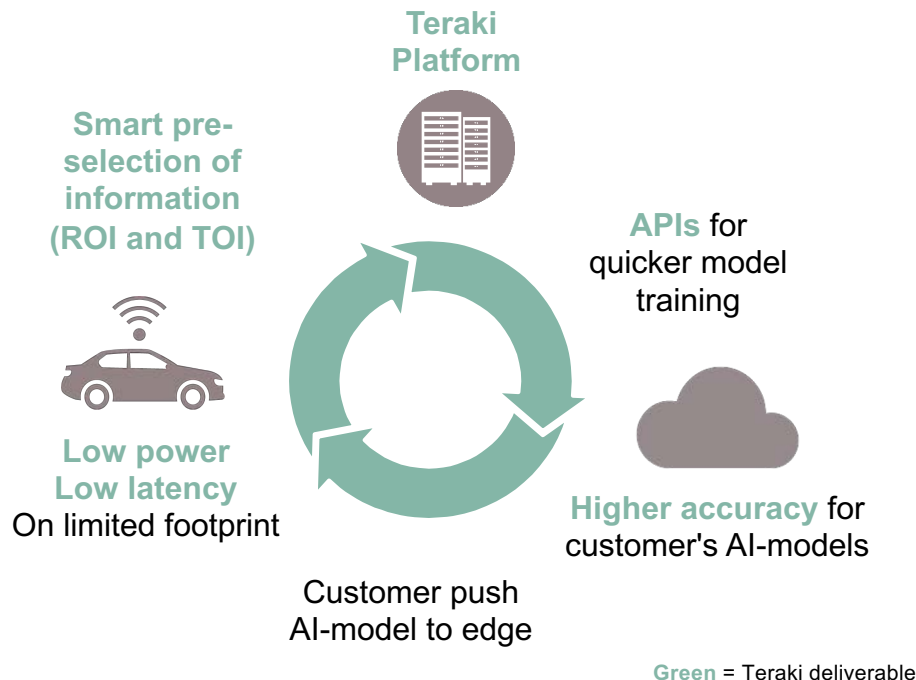
The edge AI lifecycle: how to train and run AI-models

AI models are the foundation for:

- › New functionalities
- › Better products
- › New services
- › Safer operations

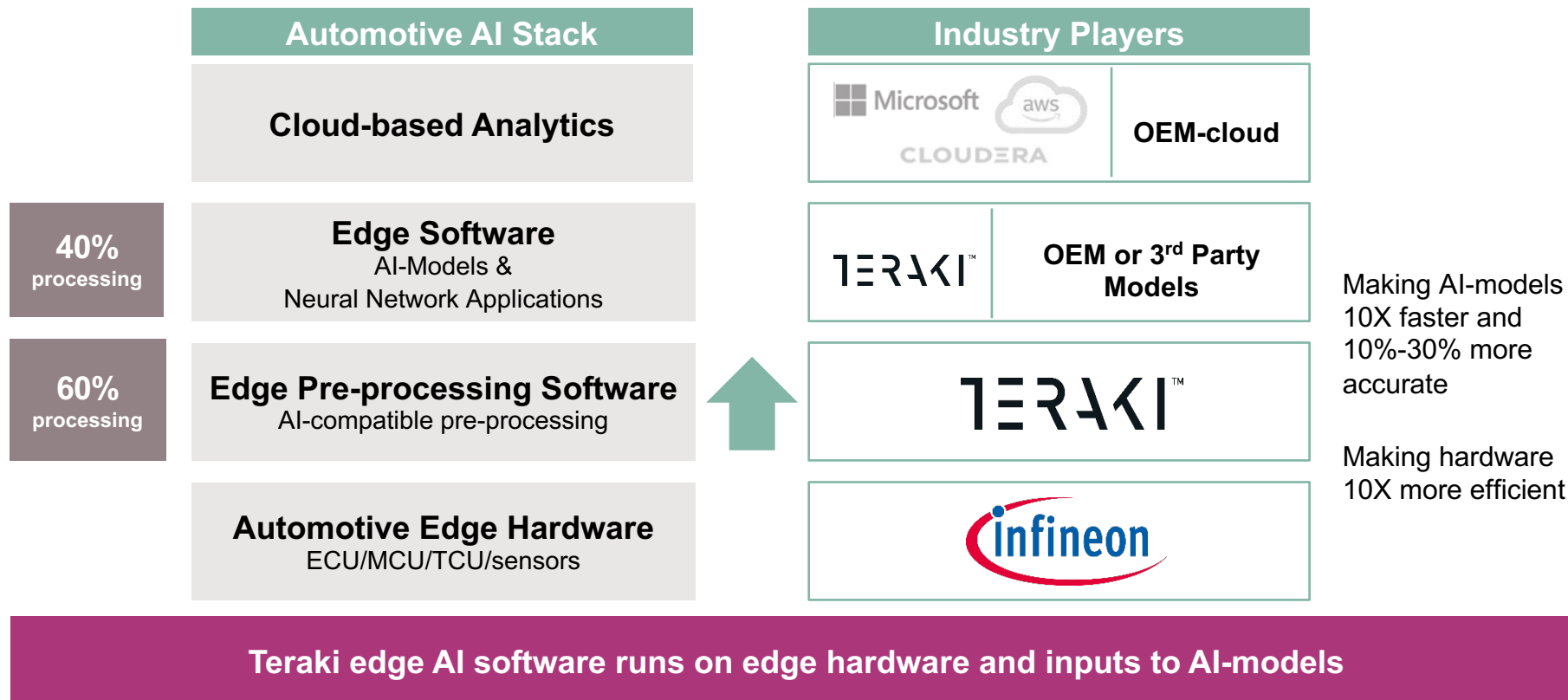
Leading to a demand for smarter processing of sensor data at the edge:

- › Sensor data is the fuel for AI models
- › The more sensors and the higher the resolution, the better AI-models get.
- › This data "flood" creates various bottlenecks and requires a solution

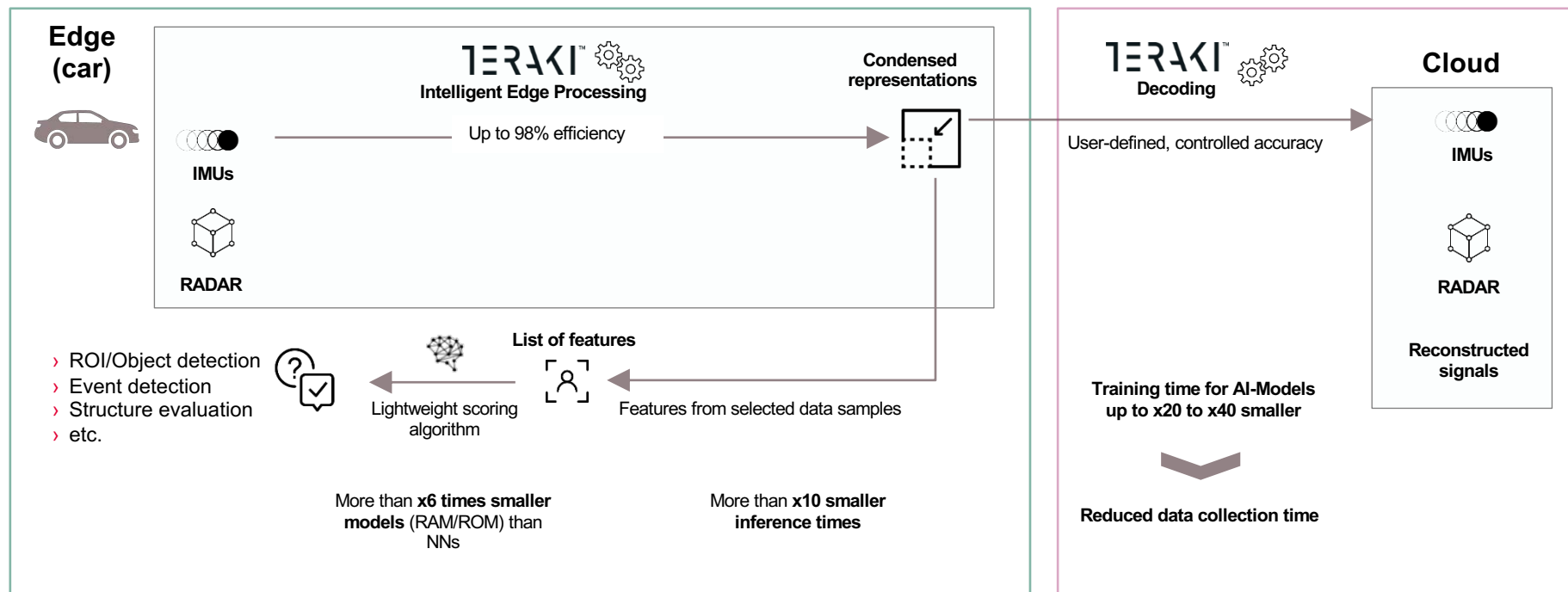


Coping with sensor data at the edge is key to deliver to the increasing customer demands for AI-models

Where is edge pre-processing in the automotive IT-stack?

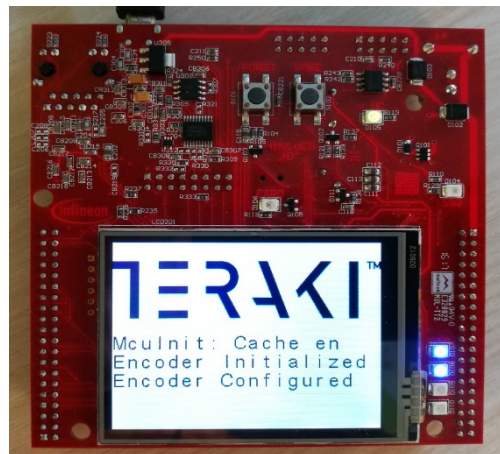


Intelligent signal processing by Teraki at the edge



Reducing raw data and extracting the relevant information

Real benchmarks on AURIX™ TC2 and TC3 implementations



Infineon AURIX™

ROM:

Total: 7,974 bytes

RAM:

Working buffer (internal memory): 7,312 bytes

Evaluation

Signal group 1 (50 signals, frame_buffer = 20):

State	Min	Max	Avg	Avg / Sig
Encode	11.95 ms	20.4 ms	14.96 ms	299.27 us

Signal group 2 (7 signals, frame_buffer = 20):

State	Min	Max	Avg	Avg / Sig
Encode	363.98 us	542.26 us	400.51 us	57.21 us

50 signals simultaneously processed in **15ms** with **7KB RAM** and ROM.

Average CPU usage 7% for 10Hz signals.

No spikes in CPU-usage.

Teraki demonstrates 10x higher speeds without compromising quality and hardware resources

Reality: Pre-processing in action on the AURIX™ TC3XX

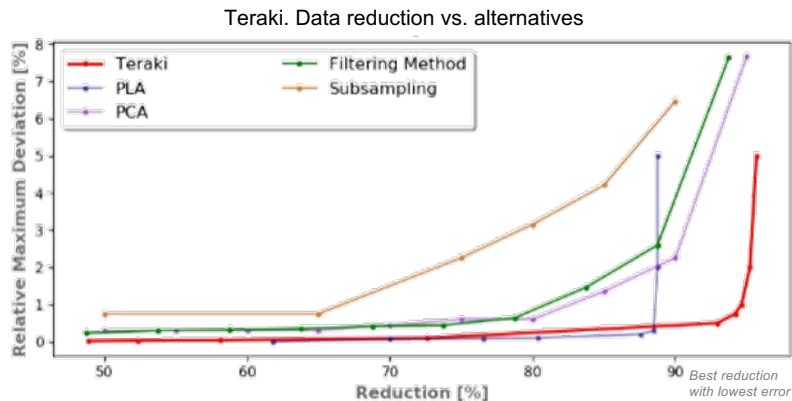
TERAKI™



Teraki successfully demonstrated working implementations on AURIX™ chipsets

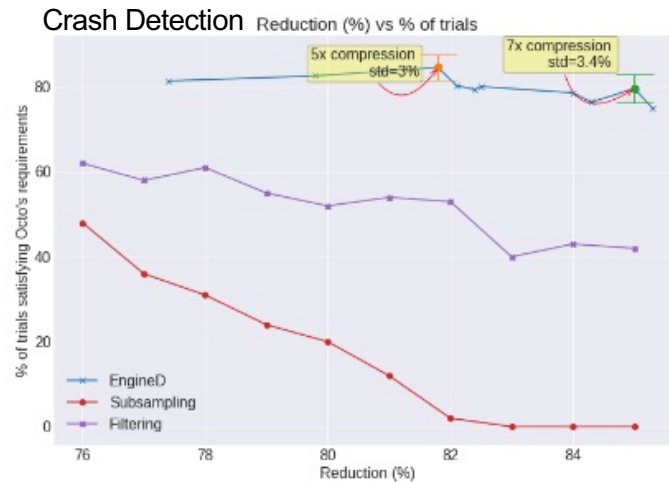
Delivering higher AI-accuracy

Only Teraki delivers high accuracy (<1% deviation) while reducing with factor 20X



Alternatives start failing in preserving accuracy at acceptable x5 increased rates and x10 lower latency

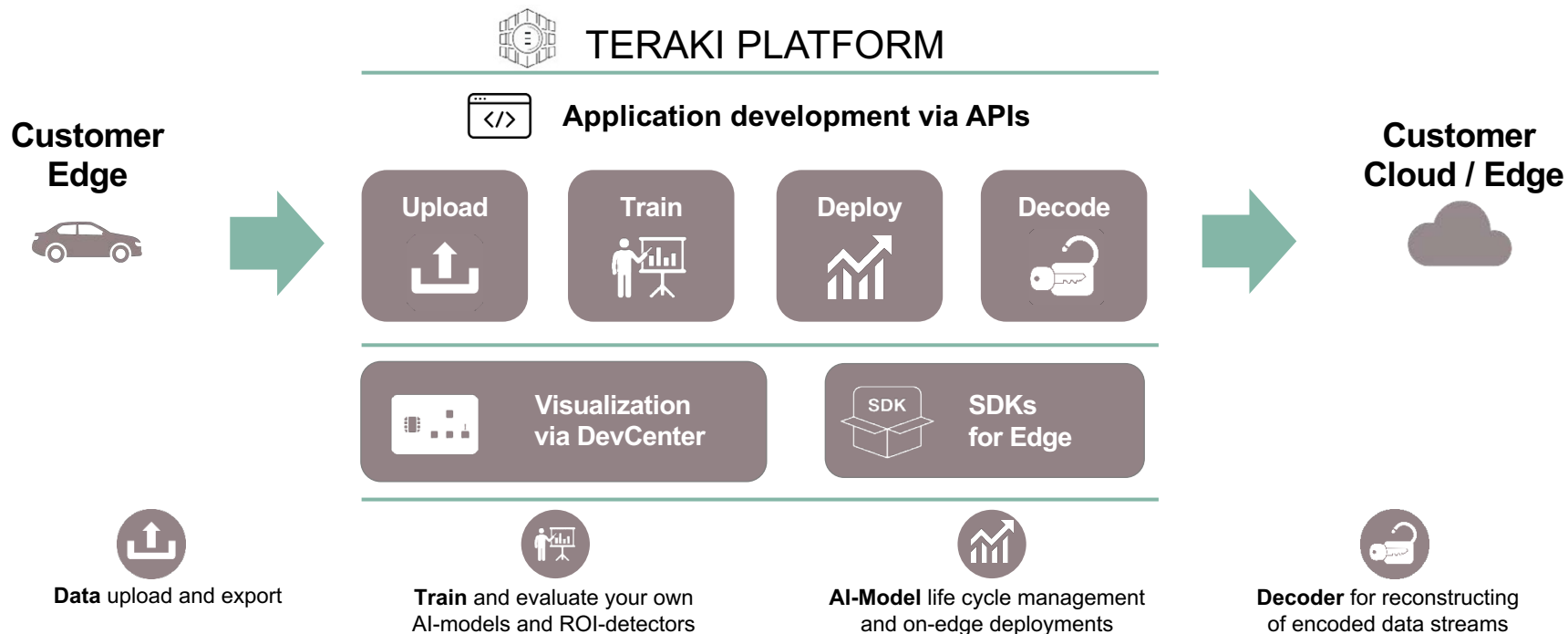
Detection accuracies 30% higher compared with other processing



With Teraki, the accuracy of the AI-model's result does not degrade and can be even improved vs. raw data

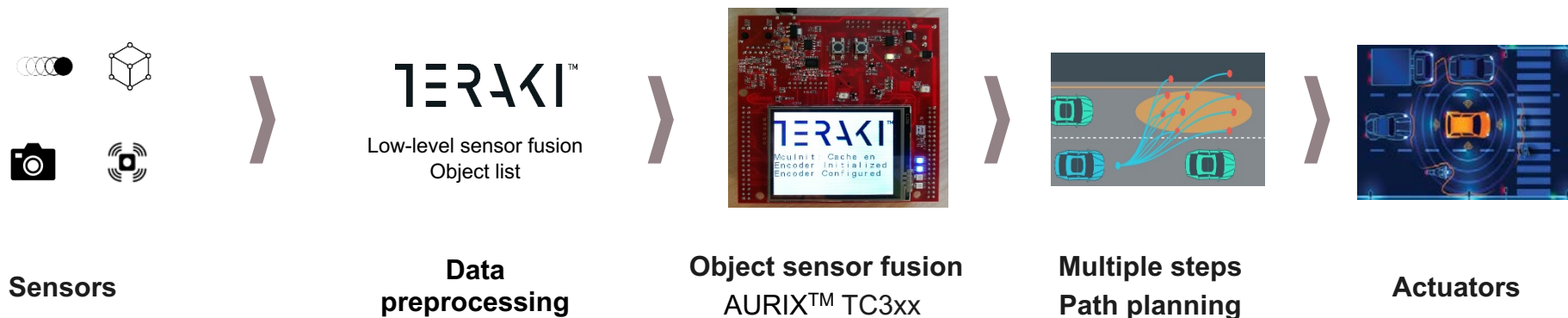
Teraki delivers 10% - 30% higher accuracy outcomes than alternative methods

Faster training of AI-models – automated via Teraki Platform



Build and deploy the best algorithms for any targeted use case and scale to high volumes

Low level sensor fusion: the step prior to AURIX™ decision making

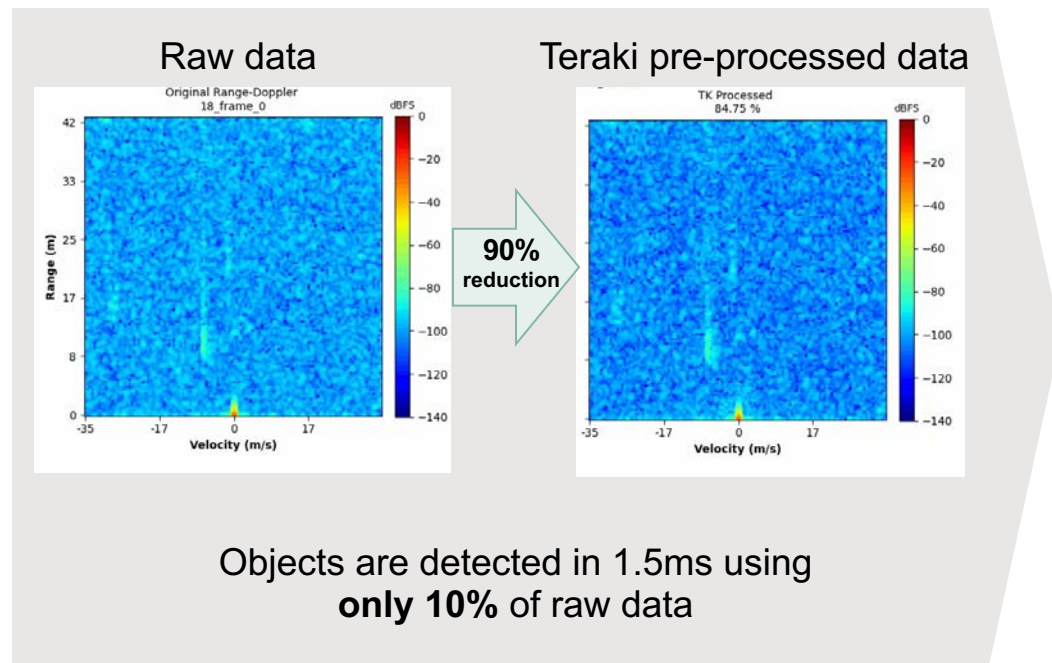


"With TERA KI, the Safety SoC can process more sensor data at higher resolutions, leading to better real-time decisions."

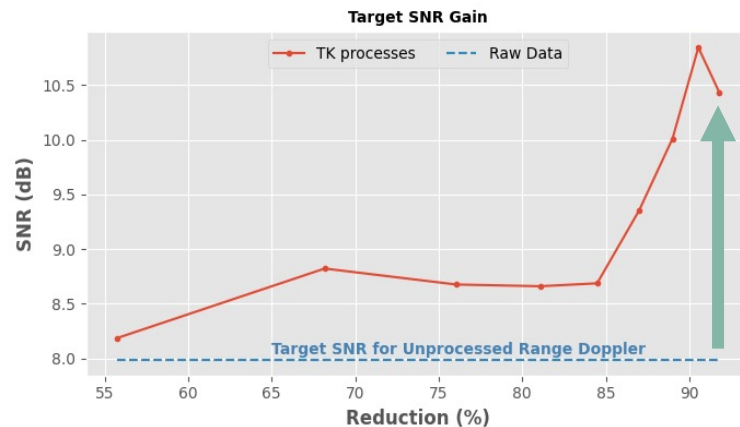
Raw vs Pre-processed data:
2D Camera: 40x faster transmission
(10x Codec, 4x ROI)
3D Lidar: 80x faster transmission
(20x Codec, 4xROI)
3D Radar: 10x faster transmission

Efficiently combining powerful sensor information in low-powered chipsets

Example 1: Radar pre-processing for improved SN-ratio

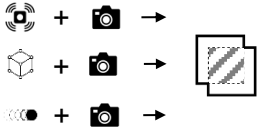


31% SNR improvement
by applying Teraki pre-processing
(on target at 90% reduction)



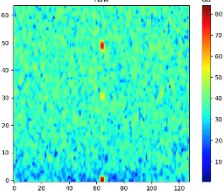
Teraki software improves Signal to Noise ratio by 31% in 1.5ms

Example 2: Low level sensor fusion of radar / lidar & camera

Sensor Fusion	Value
<p>Sensor Fusion:</p> <ul style="list-style-type: none"> › Lidar & camera › Radar & camera › IMUs & camera  <ul style="list-style-type: none"> › Lower CPU and energy › Lower latencies › Accurate info for planning, etc 	<ul style="list-style-type: none"> › Making Sensor Fusion efficient and scalable › Production-grade ADAS functionalities › Accurate, real-time fusion done on one single core

Process

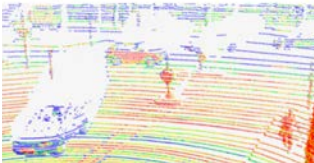
Raw Radar data



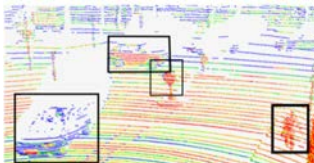
7 ms latency for 128x128 frame on single CPU

or


Raw Lidar data



ROI Inference (Radar/ Lidar)




ROI Encoding (2D)




25 ms latency for 100K/frame lidar point cloud and 30fps HD camera

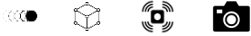
Benefits



Production-scale automotive hardware (single core)



Real-time, local processing of large data streams



Powerfull combination of complementary sensors

Enabling ADAS with high precision and low latency on existing production hardware

Low level sensor fusion: 1) IMU + Camera

Lane Change detections

IMU + Video.mp4 (in wetransfer)

Real-life, automotive-grade & accurate sensor fusion (IMU & camera) to detect events

Low level sensor fusion: 2) Lidar + Camera

People and car detections

LIDAR + Camera.mp4 (in wetransfer)

Real-life, automotive-grade & accurate sensor fusion (lidar + camera) to detect objects

More accurate AI-models in high volume series production



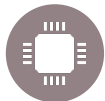
10% - 30% higher accuracy rates of AI-model



Reduction performance between 90% - 97%



Deterministic – hence certifiable and for safety related functions



Embedded on low powered ECU's – constant CPU-usage (7% for 50 signals at 100Hz)



Faster training and continuous improvements of customer AI-models via Teraki's Platform



Enabling low-level sensor fusion outputs towards path planning or decision making in AURIX™

Contact: info@teraki.com



Part of your life. Part of tomorrow.