

## Automotive AI on the edge for car state classification



### Features

- The AEKD-AICAR1 is a hardware kit that consists of the following boards:
  - AEK-MCU-C4MLIT1–SPC58EC Chorus 4 Mbytes MCU board
  - AEK-LCD-DT028V1–SPI-based TFT LCD display
  - AEK-CON-SENSOR1–MEMS sensor connector for SPC5 MCU
  - STEVAL-MKI206V1–Adapter board with AIS2DW12 digital motion sensor
- Pretrained neural network code flashed in the MCU
- Classification of four vehicle states: parking, normal road, bumpy, and skidding
- Real-time data collection and processing of MEMS sensor data
- LCD display for vehicle state
- On MEMS disconnection, the system performs classification based on the internal datalog in the MCU flash memory
- 28x18x7 cm
- Supplied by 12 V or by eight AA batteries (not provided in the package)

### Applications

- Automotive AI on the edge
- ADAS
- Automotive sensors reading and processing
- Automotive predictive maintenance

### Description

The AEKD-AICAR1 is a versatile system based on a long-short term memory (LSTM) recurrent neural network (RNN), which can provide a car state classification: car parked, car driving on normal road conditions, car driving on a bumpy road, car skidding or swerving.

The innovative idea in the AEKD-AICAR1 is to define an ECU detection node with an embedded artificial intelligence processing.

The AEKD-AICAR1 houses an SPC58EC chorus 4Mbytes microcontroller, which can acquire discrete acceleration variations on a three-axis reference system.

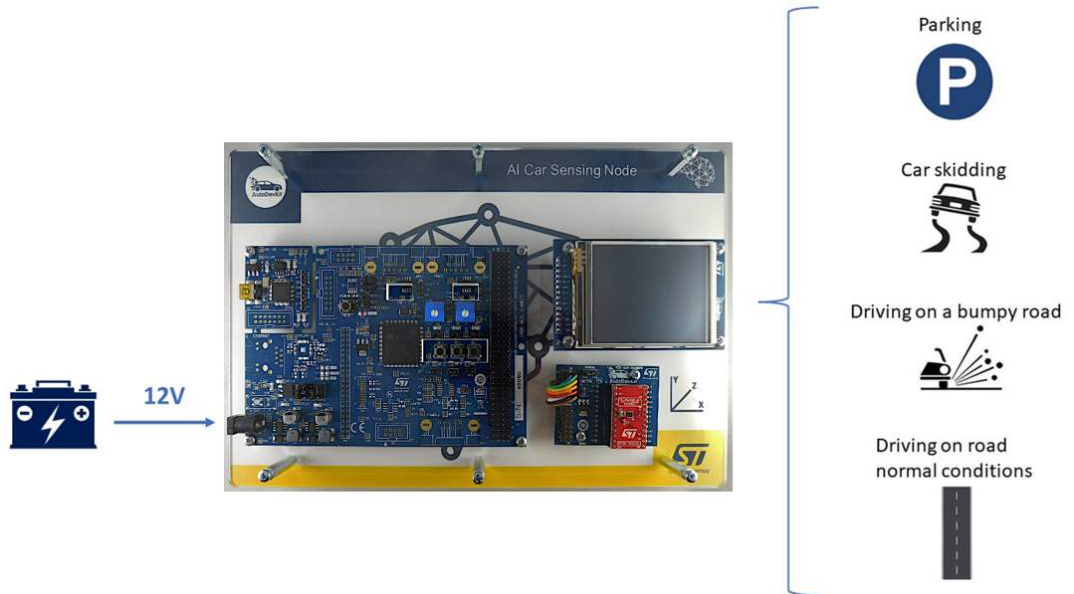
The AEKD-AICAR1 system represents a reference for the automotive AI on the edge processing.

It is possible to replace easily the sensor with another one that belongs to the ST MEMS family. It is also possible to modify the neural network and/or retrain the neural network. The new neural network is converted into a library executable by the MCU using SPC5-STUDIO-AI.

Product summary	
Automotive AI on the edge for car state classification	AEKD-AICAR1
Connector board for SPC5 MCU discovery boards and MEMS sensor boards in DIL 24 socket	AEK-CON-SENSOR1
MCU discovery board for SPC5 Chorus	AEK-MCU-C4MLIT1
Display expansion board with resistive touch for Chorus family	AEK-LCD-DT028V1
AIS2DW12 adapter board for a standard DIL 24 socket	STEVAL-MKI206V1A
AutoDevKit library plugin for SPC5-STUDIO	STSW-AUTODEVKIT
Artificial Intelligence (AI) plugin for automotive SPC5 MCUs	SPC5-STUDIO-AI
Application	ADAS/Predictive Maintenance

# 1 Block diagram

Figure 1. AEKD-AICAR1 block diagram



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## 2 Schematic diagrams

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**Note:** *The AEKD-AICAR1 kit consists of the following evaluation boards: [AEK-MCU-C4MLIT1](#), [AEK-CON-SENSOR1](#), [AEK-LCD-DT028V1](#), and [STEVAL-MKI206V1](#). You can find their detailed schematic diagrams at the related web pages:*

- [AEK-MCU-C4MLIT1 schematic diagrams](#)
- [AEK-CON-SENSOR1 schematic diagrams](#)
- [AEK-LCD-DT028V1 schematic diagrams](#)
- [STEVAL-MKI206V1 schematic diagrams](#)

## Revision history

**Table 1. Document revision history**

Date	Revision	Changes
21-Sep-2022	1	Initial release.

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