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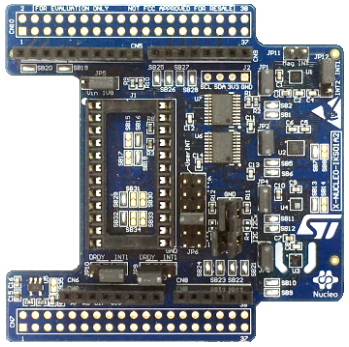
ISM330DHCX
iNEMO™ inertial module

Evaluation tools and GUI for Machine Learning

ISM330DHCX quick prototype

Two solutions to capture and process data

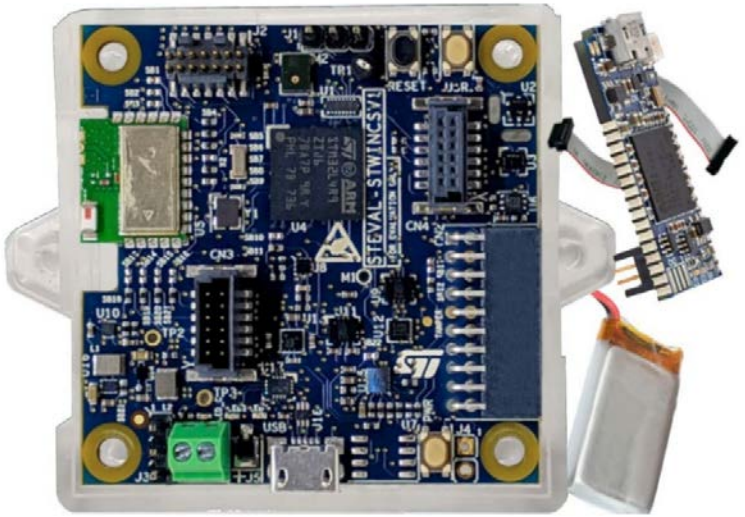
STM32 Nucleo with Expansion board tool & Unicleo GUI



STM32 NUCLEO with EXPANSION
X-NUCLEO-IKS02A1

Software package:
UNICLEO GUI with X-CUBE-MEMS1
UNICO GUI for MLC development

STWIN kit



STEVAL-STWINKT1

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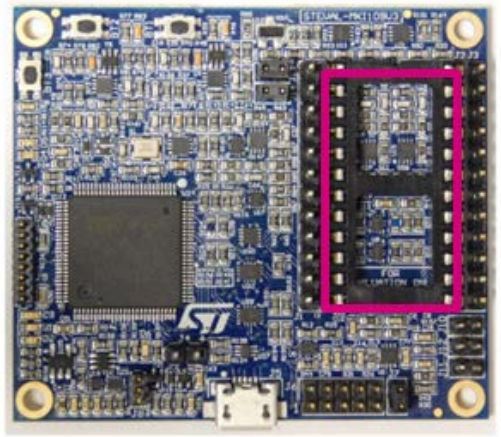
ISM330DHCX performance evaluation

Form Factor Tool & GUI to capture and process data

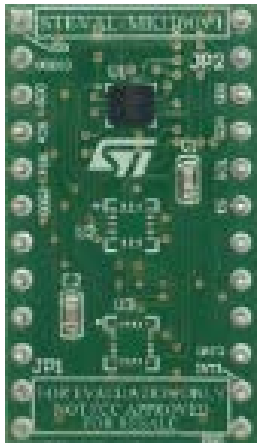
Professional MEMS motherboard	Evaluation board (adapter)



Professional MEMS motherboard
STEVAL-MKI109V3

Software package:
UNICO-GUI

Linux → STSW-MKI109L ,
Mac OS X → STSW-MKI109M,
Windows → STSW-MKI109W



DIL24 adapter board
STEVAL-MKI207V1
STEVAL-MKI210V1K

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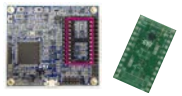
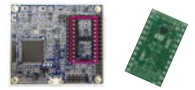
ISM330DHCX form factors & GUI
Decision tree creation process

	Capture data	Label data	Build decision tree	Embed decision tree	Process new data
WHAT	Accelerometer Gyroscope External sensors	Filters Features	Classification Results	DT implementation	Real-time test
HOW – HW	Unicleo-GUI				Unicleo-GUI
HOW – SW	Unico-GUI 	Unico GUI*			Unico-GUI  AlgoBuilder

*** External tools for building decision tree:**
Weka, RapidMiner, MATLAB, Python

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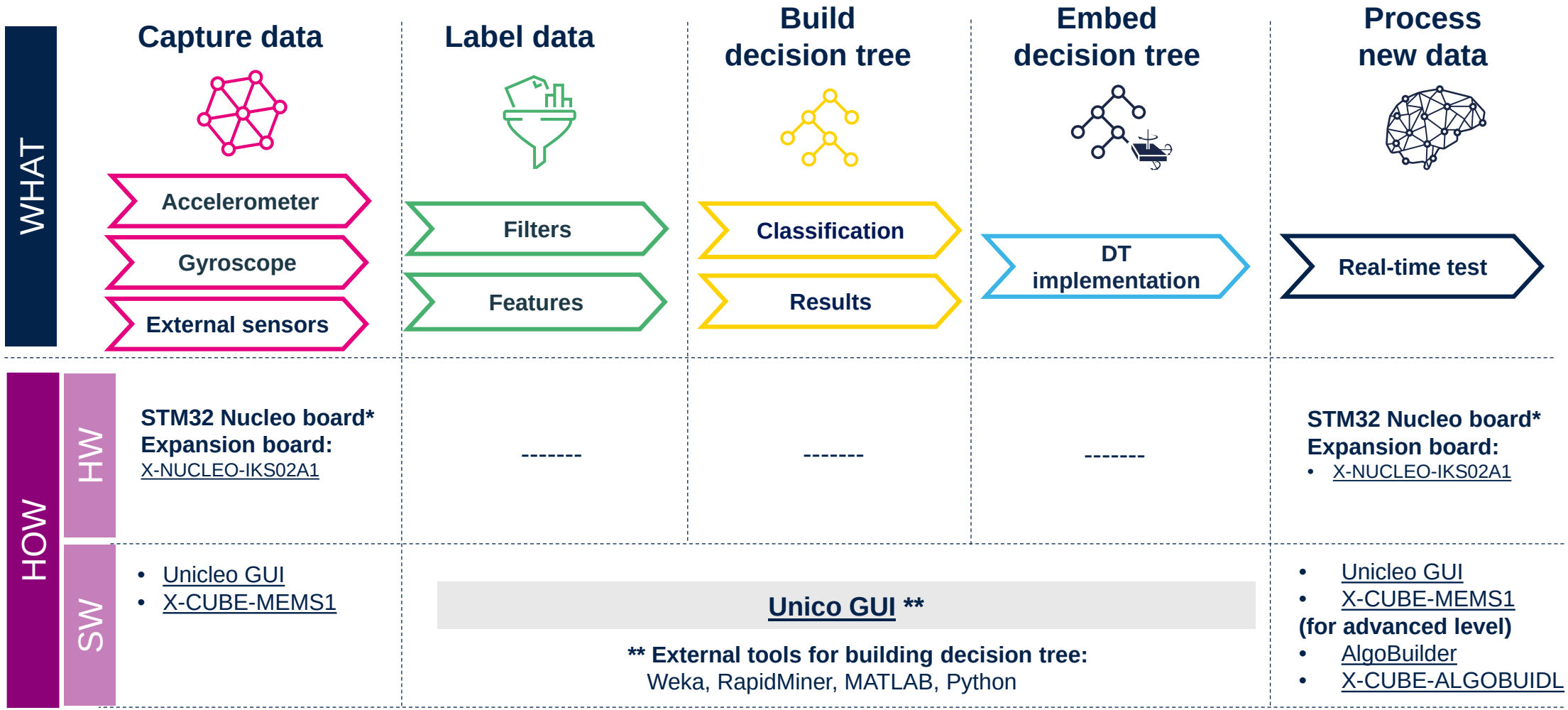
ISM330DHCX
STM32 Nucleo with expansion board



* Refer to product specification: NUCLEO-F401RE, NUCLEO-L152RE, NUCLEO-L476RG, NUCLEO-L073RZ
With **STM32CubeMX** SW support

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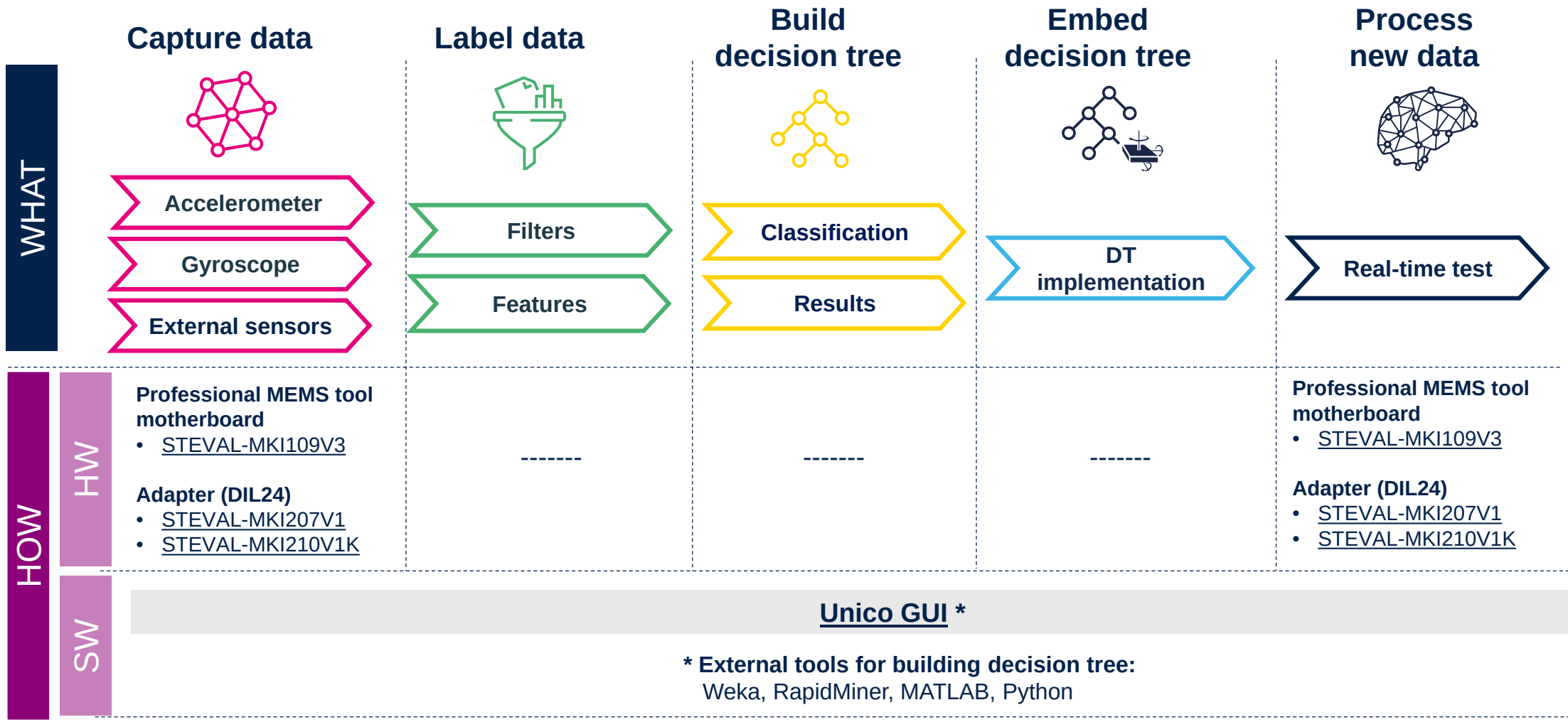
ISM330DHCX
Professional MEMS tool motherboard



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ST sensor tools
Decision tree creation process – Dataset & label

Capture data

a) **Professional MEMS tool motherboard**

Unico-GUI (USB cable)

b) **STM32 Nucleo board with expansion**

Unicleo-GUI (USB cable)

1

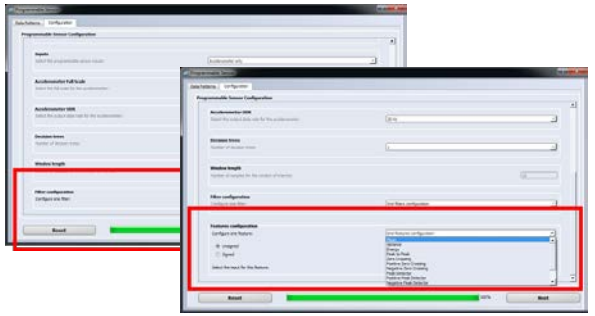
Logs generation in .csv files

Label data

Unico-GUI → **MLC development tool**

STEPS

1. Import .csv files in Unico
2. Assign label (class) to the files
3. When all files are imported, start MLC configuration: sensors setup (ODR, FS, etc), windows length, filters and features
4. Generation of .arff file



2

from Logs in .csv files to .arff file generation

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ST sensor tools
Decision tree creation process – build & embed

Build decision tree

Unico-GUI → **ST MLC development tool**

3

From .arff file to Decision Tree generation in .txt file
(only for Weka/RapidMiner copy the content in .txt file)

Embed decision tree

Unico-GUI → **MLC development tool**

4

STEPS:
1. Import .txt file in Unico
2. Assign values to the classes
3. Meta-classifier configuration (if needed)
4. Generation of .ucf/.h file

From . txt file to .ucf/.h file generation

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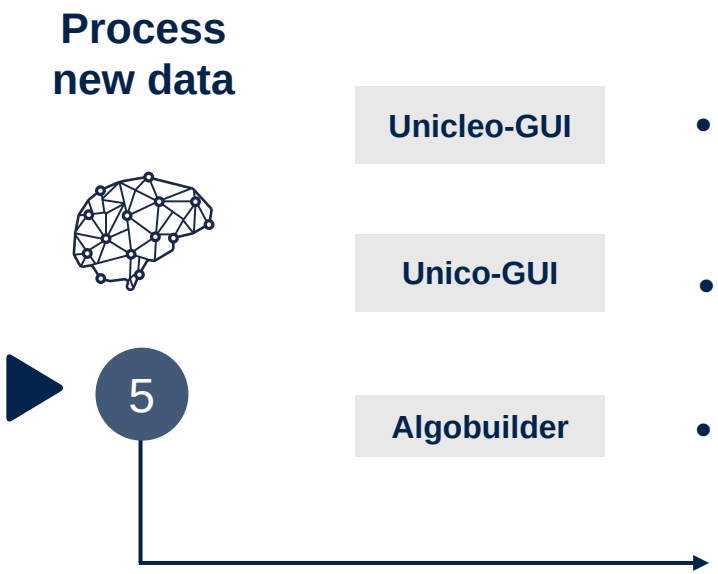
ST sensor tools
Real-time test with trained decision tree



- Test the Decision Tree on STM32 Nucleo board with expansion using USB cable
- Test the Decision Tree on Professional MEMS board using USB cable
- PC application for advanced development level

AlgoBuilder GUI – PC application

- AlgoBuilder is a graphical design tool to build and use algorithms
- AlgoBuilder GUI uses the outputs from MLC and FSM to allow you to build more complex projects
- An existing MLC / FSM configuration (.ucf file) can be implemented

Explore MLC examples and resources

- Decision tree examples are available online at the dedicated **GitHub project for Machine Learning Core**

https://github.com/STMicroelectronics/STMems_Machine_Learning_Core

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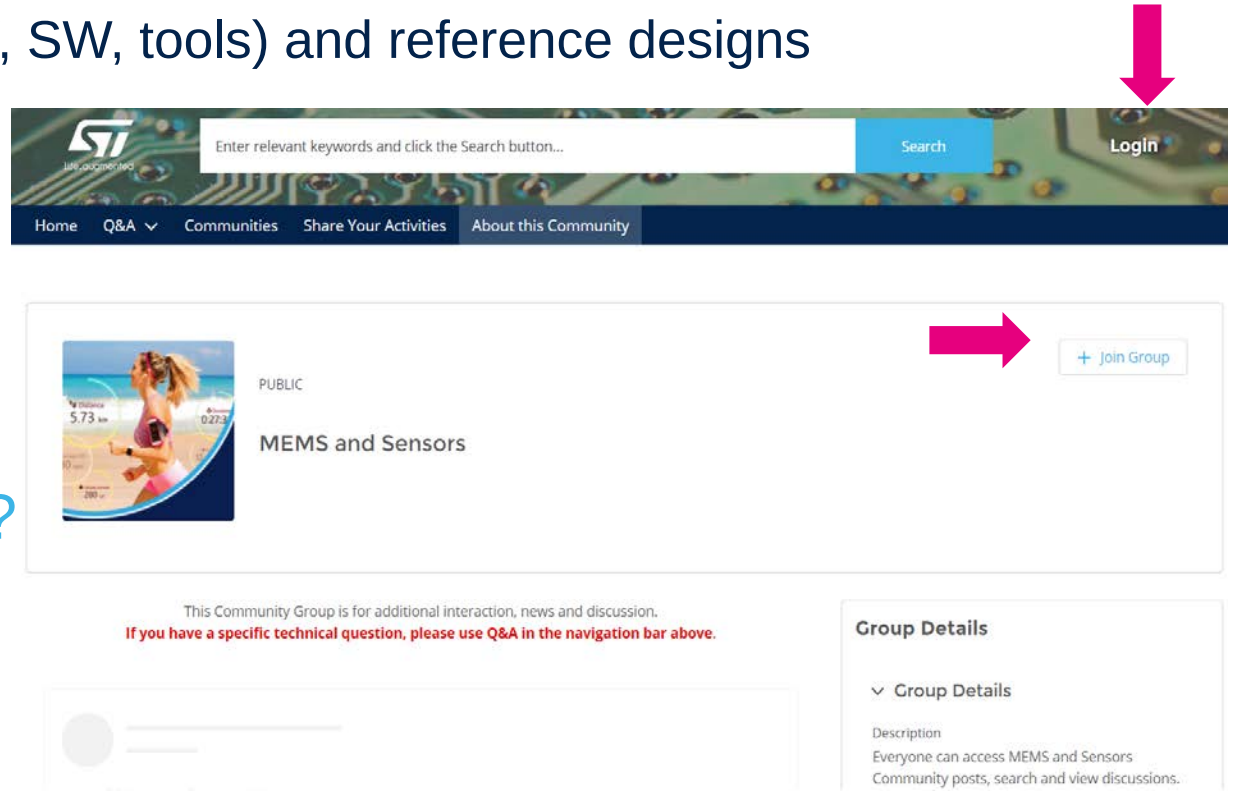
MEMS and sensors Community and Q&A

- MEMS and sensors Community
  - The latest information on MEMS product (HW, SW, tools) and reference designs
  - Join the community to…
    - …share ideas and find sparks!
    - …find potential customers



- Q&A: Do you have a technical question?
  Ask here!

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MEMS and sensors Community and Q&A

- Join us in 3 steps!
  1. Register (if you do not already own an account)
     https://my.st.com/cas/login?service=https://my.st.com/content/my_st_com/en.html

  2. Join MEMS and Sensor community becoming a follower
     https://community.st.com/s/group/0F90X000000AXsjSAG/mems-and-sensors

  3. Post your company competence / competitive advantage!

Refer to the MEMS and Sensor community or Q&A section for questions and updates. Our experts are there to help you!

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Thank you

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