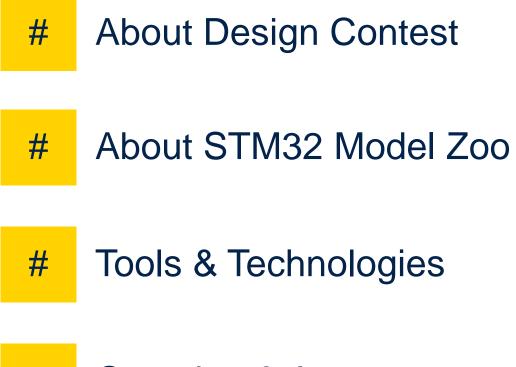




#### VLSID-2024 : Design Contest Orientation Session

21<sup>st</sup> August 2023









# About Design Contest

- The theme of the contest is Artificial Intelligence on the Edge
- The objective is to use the STM32Cube.AI Edge AI development tools and ecosystem to create and deploy embedded AI/ML based solutions to real world problems from the following domains: Robotics, Healthcare, Agriculture, Battery Management, Digital Power, and Renewable Energy Management Systems.
- Important dates
  - Idea Submission by : 10<sup>th</sup> September,2023
  - Selected idea Announcement on : 18<sup>th</sup> September 2023
  - Kit Dispatch by : 21<sup>st</sup> September 2023
  - Project Submission by : 5<sup>th</sup> December ,2023
  - Selected Demo Announcement on : 12<sup>th</sup> December 2023
  - Final Demonstration on : 9<sup>th</sup> Jan 2024



#### About STM32 Model Zoo

 STM32 Model Zoo : <u>GitHub - STMicroelectronics/stm32ai-modelzoo: Al Model Zoo</u> for STM32 devices

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	HASTM Update in common/stm32ai_	dc:	f70a045 last month 😗 20 commits	Al Model Zoo for STM32 devices ai stm32 stm32f4 st stm32f7			
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	Common	Update in common/stm32ai_dc:	last month	stmicroelectronics stm32h7 stm32mp1			
	hand_posture	Release AI-ModelZoo-1.3.0:	2 months ago				
	human_activity_recognition	Release AI-ModelZoo-1.3.0:	2 months ago	☐ Readme Ճħ View license			
	image_classification	Release AI-ModelZoo-1.3.0:	2 months ago	Code of conduct			
	bject_detection	Update Object Detection:	last month	▲ Security policy			
	🖿 tutorials	Release AI-ModelZoo-1.3.0:	2 months ago	✓ Activity			



# **X-CUBE-AI : AI Tool Features**

- Generation of an STM32-optimized library from pretrained neural network and classical machine learning models
- Native support for various deep learning frameworks such as Keras and TensorFlow<sup>™</sup> Lite, and support for all frameworks that can export to the ONNX standard format such as PyTorch<sup>™</sup>, MATLAB®, and more
- Support for various built-in scikit-learn models such as isolation forest, support vector machine (SVM), K-means, and more
- Support for 8-bit quantized neural network format (TensorFlow<sup>™</sup> Lite and ONNX Tensor-oriented QDQ)

- Support for deeply quantized neural networks (down to 1-bit) from QKeras and Larq
- Relocatable option enabling standalone model update during product lifecycle by creating a model binary code separated from the application code
- Possibility to use larger networks by storing weights in external flash memory and activation buffers in external RAM
- Easy portability across different STM32 microcontroller series through STM32Cube integration
- With a TensorFlow<sup>™</sup> Lite neural network, code generation using either the STM32Cube.AI runtime or TensorFlow<sup>™</sup> Lite for Microcontrollers runtime



#### STM32 IoT Kit

- Ultra-low-power STM32L4 Series MCUs based on Arm® Cortex®-M4 core with 1 Mbyte of Flash memory and 128 Kbytes of SRAM, in LQFP100 package
- 64-Mbit Quad-SPI Flash memory
- Bluetooth® V4.1 module (SPBTLE-RF)
- Sub-GHz (868 MHz or 915 MHz) low-power-programmable RF module (SPSGRF-868 or SPSGRF-915)
- 802.11 b/g/n compliant Wi-Fi® module from Inventek Systems (ISM43362-M3G-L44)
- Dynamic NFC tag based on M24SR

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- 2 digital omnidirectional microphones (MP34DT01)
- Capacitive digital sensor (HTS221). 3-axis magnetometer (LIS3MDL)
- 3D accelerometer and 3D gyroscope (LSM6DSL)
- 260-1260 hPa absolute digital output barometer (LPS22HB)
- Time-of-Flight and gesture-detection sensor (VL53L0X)





The board's serial number is indicated on a sticker under the MB1297 reference on the bottom of the board. If this number is lower than 182404896 for B-L475EI0T01A1C boards, or than 184906074 for B-L475EI0T01A2C boards, the default firmware connecting to AWS Cloud needs updating. Download the latest version available at http://www.at.com/a-cube-aws



Enabled

#### Resources

- Top level ST page on AI, <u>https://www.st.com/content/st\_com/en/about/innovation---</u> technology/artificial-intelligence.html
- Webpage aggregating all ST <u>AI tool</u> solution
- MOOC on ST AI developer tool
- ST sensor portfolio
- MOOC on Intro to STM32 microcontroller



## **Tools & Technology**

- STM32CubeMx : <u>STM32CubeMX STM32Cube initialization code generator -</u> <u>STMicroelectronics</u>
  - Video : <u>STM32CubeMX STM32Cube initialization code generator STMicroelectronics</u>
- STM32CubeIDE : <u>STM32CubeIDE Integrated Development Environment for</u> <u>STM32 - STMicroelectronics</u>

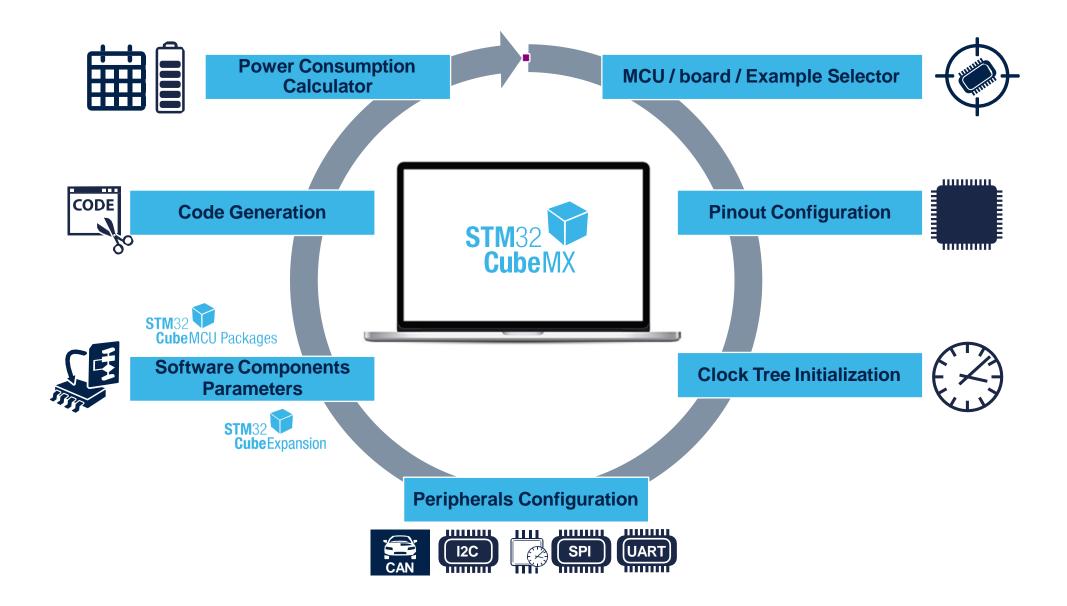


#### STM32CubeMX





# STM32CubeMX key steps



## MCU / MPU selection



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# Add Expansion Middleware and build your own

or

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Artificial Intelligence Pack version 5.2.0 for STM32 Cortex M7, M4 and M33 MCUs	> STMicroelectronics.FP-ATR-SIGFOX1		3.2.0 🕒	Install
What's new in this release:	> STMicroelectronics.FP-SNS-FLIGHT1		5.0.2 🛿 🕒 🗸 🗸	Install
added support for relocatable binary model TFLite and Keras importers are now fully based on TensorFlow 2.3	> STMicroelectronics.FP-SNS-MOTENV1		4.3.2 😫 🕒	Install
up-to Keras version 2.4.0 model can be imported	> STMicroelectronics.X-CUBE-AI		8.1.0 🖆 🛛 🗸	Install
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Build your own Expansion Package with **STM32PackCreator** 



STMicroelectronics.X-CUBE-AZRTOS-WB STMicroelectronics.X-CUBE-AZRTOS-WL

STMicroelectronics.X-CUBE-BLE1

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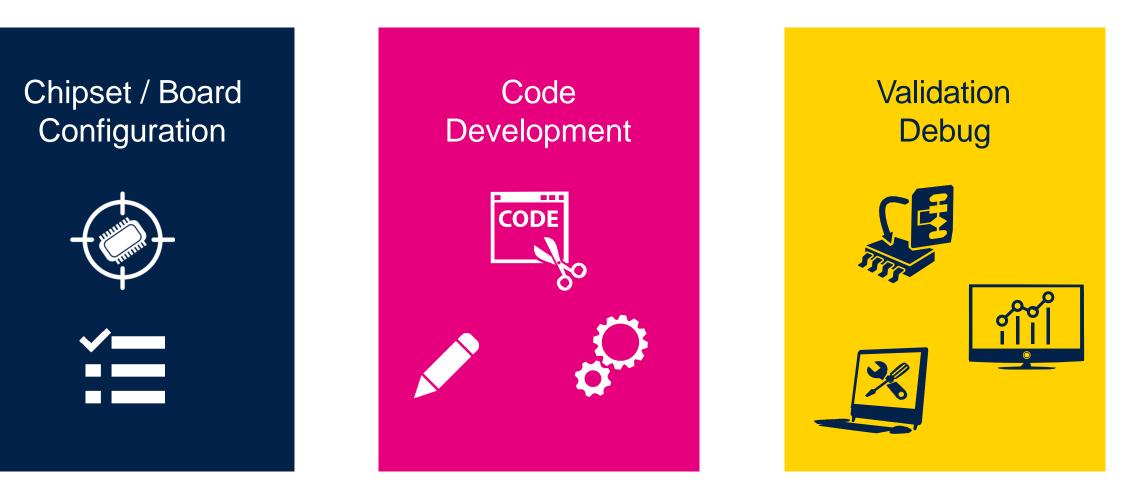
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#### STM32CubeIDE



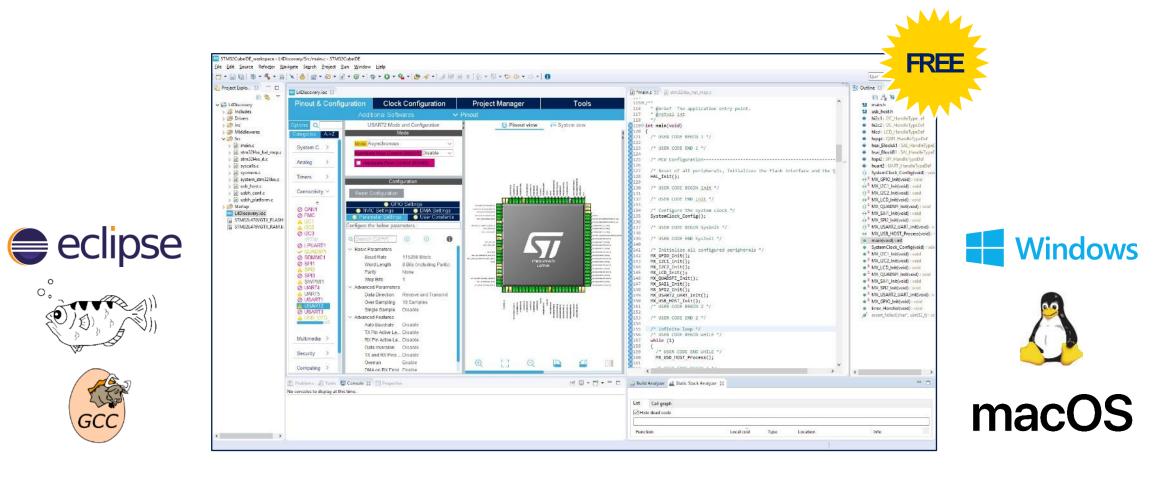


### One tool for all your STM32 development





#### Free multi-platform development tool



**Eclipse/GCC Based** 

#### **Free for Commercial Development**

**Multi-OS Support** 



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# Our technology starts with You



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