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STM32N6 high-performance MCUs

Redefining microcontroller performance to drive innovation in industrial and consumer applications.

The first high-performance STM32 MCU with AI acceleration

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The STM32 portfolio

Five product categories

- **Wireless MCU** — Short- and long-range connectivity
- **Ultra-low-power MCU**
- **Mainstream MCU**
- **High-performance MCU**

  32-bit general-purpose microcontrollers: from 75 to 3,360 CoreMark score
- **Embedded MPU** — 32- and 64-bit microprocessors





Enabling edge AI solutions

Scalable security

[MPU portfolio]

[MCU portfolio]

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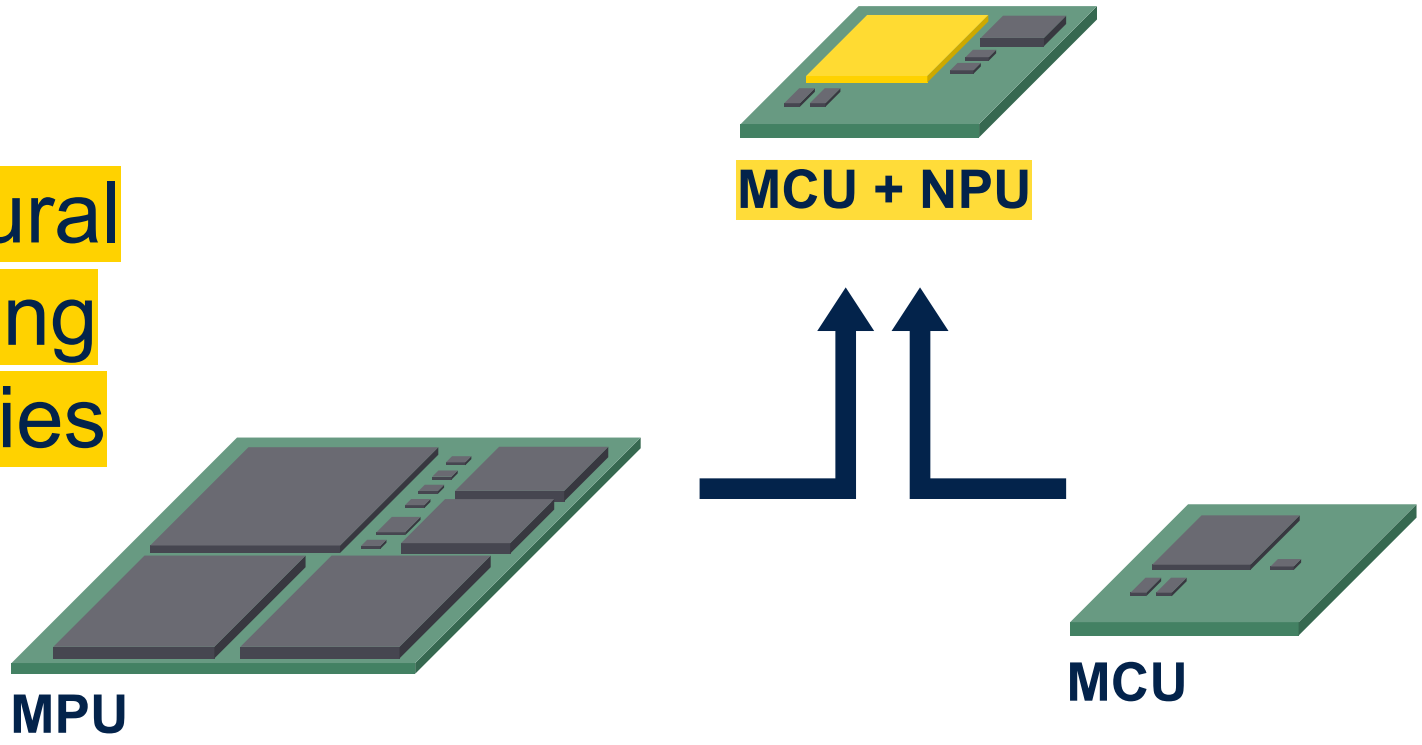
Enabling unmatched edge AI performance on an MCU

Benefit from extended neural network computing capabilities while leveraging the advantages of an MCU.

High neural processing capabilities



Small footprint

Lower power

Lower cost

Lower BOM

Faster boot/wkup

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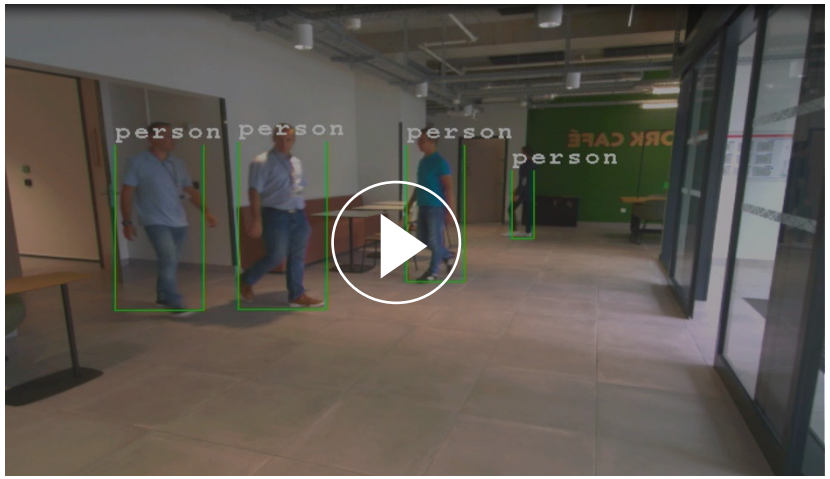
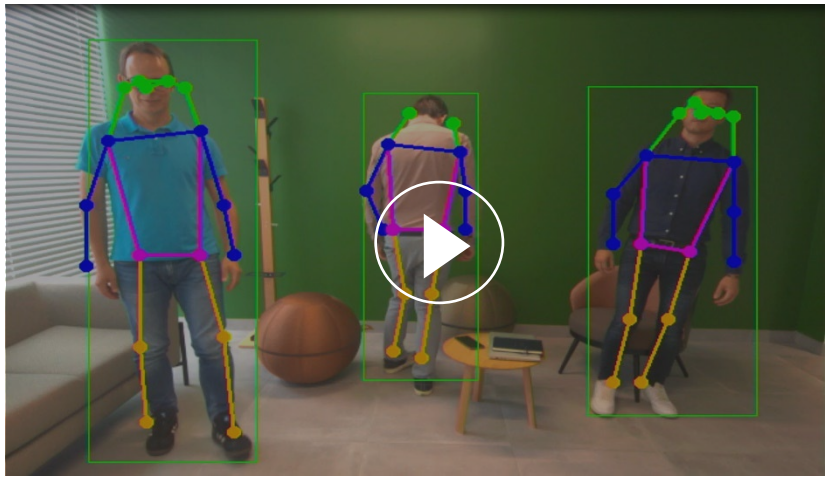
How the STM32N6 changes the game

An MPU-like end-user experience. Available on an MCU.

People detection



Pose estimation



Hand landmark

Watch all videos on YouTube

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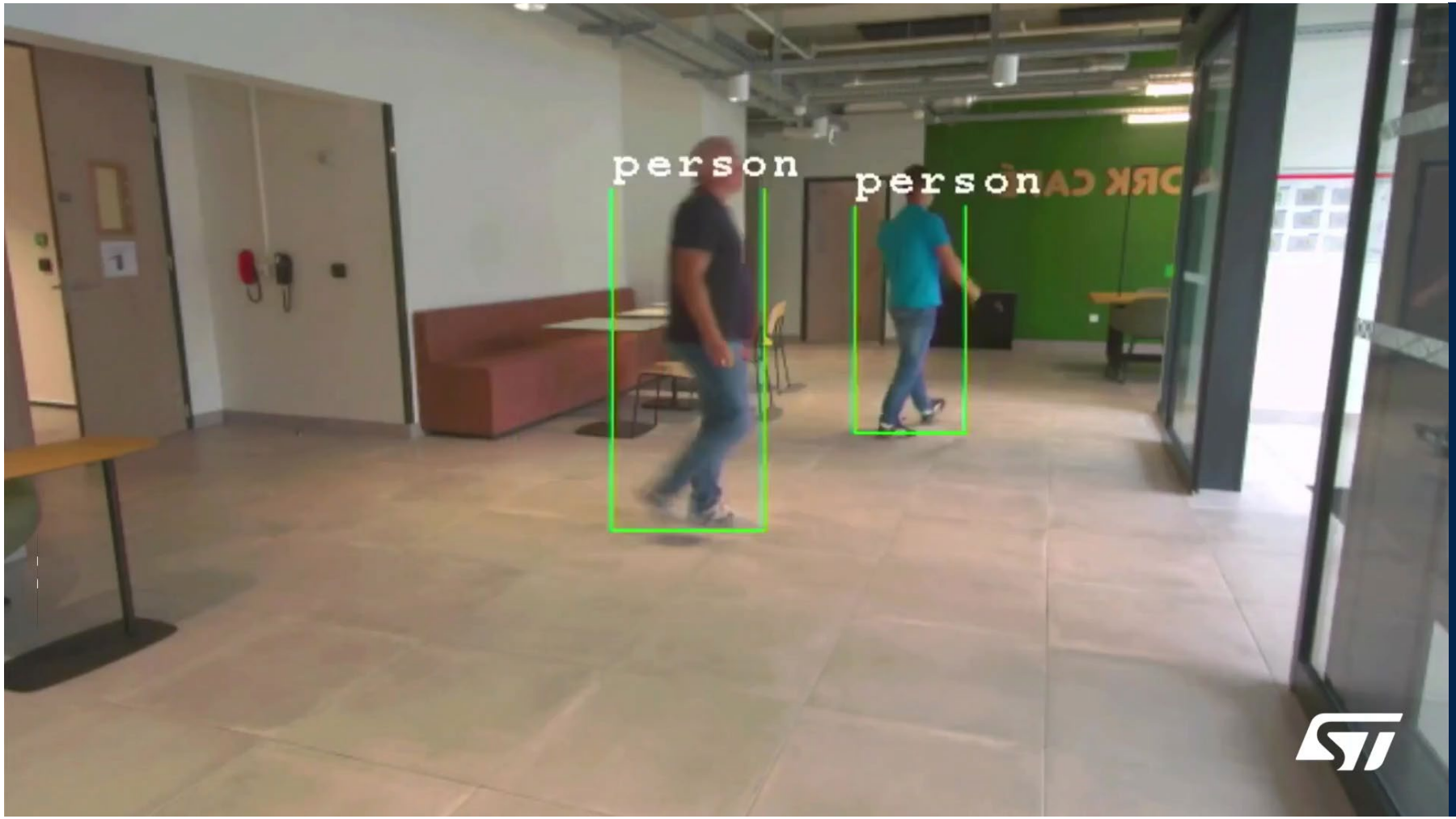
High-accuracy people detection at a distance in varied ambient conditions



KEY METRICS

Yolo v8

- 320 x 320
- 26 FPS
- 2.9 MB weights
- 1.6 MB activations

KEY APPLICATIONS

- Smart doorbells
- Room occupancy
- Alarm systems

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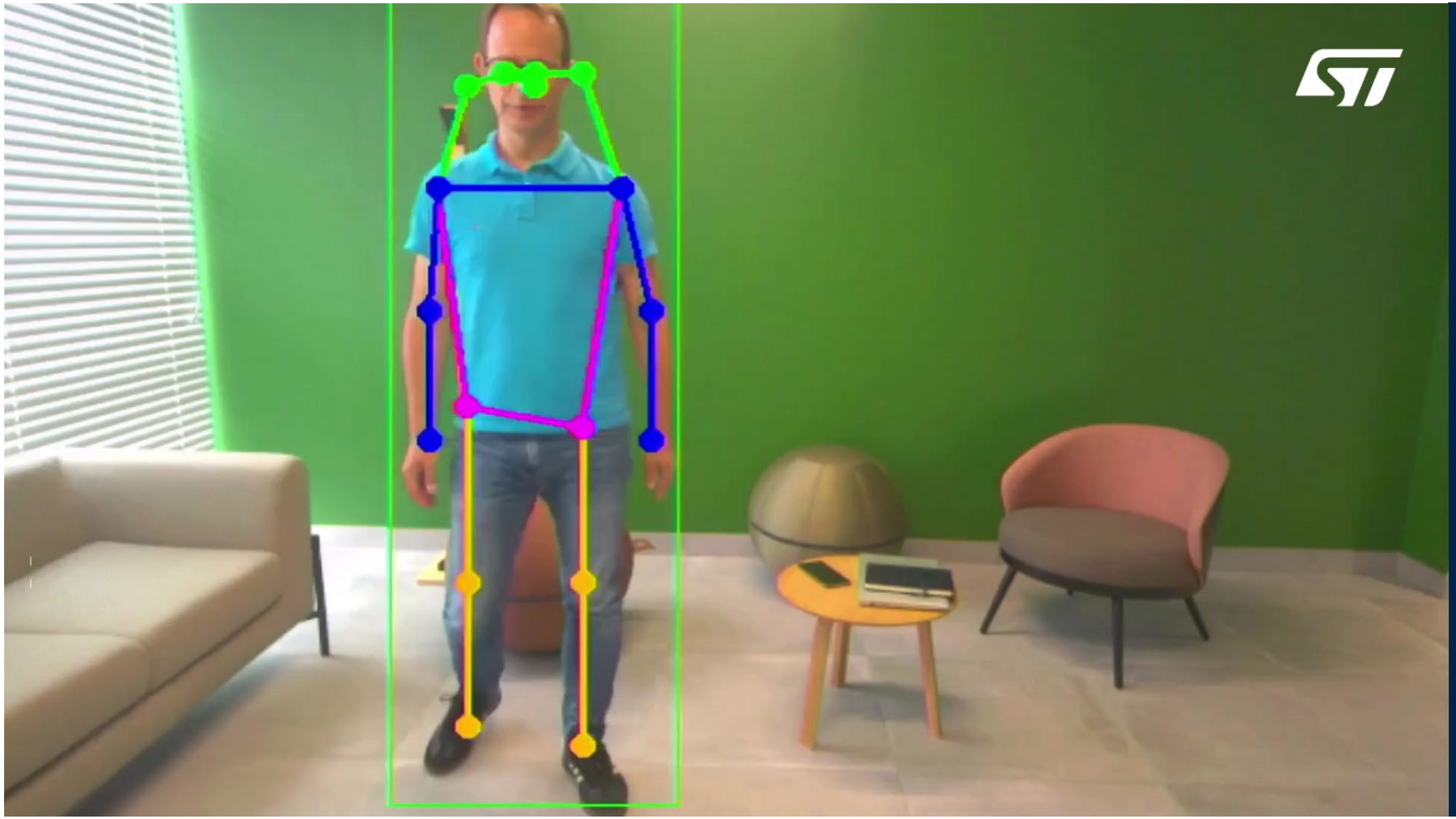
High-accuracy multipose estimation



KEY METRICS

Yolo v8n

- 256 x 256
- 26 FPS
- 3.35 MB weights
- 2.59 MB activations

KEY APPLICATIONS

- Behavior analysis
- Activity monitoring
- Fall detection

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Precise system control with hand landmark

KEY METRICS
(Two models in parallel)

Palm detector
- 192 x 192
- 1.1 MB weights
- 1.1 MB activations

Hand landmark
- 224 x 224
- 3.2 MB weights
- 1 MB activations

KEY APPLICATIONS

- Touchless HMIs
- Smart appliances
- Smart industry

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From DMIPS to TOPS, the paradigm shift
Opening a new range of embedded AI applications


Object segmentation localization


Pose estimation


Object classification


Speech recognition


Sound analysis


Face/people detection


Wake word


Time series classification


Anomaly detection

Microcontrollers (Arm® Cortex® -M)

Microcontrollers with NPU accelerator

Mono-modality workloads	**Multi-modality workloads**
Static single subjects	**Faster moving multiple subject**
Low power	**High efficiency**
Optimal light conditions	**Open light conditions**
Acceptable precision	**High precision**
Low resolution and framerate	**Higher resolution and framerate**

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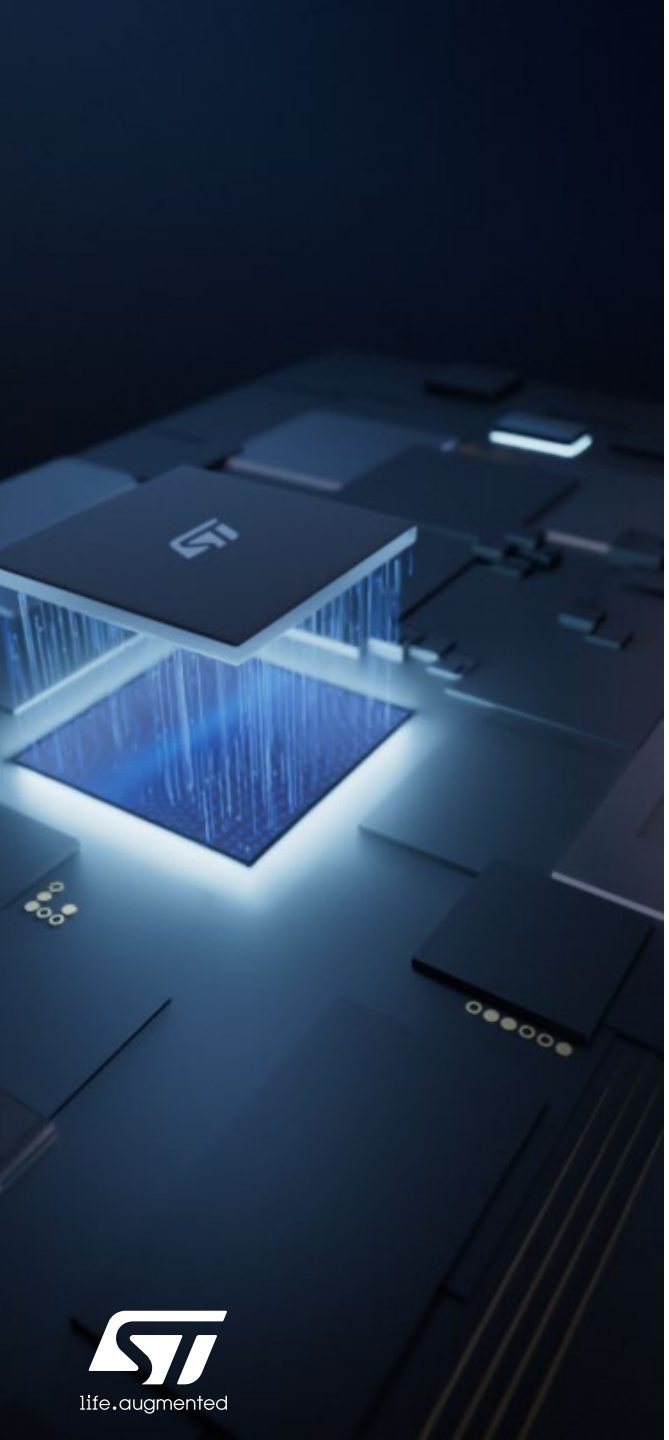

Achieve new performance levels with the STM32N6

Enabling high-performance edge AI on MCUs

- Embedded proprietary neural processing unit, ST Neural-ART accelerator.
- Arm® Cortex®-M55 core at 800 MHz, highest STM32 core frequency yet.

Elevating graphics & multimedia experiences

- Multiple graphics accelerators.
- Computer vision pipeline.
- Multimedia encoder/decoder.

Seamlessly integrated in the STM32 ecosystem

- Supported by ST Edge AI Suite tools, resources, and case studies.
- Compatible with the TouchGFX packages for graphics.

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STM32N6 feature overview

Dedicated embedded neural processing unit (NPU)

- 600 GOPS NPU
- 3 TOPS/W power consumption

Arm® Cortex®- M55 core

- 1280 DMIPS / 3360 CoreMark
- New DSP extensions (MVE)

Embedded RAM

- 4.2 Mbytes of embedded RAM for real-time data processing and multitasking

Computer vision pipeline

- Parallel and MIPI CSI-2 camera module I/F
- Dedicated image processor (ISP)

Extended multimedia capabilities

- 2.5D graphics accelerator
- H.264 encoder, JPEG encoder/decoder

Extended security features

- Arm® TrustZone® for the Cortex®-M55 core and the NPU
- Target certifications SESIP3, PSA L3

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* 600 GOPS NPU vs 1 GOPS NN peak processing capabilities on STM32H7

Embedding innovation across product segments

Drones
Flying & landing

Smart industry
Anomaly detection

Smart homes
Event detection

Smart farming
Animal well-being

Personal healthcare
Body measurements

White goods
Smart control

Automotive
Environment sensing

Smart buildings
Building automation

Robots
Collision detection

Personal electronics
Wearables

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...in a smart & efficient way

Edge AI

Ultra-low latency
Real-time applications

Privacy & security
No raw data sent to the cloud

Improved accuracy
Adapt to local environment

Sustainable on energy
Low-power consumption

Reduced data transmission
Generate meaningful information

Advanced experience
Personalized features

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The most powerful STM32 series ever made

Two lines sharing the same DNA

Artificial intelligence line

STM32N6x**7** MCUs

General-purpose line

STM32N6x**5** MCUs

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Discover the enabling features

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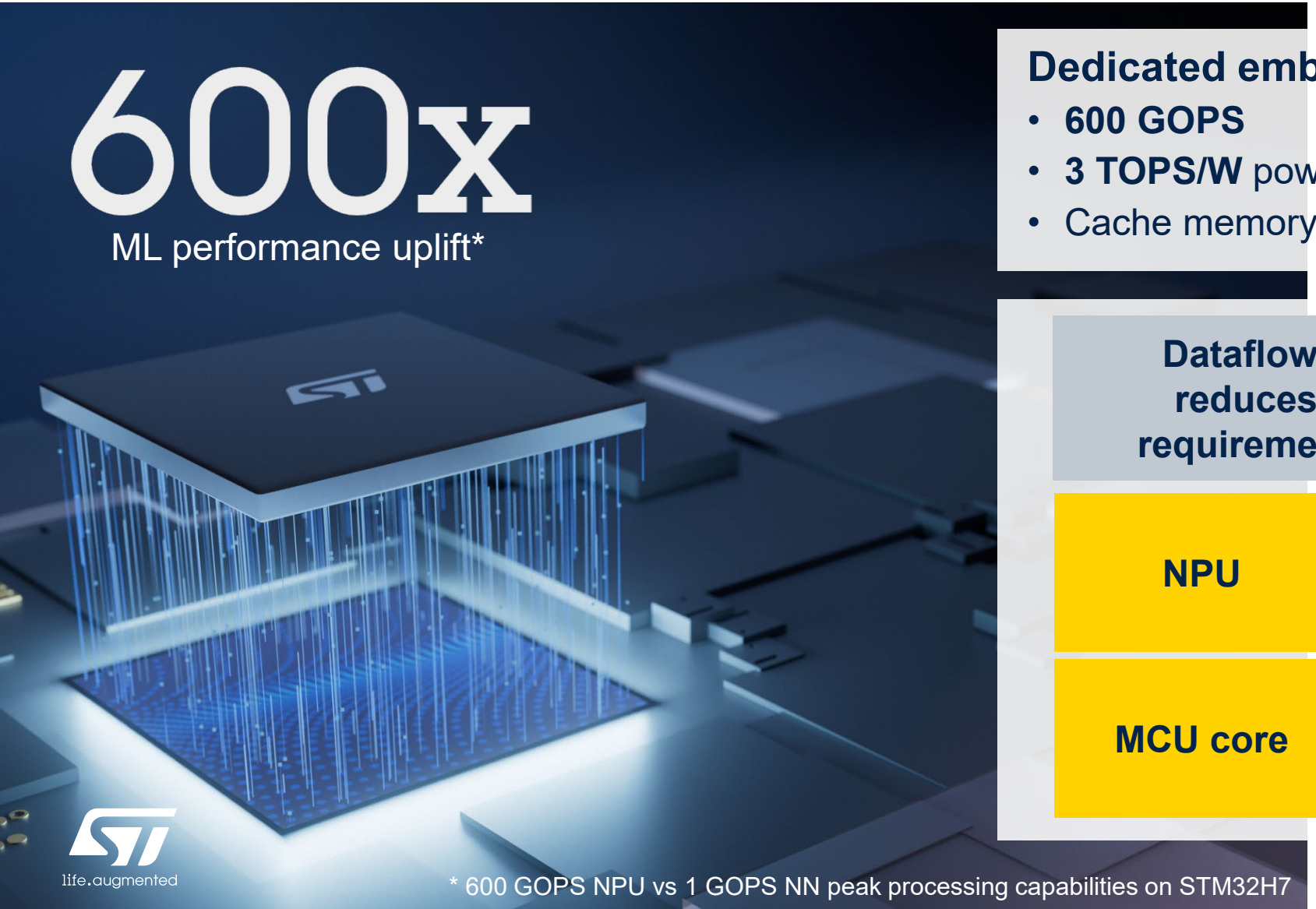
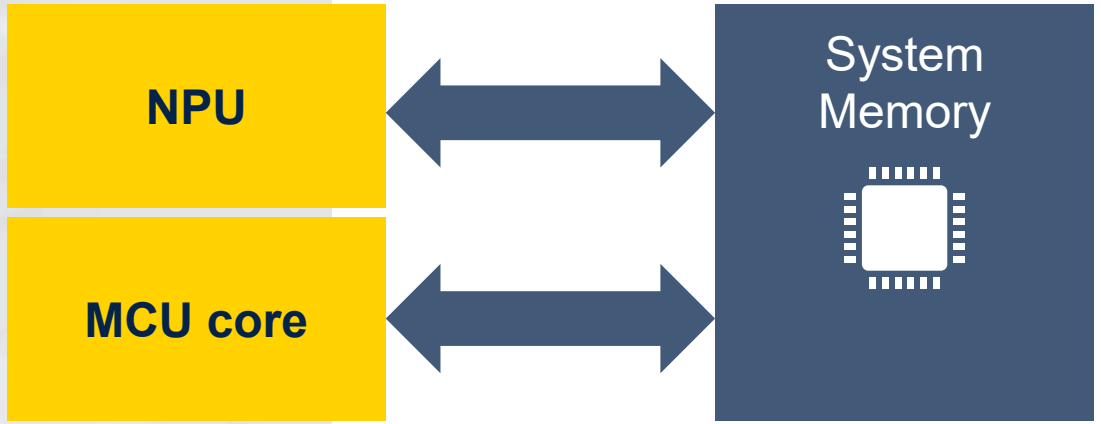
ST Neural-ART Accelerator



Dedicated embedded neural processing unit

- **600 GOPS**
- **3 TOPS/W** power consumption
- Cache memory to optimize external memory access

Dataflow stream processing engine reduces MCU memory throughput requirements and power consumption



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* 600 GOPS NPU vs 1 GOPS NN peak processing capabilities on STM32H7

A leading MCU Arm® core

Arm® Cortex®-M55

800 MHz

32 Kbytes
I-Cache

32 Kbytes
DCACHE

64 Kbytes I-TCM
256 Kbytes D-TCM with ECC

A powerful Arm® core

- 1280 DMIPS / 3360 CoreMark

Energy-efficient digital signal processing

- Helium technology
  M-Profile Vector Extension (MVE)
- Ideal for signal pre- and post-processing

Enhanced security with TrustZone®

- Isolate processes in the Arm core
- Isolate processes in the neural processing unit

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Optimize your application with the large embedded memory

Large embedded RAM

4.2 Mbytes

Fast external memory I/F

Hexa-SPI	Octo-SPI	FMC
Up to 800 Mbytes/s	Up to 400 Mbytes/s	Up to 664 Mbytes/s

Large contiguous embedded memory

- Ideal for running neural networks or graphic applications
- External RAM becomes optional

Fast serial I/F for external memories

- Allows the use of fast and cost-effective memory
- Hexa-SPI for fast access to RAM
- Octo-SPI for secured flash memory

Flashless configuration

- Adaptability to application requirements
- Enabling cost flexibility

Flexible memory controller

PSRAM, SDRAM, NOR, NAND

Improved security with on-the-fly encryption

Hardware-accelerated crypto engine on all interfaces

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Elevating graphics performance

Graphic accelerators

NeoChrom GPU	• 2.5D GUI acceleration • Perspective correct texture mapping (scale, rotate, flip)
Chrom-ART Accelerator	Efficient 2D graphics sub-system
JPEG codec	MJPEG video coding & decoding
Chrom-GRC	Framebuffer optimization

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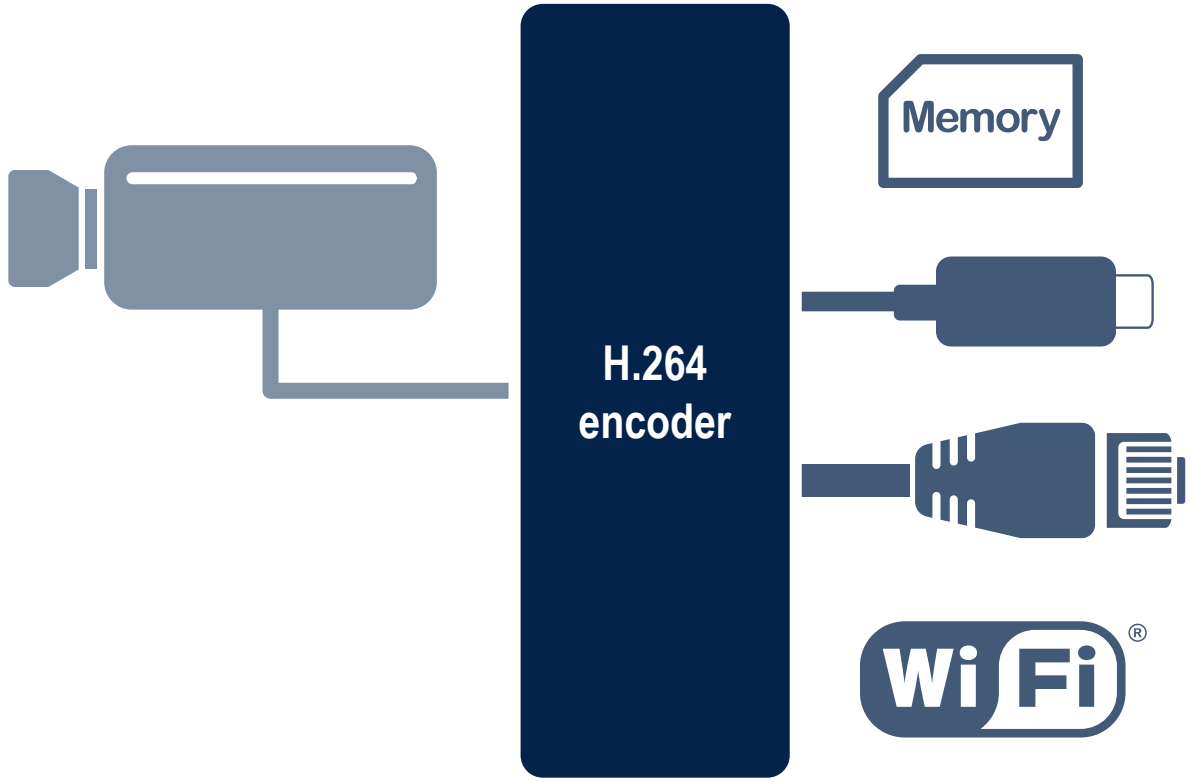
Elevating multimedia experiences

Multimedia unit

H.264 encoder

- 1080p15 and 720p30
- Real-time streaming over USB, over Ethernet, Wi-Fi



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State-of-the-art mechanisms for high security levels

Extensive security mechanisms to protect AI algorithms, ensure hardware robustness to attacks, and enable a multitenant approach.

psacertified™ level three

Target certification

SESIP™3

Target certification

Cryptography for hardware robustness,
including MCU and NPU memory on-the-fly encryption & decryption (*)

Hardware and temporal code isolation
for runtime protection

Device authentication
during product life cycle

(*) Available soon

Memory protections
against illegal access control

Active tamper protection

Trust anchor
ensuring authenticity & integrity

More insights on the STM32N6 wiki page

More on STM32Trust security framework.

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STM32N6 portfolio: one series, two lines

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STM32N6x7 and STM32N6x5 MCUs

Embedded memories

- 4.2 MB Contiguous RAM
- BOOT 128KB
- 8 kB Backup RAM
- 4 kB Debug RAM

External memory interfaces

- Hexa-SPI
- Octo-SPI
- 2x SD/SDIO /MMC
- Flexible Memory Controller (PSRAM, SDRAM, NOR, NAND, TFT-LCD)

Camera pipeline

- MIPI CSI-2, 2 lanes Camera I/F Parallel 16b With PSSI
- Image Signal Processor

Graphics & multimedia

- Chrom-ART Accelerator
- H.264 Encoder
- Chrom-GRC
- JPEG hardware accelerator
- NeoChrom Accelerator
- LTDC/TFT-LCD Display Controller

Arm® Cortex®-M55 800 MHz
TrustZone®
MVE

ST Neural-ART accelerator 600 Gops

System

- 96-bit unique ID
- Watchdogs
- Cyclic Redundancy Check (CRC)
- XTAL & Internal osc.

Security

- Secure boot
- Secure RTC
- Analog true RNG
- Crypto/Hash
- Tampering
- OTP Fuses 8 KB

Connectivity

- 3x CAN FD
- 2x USB 2.0 D/H HS + HS PHY
- 1x UCPD controller
- 3x I²C + 2x I3C (SDR)
- 5x UART, 5x USART
- 6x SPI (incl. 4x I2S)
- 1x ULP UART
- 1x Gbit Ethernet with TSN

Audio

- SPDIF-RX/TX
- 2x SAI
- 1x MDF (6 Filters)
- 1X ADF filter (with SAD)

Analog

- Digital Temperature Sensor
- 2 x 12-bit ADC 5 MSPS

Timers/Control

- 2x 16-bit motor control PWM synchronized AC timer
- 12x 16-bit timer
- 5x 16-bit LP timer
- 4x 32-bit advanced timers

Leading edge MCU core

Neural processing unit (STM32N6x7 MCUs only)

Large embedded memory + flexible I/F

Dedicated camera pipeline

Extended multimedia capabilities

Advanced & certified security

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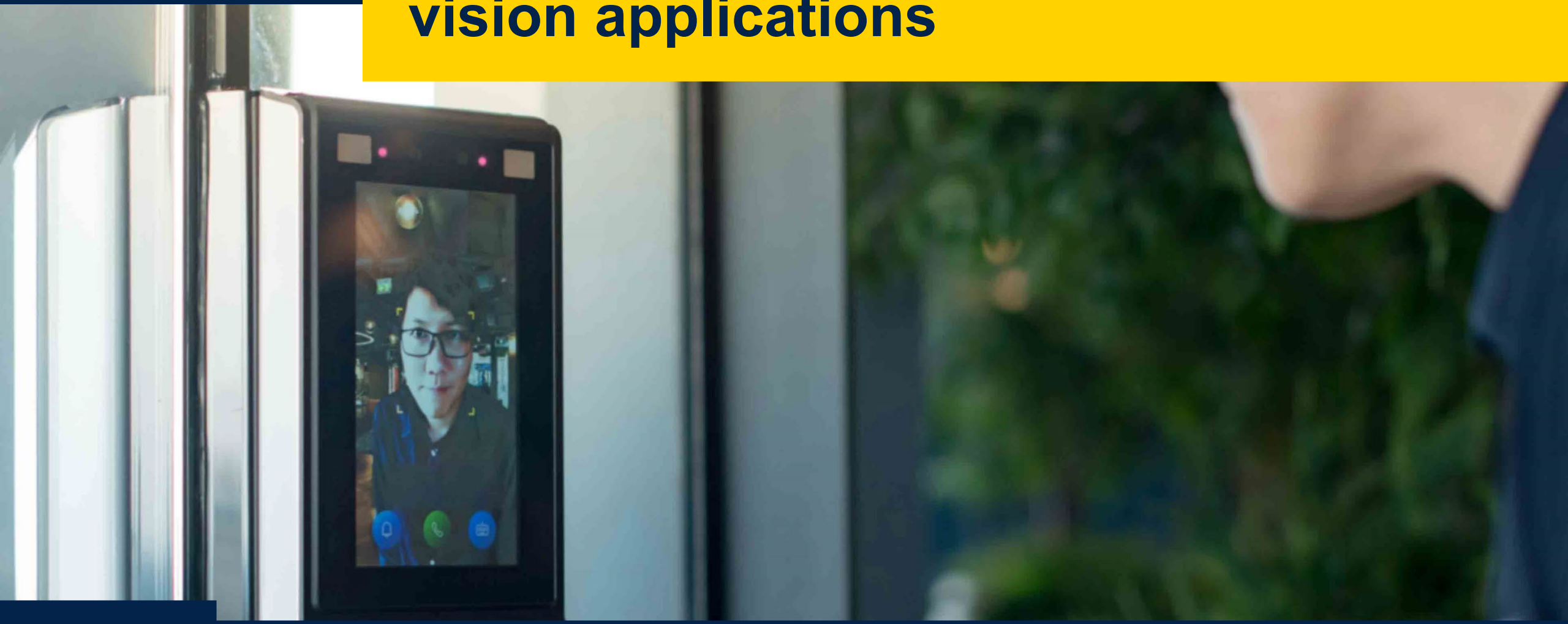
How the STM32N6 boosts computer vision applications



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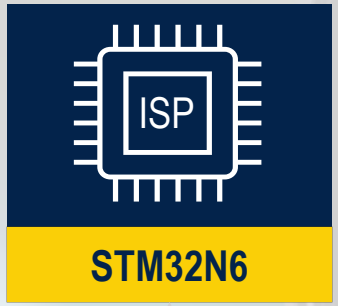
Geared for computer vision applications

Enabling fast & efficient image acquisition and processing thanks to a widely adopted camera interface and embedded ISP.

CAMERA PIPELINE

HR image sensor,
such as ST BrightSense

MIPI CSI-2
Parallel Camera I/F



Embedded firmware
2A algorithms

Image signal processor (ISP)

- Dimensioned for 5 Mpixel camera at 30 FPS
- Generates 3 different outputs from the same input for sending to the multimedia encoder or to the NPU
- ISP IQTune Software tool to tune ISP for cost savings and design flexibility

Embedded firmware on Arm® Cortex® core

- 2A for auto white balance and auto exposure
- Image processing library

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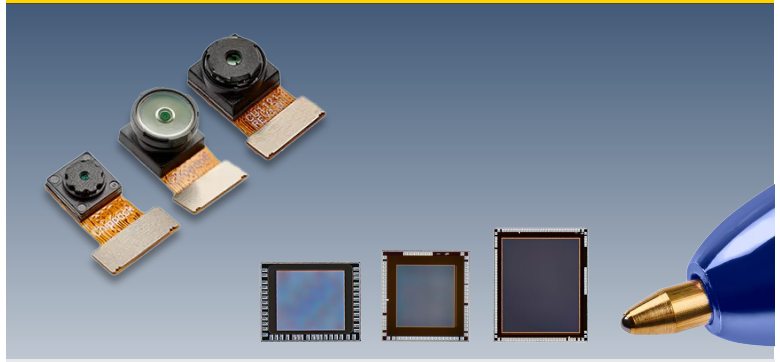
Pairing STM32N6 MCUs with ST BrightSense camera sensors

Bring computer vision to the next level

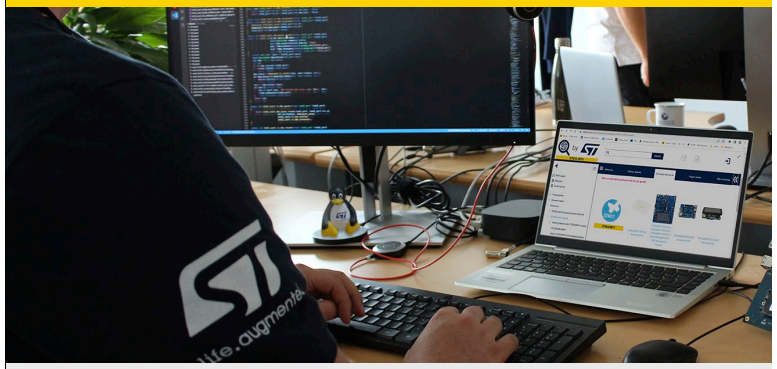


- Capture high-quality images in any condition
- Reveal the unseen with Near-InfraRed
- Benefit from state-of-the-art patented technologies

Create smart & power-efficient vision solutions

- Develop new smart functionalities
- Design vision systems to fit in anywhere
- Extend battery life in mobile systems

Save resources and accelerate your time-to-market



- Every resource you need in a few clicks.
- Effortless evaluation & development
- Support from prototype to production

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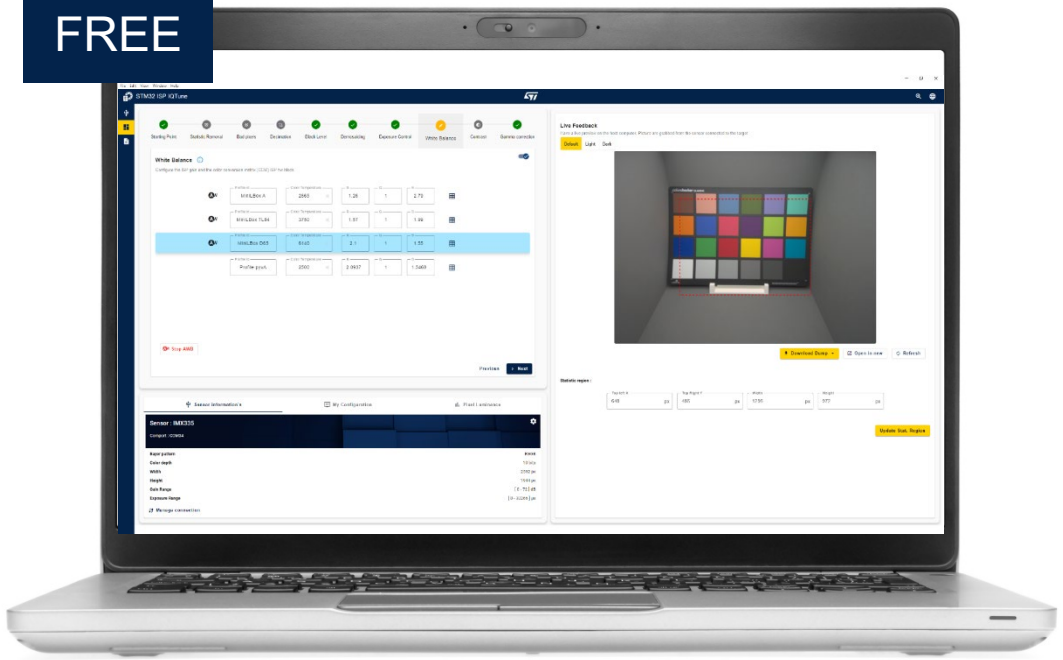
Configure the image signal processor for free

ISP IQTune

FREE



Access now

ubuntu

mac OS

Industry-first software tool for ISP tuning on MCUs and MPUs.

Save ISP tuning cost and gain efficiency.

Flexibility to configure the ISP to your application requirements.

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Smoother and richer graphics with NeoChrom GPU

The NeoChrom GPU offloads the CPU from the graphic computations, freeing up the memory and boosting performance.

Fully supported by **TouchGFX** and partner GUI software.

NeoChrom GPU

Scale/animate bitmaps

Full screen transitions

360° Bitmap rotations

Text animation

Vector graphics (software)

Perspective correct texture mapping

Fast 2D bitmap copy color format conversion

MJPEG videos

STM32 MCUs for building UIs

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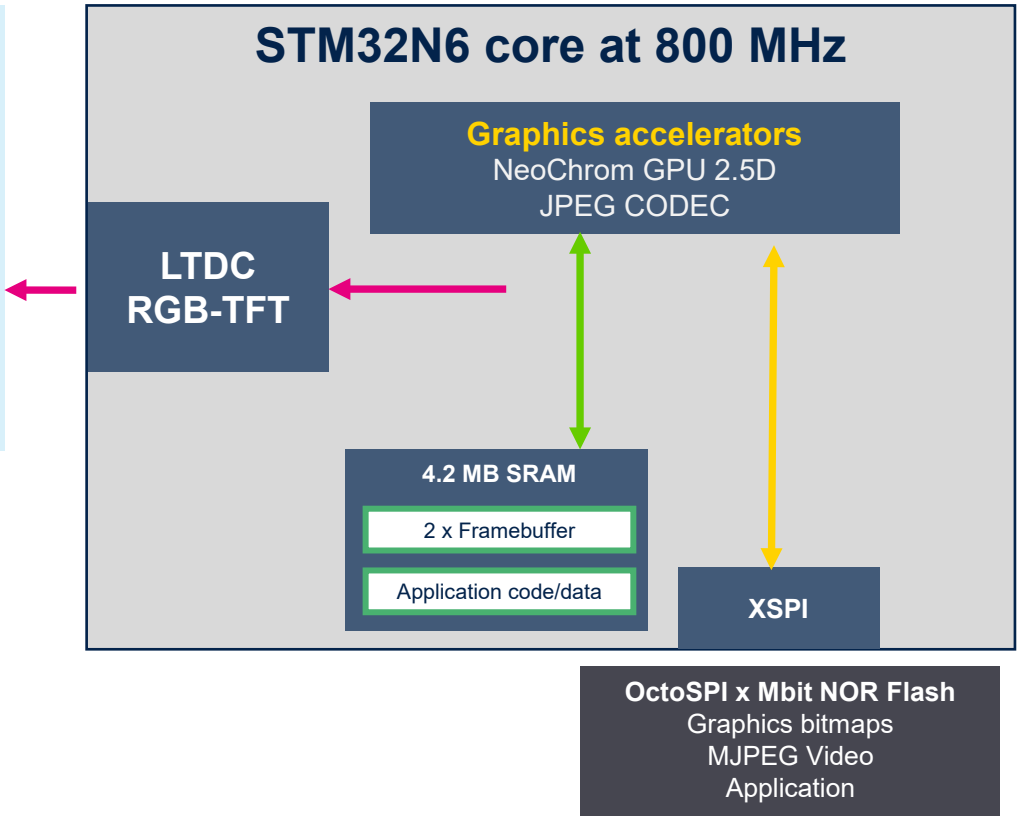
Run up to 1280 x 720 GUIs using internal SRAM only

RGB-TFT display
16BPP: 1280 x 720 resolution
24BPP: 1024 x 600



- **No external RAM needed**
- **Fastest framebuffers on STM32**
- **2.5D GUIs on high resolution**
- **Down to 2-3% CPU Load**

Step 1: NeoChrom call back to get the assets from external flash.
Step 2: NeoChrom processes the image. The image is stored into dedicated memory in internal RAM.
Step 3: The framebuffer is transferred to the display.

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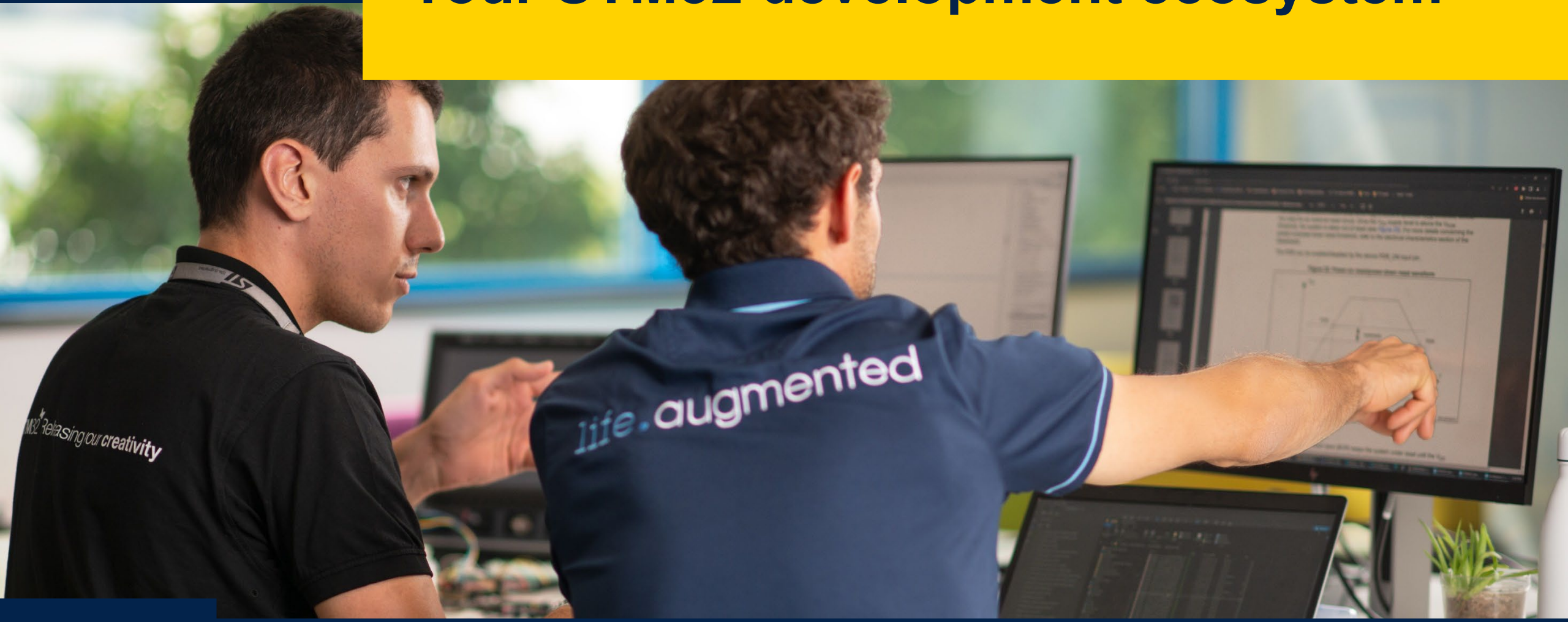
Your STM32 development ecosystem



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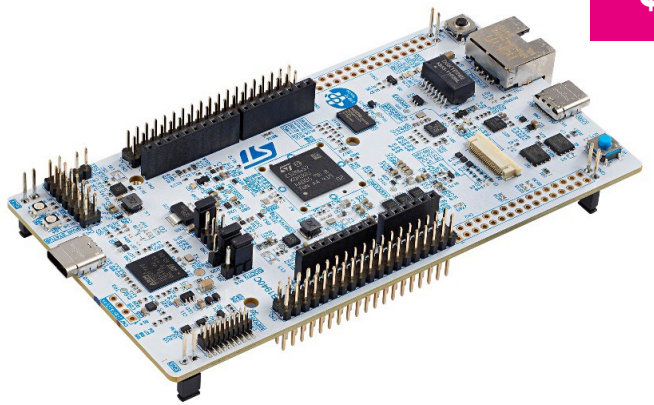
Development tools for STM32N6 series

Jump-start your evaluation, prototyping, and design



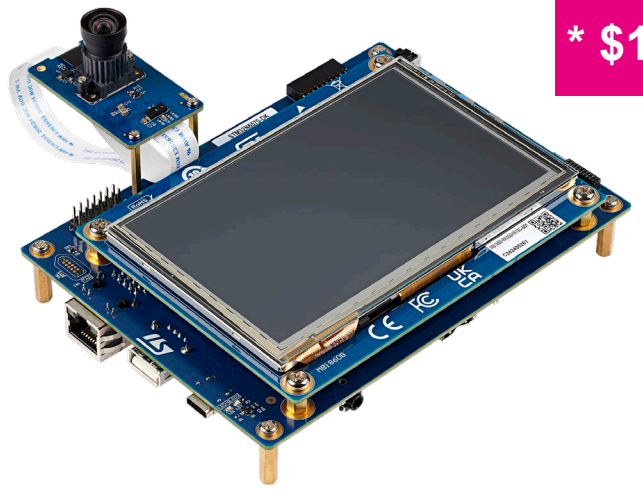
*** $56.25**

NUCLEO-N657X0-Q

Affordable prototyping

STLINK v3, ST morpho, ARDUINO®, MIPI CSI-2 connector, USB 2.0, 1GB Ethernet

Camera connector compatible with Raspberry.



*** $185**

STM32N6570-DK

Advanced prototyping including AI

STLINK v3, ST morpho, Arduino®, MIPI connector, USB 2.0, 1 Gbyte Ethernet, 32 Mbytes HexaRAM, Audio Jack, SD card

*** $77**

**Recommended resale price (RRP)*

B-CAMS-IMX expansion board

Rolling shutter camera, M12 removable lens, multizone direct Time-of-Flight sensor, inertial motion unit, Raspberry Pi compatible 22-pin connector.

Included in discovery kit.

A comprehensive ST camera offer to complete your STM32N6 design

Complete your computer vision setup with ST BrightSense advanced camera image sensors

*** $55**

STEVAL-55G1MBI camera board

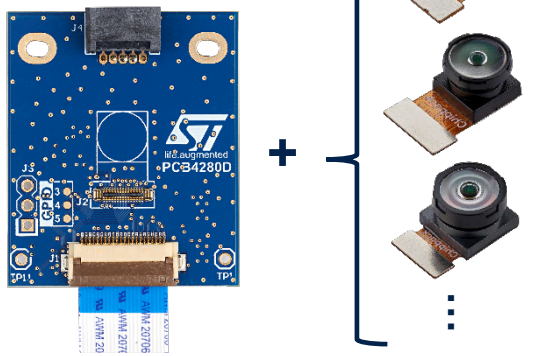
0.56MP smart global shutter camera (ST VD55G1 sensor), M12 removable lens, 22-pin connector & flex cable

*** $55**

STEVAL-66GYMAI camera board

1.5MP global shutter camera (ST VD66GY sensor), M12 removable lens, 22-pin connector & flex cable

*** $37**



STEVAL-CAM-M0I module board

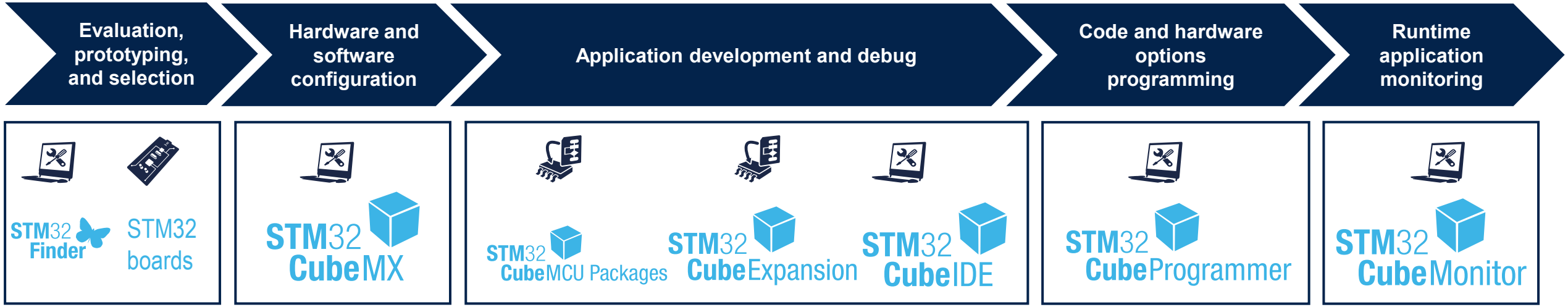
Camera module board for plugging any ST BrightSense promodule, 22-pin connector & flex cable

**Recommended resale price (RRP)*

More about ST BrightSense image sensor here

Leveraging STM32Cube framework

Tools and software supporting you during all your design steps



Complemented with open-source frameworks and partner solutions

FreeRTOS, ECLIPSE THREADX, Zephyr™, IAR, arm KEIL, Visual Studio Code

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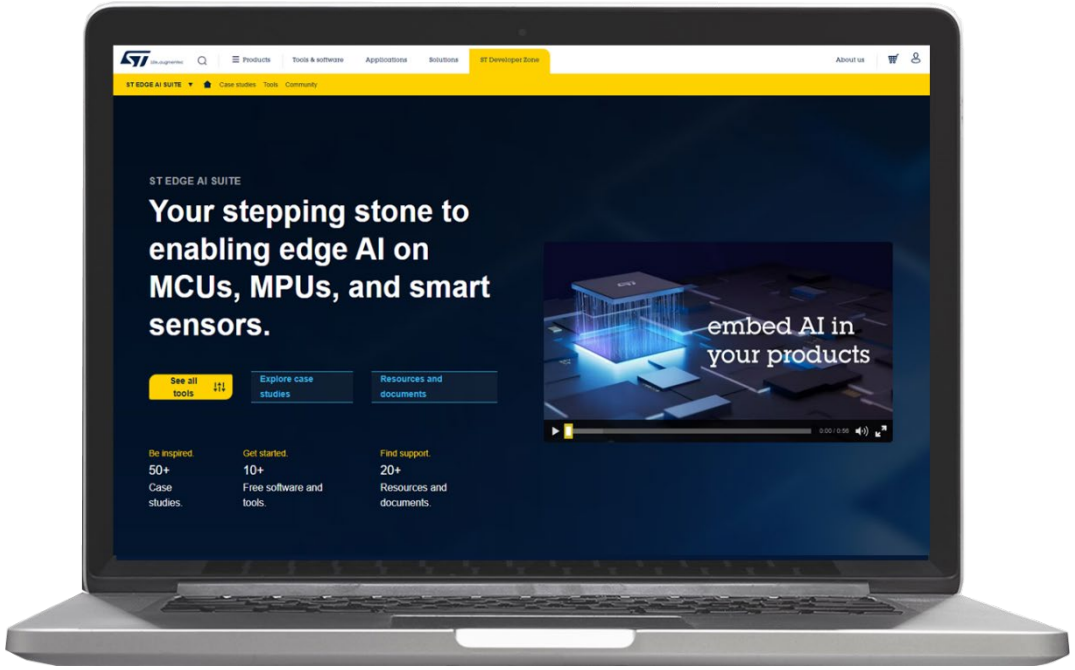
Online development tools for edge AI development

Model and code examples	**ST Edge AI model zoo**	Online resources
Model benchmark	**ST Edge AI Developer Cloud**	Online tool
Model optimization	**STM32 Cube.AI**	Plug-in for STM32CubeMX
	ST Edge AI Core	Command line interface (CLI)

ST Edge AI Suite



st.com/st-edge-ai-suite

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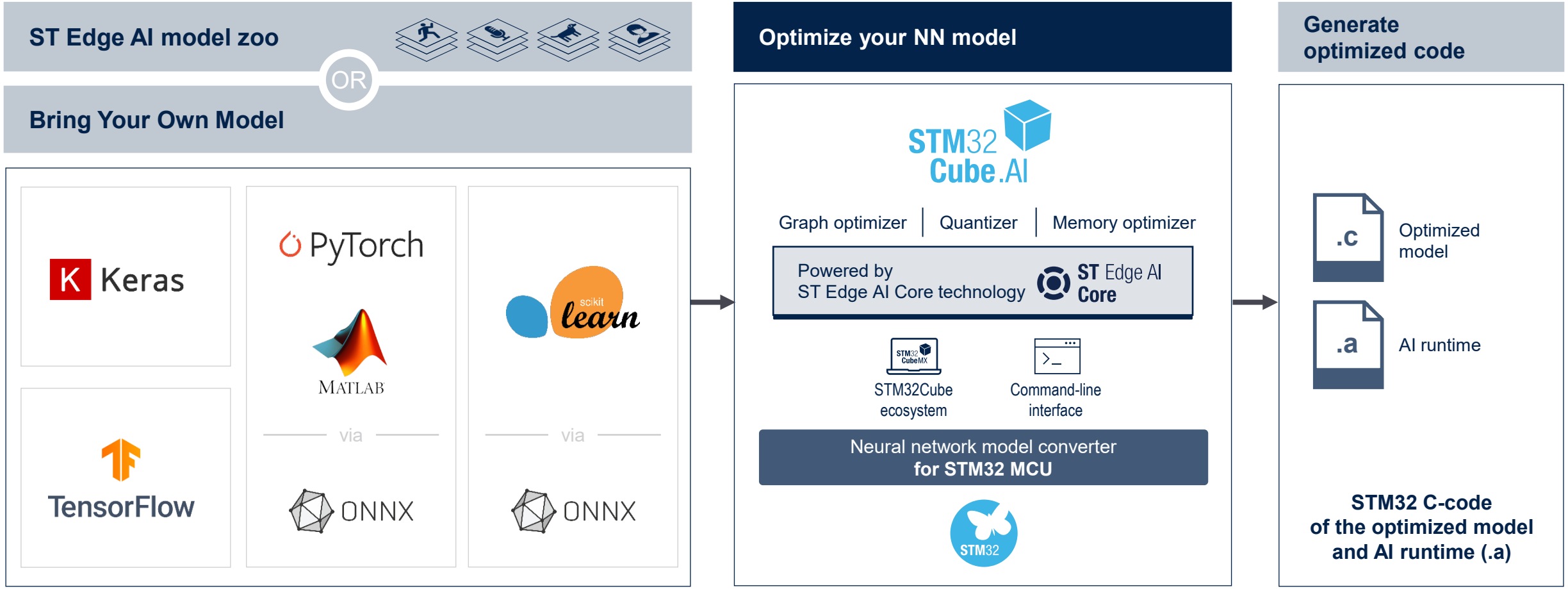
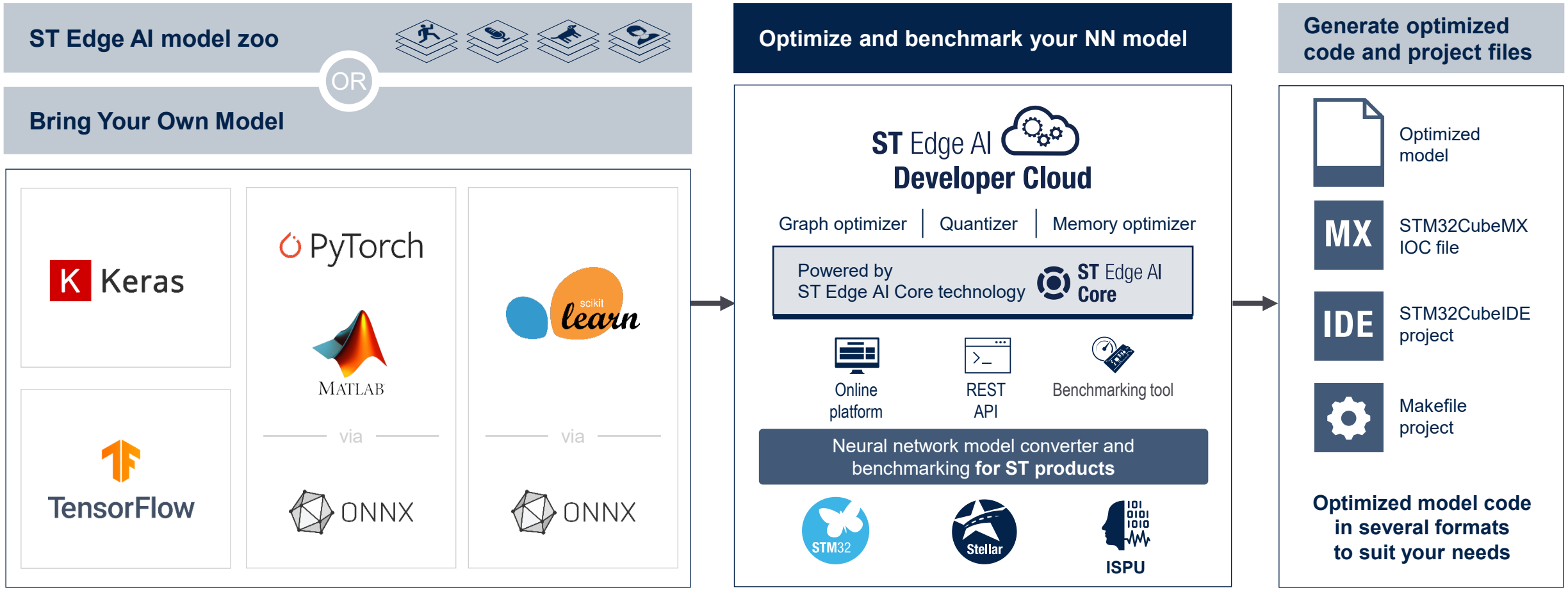
STM32Cube.AI



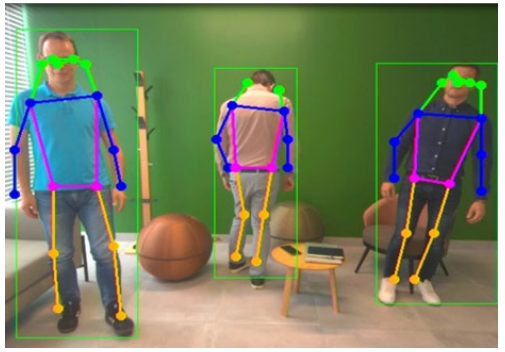
ST Edge AI Developer Cloud



Get started with edge AI examples

People detection

- Application example showing a people detection use case.
- Demonstrating typical AI computer vision application: camera capture, pre-processing, single model inference and post-processing.
- RTOS-based application example.



Multipose estimation

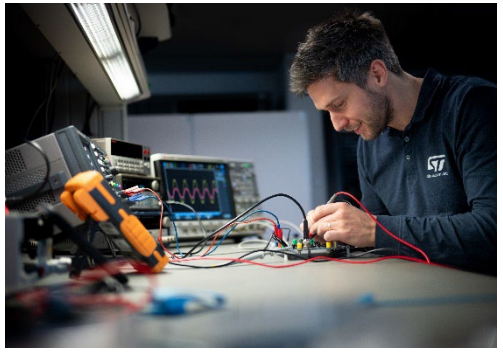
- Application like people detection but built around a multi-pose estimation use case.
- RTOS-based application example.

Hand landmark detection

- Application example showing hand landmark detections.
- Demonstrating the execution of two NN models consecutively.
- RTOS-based application example.

H264 encoding / USB UVC streaming

- Demonstrating a more complete application involving several STM32N6 multimedia features: NPU to perform the inference, H264 encoding and USB video device class stream output data to a PC.
- RTOS-based application example.



Power measurement

- Demonstrating low power optimizations.
- Enabling easy power measurement on STM32N6 discovery board.
- Bare-metal application example.

Access the source code here

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Our technology starts with You

Contact us at edge.ai@st.com

Find out more at st.com/STM32N6

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