



NEUROKIT2E

Making Artificial Intelligence faster, greener, more secure and closer to data

Artificial Intelligence is everywhere : in our phones, cars, buildings and healthcare systems. But today, most of AI relies on **cloud computing**, meaning data must be sent to remote servers to be processed. This generates delays, raises privacy concerns and consumes a lot of energy. NEUROKIT2E addresses this challenge by focusing on **Edge AI**: AI that runs **directly on devices**, close to data. The goal is simple: **faster decisions, better data protection and lower energy consumption.**



What is NEUROKIT2E ?

NEUROKIT2E is a European research and innovation project bringing together **25 partners from 5 countries**, including research centers, universities, large industries and SMEs. Running from **2023 to 2026**, the project aims to provide Europe with an **open-source AI platform**, designed specifically for **embedded and edge devices**, such as sensors, microcontrollers, robots or industrial equipment.



What problem are we solving?

Developing AI for small, embedded devices is still complex and expensive.

AI models are often:

- Too large
- Too energy-hungry
- Difficult to adapt to different hardware
- Hard to deploy safely in industrial or critical environments

NEUROKIT2E builds tools to **simplify this process**, so AI can be deployed **faster, more efficiently and more reliably** on memory and energy constrained hardware devices.





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Where we are today? Key advances so far



From ideas to usable platform

One of the first major achievements of NEUROKIT2E is the creation of a **common AI development platform**, built on European technology: Aidge.

Today, developers can already use it to:

- Start from an existing AI model
- Adapt it automatically to embedded devices
- Deploy it on real hardware in a much shorter time than before



This means that **AI development is no longer reserved to large cloud infrastructures**: smaller companies and industrial players can now work directly on embedded systems.



Making AI lighter and more energy-efficient



A central objective of NEUROKIT2E is to make AI models **smaller and less energy-consuming**, without losing performance.

To do this, the project explores smart optimization techniques that:

- Reduce unnecessary calculations
- Remove redundant parts of AI models
- Adapt models to the real needs of embedded devices

In practical terms, this allows AI to run on **low-power devices**, opening new possibilities for applications such as smart sensors, mobile devices or autonomous systems.



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Where we are today? Key advances so far



Inspired by the human brain

NEUROKIT2E also explores **new ways of designing AI**, inspired by how the human brain works. Instead of continuously processing data, some AI models developed in the project react **only when something meaningful happens**.

This approach is particularly promising for:

- Vision
- Sound recognition
- Real-time monitoring

By combining these new approaches with more traditional AI, the project shows that **different types of AI can work together**, depending on the task and the device.



Building trust in AI



For AI to be applied in demanding domains such as transport, healthcare or industrial automation, it must be **reliable and predictable**.

NEUROKIT2E integrates safety and reliability considerations from the very beginning:

- AI behavior can be monitored
- Performance can be evaluated before deployment
- Systems are designed to remain understandable and controllable

This work is carried out together with industrial partners who already operate in **safety-critical environments**, ensuring that solutions are realistic and applicable.



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NEUROKIT2E in Action: Concrete Use Cases



Electric Vehicle Monitoring

This use case focuses **on intelligent monitoring of electric vehicles**, including battery lifetime and safety diagnostics.

- **STMicroelectronics** defined the full AI monitoring architecture for battery and power device supervision.
- **Universita Degli Studi di Messina** developed battery aging models.
- **Deepsensing** and **High Technology Systems** worked on reliability models for power semiconductors.
- Knowledge distillation techniques were applied to reduce model size for deployment on microcontrollers.



Autonomous People Mover

This mobility use case addresses AI integration in safety-critical rail transport systems.

- **TTTECH AUTO** and **TTTECH COMPUTER** defined safety-related software and hardware requirements.
- **Silicon Austria Labs** contributed to safety-aware AI hardware co-design.
- **FH Campus Wien** conducted safety analysis and requirement derivation.
- Runtime "AI checker" concepts were specified for system validation.



On-board Satellite AI

The objective is to process Earth observation images directly onboard satellites, reducing data transmission needs.

- **THALES** defined performance constraints (image size, latency, reliability).
- **NANOXPLORE** worked on FPGA integration and system-level constraints.
- Optimized neural networks were adapted to embedded space hardware environments.



On-device Biometrics

This use case moves biometric verification (face, voice) from the cloud directly onto mobile devices.

- Sensity defined performance and privacy KPIs.
- Compressed versions of biometric AI models were developed.
- Quantization and optimization techniques reduced model size while preserving accuracy.



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Service Robotics for Elderly Care

This application focuses on real-time fall detection and monitoring in care facilities.

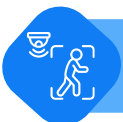
- **Kompai Robotics** defined response-time constraints.
- AI models were optimized to ensure real-time reaction.
- Embedded deployment tests were initiated.



Smart Building Occupancy Monitoring

This use case uses radar-based sensing to monitor room occupancy efficiently.

- The **German Partner under the lead of Infineon Technologies AG** defined system architecture and target hardware,
- explored and developed DNN and spiking neural network models,
- doing currently hardware-aware optimization and mapping on RISC-V target hardware that was developed in the project.



Footstep detection for fall prevention

This use case detects footsteps that can be used by physiotherapists for gait analysis in domestic and elderly care environments:

- **SORAMA** : acoustic sensor array and classification model
- **ALMENDE** : Crownstone technology, indoor localization engine, and electric device identification model.
- **IMEC-NL** : support on system architecture with AI accelerator for optimization
- AI models were optimized for local sound processing.

A Platform Validated Across Sectors

From electric vehicles to satellites, from biometrics to assisted living, NEUROKIT2E demonstrates that:

- The same optimization framework can serve very different industries.
- AI models can be significantly reduced in size and energy consumption.
- European hardware and software can work together within a unified ecosystem.



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A truly collaborative European effort



Funded by
the European Union

NEUROKIT2E brings together **complementary expertise**:

- Research organizations develop the core technologies
- Universities explore innovative AI concepts
- Industrial partners define real-world needs and test solutions on concrete use cases

This close collaboration ensures that the project does not remain theoretical, but leads to **practical tools and demonstrators**, ready for industrial adoption.



By the end of the project, NEUROKIT2E will:

- Help European industries adopt AI more easily
- Reduce dependence on non-European AI frameworks
- Support more energy-efficient digital technologies
- Strengthen Europe's position in embedded and edge AI



What's next?

The coming months will focus on:

- Finalizing real-world demonstrators
- Validating solutions in industrial environments
- Sharing results with the broader European innovation ecosystem

Stay tuned to follow how NEUROKIT2E is bringing AI closer to where it really matters:



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<https://www.neurokit2e.eu/>