Friedrich-Alexander-Universität
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Elevating AI on the Edge: MIMaaS

Machine Intelligence with Microcontroller-as-a-Service

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ABSTRACT

Deploying AI on microcontrollers (MCUs) is challenging. We introduce MIMaaS, a **microcontroller-as-a-Service platform** that enables users to **evaluate** their **Edge AI models in the cloud**. A key innovation is our **measurement** of **real-world power consumption**, alongside latency and memory usage, directly from the physical hardware.

INTRODUCTION

Testing AI models on different microcontrollers is **complex** and **time-consuming** due to the manual setup and maintenance of test benches, which **slows down innovation**. MIMaaS empowers developers to easily validate **hardware-aware Edge AI models** without needing physical **hardware access** or in-depth **know-how**.

OBJECTIVES

The goals of this work were to create a platform that has:

- Streamlined evaluation processes
- Easy deployment workflows
- Transparent implementations
- Easy to understand error reports

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SYSTEM ARCHITECTURE

Submission Interface: Users can upload models via a web interface or Python API.

Processing Backend: Each model is flashed to the desired MCU and evaluated.

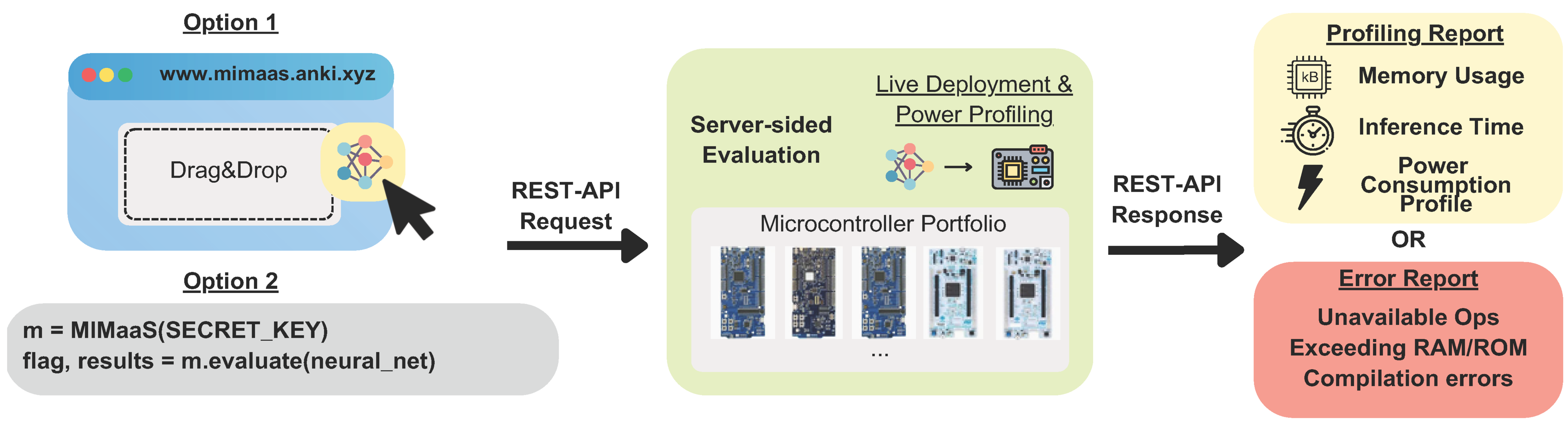
Performance Report: Afterwards, users receive a detailed report with latency, RAM/ROM usage, and energy data.

MCU Portfolio

6 Widely used MCUs: nrf5340, STM32, ESP32

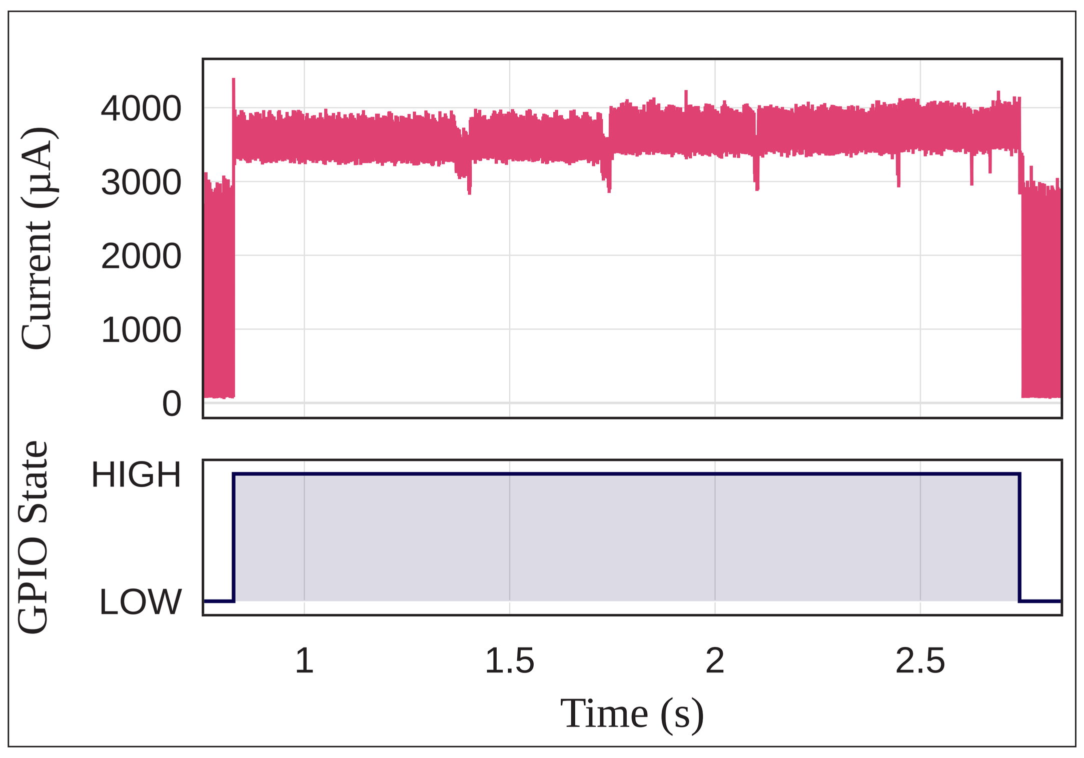
3 Major Manufacturers: Nordic, Espressif, STM

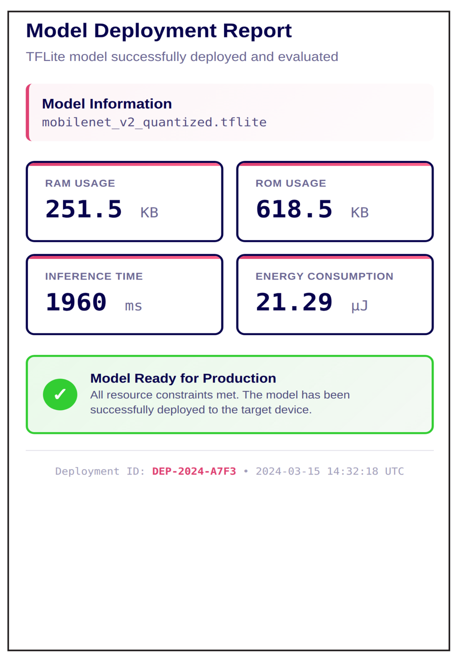
More MCUs are added constantly!

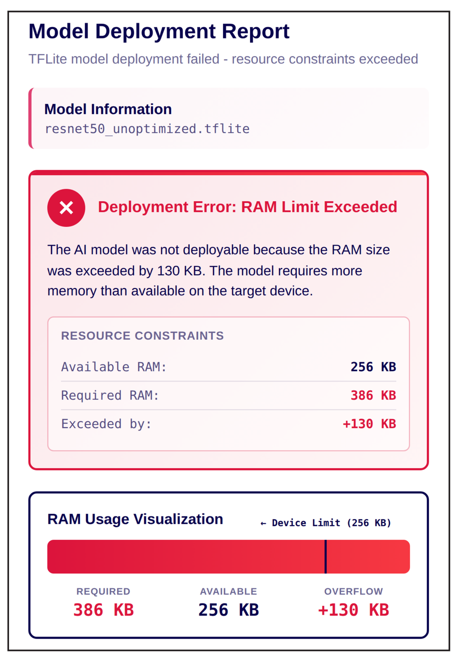


RESULTS

Reports from MIMaaS include fine grained power consumption recordings, the model's inference time, RAM/ROM usage or a detailed error analysis in case the model was not deployable. Below are some examples shown.







CONCLUSION

MIMaaS simplifies Edge AI development by supplying key metrics like latency, memory, and power consumption to devs in the cloud.

Want to know more?

Read more about MIMaaS by scanning the QR Code!

- Access to the full conference paper
- Link to more online resources: Web-Service, GitHub repository and more
- Contact information

Contact Information

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