AI and Edge Computing: Driving Competitive Advantage for Businesses

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Intro: What’s IKERLAN

We are a technology center.

What’s IKERLAN?

We focus on the transfer of knowledge to Industry.

iKerlan
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Sectors

43% Transport and mobility
19% Manufacturing
14% Energy
5% Services and other industries

407 PEOPLE

7% Automotive
2% Health
1% Aeronautics

Ludwigsburg, Germany
Intro: What’s IKERLAN

We develop industrial prototypes through the application for our technological knowledge.

OUR PARTICIPATION IN PROJECTS

CONTRIBUTION OF OUR OWN TECHNOLOGICAL ASSETS

REQUIREMENT  CONCEPTUALIZATION  DESIGN  IMPLEMENTATION  VALIDATION

NEED  IDEA  DEVELOPMENT  PROTOTYPE  INDUSTRIALIZATION  PRODUCT
Intro: What’s MONDRAGON

- Top 10 Industrial Group of Spain, #1 in Basque Country region
- Corporation of Cooperative Companies
- Workforce of >70,000 people
- 174M€ in R&D&S in 2022
AI in the Edge-Cloud Continuum for Industry:
  - MLOps
  - Collaborative AI
  - AI optimization
  - Data Spaces

Integrating Open-Source Technologies:
  - Interoperability
  - Vendor neutrality

Open-Source as Building Blocks

Customization as Glue
Use Cases

Manufacturing Use Case
Mondragon Assembly
Federated Learning and AI in production

Research
FaaS Framework
IoT & Edge to Cloud Continuum

Industrial Use Case
Multiple Clients
AI in the Edge and IoT
Mondragon Assembly Use Case

- International reference in automation and assembly solutions
- International presence
- 3 Business Units:
  - Automation
  - Turnkey lines for PV modules manufacturing
  - Turnkey lines for battery pack technologies
Mondragon Assembly Use Case

- Use Case with various AI models for predictive maintenance, defect detection, etc.
- Each automation line is deployed in different plants/clients
Mondragon Assembly Use Case

- How to train a common model without sending data to the Cloud?
  - *Federated Learning*: decentralized ML approach where models are trained locally on distributed edge devices without sharing raw data
- Using Open-Source
- Using Edge Resources
Mondragon Assembly Use Case

- How to take the AI models from PoC stage to production?
  - **MLOps**: manage the full life-cycle of the models, from taking the data, training, deploying, detecting drift, retraining, etc.
Mondragon Assembly Use Case

MLOps plataform with Federated Learning and Distributed AI
Mondragon Assembly Use Case
MLOps platform with Federated Learning and Distributed AI
Industrial Use Case

- How to use AI models in production in constrained devices?
  - Very common use case in lots of industrial clients
  - Use current devices in production to run AI workloads
  - Improve current processes with AI on the Edge
  - Reduce cost
  - Use dynamic/elastic architectures that can be updated to adapt fast
Industrial Use Case

- How to use AI models in production in constrained devices?
  - AI optimization / TinyML
  - Deployment (MLOps-EdgeOps) + Software Architecture

- Which kind of devices?
  - Edge devices: Microprocessors (x64, ARM Cortex-A, etc.) with capability to run containers and GNU Linux
  - IoT devices: Microcontrollers (ARM Cortex-M, Espressif, etc.) with baremetal Firmware or RTOS

- With what constraints?
  - Availability (continue running while offline) and security
  - Run with current applications
Industrial Use Case

- **AI optimization / TinyML**
  - **Frameworks**: TF Lite, TensorRT, PyTorch Mobile, ONNX, GLOW, Apache TVM, ARM NN, etc.
  - **Small and Efficient networks** (model architecture)
  - **Edge-Cloud Continuum**: Wide variety of hardware with different capabilities
  - **Integration with MLOps-EdgeOps** to auto-optimize model for HW

- **Deployment & Architecture**
  - **Edge devices**: K8S, K3S, AWS Greengrass, Custom microservices deployment IKERLAN KonnektBox, etc.
  - **IoT devices**: Custom integration with baremetal, FreeRTOS, etc.
A Cognitive Serverless Framework for the Cloud-Edge Continuum

COGNIT.SovereignEdge.EU

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Shaping the future in Cognit

- Building an European Open Source FAAS Function-as-a-Service Framework
- Task offloading:
  - From IoT -> To the Edge-Cloud Continuum
  - The device decides WHAT and WHEN to offload
  - The framework decides WHERE to offload it in the continuum
Shaping the future in Cognit

- Define application and non-functional requirements to orchestrate the task offloading
  - Low Latency -> MEC 5G
  - ML/AI based -> Continuum resources with GPU
  - Best effort -> Cloud based
  - Etc.
Shaping the future in Cognit

- Four validation use cases in different sectors
eSAAM 2023
on Cloud to Edge Continuum

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