MONDRAGON
HUMANITY AT WORK
Finance
Industry
Retail
Knowledge
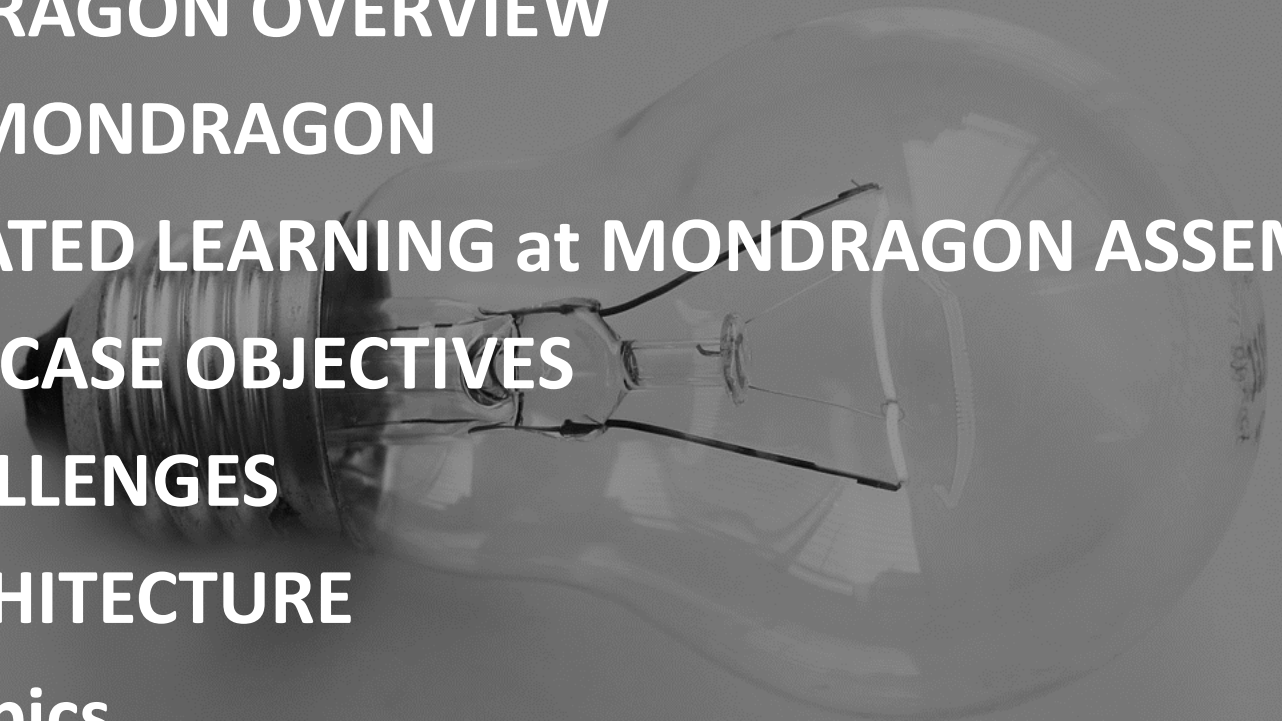
Federated Learning in Industry at Edge-Cloud Environment

Industry viewpoint

Michel Iñigo

Senior Innovation & Technology Project Manager

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- ✓ **MONDRAGON OVERVIEW**
- ✓ **AI AT MONDRAGON**
- ✓ **FEDERATED LEARNING at MONDRAGON ASSEMBLY & IKERLAN**
  - • **USE CASE OBJECTIVES**
  - • **CHALLENGES**
  - • **ARCHITECTURE**
- ✓ **CL4 Topics**
- ✓ **AIM-NET BENEFITS**

INTERNATIONAL PRESENCE DISTRIBUTED IN 4 BUSSINES AREAS

MONDRAGON | HUMANITY AT WORK | Finance Industry Retail Knowledge

INDUSTRY

€4,229 M SALES

FINANCE

1,500,000 clients

RETAIL

€5,387 M Sales

KNOWLEDGE

€10,236M
TOTAL SALES

83 cooperatives
80 subsidaries

68,743
WORKERS

76%
INTERNATIONAL SALES

TOTAL EXPEDITURE IN R&D/YEAR	INVESTMENT IN OVER ADDED VALUE OF INDUSTRIAL AREA	TOTAL # OF RESEARCHERS	R&D CENTRES	PATENT FAMILIES IN EFFECT
165M€	12,20%	2,200	12	370

* 2021 figures

MONDRAGON COMMUNITY IN ARTIFICIAL INTELLIGENCE

COMUNIDAD IA
MONDRAGON

Boosting Manufacturing Value through AI

To generate and transmit transversal knowledge among interested cooperatives and to **support them solving their AI challenges**.

OBSERVATORY of technological trends, patents, funding calls & legislative and ethical aspects

AI SKILLS & TALENT

DATA STRATEGY (data sharing & MLOPS)

**CORPORATE AI USE CASES** and generation of innovation projects

STRATEGIC POSITIONING at international level

Mondragon Assembly

MONDRAGON ASSEMBLY — Automation and assembly solutions for industrial components

International group specialized in **the development of automatic assembly solutions** for various sectors (Solar, E-Mobility, Energy Storage, Automobile, Electrical Switchgear, Home Appliance Components and Medical).

- 6 production plants distributed throughout the world.
- Mondragon Assembly exports more than 60% of production
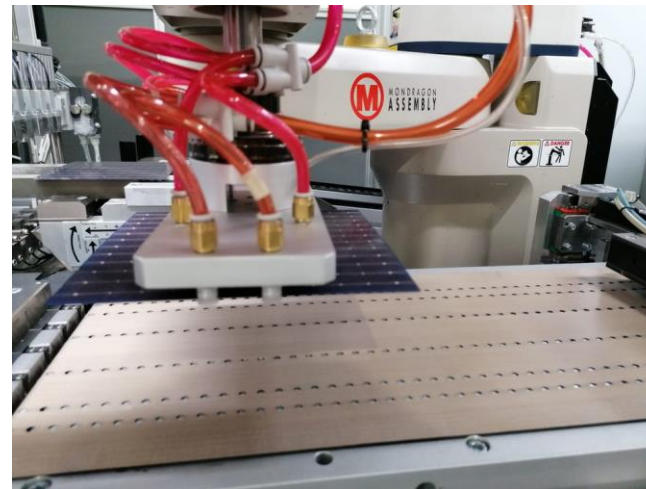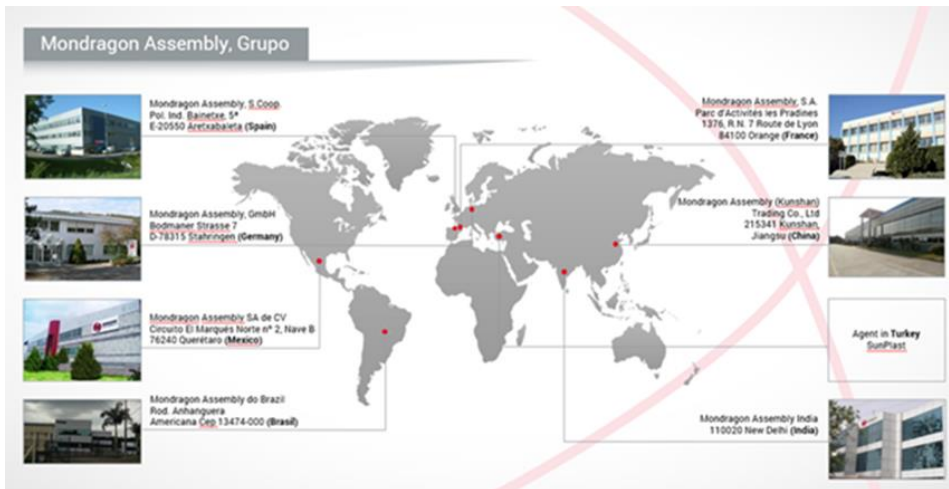
Digital & AI Strategy

Anomaly Detection

MLOPS

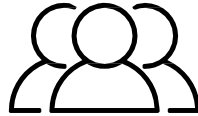FEDERATED LEARNING

Concept Drift

Data Spaces

https://www.mondragon-assembly.com/

INNOVATION

Corporate Center - Innovation & Technology

IKERLAN

ikerlan
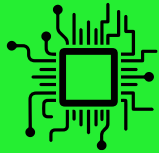MEMBER OF BASQUE RESEARCH
& TECHNOLOGY ALLIANCE

MORE THAN
364
WORKERS

48
ON-GOING PhDs

ELECTRONICS, INFORMATION AND COMMUNICATION TECHNOLOGIES	**185 WORKERS**

ENERGY AND POWER ELECTRONICS	**60 WORKERS**

MECHATRONICS AND AUTOMATION	**85 WORKERS**

BRTA
BASQUE
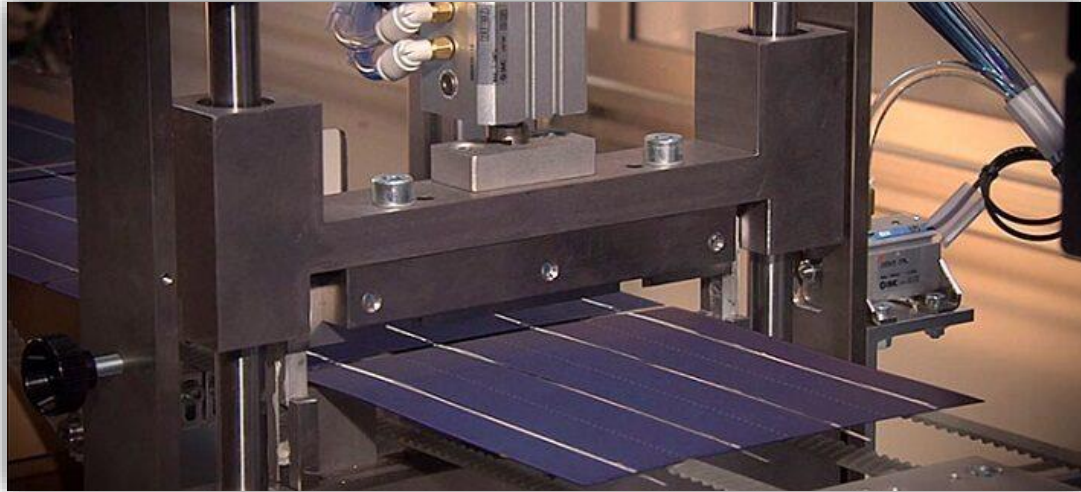RESEARCH &
TECHNOLOGY
ALLIANCE

https://www.ikerlan.es/en/

Federated Learning in Industry at Edge-Cloud Environment - OBJECTIVES

SOLAR PANEL WELDING

- Anomaly detection.->Photoluminiscence
- Federated solution to implement throught multiple manufacturing lines

ANOMALY DETECTION IN AXES

- Automated Clasification (Normal/non-normal) of axes movements
- Provide federated architecture for diferent clients

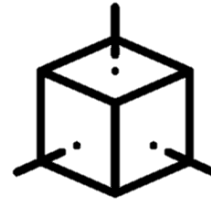MONDRAGON ASSEMBLY — Automation and assembly solutions for industrial components

ikerlan — MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Federated Learning in Industry at Edge-Cloud Environment- CHALLENGES

Edge-Cloud Needs

Data Spaces and Interoperabilty

AI Operations in Distributed Environment
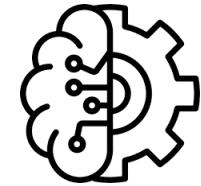
- Building open IoT platforms
- Open standards for virtualization
- Up-scaling of edge infrastructure
- Low data processing latency
- Accelerate adoption of edge infrastructure
- Cybersecurity

- From data islos to many to many ecosystem
- High interoperability scale
- Data Exchange Agile and trust
- Data sovereignty and governance
- Industrial value chain
- Standards (IDS Connectors)

- Common architectures and standards
- MLops
- AI inference for distributed environment
- Semantic perspective
- Explainable AI

Federated Learning in Industry at Edge-Cloud Environment - ARCHITECTURE

✓ New AI Models for Photoluminiscence and cells quality check for predictive maintenance, forecasting/simulation and federated learning

✓ Models automatic management -> Retraining & model upgrade with new axes data

✓ DataGovernance/Interoperability/Ssytem Connected
  • Data Format
  • Registry
  • Data Exchange/Trusted Exchange

✓ Standardized AI Models- Asset Administration Shell

✓ Edge-Cloud environment scaling and improving productivity

✓ MLOPS strategy

✓ Concept Drift
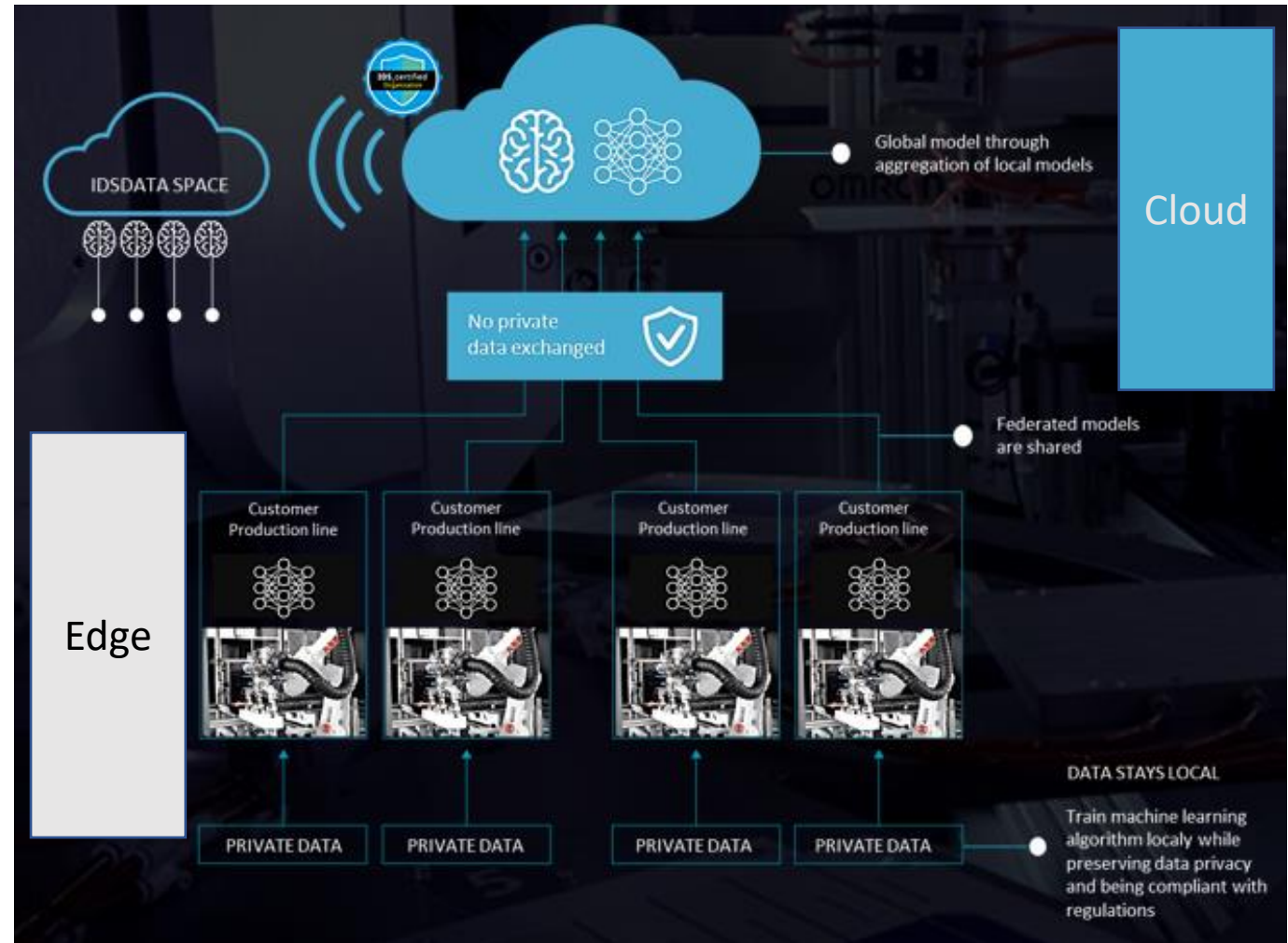
Federated Learning in Industry at Edge-Cloud - TECHNICAL CHARACTERISTICS

✓ **TECHNOLOGICAL TOOLS**
- **Training:** Tensorflow + Keras Autoencoder in Python

- **Clasification**: Tensorflow + Keras Alexnet in Python

- **Forecasting**: Sklearn DecisionTreeRegressor in Python

✓ **DATASET**
- **Training**:
  - 100 images/step (5-10 steps)
  - 20 images/defect
  - Multivariate Time Series Curves : 500 curves
- **Forecasting**:
  - Axis Movements for: 40,000 movements (12 hours)

✓ **AI PERFORMANCE**
- **Macro/Medium Defects**
  - Defect > 99%
  - No Defect < 0,5%
  - Defect No identified <1%

- **Micro Defects**
  - Defect >95%
  - No defect 10%
  - Defect No identified <5%

Horizon Europè - TOPICS

- ➤ **HORIZON-CL4-2024-TWIN-TRANSITION-01-03** - Manufacturing as a Service: Technologies for customised, flexible, and decentralised production on demand (Made in Europe Partnership) (RIA)

- ➤ **HORIZON-CL4-2024-TWIN-TRANSITION-01-05** - Technologies/solutions to support circularity for manufacturing (Made in Europe Partnership) (RIA)

- ➤ **H**ORIZON-CL4-2024-DATA-01-03 - Piloting emerging Smart IoT Platforms and decentralized intelligence (IA)

- ➤ **HORIZON-CL4-2024-HUMAN-01-06** - Explainable and Robust AI (AI Data and Robotics Partnership) (RIA)

- ➤ **HORIZON-CL4-2024-DIGITAL-EMERGING-01-03** - Novel paradigms and approaches, towards AI-powered robots– step change in functionality (AI, data and robotics partnership) (RIA)

- ➤ **HORIZON-CL4-2024-DIGITAL-EMERGING-01-04** - Industrial leadership in AI, Data and Robotics boosting competitiveness and the green transition (AI Data and Robotics Partnership) (IA)

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