Resource-efficient (Gen)AI for Inspection & Monitoring

Sabine Demey

Director Flanders AI Research Program, imec

ADR Forum, Eindhoven, 5 November 2025
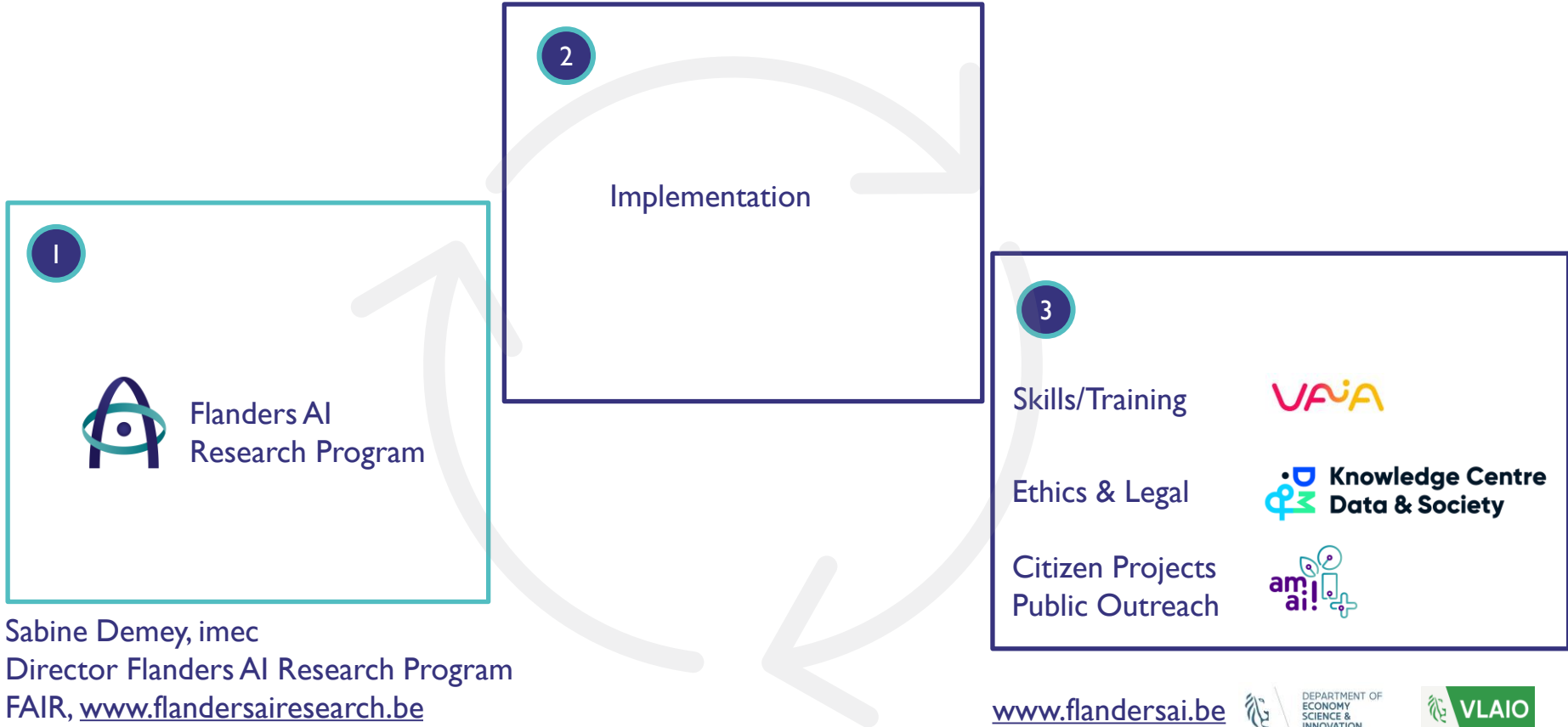
Flanders AI Plan for a successful adoption of AI

2 Implementation

1 Flanders AI Research Program

3
Skills/Training

Ethics & Legal

Citizen Projects
Public Outreach

Sabine Demey, imec
Director Flanders AI Research Program
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www.flandersai.be

Flanders AI Research Program

One program that brings together a **critical mass** of researchers

40 Research Groups
90 Professors
300+ researchers
1 Program Book

Flanders AI Research Day, October 2024

KU LEUVEN   GHENT UNIVERSITY   VUB VRIJE UNIVERSITEIT BRUSSEL   University of Antwerp   UHASSELT   imec   FLANDERS MAKE   VIB   vito   sirris ILVO

Foto: KU Leuven

HEALTH

SOCIETY

Foto: Flanders Make

INDUSTRY

PLANET & ENERGY

Foto: VUB

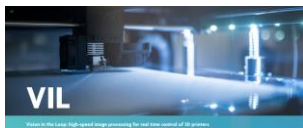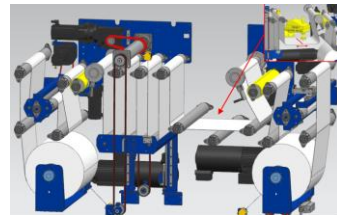# Inspection & Maintenance
wide range of use cases with different requirements

Environments
(manufacturing, assets in the field)

Production Process

VIL

Machine
(component level, subsystem level, fleet of machines)
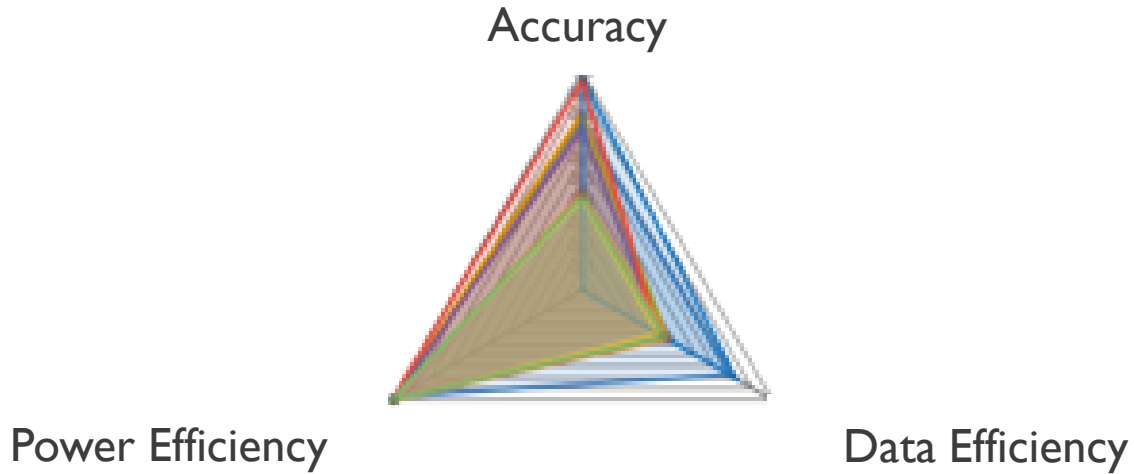
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Which method is most effective, depends on requirements of use case

The use of domain knowledge is indispensable for high-performant anomaly detection: use physics-informed AI, neuro-symbolic AI, combination learning & reasoning

GenAI for Inspection&Maintenance

- Anomaly Detection
  - Physics-informed AI & hybrid AI with domain knowledge
  - GenAI to create synthetic data
  - GenAI for textual explanations for the operator
  - GenAI / Multi-agent AI for anomaly detection in fleet
- Decision support system for Preventive Maintenance, Prognostic Health Management
  - Conversational user interface
- Scheduling of maintenance tasks
- Operator-assistance during maintenance
- GenAI in support of software development

AI is a transversal technology
Anomaly detection across different sectors

APPLICATIONS and AI SYSTEMS
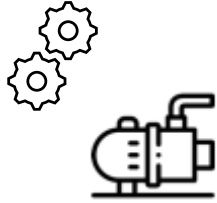
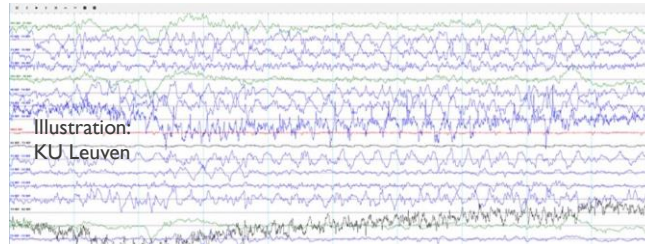Anomaly detection, preventive maintenance, prognostic health management

Smart grids - faster simulations and predictions of electricity consumption

Foto: KU Leuven

Epileptic Seizure Detection

AI TECHNOLOGY

Illustration: KU Leuven

AI on time series