METRICS PROJECT

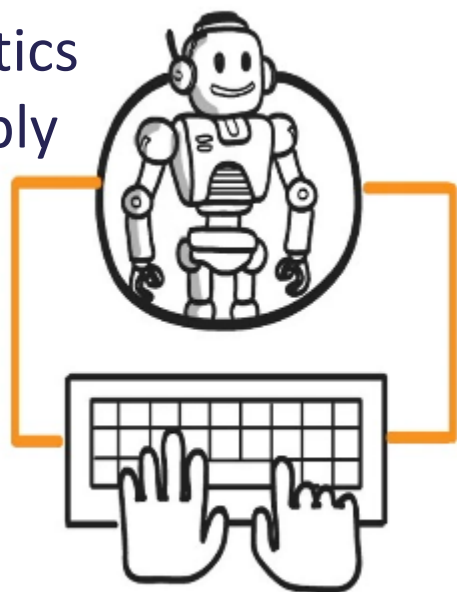## Metrology-grade robotics competitions:

Healthcare
Inspection and Maintenance
Agri-food
Agile production

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MATCHING SUPPLY AND DEMAND IN AI AND ROBOTICS THROUGH COMPETITIONS
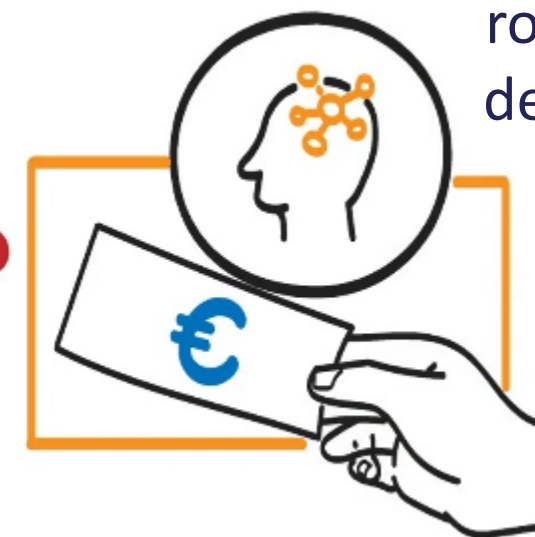
AI and robotics supply

AI and robotics demand

Black-box, non convex, evolutive systems

Need: evaluation of AI and Robotics

Trustworthy and efficient functionalities

METRICS OBJECTIVES

1

Development of the Evaluation Framework

Evaluation framework based on **metrological principles** ensuring repeatable measurements and reproducible experiments

2

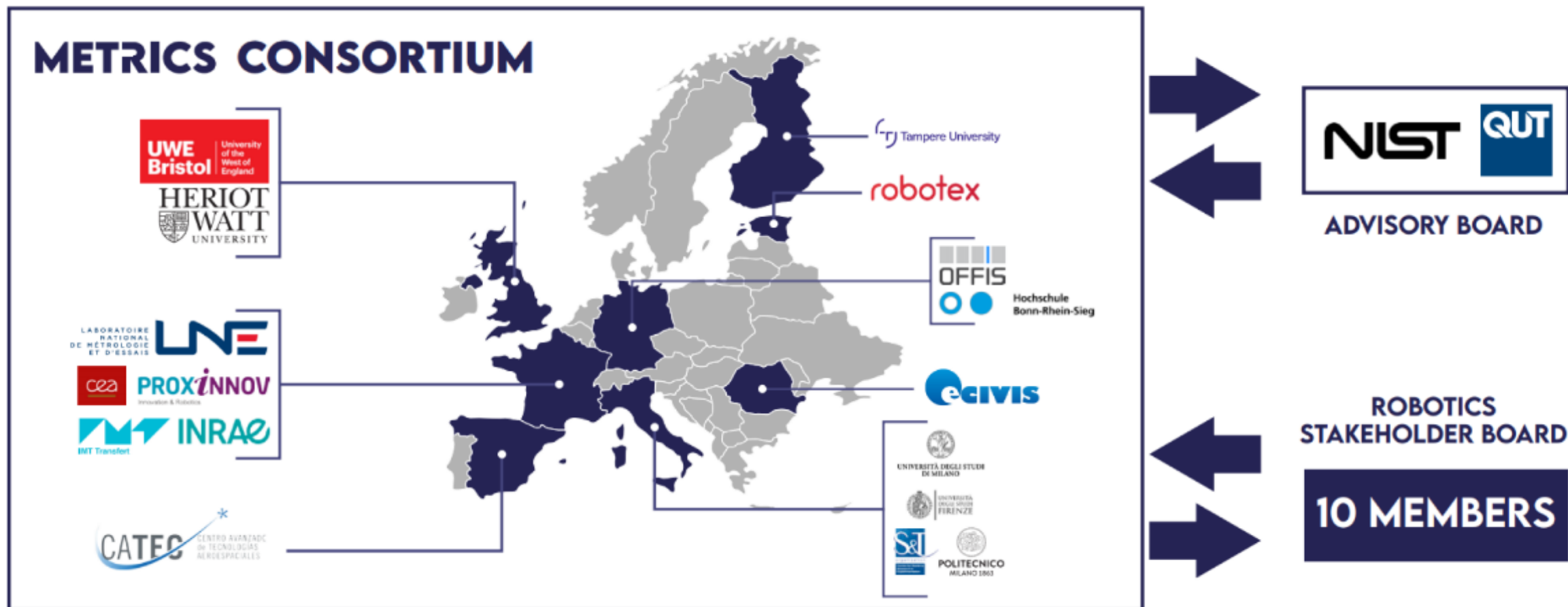Organization of the 4 competitions

Combination of evaluations of **AI modules and entire robots**

3

Consolidation of the European robotics and AI community

Collaborations with **DIH and external sponsors** to ensure industrial relevance

METRICS consortium relies on the collaboration of **17 partners from 8 EU countries** (Estonia, Finland, France, Germany, Italy, Romania, Spain, United Kingdom), which will contribute to strengthening the European AI and robotics communities, including in EU Widening countries

EVALUATION CAMPAIGNS ORGANISATION

- **Dry-run**: First year campaigns aiming to validate the evaluation plan.

| Preparation of the evaluation plans | Dry Run | 1st Campaign | 2nd Campaign |
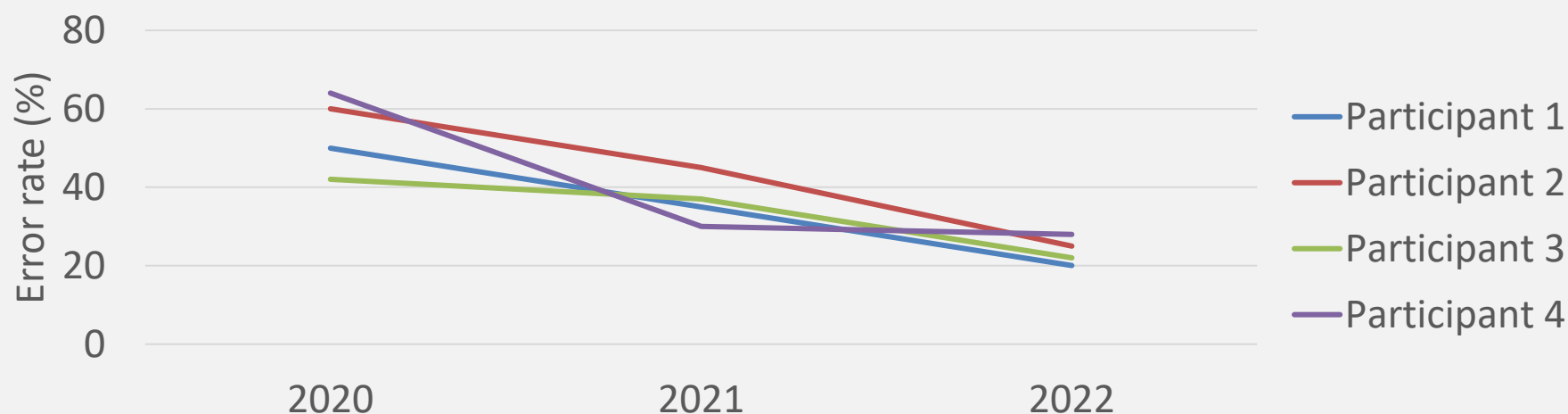
COMPETITION ORGANISATION

- **Field Campaign**: Evaluate robot capabilities on a physical testbed.

- **Cascade Campaign**: Evaluate software capabilities on a dataset acquired during the Field Campaign.
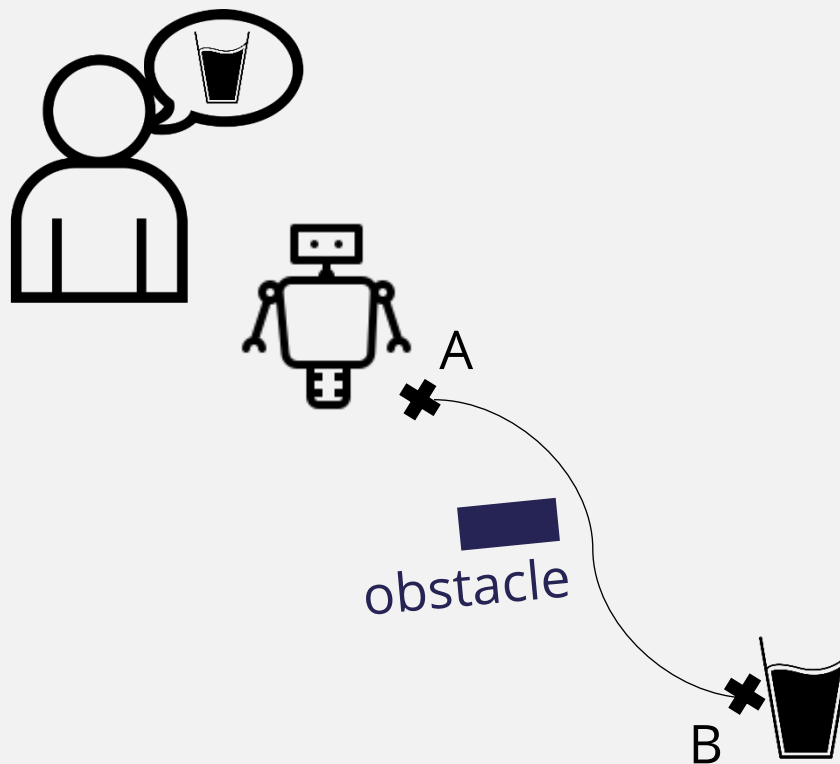
FIELD AND CASCADE EVALUATION CAMPAIGNS

- The data used to evaluate the AI algorithms of the robots during the cascade evaluation is the one which is collected during the filed evaluation

FUNCTIONALITY AND TASK BENCHMARKS

Task benchmarks (TBM)

Functionality benchmarks (FBM)

TBM1 : To fetch for a glass of water when asked

A

obstacle

B

FBM-1 : To understand fetching orders
FBM-2 : To detect obstacles
...
FBM-N : To grab a drink
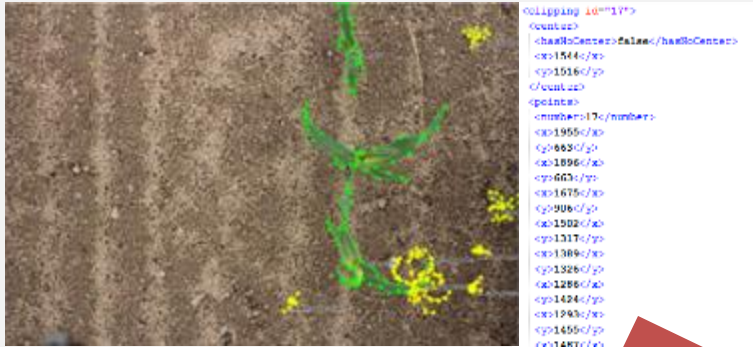
EVALUATION METHOD

References: human annotations

Metric:

$$EGER = \frac{\sum_{k=1}^{N} C_k + FP_k + FN_k}{\sum_{k=1}^{N} R_k}$$

Comparaison
1. Mapping
2. Calculation of the error rate

Crop

Acquisition of images by the 4 evaluated robots

Hypotheses : outputs from detection systems
(illustrations from ROSE Challenge - http://challenge-rose.fr)

METRICS COMPETITIONS

HEART-MET
Healthcare

Assistive robots
1. Assess activity state
2. Item delivery
3. Area coverage
4. Prepare drink
5. Receive and transport drink

RAMI
Inspection and maintenance

Inspection autonomous robots
1. Underwater: pipeline area inspection and intervention
2. Aerial: punctual and repetitive inspection in difficult access areas

ACRE
Agri-food

Weeding robots
1. Intra-row weeding
2. Crop mapping

ADAPT
Agile production

Collaborative assembly robots
1. Collaborative programming for assembly
2. Collaborative assembly of complex parts

HOW TO GET INVOLVED?

As a participant:

• **What:** take part in one of the METRICS competitions by registering your technological solution to the corresponding evaluation campaigns (a robot for field evaluations and/or an AI algorithm for cascade evaluations).

• **Why:** take advantage, free of charge, of the evaluation tools made available by the consortium, test your system, position it in relation to those of the other participants and set up new collaborations.

• **How:** contact the coordinator of the corresponding competition (e.g. acre@metricsproject.eu for the agri-food competition, im@metricsproject.eu for the I&M competition, etc.).

As a sponsor:

• **What:** help us drive the competition through sponsorship (cash or in-kind contribution) as well as active involvement in the definition of the scenarios, evaluation criteria and judging of the competitions.

• **Why:** a unique opportunity to shape the competition challenges, rules and evaluation criteria to make them meaningful to your business current and future needs in robotics.

• **How:** contact the METRICS coordinator at info@metricsproject.eu.

THANK YOU

www.metricsproject.eu | info@metricsproject.eu