



AGRI-FOOD COMPETITION FOR ROBOT EVALUATION (ACRE)

In ACRE, robots and smart implements demonstrate their ability to perform agricultural tasks requiring autonomous capabilities. These abilities are crucial for the transition of traditional agricultural practices to Agriculture 4.0, where Artificial Intelligence and Robotics support Precision Agriculture.

- ◎ ACRE is a European project open to teams from all around the world.
- Performance evaluation based on objective benchmarks
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- ◎ Field Campaigns (physical, in the field) and Cascade Campaigns (data-based, remote): dry-runs are already took place
- State Acressing State Acres
- ◎ For detailed information on the benchmarks' execution, check the Evaluation Plan at metricsproject.eu/agri-food.

1ST ACRE FIELD EVALUATION CAMPAIGN - JUNE 2022, "AGROTECHNOPÔLE" SITE OF INRAE, MONTOLDRE, FRANCE

Functionality Benchmarks (FBMs)

- focused on specific capabilities of a robot

- Seaf area estimation FBM
- $\ensuremath{\mathfrak{S}}$ Biomass estimation FBM

Task Benchmarks (TBMs)

- evaluating the execution of complex tasks involving multiple functionalities

- ◎ Intra-row weeding TBM

Registered participants will have the possibility of executing their own choice of FBMs and TBMs.

To join the 2022 Field Evaluation Campaign, fill the registration form at https://forms.gle/HATncmkeMV8KBy4eA or use QR code



Contact us: acre(a)metricsproject.eu

CRE competition is organised by: Politecnico di Milano (POLIMI, Italy), ACRE leader Iniversità degli Studi di Milano (UNIMI, Italy) French National Research Institute for Agriculture, Food and the Environment (INRAE, France).

www.metricsproject.eu

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ACRE FUNCTIONALITY BENCHMARKS

PLANT DISCRIMINATION FBM :

Goal: Detect which plants of an intra-row are weeds and which are crops.

Evaluation: Performance metrics compare plant classification produced by the robot with ground truth or reference labelled images.

WEED DESTRUCTION FBM :

Goal: Destroy in intra-row the unwanted plants (weeds) while not damaging the wanted plants (crops).

Evaluation: Crops and weeds count before and after the weeding action and assessment of the weed destruction's effectiveness.

LEAF AREA ESTIMATION FBM :

Goal: Estimate the leaf area of the plants along a cultivated row

Evaluation: Comparison with ground truth leaf area measured by experts with an instrument

BIOMASS ESTIMATION FBM :

Goal: Estimate above-ground crop biomass

Evaluation: Comparison with ground truth obtained by destroying the cultivation and weighing the plants





FIELD NAVIGATION FBM :

Goal: Navigate through field rows without causing damage to the crop.

Evaluation: Performance metrics consider the amount of damage caused by the robot to the crops and the time to complete the task.

ACRE TASK BENCHMARKS

INTRA-ROW WEEDING TBM :

Goal: Perform fully autonomous intra-row weeding of an intra-row to eliminate the weeds located among the crop plants of a row while not damaging the crop.

Evaluation: Number of weeds destroyed and crops plants damaged after

weeding.





CROP MAPPING TBM :

Goal: Autonomously produce a map of a multi-row cultivated plot with variable plant density.

Evaluation:

- Participants are asked to produce a map containing plant positions in terms of absolute coordinates (like UTM).
- Accuracy of plant positions is evaluated by comparing the participant map with the ground truth.