# Open Deep Learning toolkit for Robotics

## FACTSHEET

This project has received funding from the Horizon 2020 programme under grant agreement No 871449. The content of this factsheet reflects only the author's view. The European Commission is not responsible for any use that may be made of the information it contains.

Open Deep Robotics

FACTSHEET

# Open Deep Learning toolkit for Robotics

## Context

Almost everything we hear about artificial intelligence today is thanks to deep learning (DL). This category of algorithms have been proved to be immensely powerful in mimicking human skills such as our ability to see and hear. To a very narrow extent, it can even emulate our ability to reason. These capabilities power Google's search and translation services, Facebook's news feed, Tesla's autopilot features and Netflix's recommendation engine and are transforming industries like healthcare and education. Deep learning has achieved tremendous performance jumps in the last decade in several Computer Vision (CV) and Machine Learning (ML) tasks, achieving in many cases super-human performance. However, DL cannot be currently fully exploited in robotics scenarios due to a number of barriers.

### Learning Curve Barrier

**DL** has a **steeper learning curve** than traditional CV and ML methods

### Computational Complexity Barrier

**DL requires vast amounts of computational power** and **energy**

### Static Perception Barrier

**DL** is applied on **static environments** and **does not exploit spatial or temporal embodiment**

The need for an open deep learning toolkit that contains easy to train and deploy real-time, lightweight, Robot Operating System (ROS) compliant deep learning models for robotics is evident.

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# OpenDR

**OpenDR** aims to develop a **modular**, **open** and **non-proprietary toolkit** for **core robotic functionalities** by harnessing **deep learning** to provide **advanced perception and cognition capabilities**, meeting in this way the general requirements of robotics applications in the applications areas of **healthcare**, **agri-food**, and **agile production**.

***H2020 Research and Innovation Project***

***8 partners from 7 countries***

***6.6M € budget, started on 1 Jan 2020 (36 months)***

***Coordinated by Aristotle University of Thessaloniki***

***Prof. Anastasios Tefas (tefas@csd.auth.gr)***

## Objectives

- To provide a modular, open and non-proprietary toolkit for core robotic functionalities enabled by lightweight deep learning
  - enhance the **robotic autonomy** exploiting **lightweight deep learning for on-board deployment**
  - provide **real-time deep learning tools** for robotics visual perception on **high-resolution data**
- To leverage AI and Cognition in robotics: from perception to action
  - propose, design, train and deploy models that **go beyond static computer perception, towards active robot perception**
  - provide deep **human-centric active robot perception tools,** as well as **tools for enhanced robot navigation, action and manipulation capabilities**
- To propose **a co-integration of simulation and learning methodology** for deep learning in robotics and demonstrate the potential of OpenDR in three prioritized application areas
- To establish strong links to robotics Digital Innovation Hubs

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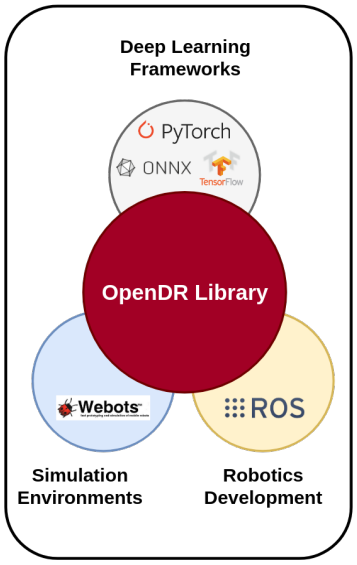
# OpenDR

## Expected Impact

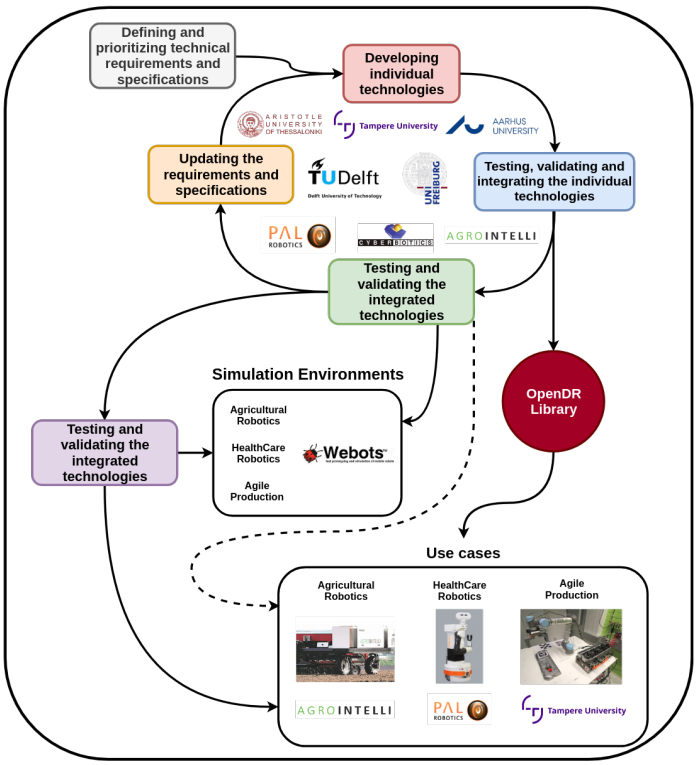
- Improve the technical capabilities in robotics by providing easily deployable, efficient and novel DL tools.
- Lower the technical barriers by providing a modular and open platform for developing DL models.
- Enable a greater range of cognitive applications in agri-food, healthcare robotics and agile production (TRL 3+).
- Strengthen the competitiveness of companies by lowering the cost to access robotics-oriented DL tools.

## OpenDR at glance

### OpenDR Toolkit




### OpenDR Development and Validation Cycle




## Consortium

ARISTOTLE UNIVERSITY OF THESSALONIKI

TU Delft

AARHUS UNIVERSITY

Tampere University

UNI FREIBURG

CYBERBOTICS
robot simulation

PAL ROBOTICS

AGROINTELLI

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