



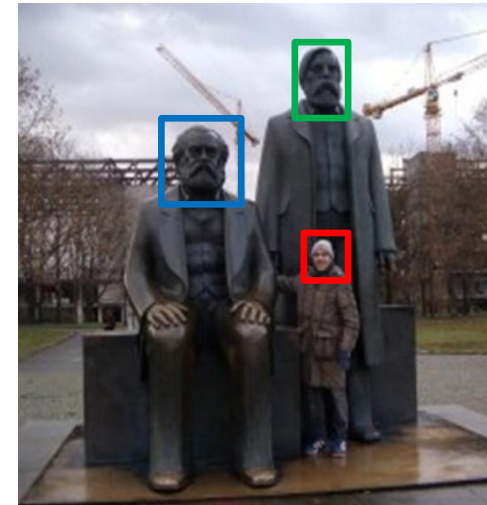
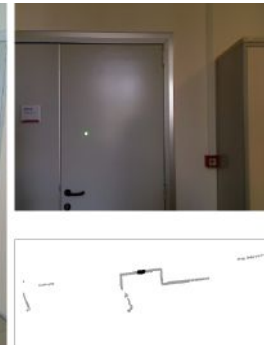
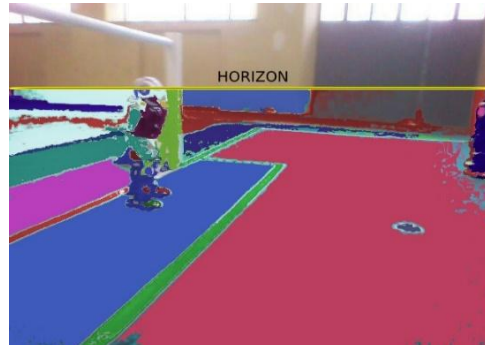
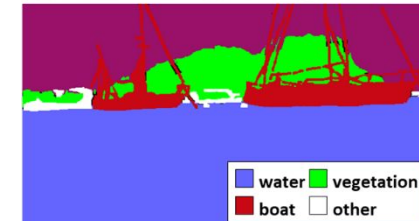
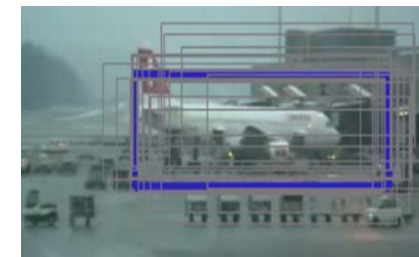
**UNIVERSITÀ DEGLI STUDI
DELLA BASILICATA**

RoboCup

i mondiali della
robotica

Domenico Daniele
Bloisi

Dipartimento di
Matematica, Informatica
ed Economia



RoboCup

Che cos'è

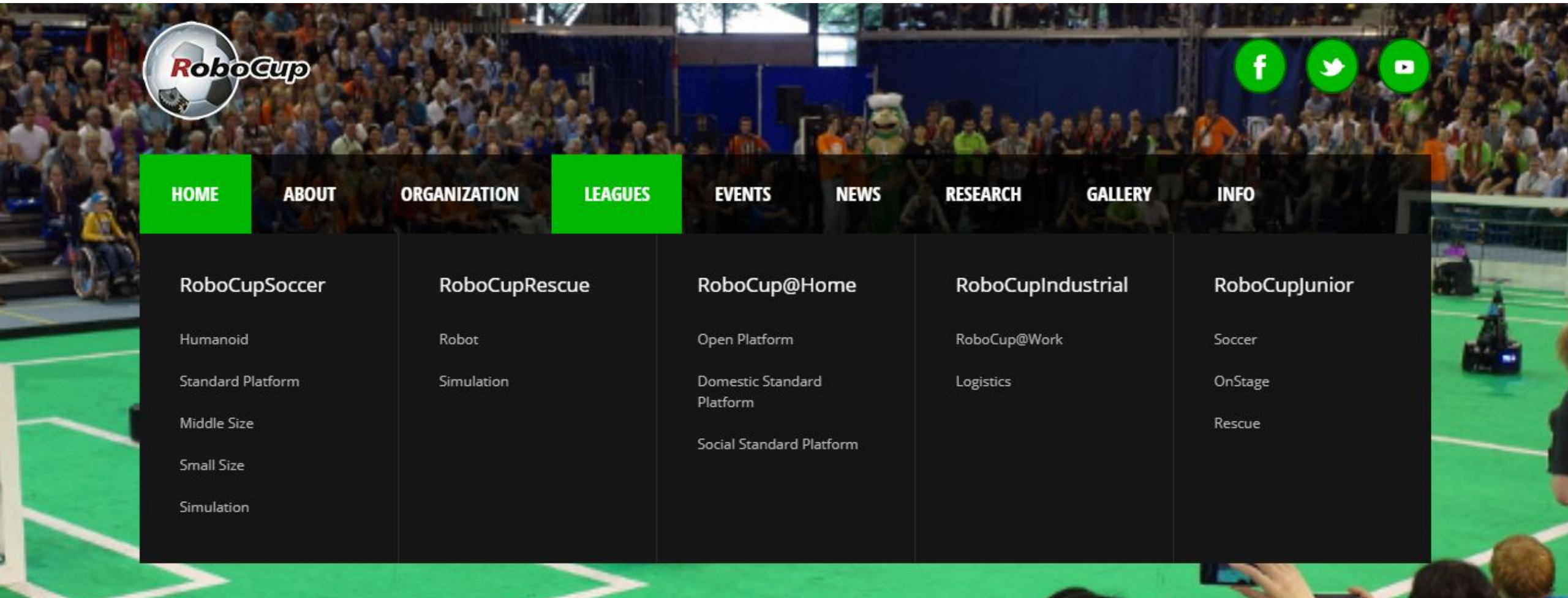
La RoboCup è una competizione internazionale che si tiene ogni anno con la partecipazione di oltre 5000 robot programmati da studenti e ricercatori provenienti da 35 nazioni differenti

Obiettivo

Entro il 2050, costruire una squadra di robot umanoidi completamente autonomi in grado di battere la squadra campione del mondo FIFA



Leghe RoboCup



RoboCupSoccer

Humanoid

Standard Platform

Middle Size

Small Size

Simulation

RoboCupRescue

Robot

Simulation

RoboCup@Home

Open Platform

Domestic Standard Platform

Social Standard Platform

RoboCupIndustrial

RoboCup@Work

Logistics

RoboCupJunior

Soccer

OnStage

Rescue

RoboCup SPL

The RoboCup **Standard Platform League** is a RoboCup robot soccer league, in which all teams compete with **identical robots**

The robots operate fully autonomously, i.e. there is no external control, neither by humans nor by computers. The current standard platform used is the humanoid NAO by SoftBank Robotics



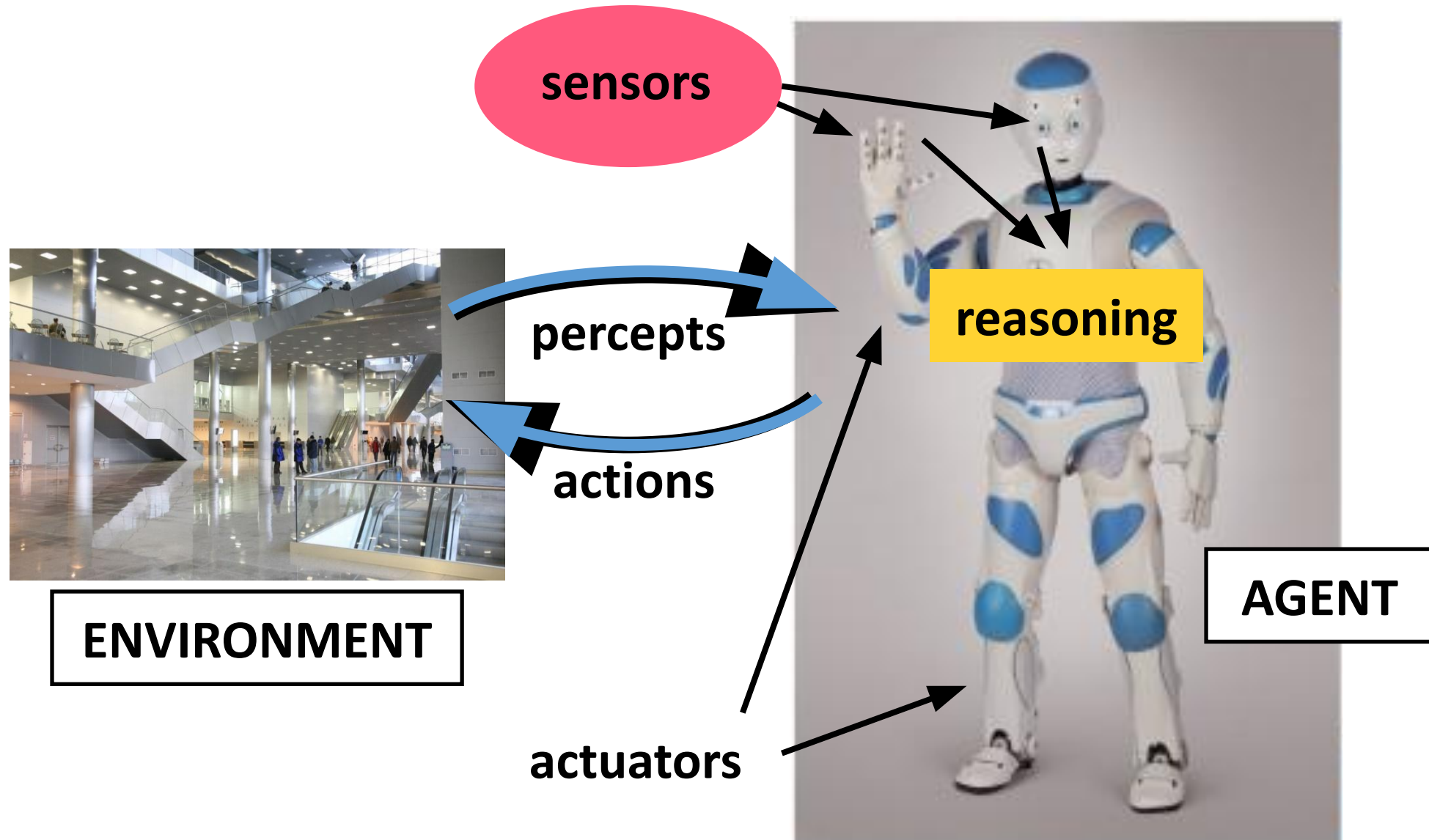
Perché il calcio?

1. É un gioco dinamico che richiede **autonomia**
2. i robot della **stessa squadra** devono cooperare con i compagni per giocare
3. la presenza dell'**avversario** rende complesso l'obiettivo di vincere la partita

Robot mobile autonomo

- **Autonomia:** capacità di portare a termine un compito basandosi sullo stato e sulle percezioni correnti, senza intervento umano
- **Sistema autonomo:** un sistema che prende decisioni da solo, agendo senza la guida di un umano
- **Robot mobile autonomo:** sistema robotico autonomo capace di muoversi nell'ambiente

Perceive-Reason-Act Cycle



Esempio DARPA Challenge



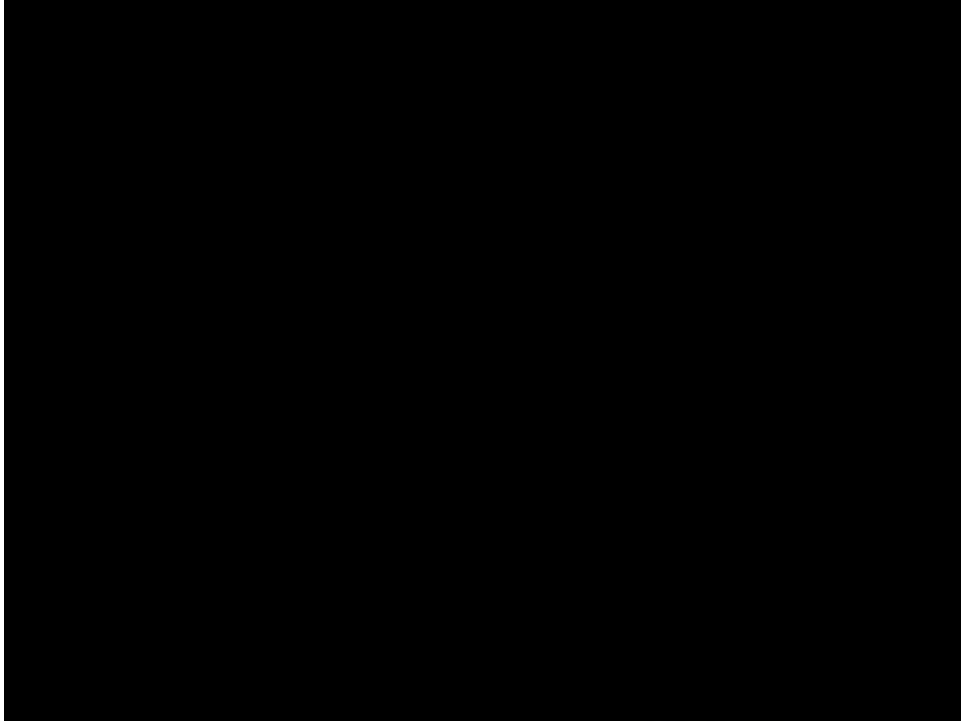
<https://www.youtube.com/watch?v=g0TaYhjpOfo>

RoboCup97 Nagoya



35 teams from 12 countries

Robot quadrupedi



To feel

Temperature Sensor
Acceleration Sensor
Electric Static Sensor: head, back
Pressure Sensor: chin, paws (4)
Vibration Sensor



back touch sensor/LED

on/off switch

head touch sensor/LED

ear LED



head LED

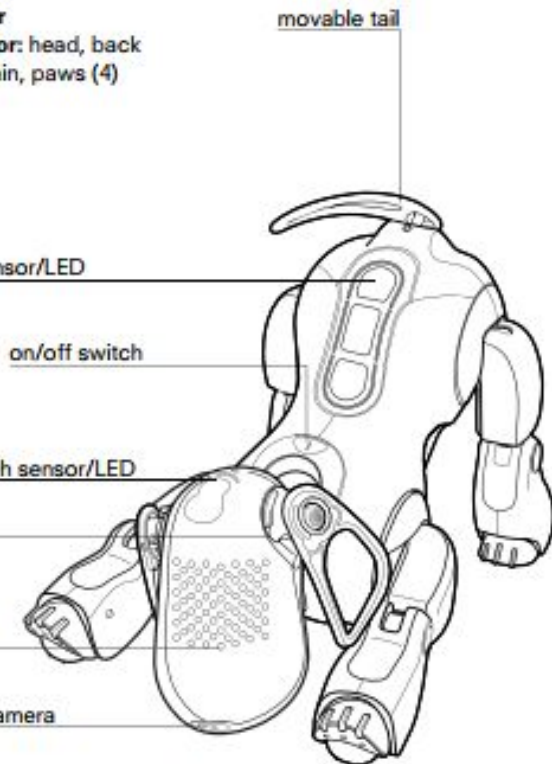


vision camera



To See

camera:
CMOS Image Sensor 350,000 pixels
Infrared Distance Sensor:
head, body



NAO Humanoid Robot

Dal 2009 la Standard Platform League ha adottato i robot umanoidi NAO



<https://youtu.be/3thVsBnAJMo>

RoboCup2016



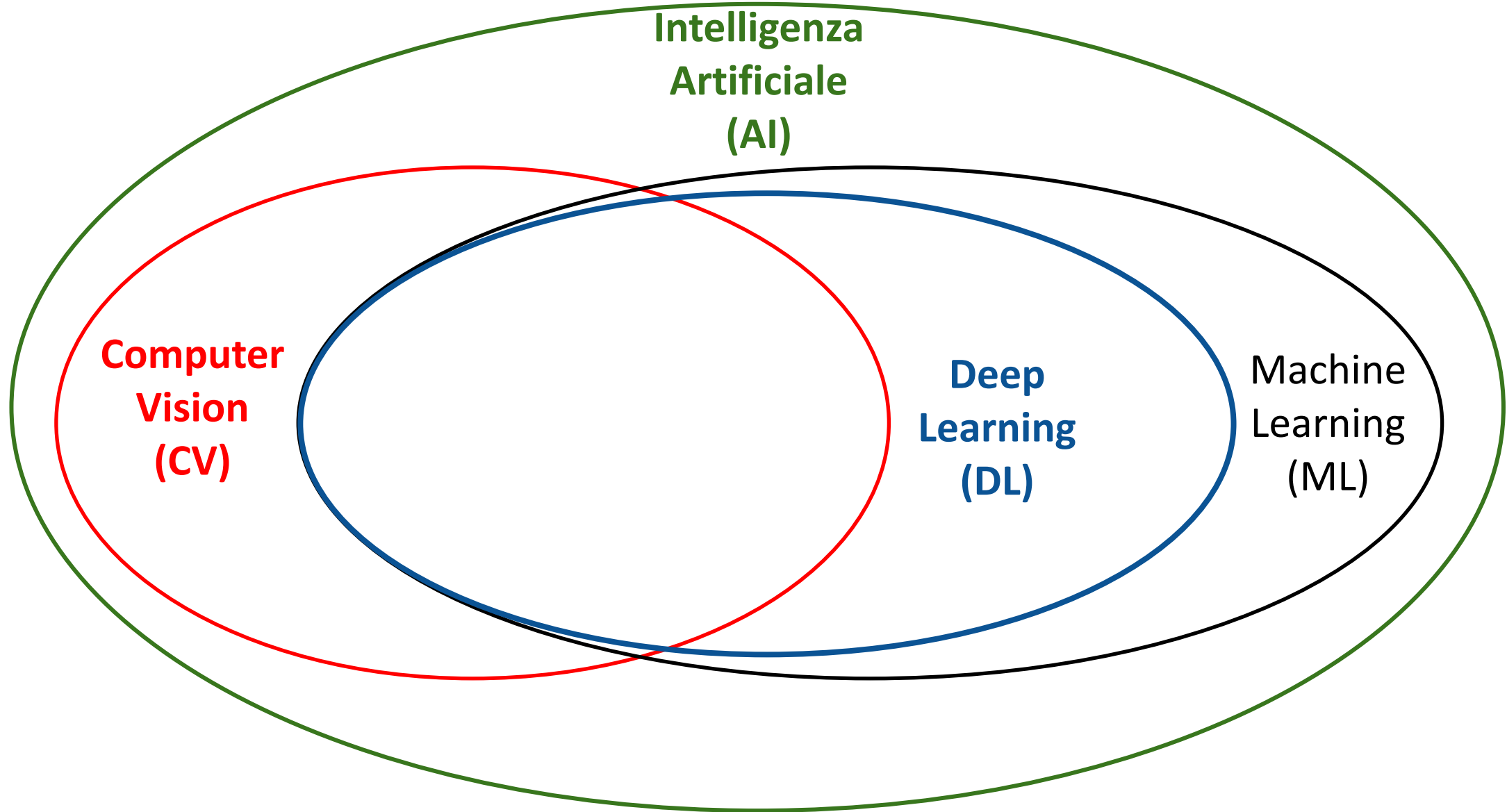
<https://www.youtube.com/watch?v=lqGMN1nbNCM>

Nuove sfide



<https://youtu.be/XgRw42oHN-Y?t=563>

AI, CV, ML, and DL



Intelligenza **Artificiale** (AI)

*“The theory and development of computer systems able to perform tasks, normally required **human intelligence**, such as visual perception, speech recognition, decision-making and translation between languages”*

(Oxford Dictionary, 2019)

Computer Vision

“creare sistemi artificiali per

- *processare*
 - *percepire*
 - *ragionare su*
- dati visuali”*

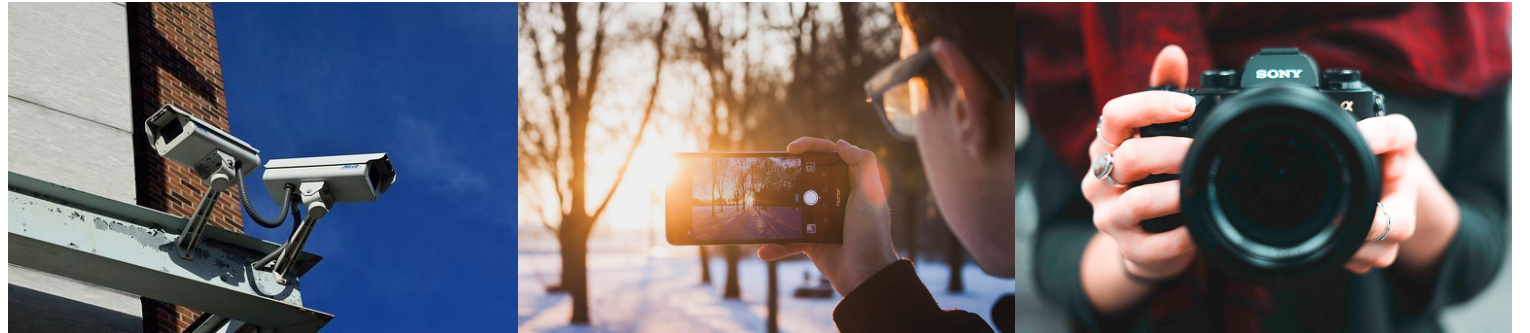
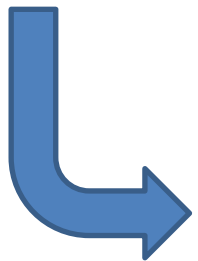


Photo by [Veronica Benavides](#)
on [Unsplash](#)



- Immagini
- Video
- ...

- **Instagram:** circa 100 milioni di foto e video caricati al giorno
- **Youtube:** più di 500 ore di video caricate ogni minuto

Source: Justin Johnson

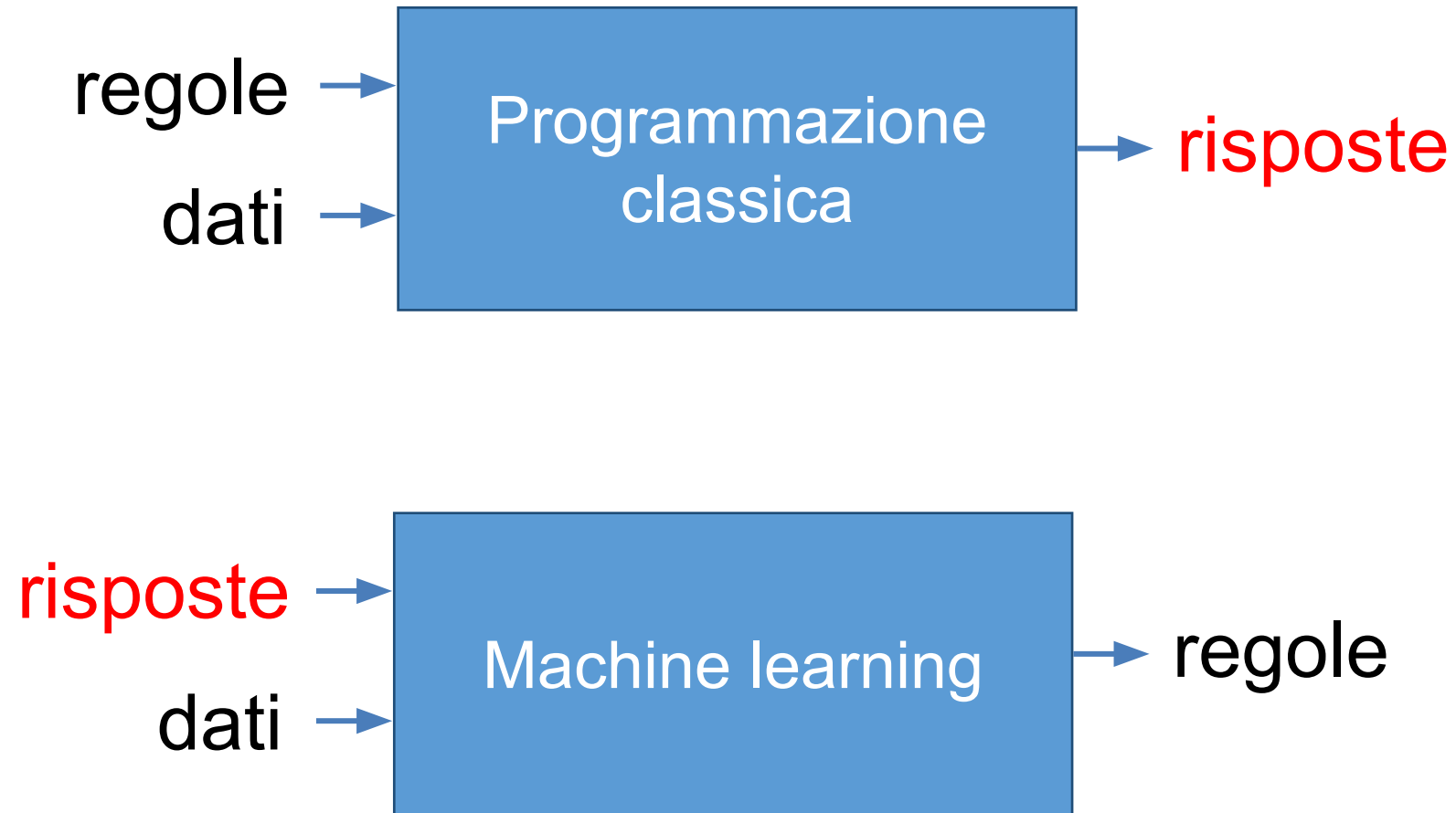
Machine Learning

“creare sistemi artificiali che imparino a risolvere problemi a partire da

- dati*
- esperienza”*

L'obiettivo del ML è ortogonale rispetto al quello della CV, la quale è interessata a risolvere il problema di interpretare i dati visuali, ma non specifica come deve essere risolto tale problema

Paradigma del Machine Learning



Ball detection con Machine Learning

Approccio classico



sfera bianca

+

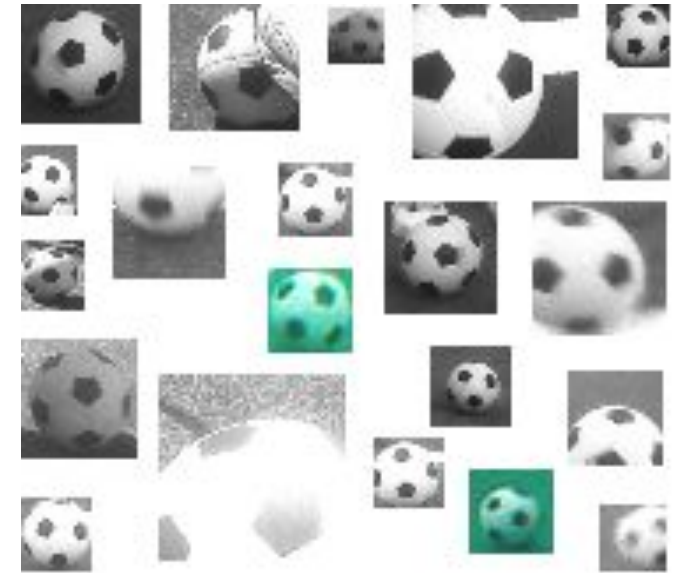
pentagoni neri

=

palla

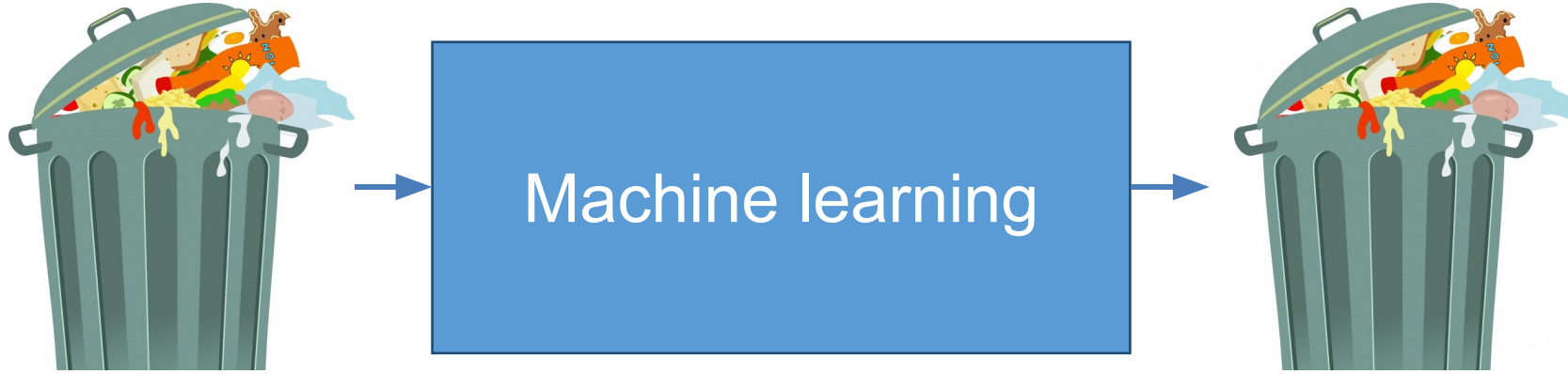


Machine Learning



dataset con migliaia di esempi diversi di "palla"

Garbage in - Garbage out



Garbage in - Garbage out



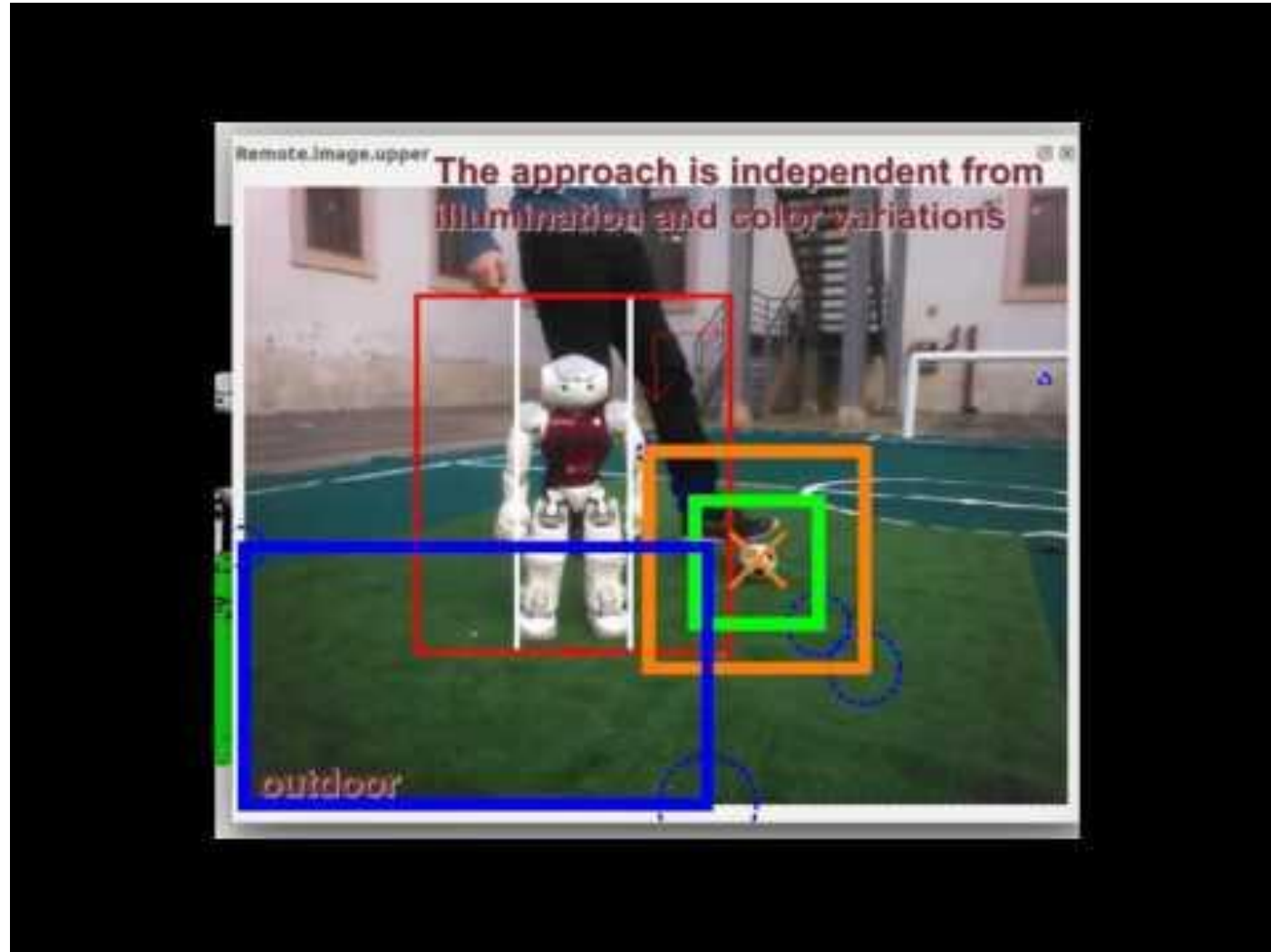
Machine learning



Machine learning



Machine learning for ball perception



<https://youtu.be/flgEwHRe6Bk>

RoboCup2018



<https://youtu.be/ji0OmkaWh20>

UNIBAS WOLVES



UNIBAS WOLVES

Home

Team

Downloads

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Contact us



WELCOME TO THE HOME OF THE WOLVES

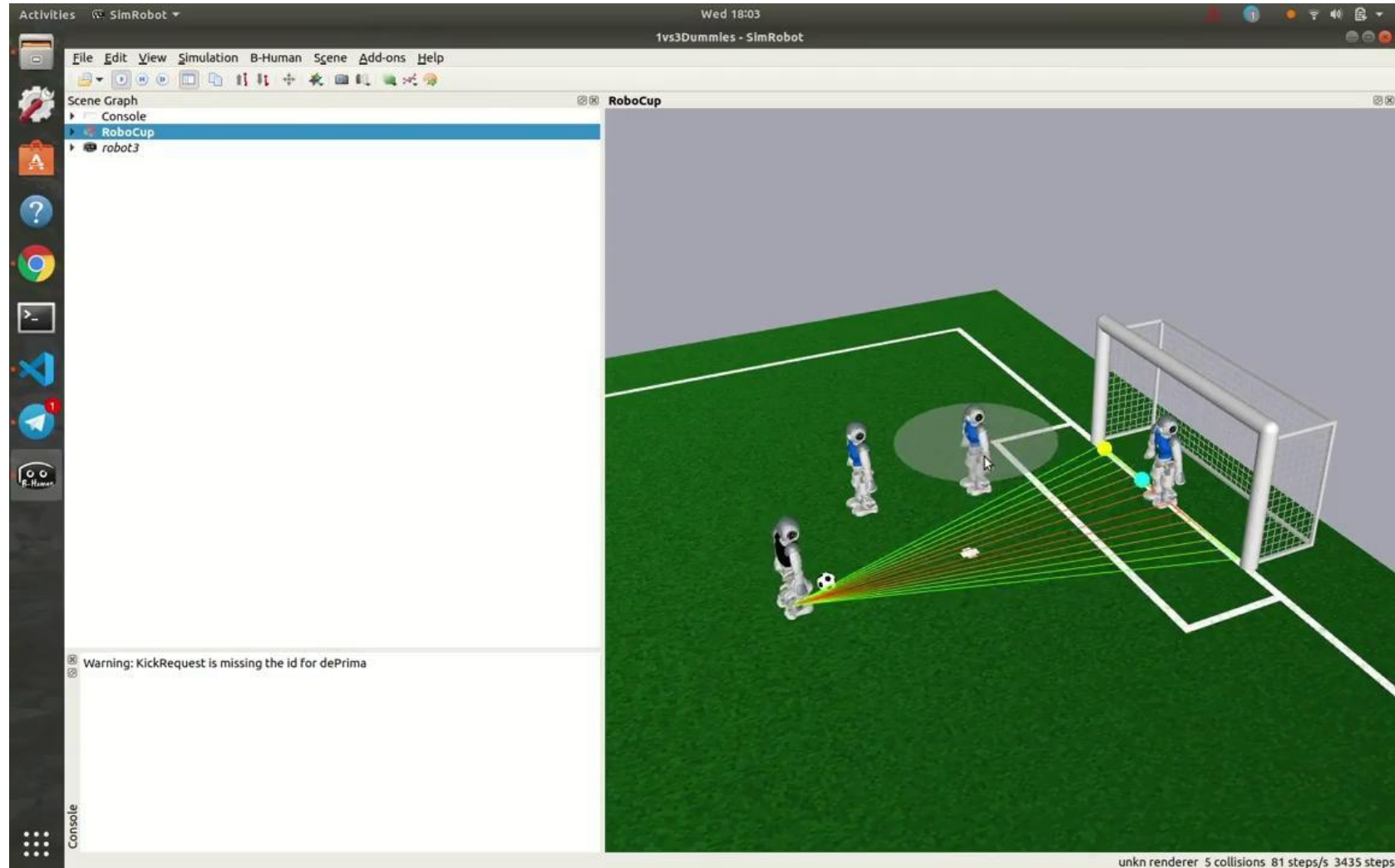


UNIBAS WOLVES is the robot soccer team of the University of Basilicata. Established in 2019, it is focussed on developing software for NAO soccer robots participating in RoboCup competitions.

UNIBAS WOLVES team is twinned with SPQR Team at Sapienza University of Rome.

<https://sites.google.com/unibas.it/wolves>

SimRobot





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