



# **DD2419 Project Course in Robotics and Autonomous Systems**

## **Lecture 2**

"ROBPVT24" Spring 2024



# Today's agenda

- Working with TF
  - Something past students often struggled with but did not really realise until "shit hit the fan" later in the project
- Project task
- Introduction to the hardware
- Project milestone (the first)
- Groups announced
- Hardware handout in A:235



## Task: Recycling robot

The task is to implement a mobile robot to **detect, pick up and sort as many objects into bins** as possible in the shortest possible amount of time.

## Task cont'd

Detect and pick up 3 types of objects

- Cubes (red, green, blue)
- Spheres (red, green, blue)
- Small fluffy animals





## Task cont'd

Put the objects into the **correct** bin

- Each object class has its own bin
- Each object bin has a unique ArUco marker
- There can also be bin that do not have a marker → to be avoided

Time limit  $T$  for the task

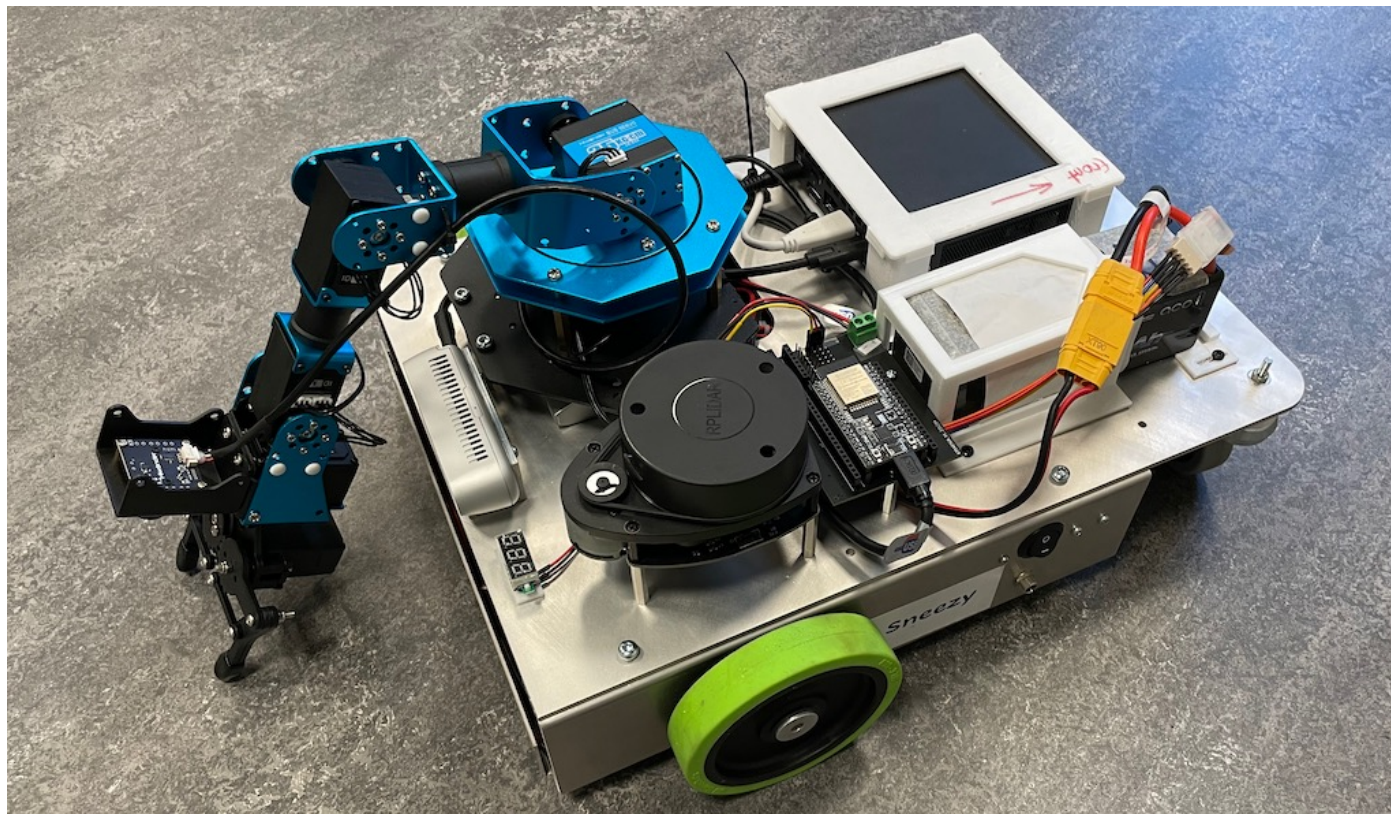


# The robot fleet





## A closer look at the robot



# The RGB-D sensor

- Intel RealSense D435i

IMU INSIDE



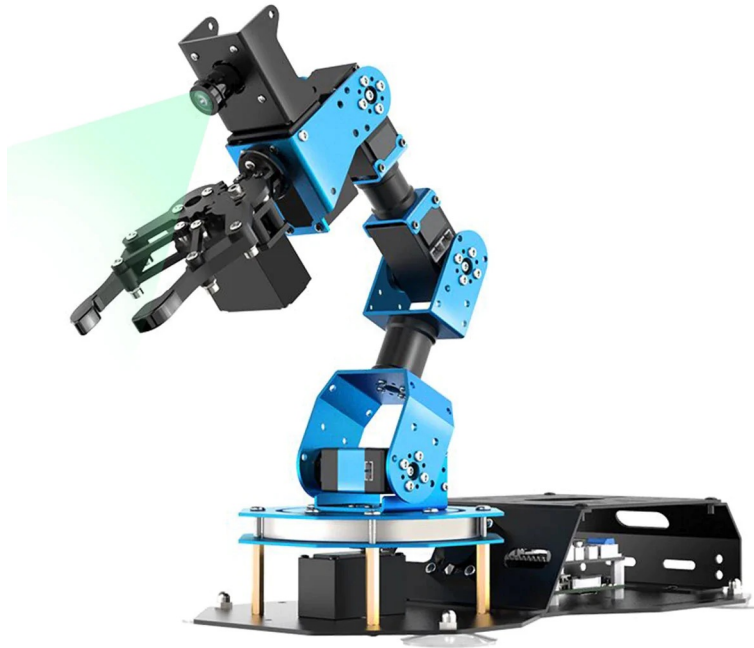
90 mm x 25 mm x 25 mm



# The LiDAR sensor



# The arm



"Hiwonder ArmPi FPV AI Vision  
Raspberry Pi ROS Robotic Arm with  
Python Open Source"

Equipped with a camera on the arm.  
Maybe used when picking up  
objects.

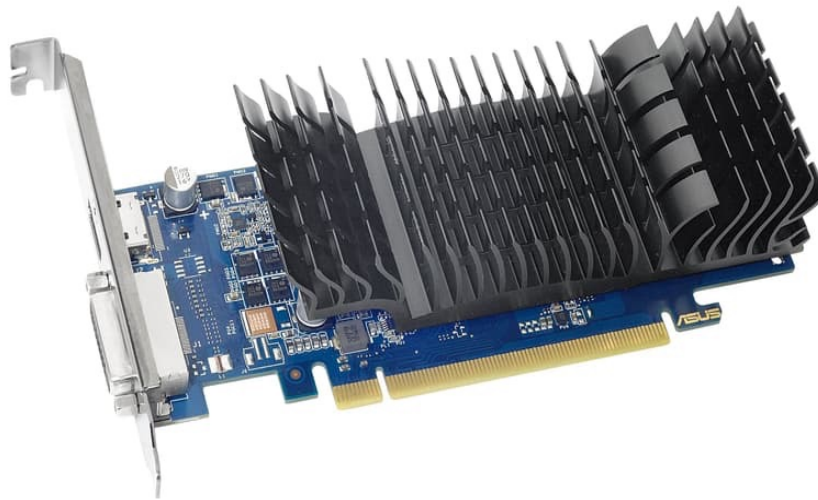
# The computer platform

- Intel NUC i5 gen 11



# GPU

- NVIDIA GT 1030





# A laptop\* for each group



\* Lenovo ThinkBook 16p G2 ACH 20YM - AMD Ryzen 7 5800H / 3.2 GHz - Win 10 Pro 64-bitars  
- GF RTX 3060 - 16 GB RAM - 512 GB SSD NVMe - 16" IPS 2560 x 1600 (WQXGA)





# User guide and safety rules

- You cannot take the robot outside.
- Don't drive the robot where people might trip over it and harm themselves or the robot
- Don't drive into thing. You will damage things and the robot.
- Be VERY gentle when you move the arm by hand. Slow and gentle!
- Be careful not to over stretch the camera cable when the arm moves.
- Don't use metal near any of the electronic components.
- The battery does not charge in the robot.
- You have to charge the batteries following the procedure described in Canvas (and pass a Quiz to show you read them).



## Some general rules

All computations must be performed onboard the robot.

You need to implement the functionality for the robot from very basic building blocks (think ROS messages, numpy, etc).

If you are uncertain if you can use something ask.



# Milestones

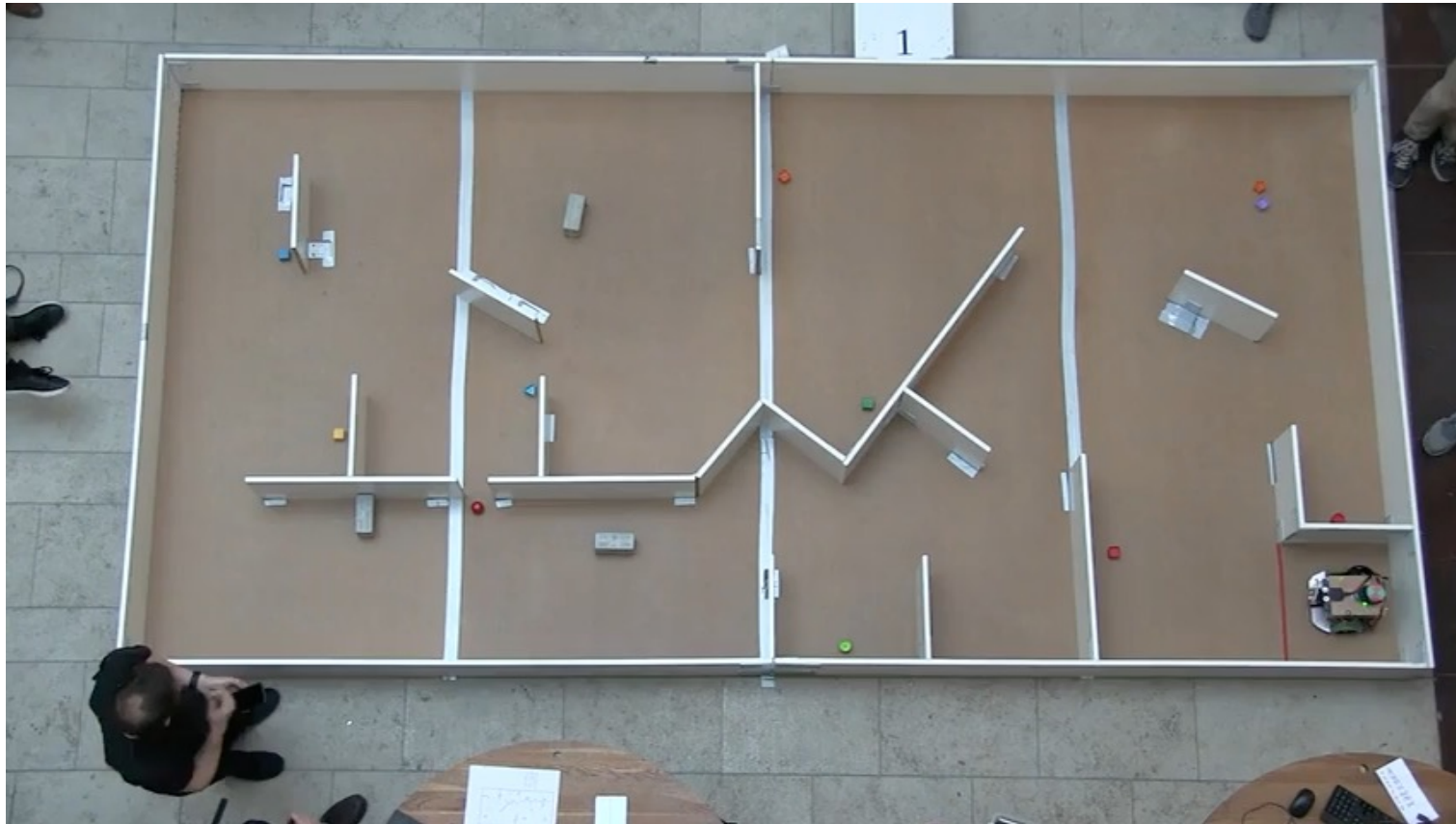
We have defined milestones (should maybe be called tollgates) for the project to help you plan.

Will come back to these

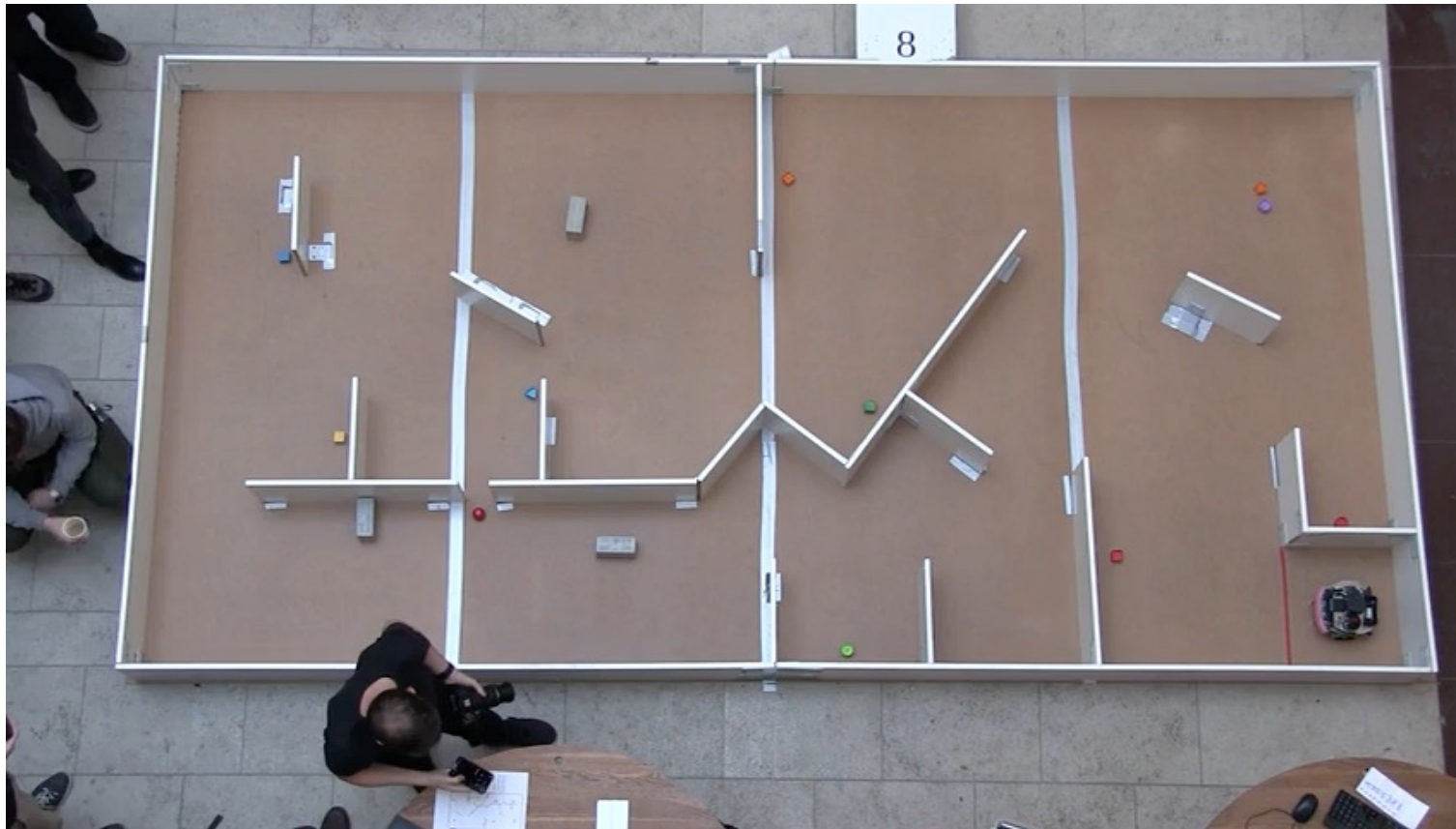
For now let us look at MS0 and MS1

<https://canvas.kth.se/courses/45204/pages/project-milestones>

# How hard can it be? (Ex with similar hardware as now)



# How hard can it be? (Ex with similar hardware as now)







# A good quote from the past

"Occam's razor is essential for each topic as well, you can always get fancier if you have time in the end (which you probably don't)."