How to teach Robotics & ROS remotely

… using Zoom

The Construct

Who is this webinar for?

- Professors/Teachers/Teacher assistants of undergrads/graduate students of robotics
- You need to prepare robotics course for 2021
- You are searching for remote robotics teaching solution due to COVID-19

What do we mean by teaching robotics?

- Robot action and perception
- Arm Kinematics
- Mobile Robots Kinematics
- Robot Dynamics
- Motion Planning and Control
- Robot Navigation
- Computer Vision
- ROS

We do not mean

We do mean

About Us

- 5 years teaching on The Construct Youtube Channel
- Almost 1.000 videos uploaded
- 1 ROS Online Class every week (for 3 years)
- 3 ROS conferences online
- Tens of webinars (like this one)

Stay with us to take a full live teaching demo including remote real robots

- First, we'll see how to teach ROS & Robotics with zoom
- Provide solutions to problems
- Then we will do a class all together, including real robot lab

For teaching robotics remotely you need

- Prepare students for the class
- Deliver the theory
- Provide some practice
- Provide off-hours support
- Evaluate students
- Control students progress

Problems

1. Preparing curriculum is hard work
2. Make students practice is difficult
3. Students don’t know Linux nor Python
4. Installing ROS in students’ computer
5. Evaluate them remotely is difficult

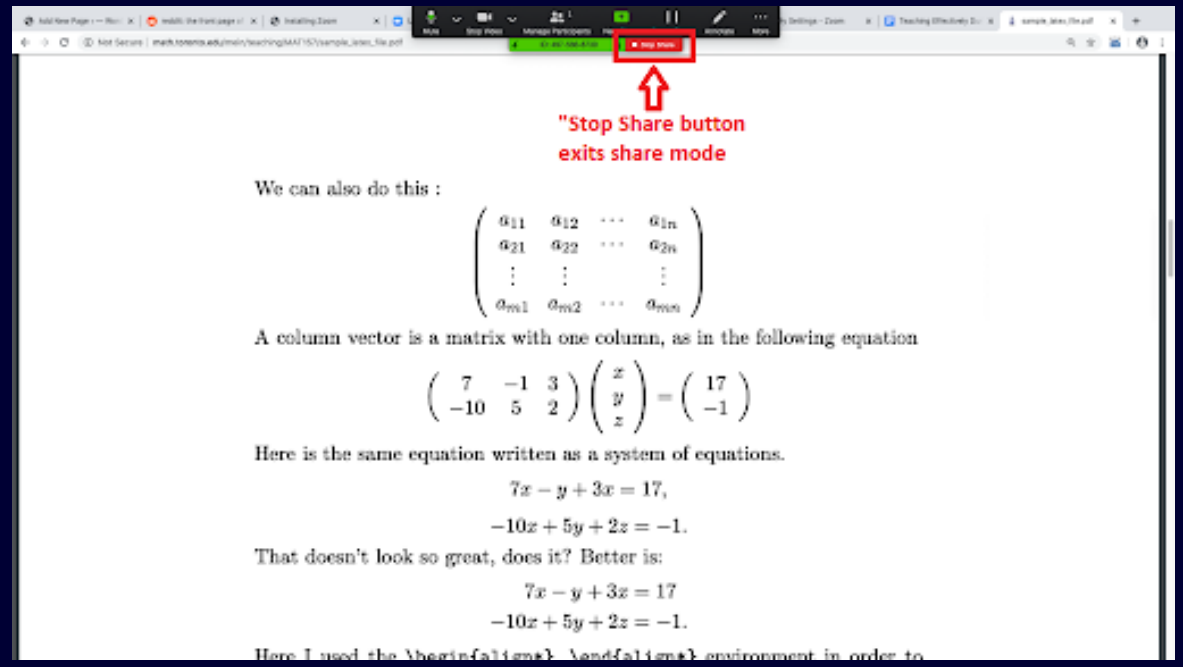
Preparing the students

The Construct

For teaching theory remotely you need

- Your teaching material (slides)
- A platform to deliver and communicate with students in real time
  - Must allow:
    - Sharing Screen (teacher & student)
    - Live Chat (mic & written)

Example: Zoom



https://youtu.be/JIRf1UH8ENw

TEACH ONLINE WITH ZOOM - BEGINNERS TUTORIAL

Pre-Requisites

- **Make students learn the requisites:**
  - Learn Linux
  - Learn Python
- **Make them take these online free courses:**
  - Linux for Robotics: https://bit.ly/3gx6za7
  - Python for Robotics: https://bit.ly/36XIdEs
- **Take the exam and get evaluation for you.**

Simulated robots: use ROS + Gazebo

- Install ROS on students' computer http://wiki.ros.org/ROS/Installation

ROS Installation Options

There is more than one ROS distribution supported at a time. Some are older releases with long term support, making them more stable, while others are newer with shorter support life times, but with binaries for more recent platforms and more recent versions of the ROS packages that make them up. See the Distributions page for more details. We recommend one of the versions below:

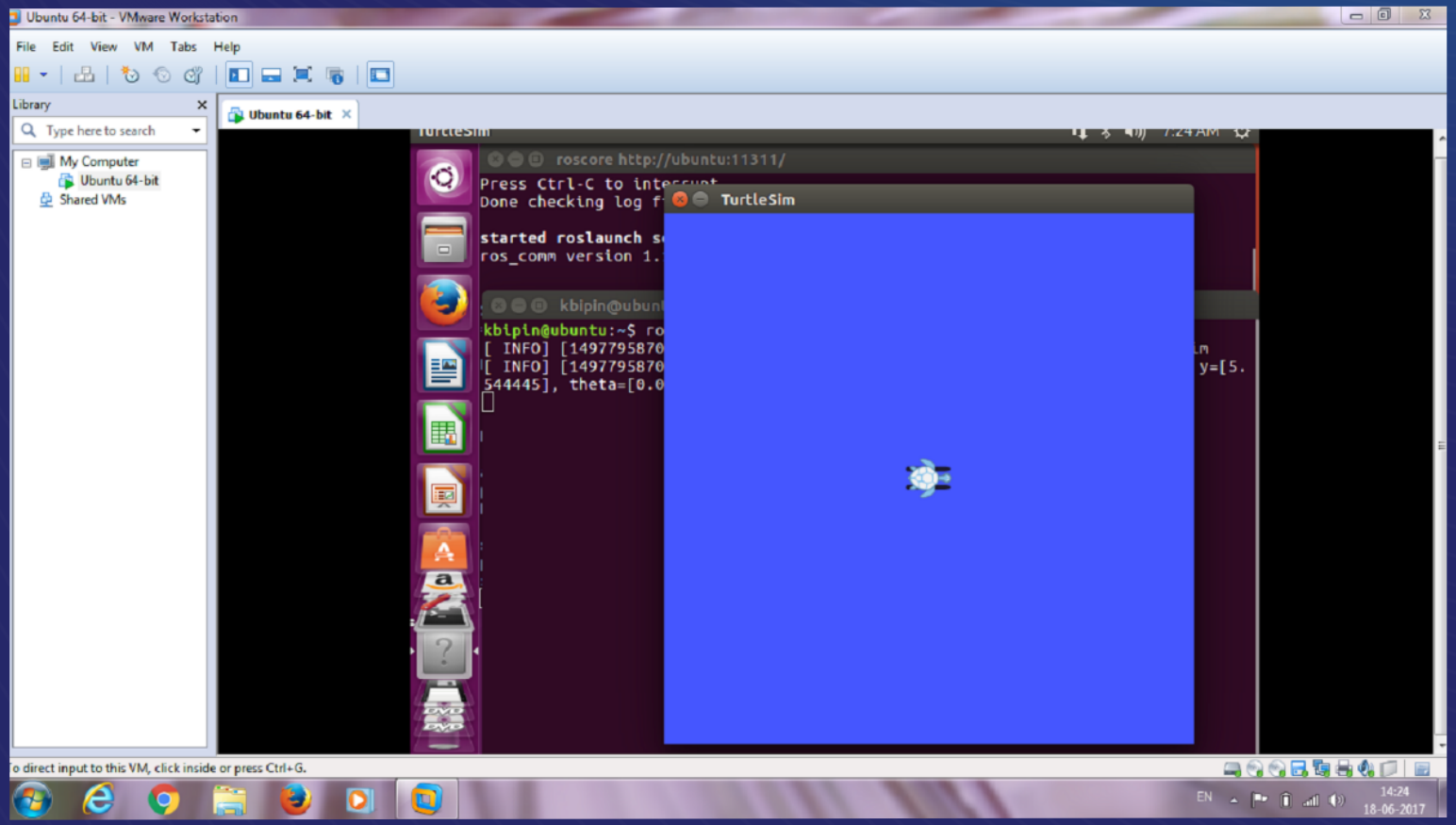
ROS Kinetic Kame
Released May, 2016
LTS, supported until April, 2021
This version isn't recommended for new installs.

ROS Melodic Morenia
Released May, 2018
LTS, supported until May, 2023
Recommended for Ubuntu 18.04

ROS Noetic Ninjemys
Released May, 2020
Latest LTS, supported until May, 2025
Recommended for Ubuntu 20.04

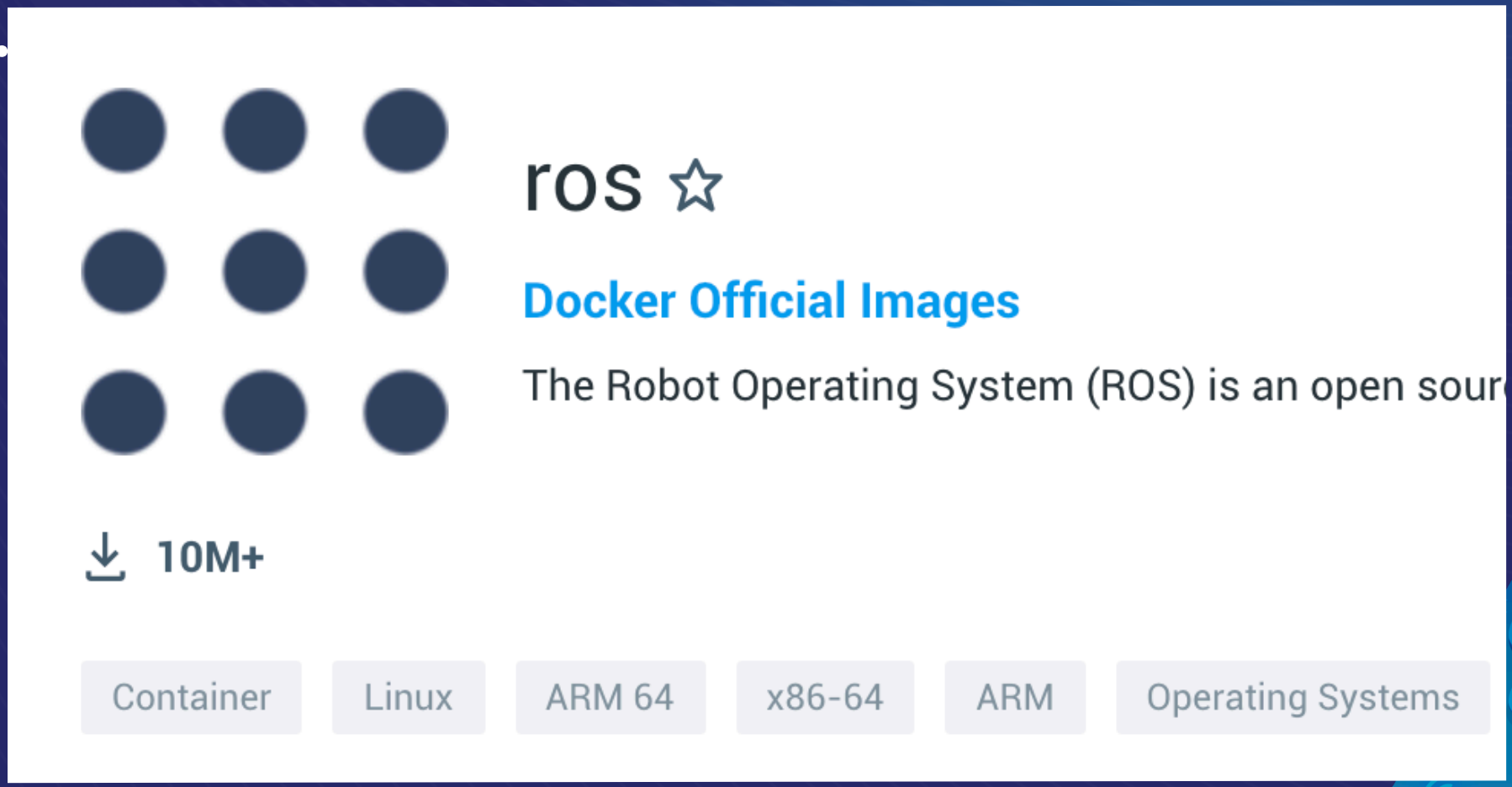
Simulated robots: use ROS + Gazebo

- Provide a Virtual Machine with ROS https://youtu.be/59F6Jake_48



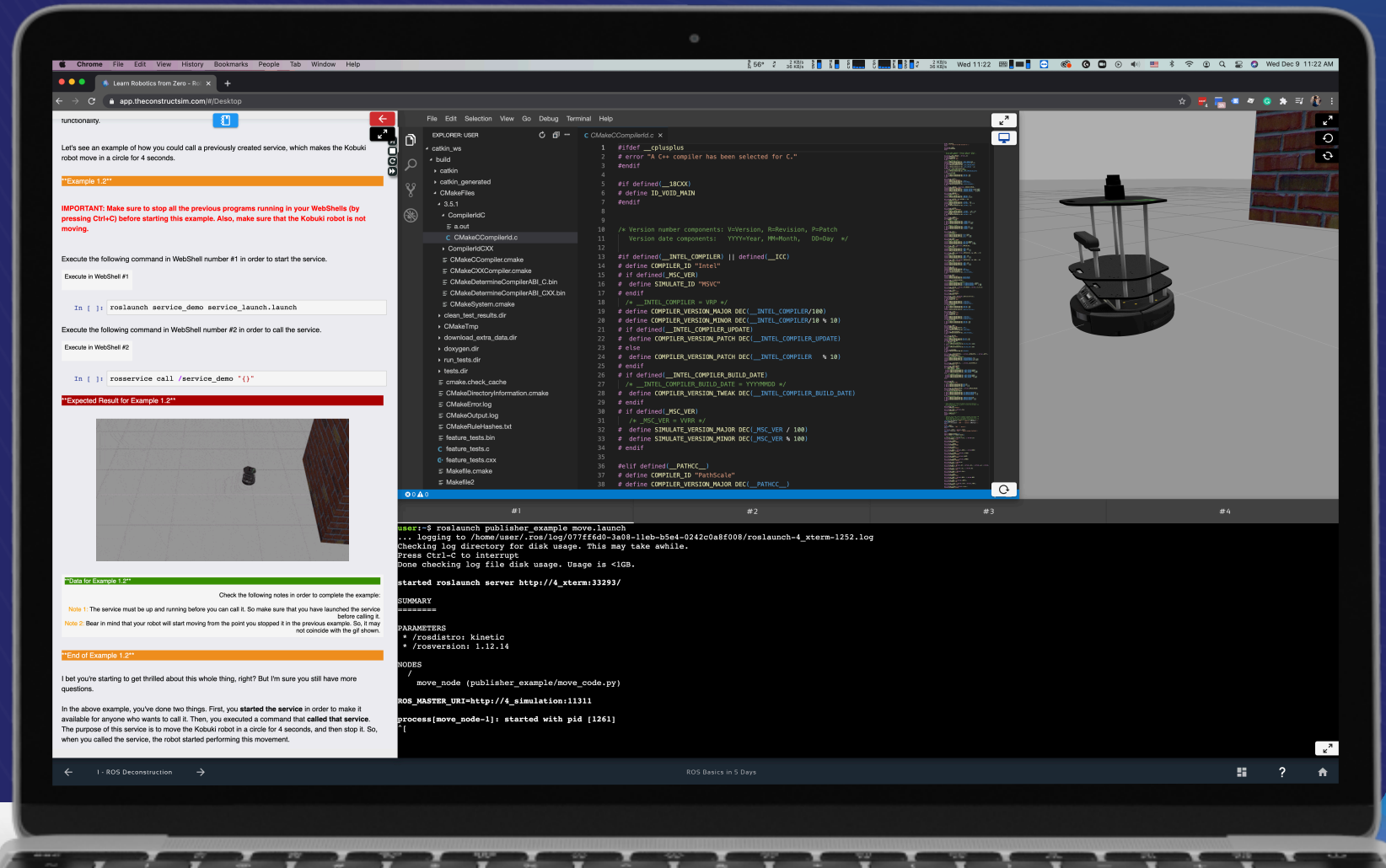
Simulated robots: use ROS + Gazebo

- Provide a docker with ROS https://hub.docker.com/_/ros/
-



Simulated robots: use ROS + Gazebo

- Use a web based environment http://robotignite.academy



Teaching the Theory

The Construct

If you are looking for

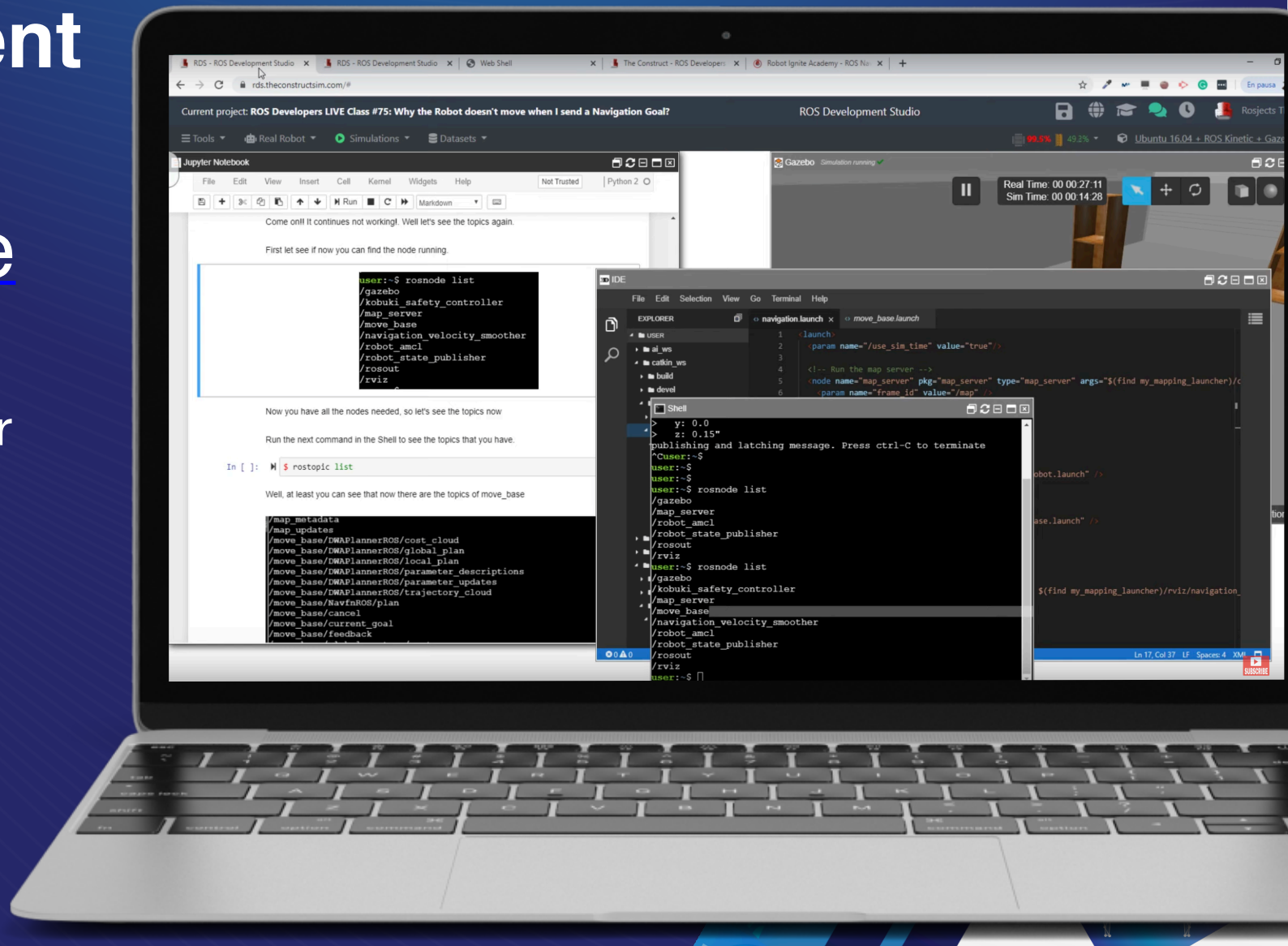
- **A fast method to create a ROS/robotics course based on slides…**
  - Just search over internet and get one of the trillions available
    - for example, this one by ETH Zurich: https://bit.ly/35OqmLV
  - Change the logo in the slides by your logo.
  - Done.

ROS Development Studio

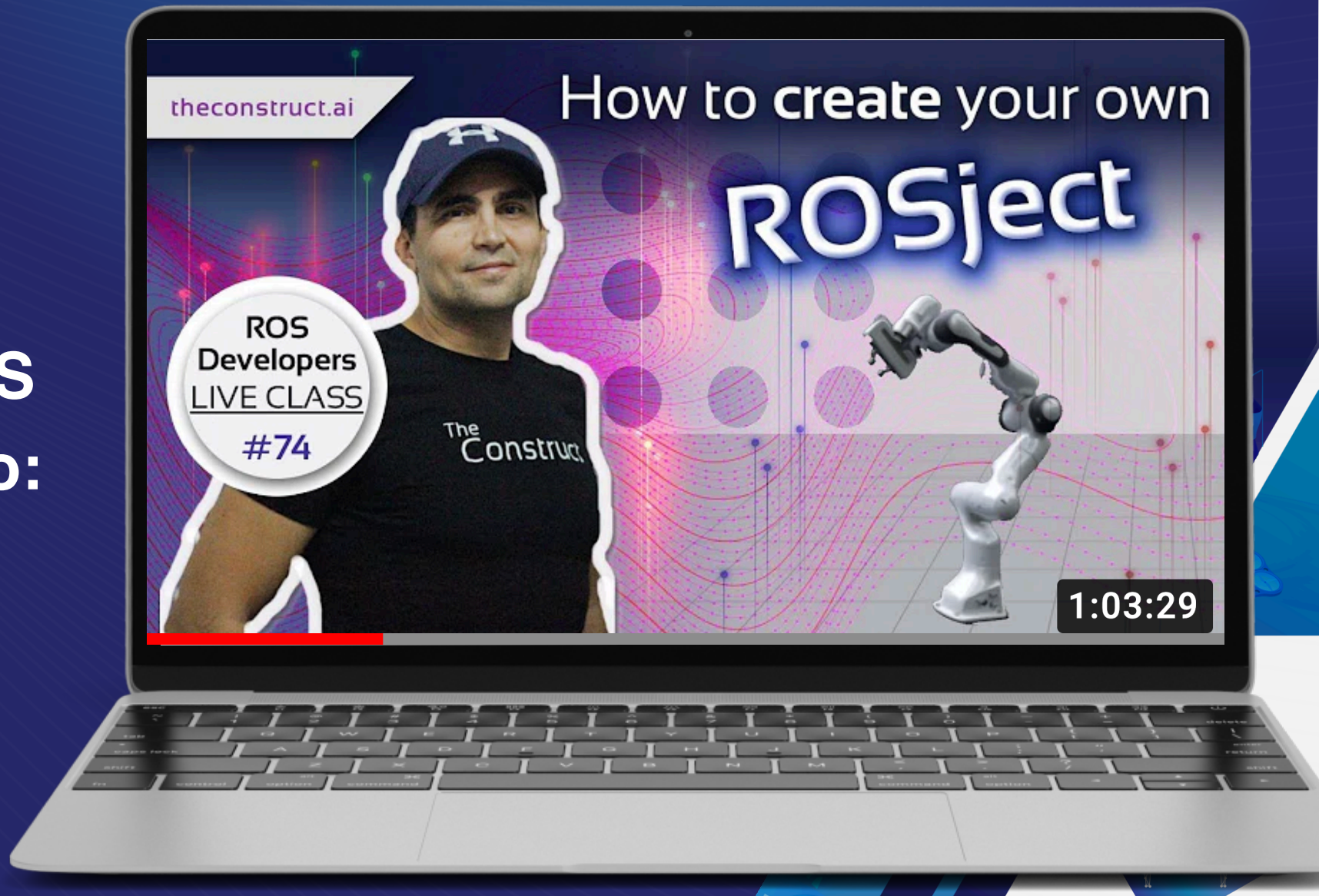
http://rosds.online

A full ROS cloud environment in your browser

Create a free account

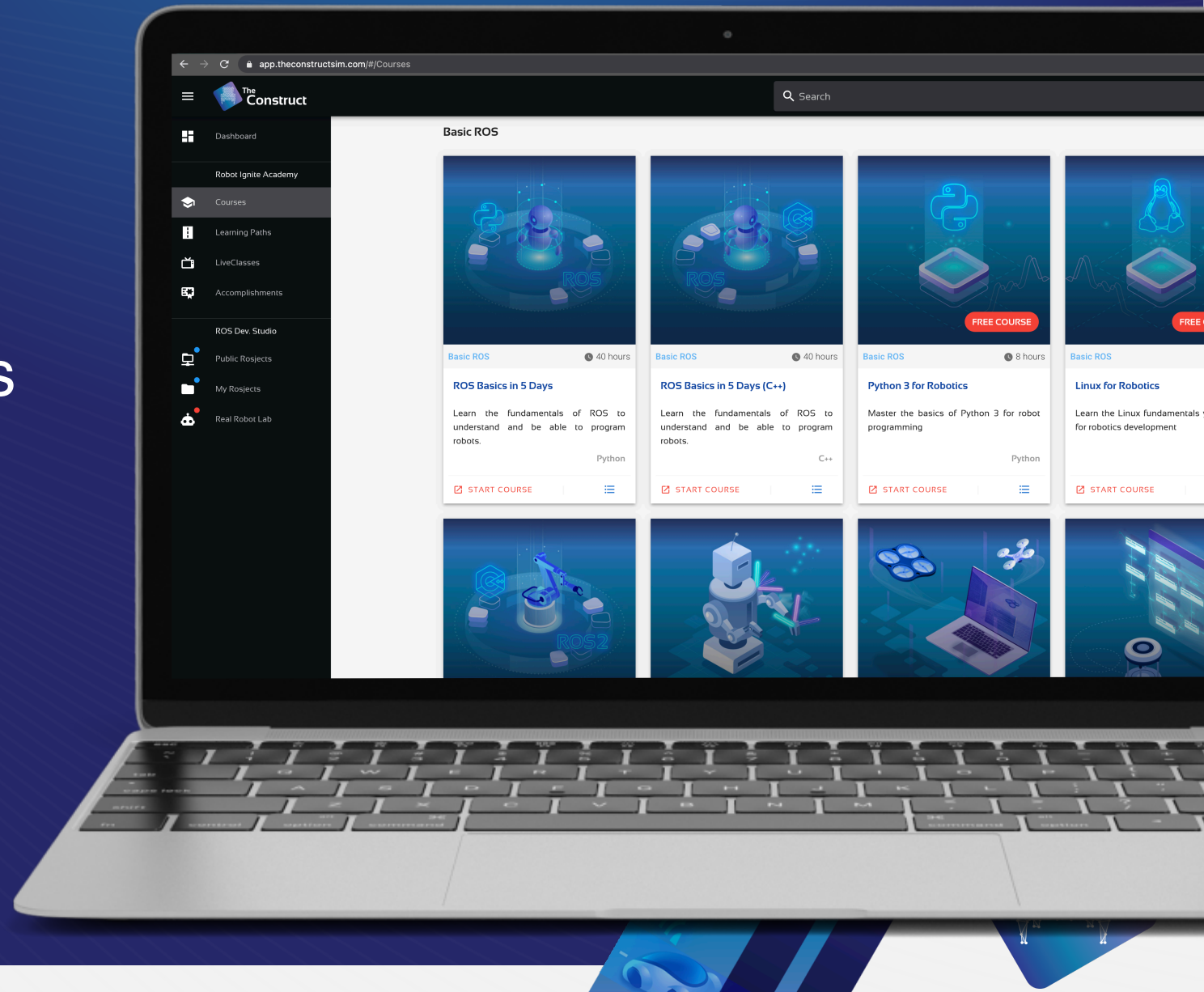


How to create your curriculum with ROS Development Studio: https://youtu.be/g2Zg31pc-XM



Get all content already created at Robot Ignite Academy

* Mathematics for Robotics
* Robot kinematics
* Robot Dynamics
* Kalman Filters
* OpenCV for Robotics
* ROS applied to Robotics
* ...

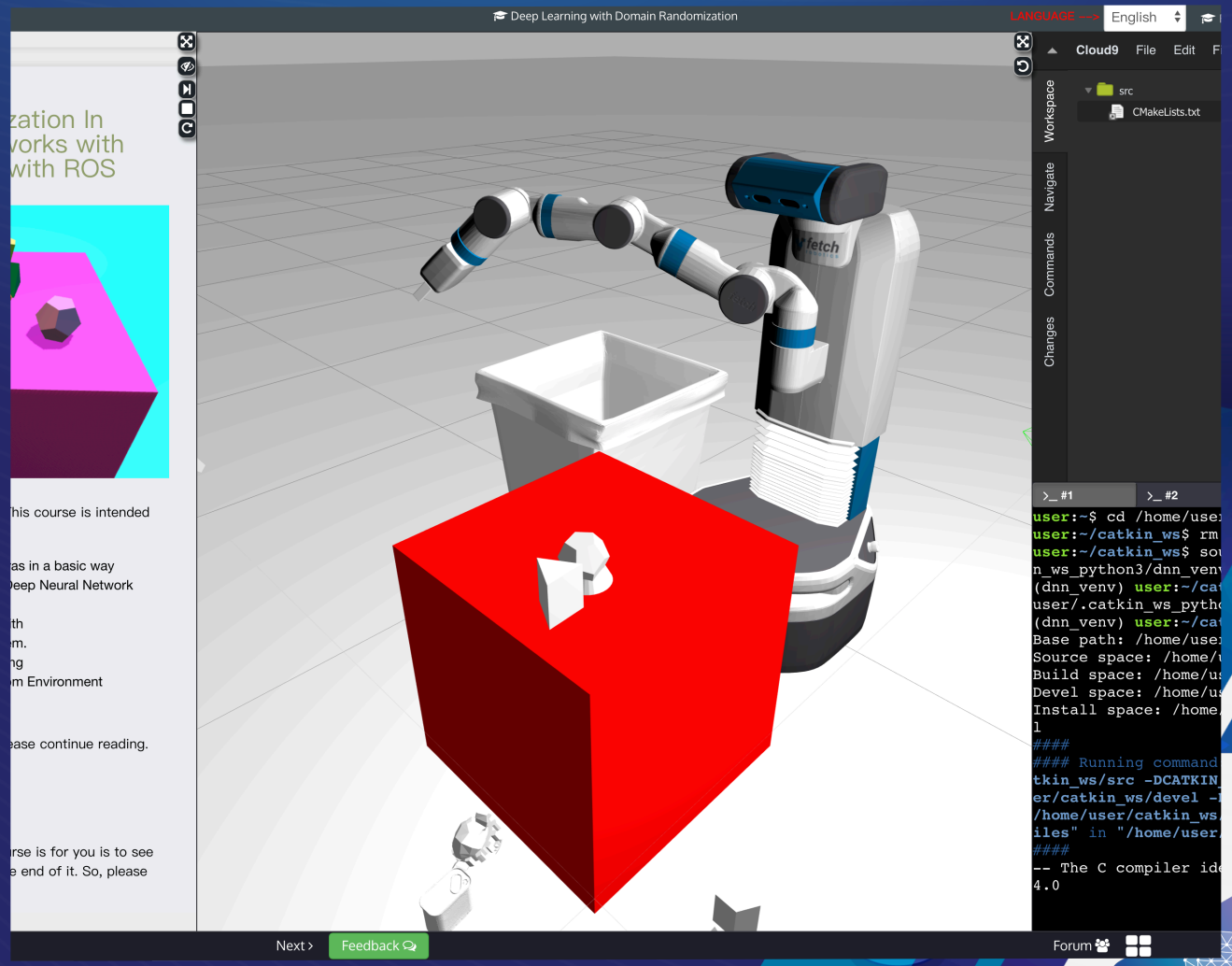


Provide Practice

The Construct

Simulated robots: use Gazebo/ROS robot sims

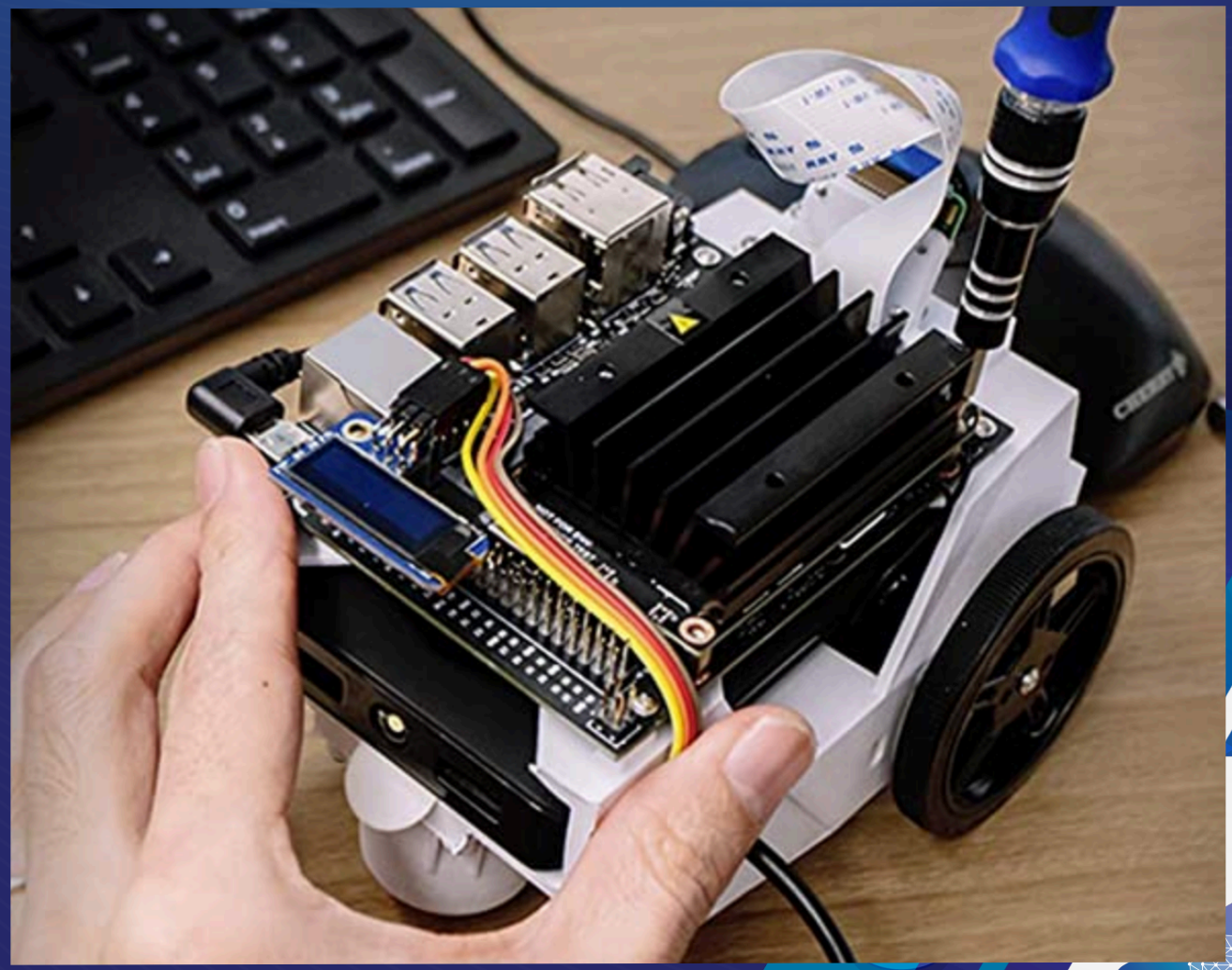
- Use the students ROS/ Gazebo environment
- Use the ROS Development Studio
- Use Robot Ignite Academy



Real robots: use ROS based robots

- Provide real robot to each student (around 200$)
  Base system (110$) : https://amzn.to/2DBpDov

- Additions for Jetbot (110$): https://amzn.to/2XwJT1G



Real robots: use ROS based robots

Provide remote robot lab

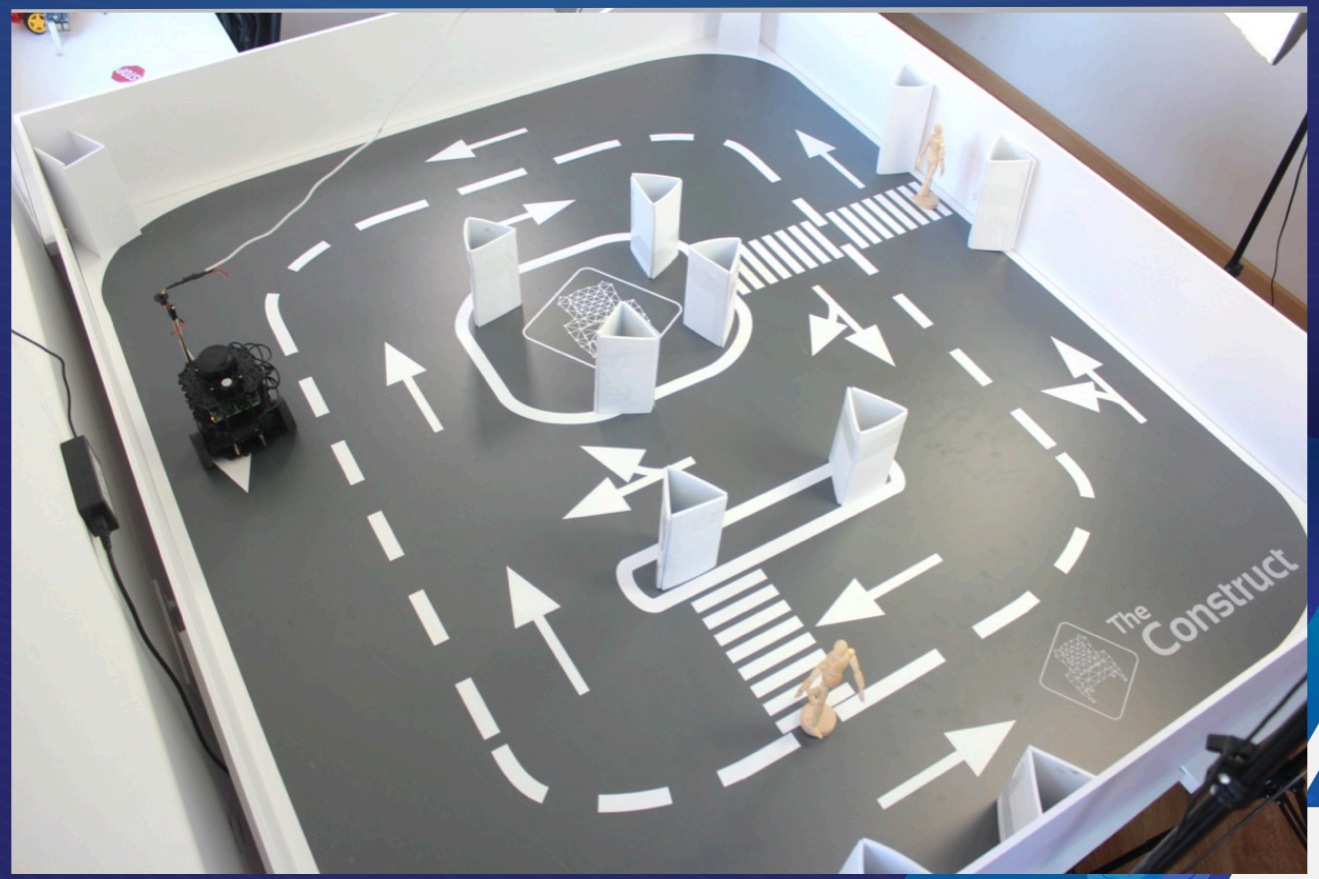
1. Have a robot with internet access
2. Install a server in the robot
3. Add external camera
4. Connect to it from ROSDS

HOW TO SETUP:

https://youtu.be/fzogfWRamDI

Real robots: use RoboX Remote Real Robot Lab

- Provided by The Construct
- Everything already setup

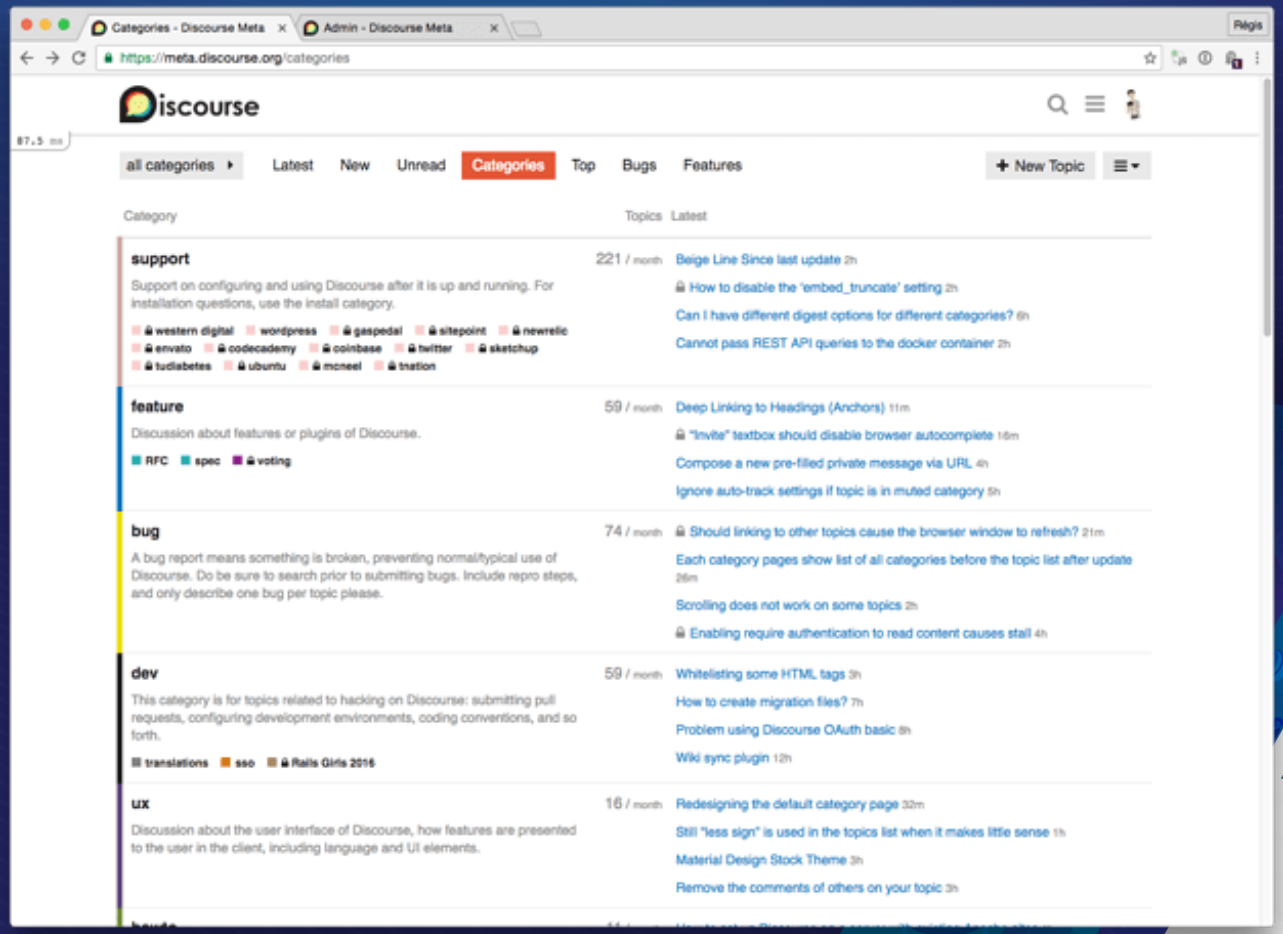


Provide off-hours support

The Construct

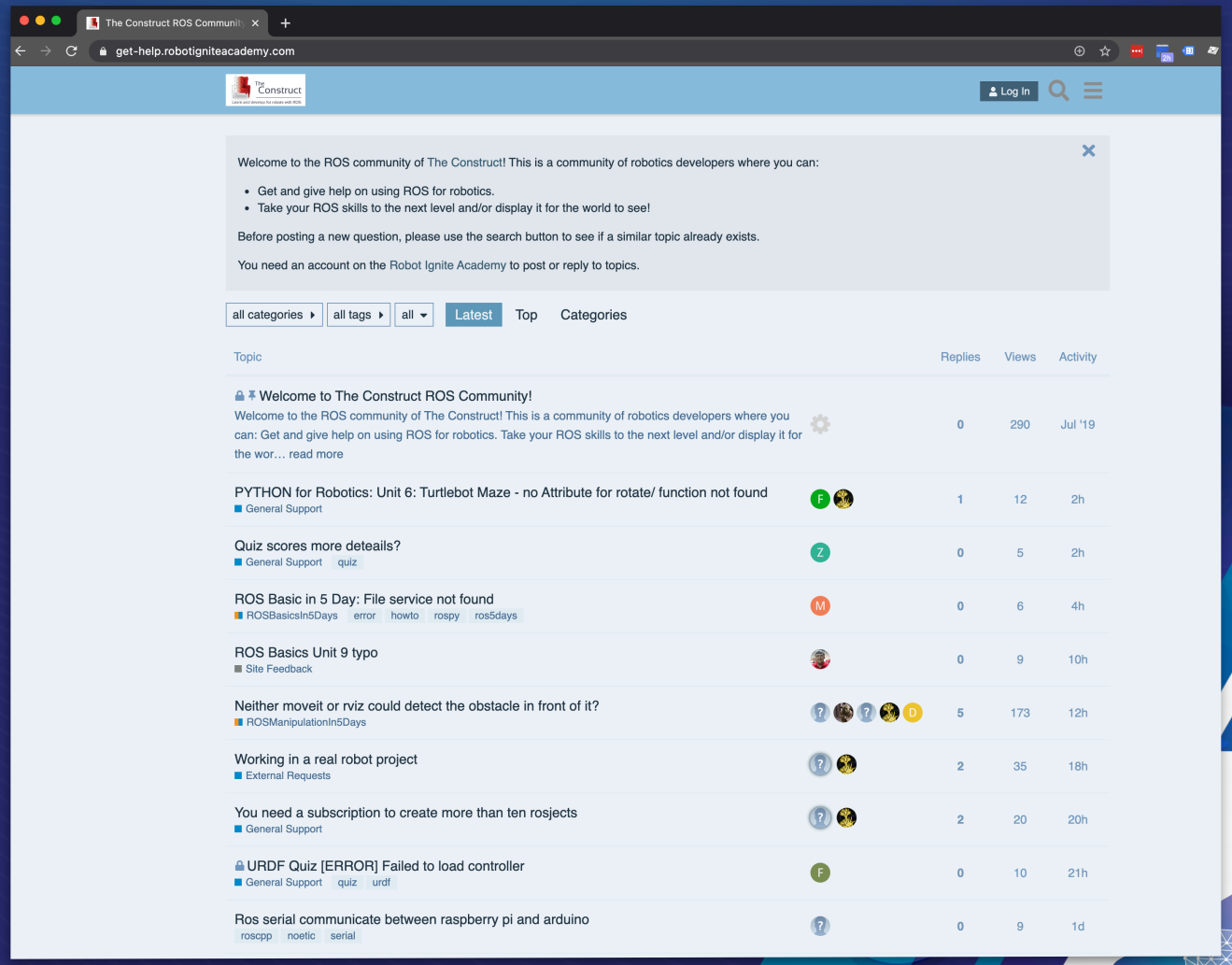
Provide a Forum for Q&A

- Use the one provided by the University
- Or install a Discourse: https://bit.ly/2C7vuS2



The Construct already provides one

- This Forum is answered by our team of ROS/Robotics experts.
- Answers typically in 24h on week days: https://get-help.robotigniteacademy.com
-



Evaluate students

The Construct

Exams based on doing ROS code

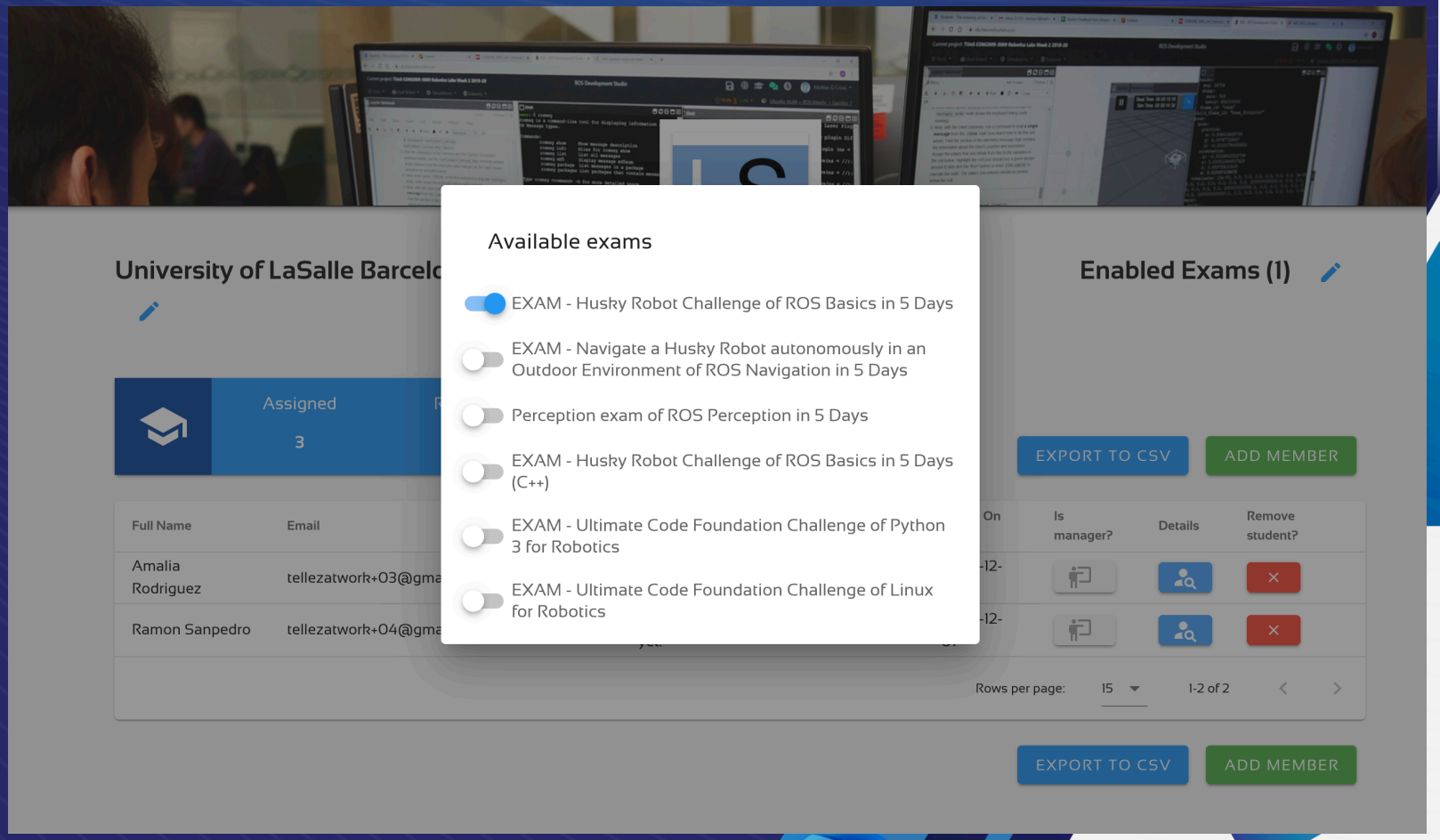
- They must apply their knowledge
- Easy to detect when they copy

Use ROSjects to provide exams

- You create the rosject exam.
- You share with students
- They do the exam online
- Then they resend it to you
- You can see what they have done and reproduce their results
- Example:

Use Robot Ignite Academy Exams

- Exams already created
- Self-corrected
- Random exam to students to prevent copying (in preparation)



Control students progress

The Construct

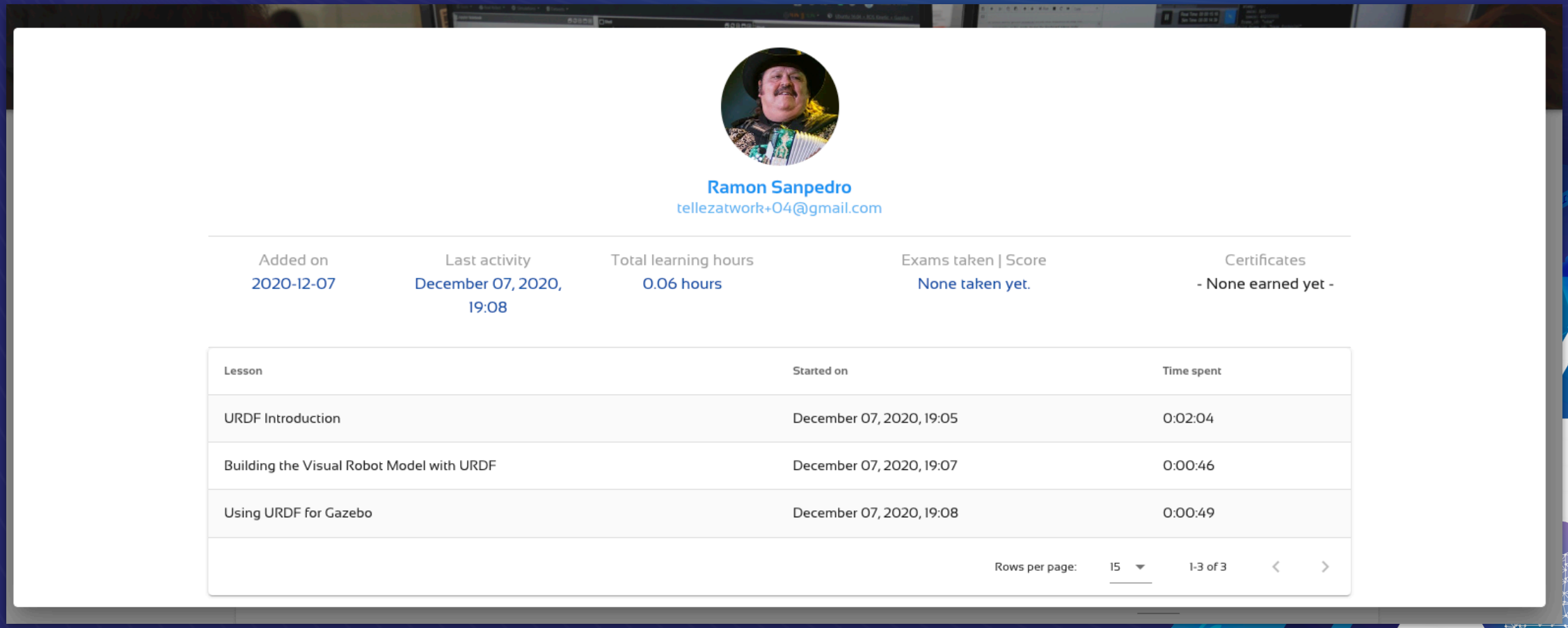
The Construct control panel

Assigned	Remaining	Total
52	10	62

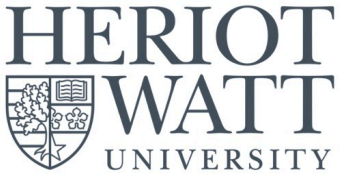
EXPORT TO CSV ADD MEMBER

Full Name	Email	Total Hours	Exams Taken	Certificates	Added On	Is manager?	Details	Remove student?
Leeor Nehardea	lneharde@ucsd.edu	22.57 hours	None taken yet.	- None earned yet -	2020-07-30			
Haoru Xue	hxue@ucsd.edu	1.02 hours	None taken yet.	- None earned yet -	2020-07-31			
Jan Tengdyantono	jtengdya@ucsd.edu	59.83 hours	None taken yet.	- None earned yet -	2020-08-05			
Nathan Perkins	nperkins487@gmail.com	42.89 hours	None taken yet.	- None earned yet -	2020-08-05			
Lavita Zuo	x5zuo@ucsd.edu	22.67 hours	None taken yet.	- None earned yet -	2020-08-05			
Ryan Dunn	ryan.dunn729@gmail.com	18.59 hours	None taken yet.	- None earned yet -	2020-08-05			
Drew Britten	drewbrit10@gmail.com	15.29 hours	None taken yet.	- None earned yet -	2020-08-13			
Songyu Lu	sol009@ucsd.edu	46.71 hours	None taken yet.	- None earned yet -	2020-09-01			
Joshua Orozco	jorozco@ucsd.edu	3.45 hours	None taken yet.	- None earned yet -	2020-10-02			
Owen Cruise	ocruise@ucsd.edu	3.53 hours	None taken yet.	- None earned yet -	2020-10-07			
Ethan Lerner	elerner@ucsd.edu	0.57 hours	None taken yet.	- None earned yet -	2020-10-07			
Benjamin Crawford	bcrawfor@ucsd.edu	0.18 hours	None taken yet.	- None earned yet -	2020-10-07			
Udai Kandah	ukandah@ucsd.edu	2.45 hours	None taken yet.	- None earned yet -	2020-10-07			
Dominic Nightingale	djnighti@ucsd.edu	16.20 hours	None taken yet.	- None earned yet -	2020-10-07			

The Construct control panel



Some Universities Using Our Solution



“With The Construct, our students can jump right into ROS without all the hardware and software setup problem. And the best: they can do this from everywhere”

Steffen Pfiffner

Lecturer at University of Weingarten

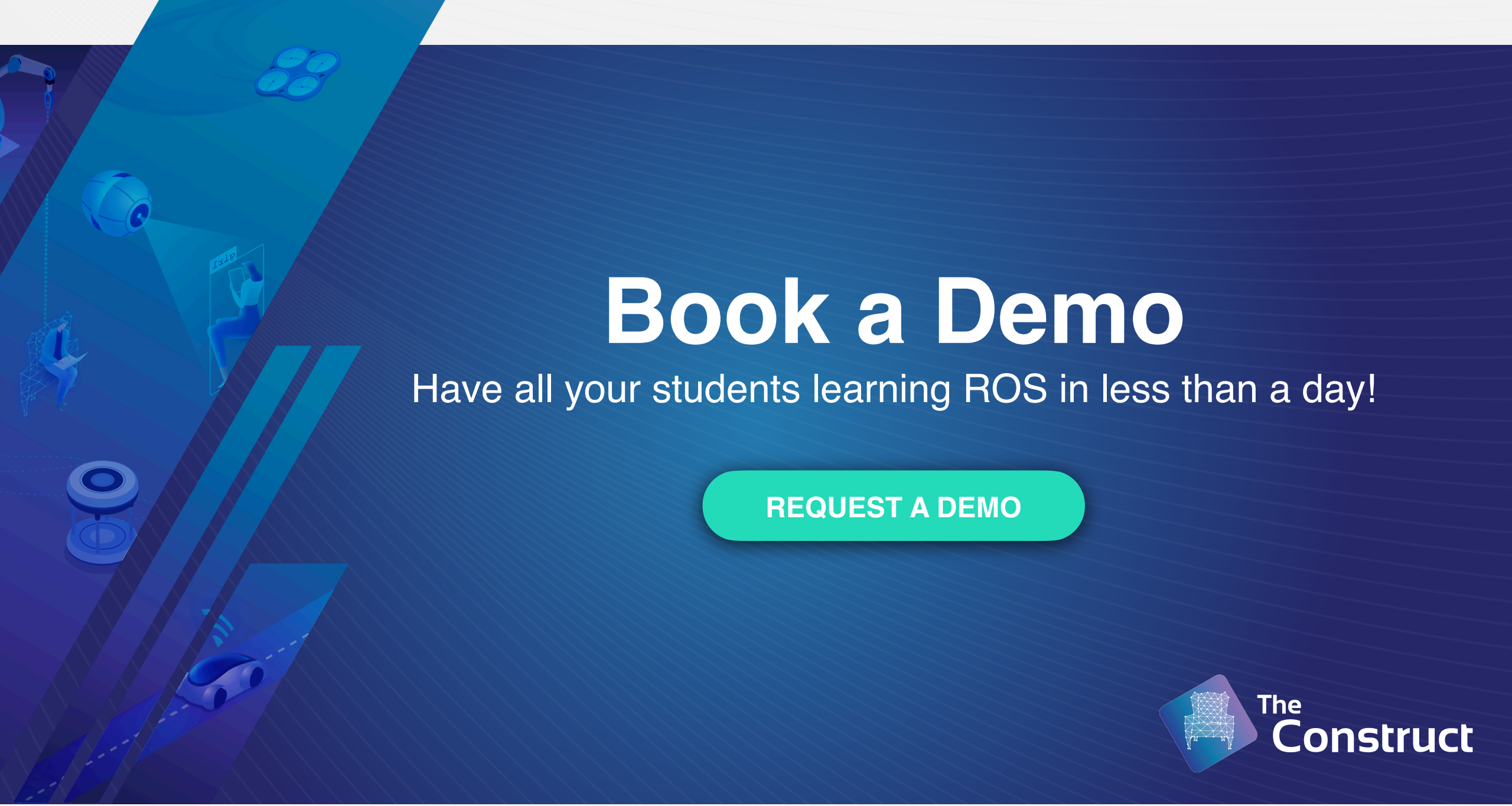
The Construct

Advantages of Paid solution

1. Get all the material done ready to teach
2. Get exams and correction of them
3. Include LinkedIn certificate
4. We provide support to your students

- Enjoy yourself teaching instead of wasting your time with the preparation

Now let’s do an example of a Zoom class!


Book a Demo
Have all your students learning ROS in less than a day!
REQUEST A DEMO
The Construct

© By The Construct 2020

The Construct

Who is this webinar for

Which one is the best for launching faster a better product?