

Nama : Mohammad Bintang Wicaksono

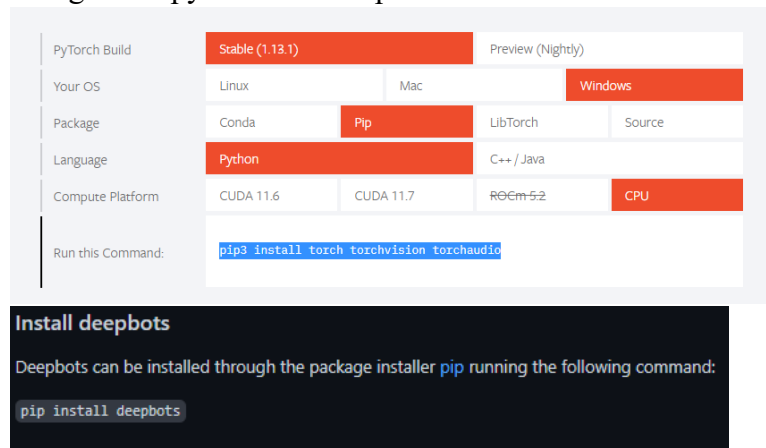
NIM : 1103194155

Kelas : TK-43-GAB

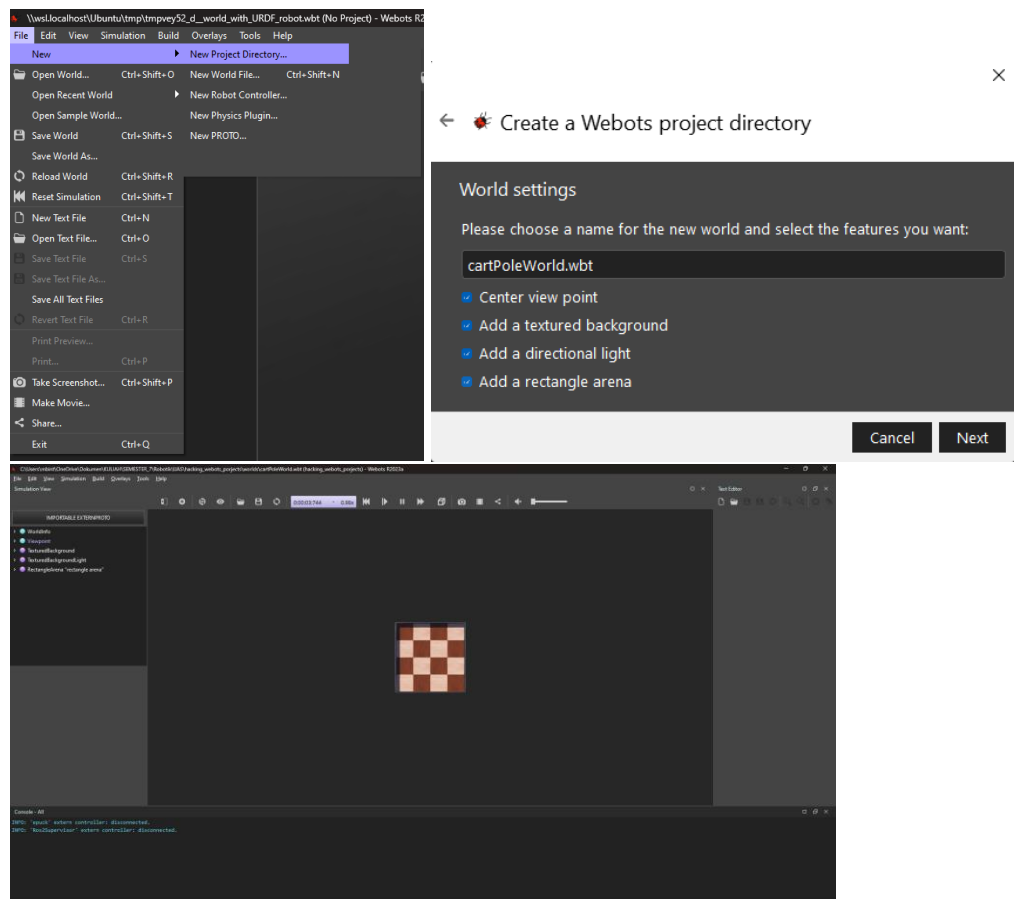
CartPole Beginner Robot-Supervisor Scheme Tutorial

1. Membuat Project

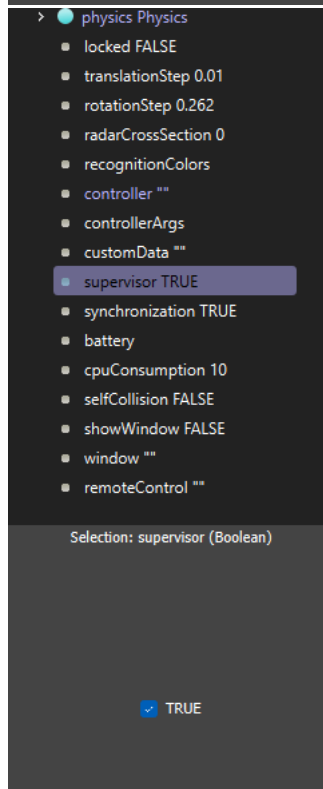
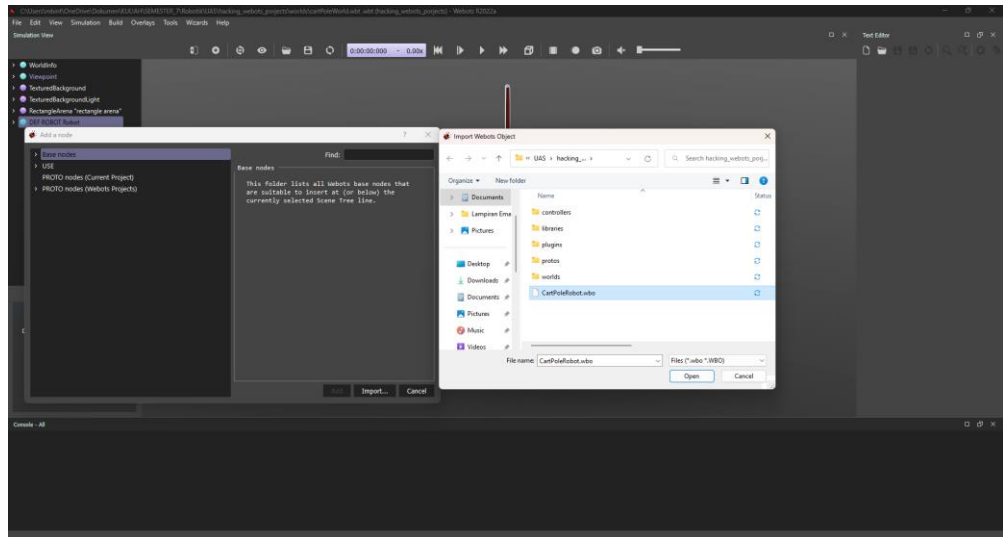
a. Menginstall pytorch dan deepbots



b. Buka Webots → File → New Project Directory → beri nama cartPoleWorld.wbt → finish

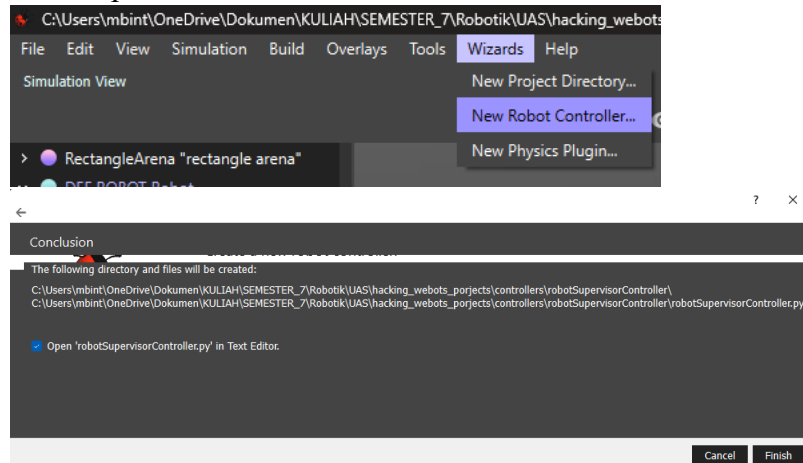


- c. Download file wbo pada link tutorial deepbots → Import file wbo yang telah didownload ke dalam *scene tree* → *expand* Robot → ubah supervisor menjadi True → lalu Save

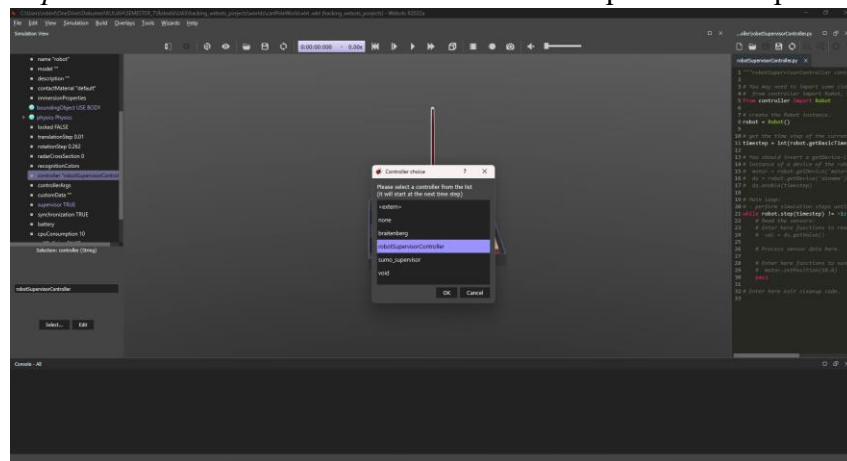


2. Membuat Controller

- a. Wizard → New Robot Controller → pilih Python → beri nama robotSupervisorController → Finish

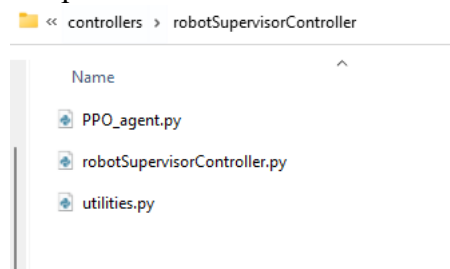


- b. Expand node Robot → sub node controller → pilih robotSupervisorController



3. Mendownload File yang dibutuhkan

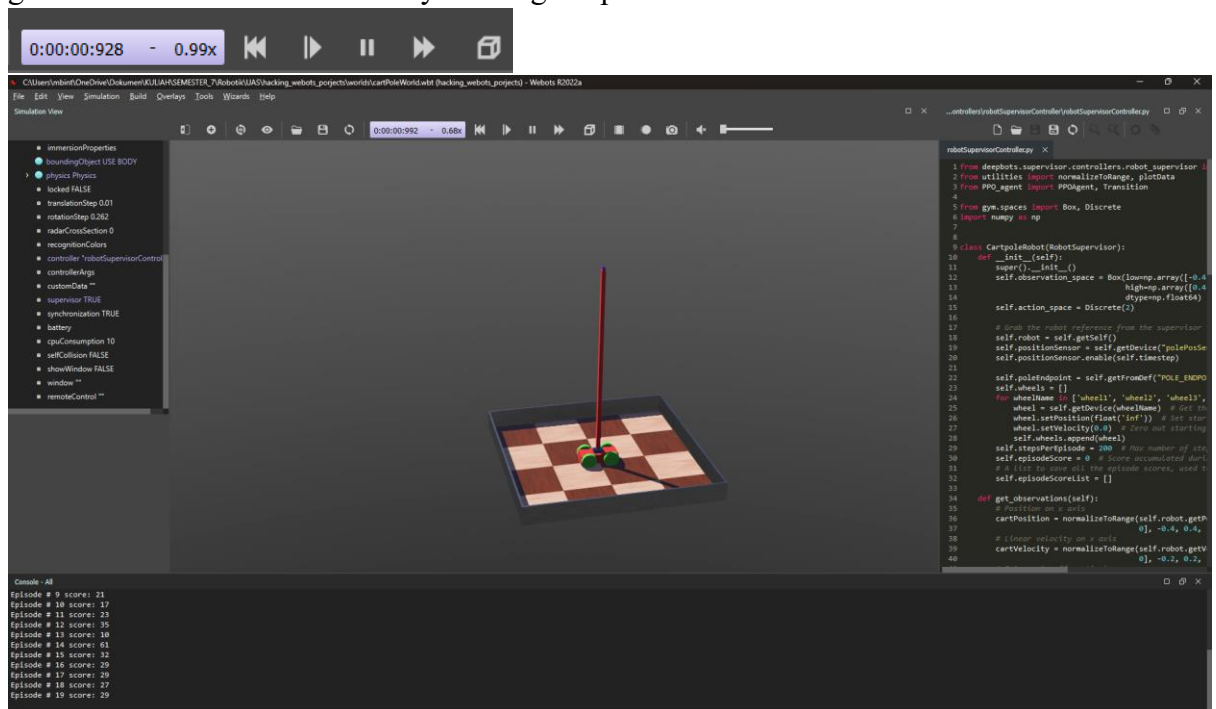
- a. Download PPO agent [klik disini](#), lalu klik kanan → save as
- b. Download utilities script [klik disini](#), lalu klik kanan → save as
- c. Simpan kedua file ke dalam folder controller → robotSupervisorController



4. Mengubah isi robotSupervisorController.py
 - a. Copy Paste code dari github tutorial ke dalam text file controller

```
robotSupervisorController.py X
1 from deepbots.supervisor.controllers.robot_supervisor import RobotSupervisor
2 from utilities import normalizeToRange, plotData
3 from PPO_agent import PPOAgent, Transition
4
5 from gym.spaces import Box, Discrete
6 import numpy as np
7
8
9 class CartpoleRobot(RobotSupervisor):
10     def __init__(self):
11         super().__init__()
12         self.observation_space = Box(low=np.array([-0.4, -np.inf, -1.3, -np.inf]),
13                                     high=np.array([0.4, np.inf, 1.3, np.inf]),
14                                     dtype=np.float64)
15         self.action_space = Discrete(2)
16
17         # Grab the robot reference from the supervisor to access various robot
18         self.robot = self.getSelf()
19         self.positionSensor = self.getDevice("polePosSensor")
20         self.positionSensor.enable(self.timestep)
21
22         self.poleEndpoint = self.getFromDef("POLE_ENDPOINT")
23         self.wheels = []
24         for wheelName in ['wheel1', 'wheel2', 'wheel3', 'wheel4']:
25             wheel = self.getDevice(wheelName) # Get the wheel handle
26             wheel.setPosition(float('inf')) # Set starting position
27             wheel.setVelocity(0.0) # Zero out starting velocity
28             self.wheels.append(wheel)
29         self.stepsPerEpisode = 200 # Max number of steps per episode
30         self.episodeScore = 0 # Score accumulated during an episode
31         # A list to save all the episode scores, used to check if task is solved
32         self.episodeScoreList = []
33
34     def get_observations(self):
35         # Position on x axis
36         cartPosition = normalizeToRange(self.robot.getPosition()[
37                                     0], -0.4, 0.4, -1.0, 1.0)
38         # Linear velocity on x axis
39         cartVelocity = normalizeToRange(self.robot.getVelocity()[
40                                     0], -0.2, 0.2, -1.0, 1.0, clip=True)
```

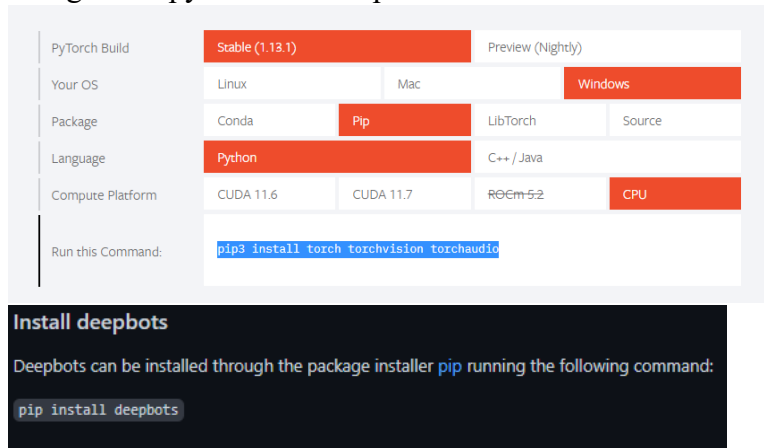
5. Setelah semua langkah selesai, kita bisa menjalankan simulasi dengan klik run, gunakan alt+klik kiri untuk menyeimbangkan pole.



CartPole Emitter-Receiver Scheme Tutorial

1. Membuat Project

a. Menginstall pytorch dan deepbots



The image shows the PyTorch Build configuration page. The configuration is as follows:

PyTorch Build	Stable (1.13.1)	Preview (Nightly)		
Your OS	Linux	Mac	Windows	
Package	Conda	Pip	LibTorch	Source
Language	Python	C++ / Java		
Compute Platform	CUDA 11.6	CUDA 11.7	ROCM 5.2	CPU

Run this Command:

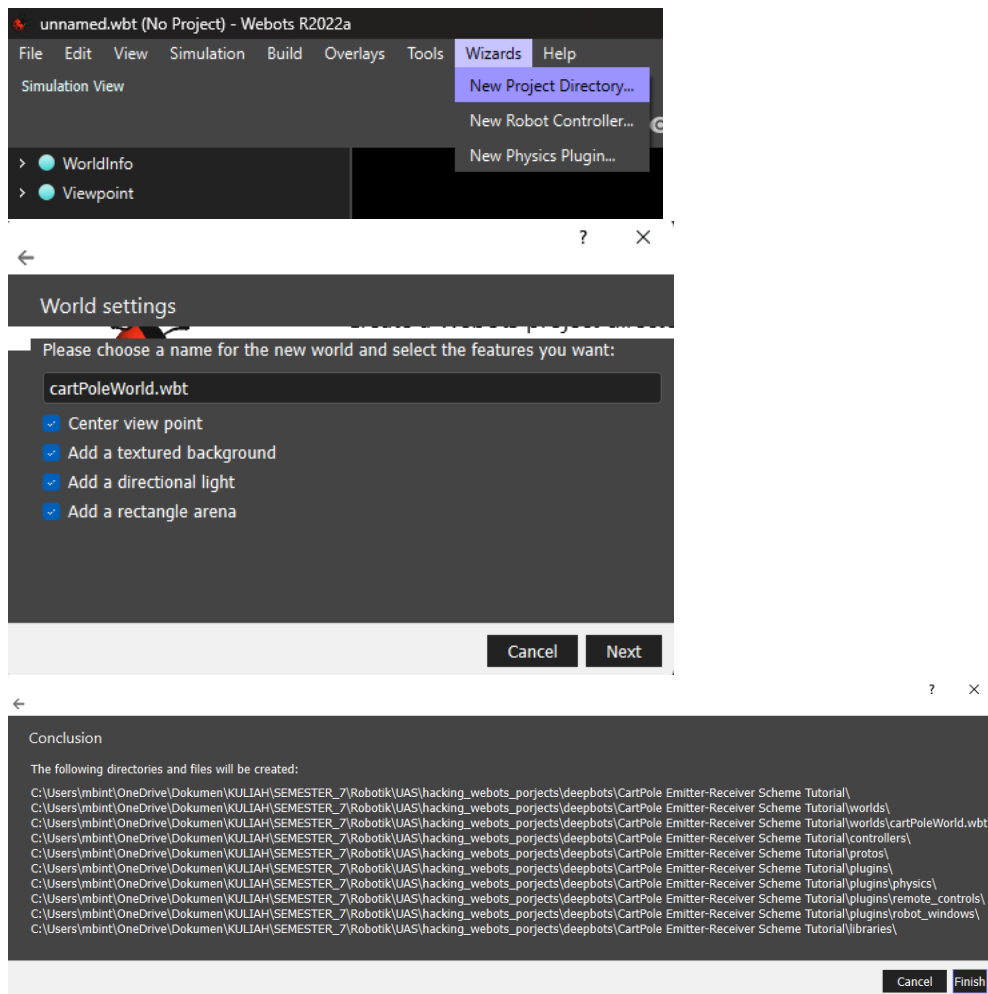
```
pip3 install torch torchvision torchaudio
```

Install deepbots

Deepbots can be installed through the package installer `pip` running the following command:

```
pip install deepbots
```

b. Buka webots → file/wizard → New Project Directory → beri nama cartPoleWorld.wbt → finish



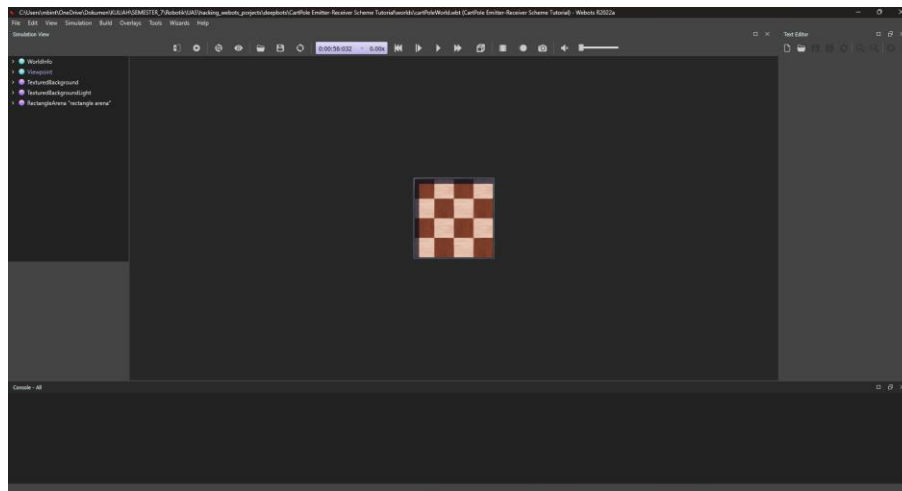
The image shows the Webots R2022a interface. The first step is the "Wizards" menu, where "New Project Directory..." is selected. The second step is the "World settings" dialog, where the name "cartPoleWorld.wbt" is entered, and the following features are checked:

- ☒ Center view point
- ☒ Add a textured background
- ☒ Add a directional light
- ☒ Add a rectangle arena

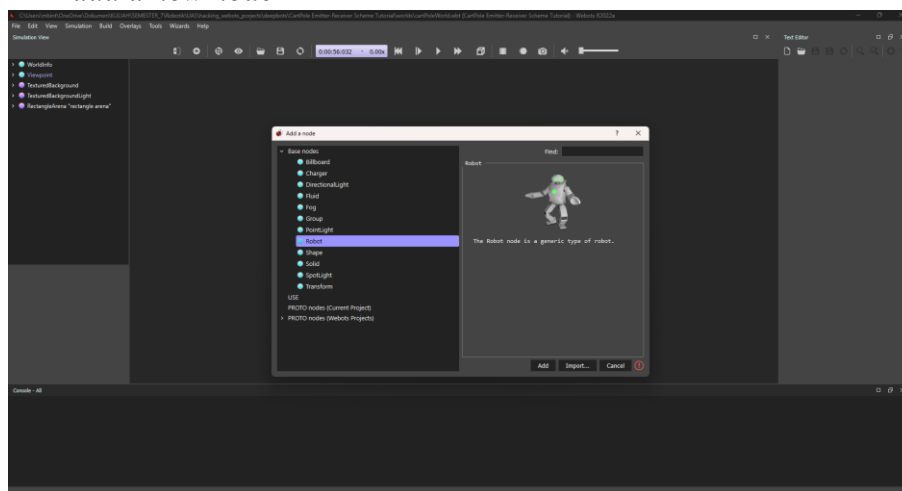
The "Next" button is clicked. The third step is the "Conclusion" dialog, which shows the following directories and files will be created:

```
C:\Users\mbint\OneDrive\Documents\KULIAH\SEMESTER_7\Robotik\UAS\hacking_webots_projects\deepbots\CartPole Emitter-Receiver Scheme Tutorial\
C:\Users\mbint\OneDrive\Documents\KULIAH\SEMESTER_7\Robotik\UAS\hacking_webots_projects\deepbots\CartPole Emitter-Receiver Scheme Tutorial\worlds\
C:\Users\mbint\OneDrive\Documents\KULIAH\SEMESTER_7\Robotik\UAS\hacking_webots_projects\deepbots\CartPole Emitter-Receiver Scheme Tutorial\worlds\cartPoleWorld.wbt
C:\Users\mbint\OneDrive\Documents\KULIAH\SEMESTER_7\Robotik\UAS\hacking_webots_projects\deepbots\CartPole Emitter-Receiver Scheme Tutorial\controllers\
C:\Users\mbint\OneDrive\Documents\KULIAH\SEMESTER_7\Robotik\UAS\hacking_webots_projects\deepbots\CartPole Emitter-Receiver Scheme Tutorial\plugins\
C:\Users\mbint\OneDrive\Documents\KULIAH\SEMESTER_7\Robotik\UAS\hacking_webots_projects\deepbots\CartPole Emitter-Receiver Scheme Tutorial\plugins\physics\
C:\Users\mbint\OneDrive\Documents\KULIAH\SEMESTER_7\Robotik\UAS\hacking_webots_projects\deepbots\CartPole Emitter-Receiver Scheme Tutorial\plugins\remote_controls\
C:\Users\mbint\OneDrive\Documents\KULIAH\SEMESTER_7\Robotik\UAS\hacking_webots_projects\deepbots\CartPole Emitter-Receiver Scheme Tutorial\plugins\robot_windows\
C:\Users\mbint\OneDrive\Documents\KULIAH\SEMESTER_7\Robotik\UAS\hacking_webots_projects\deepbots\CartPole Emitter-Receiver Scheme Tutorial\libraries\
```

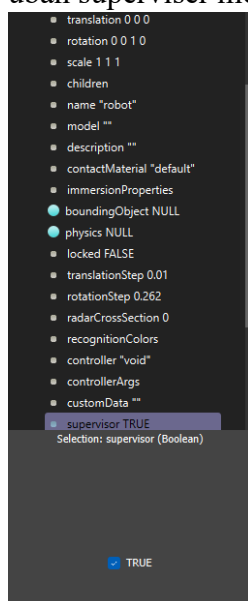
The "Finish" button is clicked.



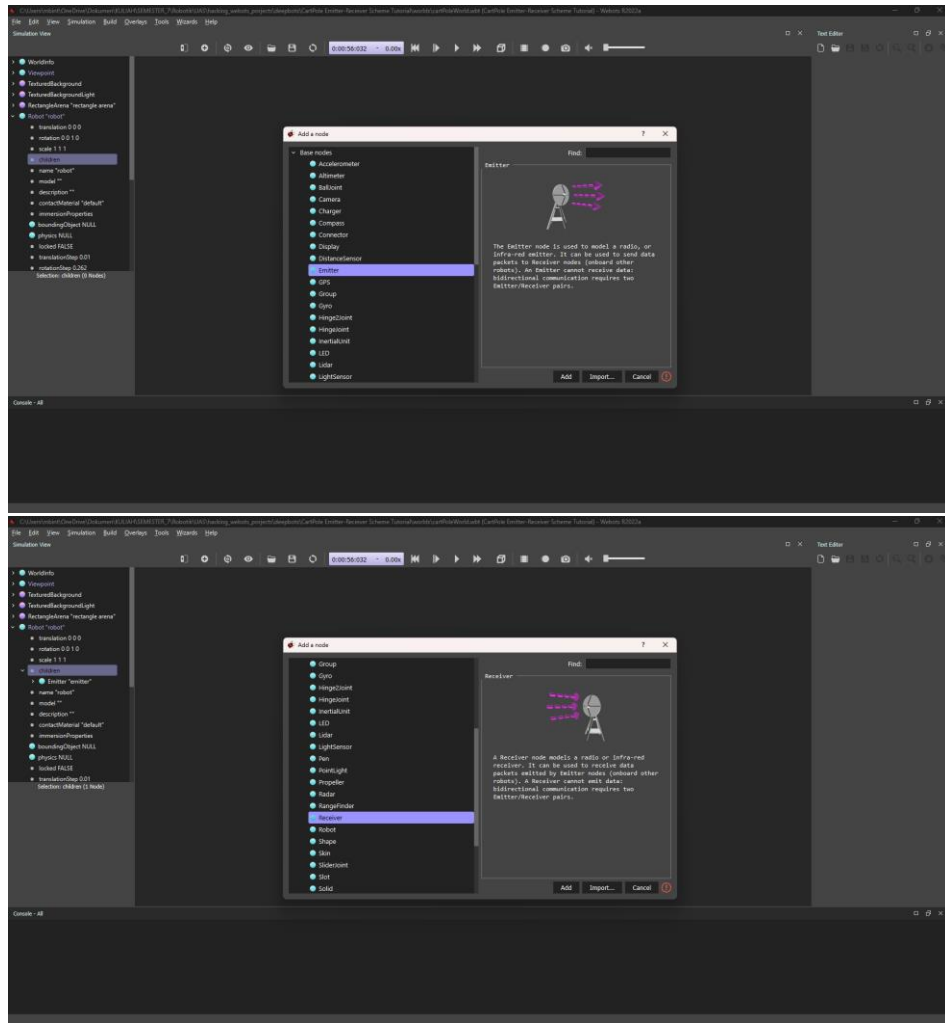
2. Menambahkan robot supervisor ke dalam world
 - a. Klik *add a new node* → base node → robot



- b. Ubah nilai sipervisor pada node Robot menjadi True (*expand node Robot* → ubah supervisor menjadi TRUE)

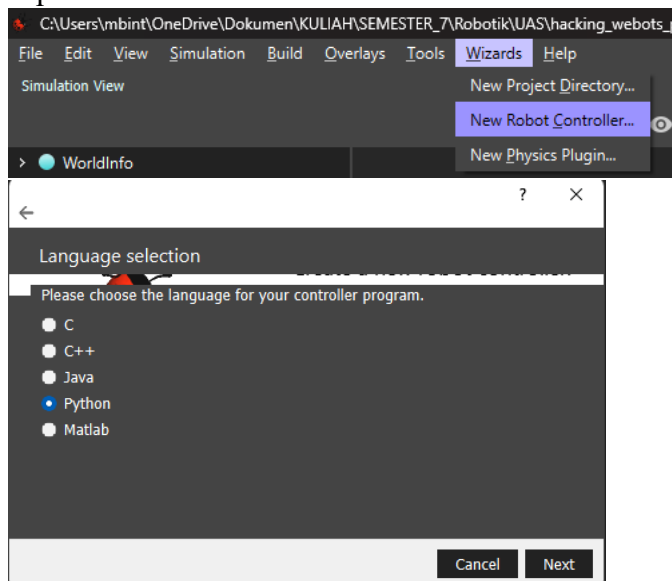


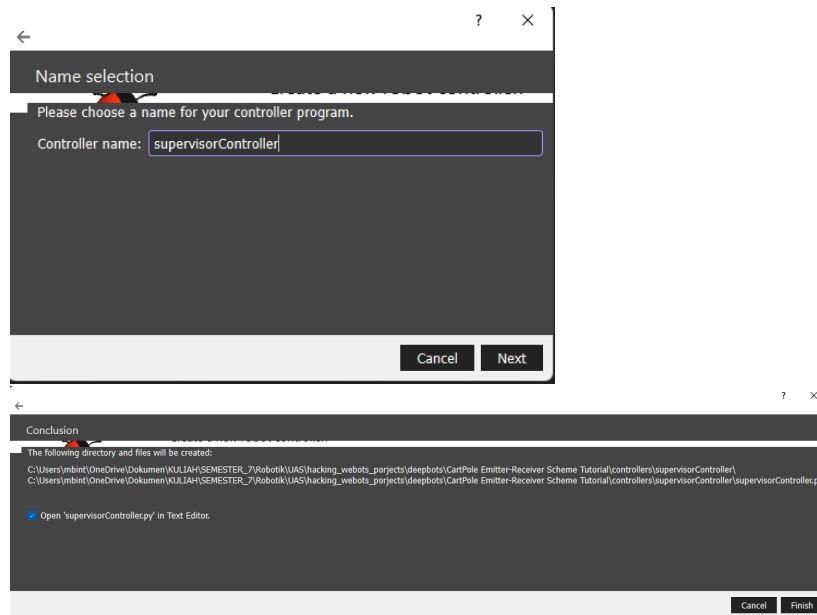
- c. *Expand node Robot* → children → add node → base node → emitter dan receiver



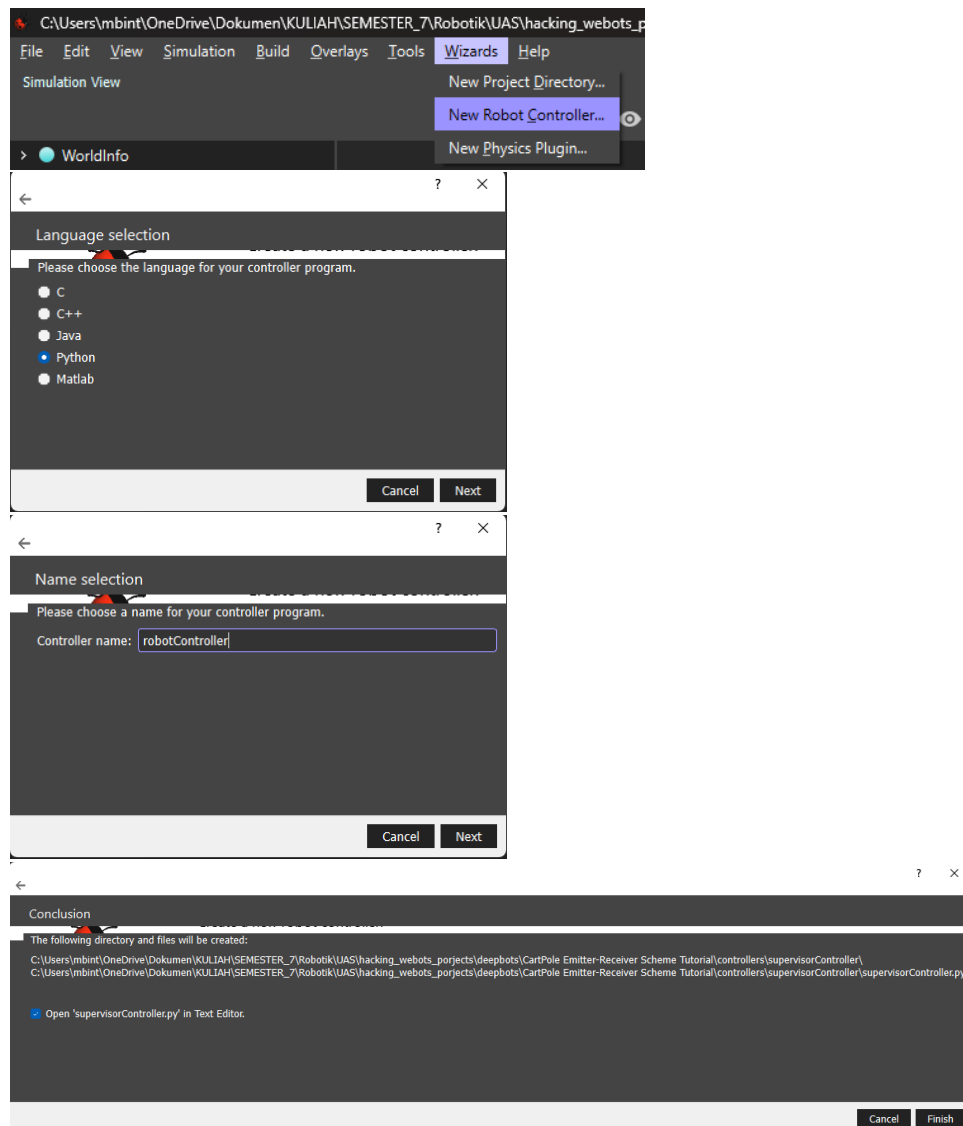
3. Menambahkan Kontroller

- a. Klik wizard/file → New Robot Controller → pilih Python → beri nama supervisorController → finish

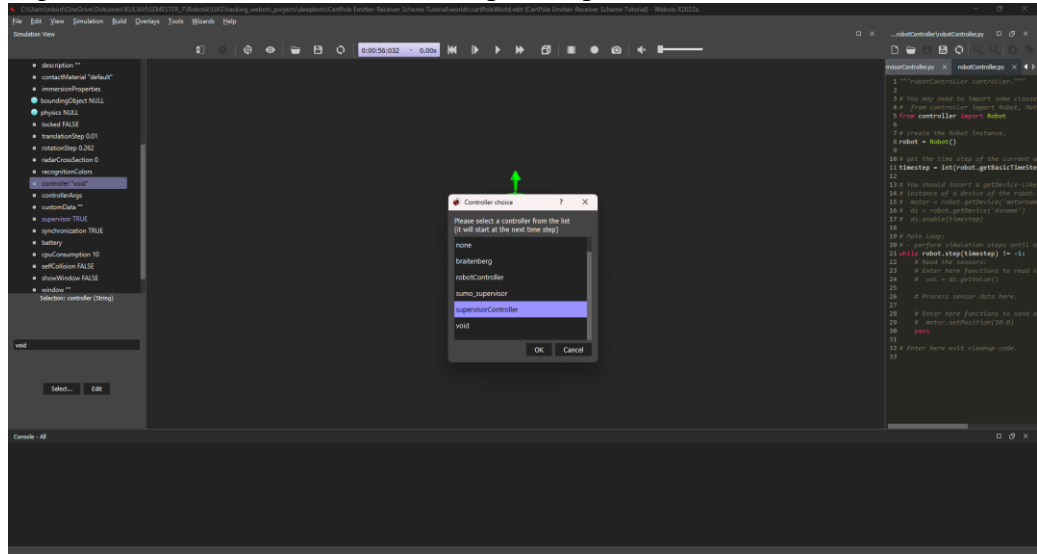




- b. Klik wizard/file → New Robot Controller → pilih Python → beri nama robotController → finish

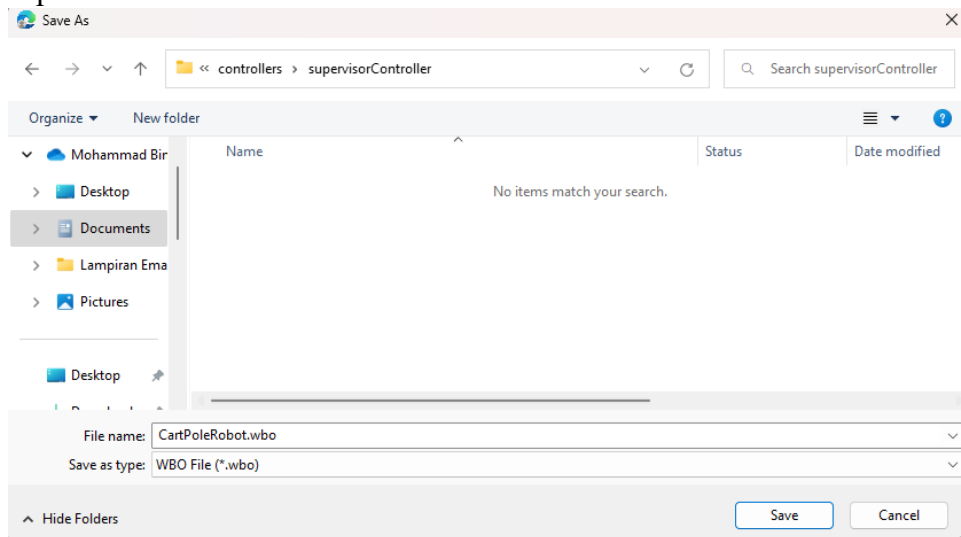


- c. *Expand Node Robot* → *controller* → pilih *supervisorController* → save

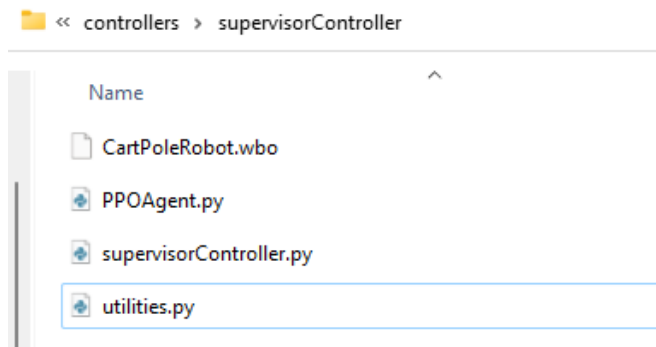


4. Mendownload CartPole robot node

- a. Download [disini](#) untuk CartPole robot node, lalu save as ke dalam folder *supervisorController*

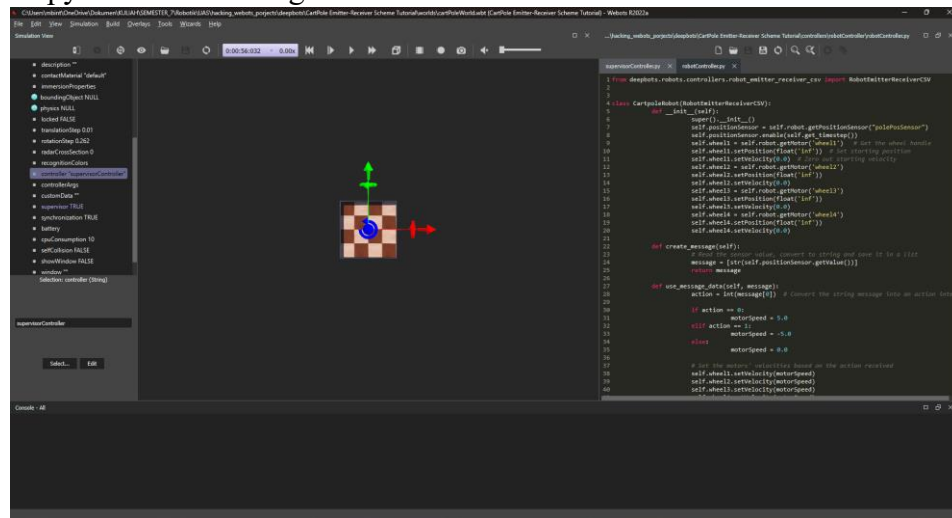


- b. Download PPO agent [klik disini](#) , lalu klik kanan → save as
 c. Download utilities script [klik disini](#) , lalu klik kanan → save as
 d. Simpan kedua file ke dalam folder *controller* → *supervisorController*

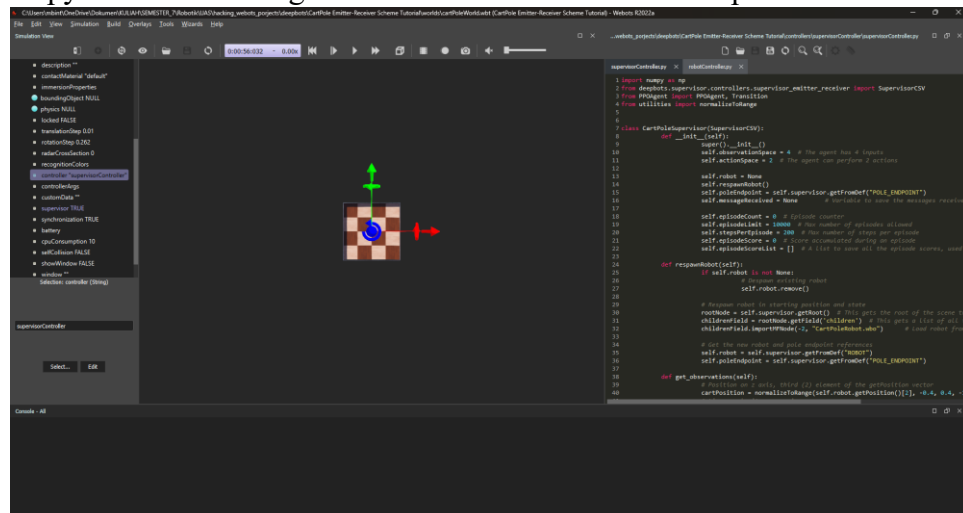


5. Mengubah isi text file robotController dan supervisorController

a. Copy Paste code dari github tutorial kedalam text file robotController



b. Copy Paste code dari github tutorial kedalam text file supervisorController



6. Setelah semua langkah selesai, kita bisa menjalankan simulasi dengan klik run, gunakan alt+klik kiri untuk menyeimbangkan pole

