# Running Franka-Emika Panda Robot Simulator and Python Control on your Computer

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**Required System:**

- **Ubuntu 18.04 LTS** (Bionic Beaver) and **ROS Melodic Morenia**
  - Installation of ROS can be found here. Follow all steps from 1.1 to 1.7

**Setting up Franka Simulation Environment**

1. Install libfranka and franka-ros with the following command.

   ```
   $ sudo apt install ros-melodic-libfranka ros-melodic-franka-ros
   ```

2. Install other necessary dependencies

   ```
   $ pip install scipy
   $ pip install matplotlib
   ```

3. Make catkin workspace with following command

   ```
   $ source /opt/ros/melodic/setup.bash
   $ mkdir -p ~/<franka_ws>/src
   ```

   (**<franka_ws>** part can be whatever name your workspace want to be)

4. Go to workspace directory

   ```
   $ cd ~/<franka_ws>/
   ```

5. Install panda simulator inside new catkin workspace following direction
   a. Install dependencies by executing following commands
      - `$ pip install numpy`
      - `$ pip install numpy-quaternion==2020.5.11.13.33.35`
      - `$ sudo apt install ros-melodic-gazebo-ros-control ros-melodic-rospy-message-converter ros-melodic-effort-controllers ros-melodic-joint-state-controller ros-melodic-moveit ros-melodic-moveit-commander ros-melodic-moveit-visual-tools`

   b. `$ git clone https://github.com/justagist/panda_simulator.git` to `<franka_ws>/src`
   c. From `src` directory, head to cloned panda_simulator directory (`$ cd panda_simulator`)
   d. Run `./build_ws.sh` from `<franka_ws>/src/panda_simulator`

6. Install python control for Panda Robot

a. Run **`git clone`** https://github.com/justagist/panda_robot.git in **<franka_ws>/src**

7. Build the workspace with **`catkin build`** command

```
$ catkin build
```

8. After build process is finished, type

```
$ source devel/setup.bash
```

9. Type the following command to open the panda robot in gazebo simulator. This will open up Gazebo simulator with Panda robot model

```
$ roslaunch panda_gazebo panda_world.launch
```

**Try it out!**

10. Open new terminal tab, head to the built catkin workspace (<franka_ws>) and type

```
$ source devel/setup.bash
```

11. Type **python** to open python interactive console
    a. **To run the pre-written code, type python name_of_code.py**

12. Import rospy and panda_robot package to set up robot control environment

```
>> import rospy
>> from panda_robot import PandaArm
```

13. Initialize ROS node

```
>> rospy.init_node("panda_demo")
```

14. Create PandaArm Instance

```
>> r = PandaArm()
```

15. Try following commands for robot control.

```
>> r.move_to_joint_position([-8.48556818e-02, -8.88127666e-02,
-6.59622769e-01, -1.57569726e+00, -4.82374882e-04,  2.15975946e+00,
4.36766917e-01]) # move robot to the specified pose

>> r.move_to_neutral() # moves robot to neutral pose; uses moveit if
available, else JointTrajectory action client
```

```
>> pos,ori = r.ee_pose() # get current end-effector pose (3d position
and orientation quaternion of end-effector frame in base frame)

>> r.get_gripper().home_joints() # homes gripper joints
>> r.get_gripper().open() # open gripper
>> r.get_gripper().close() # close gripper
```

**Troubleshooting:**

- **RLException: [panda_world.launch] is neither a launch file in package [panda_gazebo] nor is [panda_gazebo] a launch file name**
    - You might have forgotten to command **`source devel/setup.bash.`** Execute the command and try again
- **catkin: command not found**
    - **`sudo apt-get install ros-melodic-catkin python-catkin-tools`**
    - **`catkin init`**