Software Requirements

Overview of the minimum required installation corresponding to the baseline configuration of Windows OS. Performing every step and confirming its correct execution is critical for the successful installation of the software and painless work during the class.

1. Win7-Win10 x64 bit operating system (OS), assumed preinstalled.
2. MATLAB/Simulink assumed preinstalled/inherited from the previous class.
3. Python2.7.15 x32 bit interpreter. *Python 2.7.15 (v2.7.15:ca079a3ea3, Apr 30 2018, 16:22:17) [MSC v.1500 32 bit (Intel)] on Win32 OS*.
4. ARIA x32 bit library to control Pioneer3AT robot. *ARIA-2.9.4.exe*
5. Wheeled robot simulation software MobileSim. *MobileSim-0.9.8.exe*. Any earlier version from the previous class might not work properly.
6. PyCharm Community/Professional edition - latest from the IntelliJ website, check it out from https://www.jetbrains.com/pycharm/download/#section=windows.

Items 3 - 6 will be provided as individual executables for 64-bit Win OS.

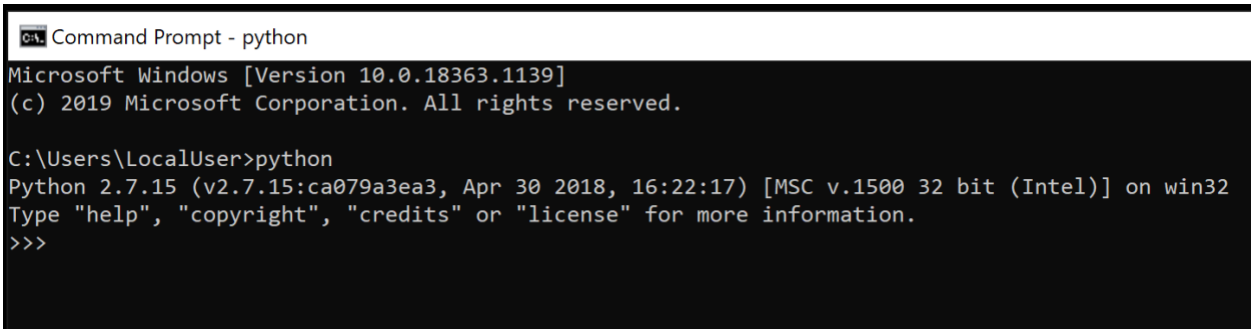
WinXX_64bit

The OS is assumed to be preinstalled. All you need to verify is that OS has a minimal version of .Net package required to support 32-bit libraries. This requirement comes from the 32-bit version of ARIA that supplies 32-bit bindings for Python2.7, see more details below.

By default, the OS comes with the "MS Visual C++ 20-15-2019 Redistributable tools" that should be sufficient to support the bindings of 32-bit ARIA libraries. If they are missing, then *vs_community__624776882.1603172234.exe* is provided. However, it is recommended to skip it first.

Installing Python2.7.15 32-bit

Unlike Linux and Mac OSX, bare Win7 or win10 do not have any versions of Python installed. A simple test is to open a command window ("Command Prompt") and start any Python interpreter as shown below:

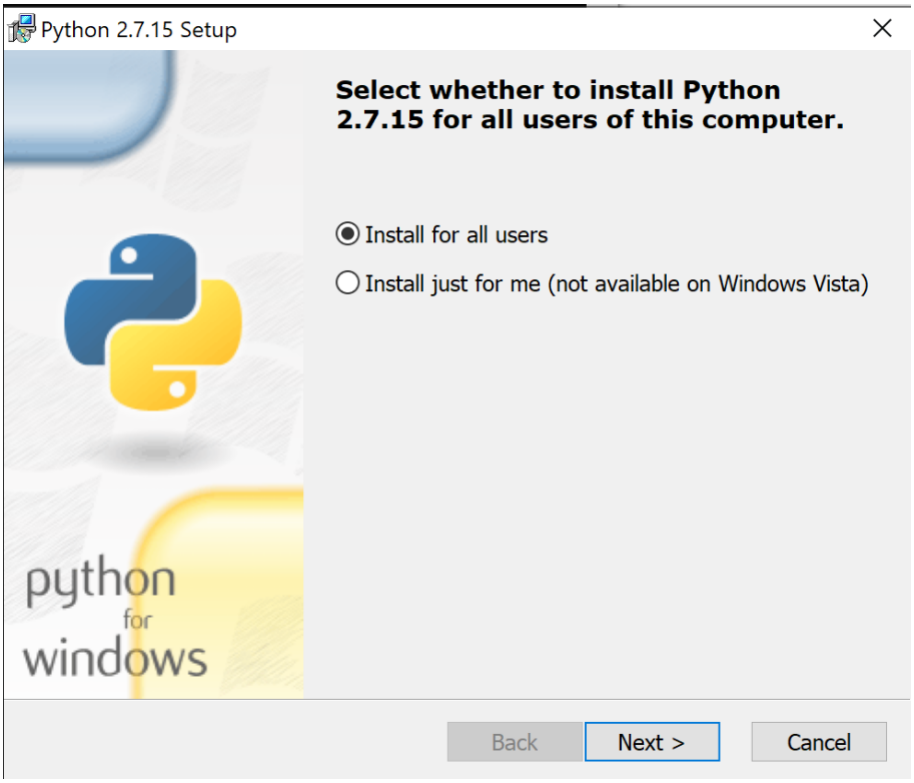


When Python is installed you should see its version displayed.

If it is not installed, then install Python2.7.15 using either a provided binary executable or navigate to https://www.python.org/downloads/release/python-2715/. When installing it on a PC with possibly other Python versions installed, please install it to C:\Python27\ path and add the Python interpreter to the global system Path. **This is critical!!!**

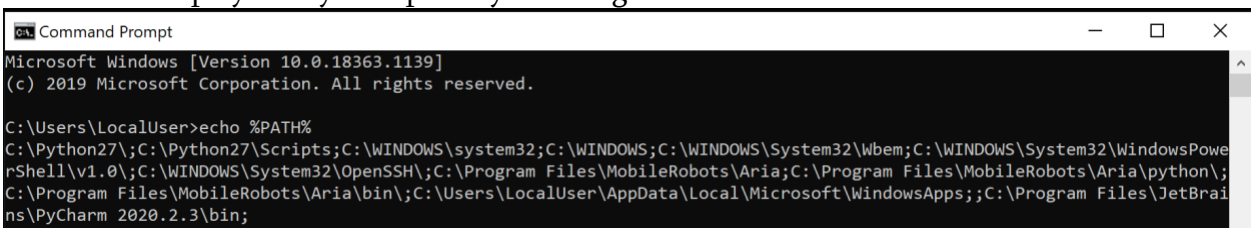
My installation steps:

1. Run the executable and follow the default prompts for *C:\Python27* path.



2. Verify that the system PATH variable has been updated. Here are the steps to refresh the environment variables without rebooting the Windows OS:
   - open the command prompt window.
   - enter >>*set PATH=C* and this will **refresh** the environment variables.

- close and **restart** the **cmd** window ("Command Prompt").
- Display the system path by entering >> *echo %PATH%*



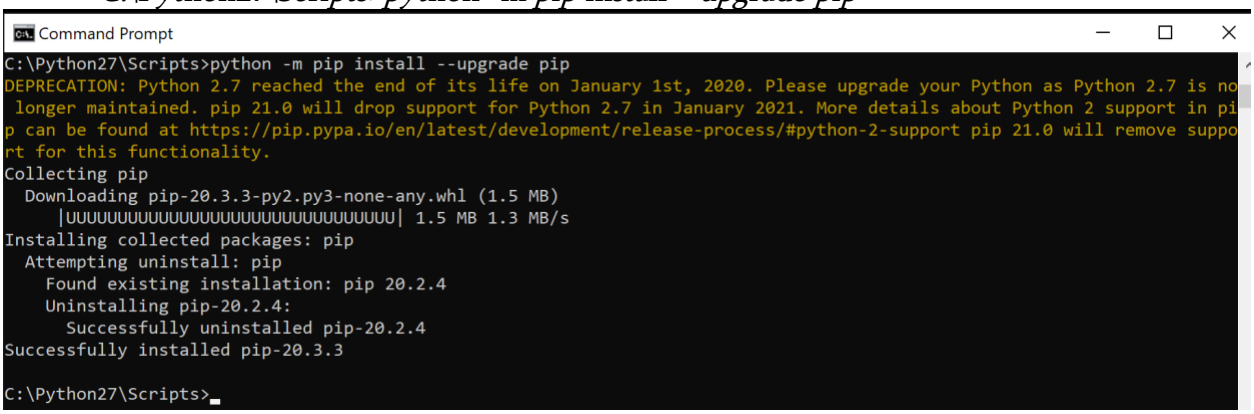
- Verify that the following paths are there: C:\Python27\;C:\Python27\Scripts;

3. Verify the installed version of the Python interpreter. See details in the previous section.

Upgrade Python package manager=> PIP

1. Make sure your computer is connected to the Internet.
2. In the command prompt terminal, navigate to the *..\Python27\Scripts*
3. From the command prompt terminal execute the following:

- *C:\Python27\Scripts>python -m pip install --upgrade pip*

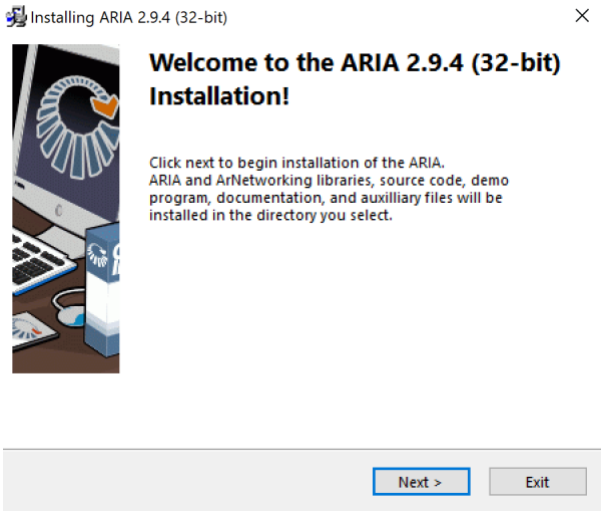


You should expect a few messages in the window which are similar to the one presented above. Ignore the DEPRECIATION warning as Python2.7 is a requirement of the ARIA library.

Installing ARIA 32 bit

Install ARIA-2.9.4.exe running it as an administrator (right-click on the executable file in the file browser and choose "Run as administrator") that saves a few steps at the end.

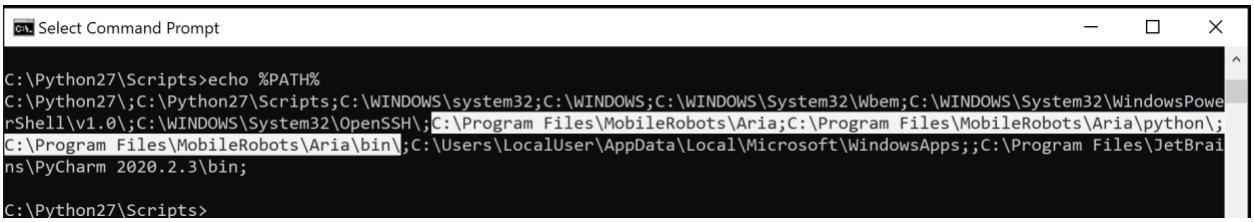
1. Run ARIA-2.9.4.exe. Accept the default path to the installation folder. Note/remember this path, C:\Program Files\MobileRobots\Aria.



At the end of the installation, the package will run a sequence of configuration scripts that write and populate a few global environment variables. Those system variables must be verified at the next step.

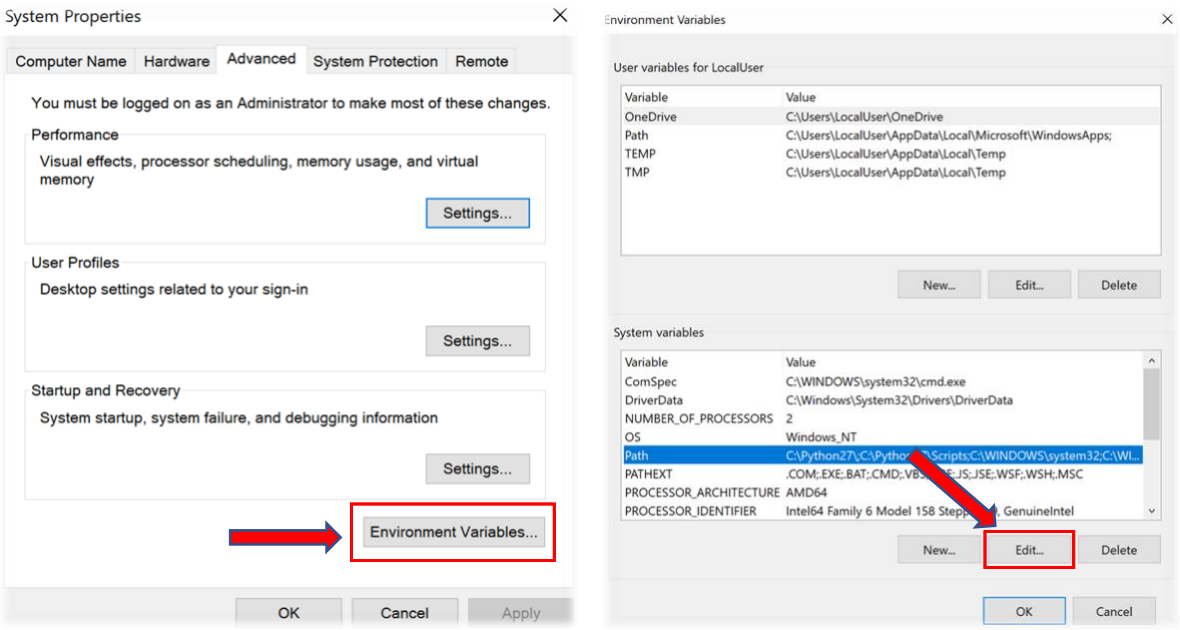
2. Verification of system variables. From the command prompt terminal do the following (always open a new one when checking the PATH):

- *>>echo %PATH%*

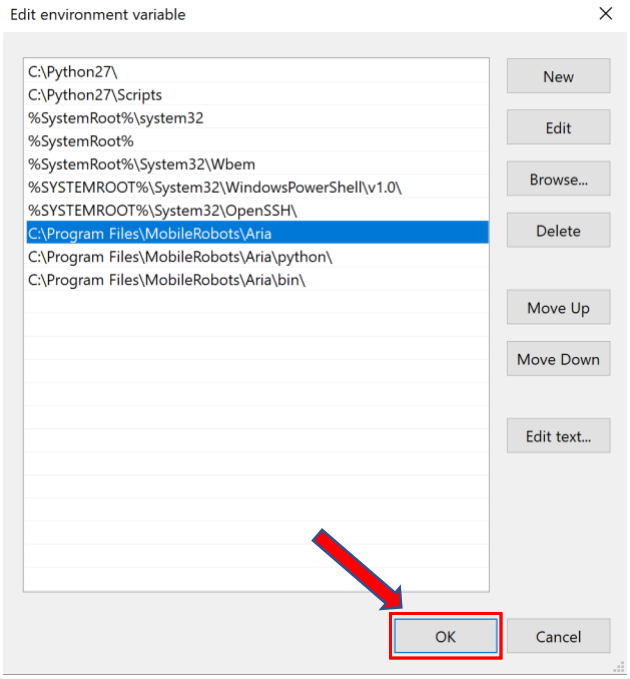


You need to verify that the highlighted paths are there so that the system knows the path to the Python libraries of ARIA.

3. If the response does not list those 3 critical locations of the ARIA library, they have to be added manually by manually editing System_Properties\Environment_Variables, see an example below.

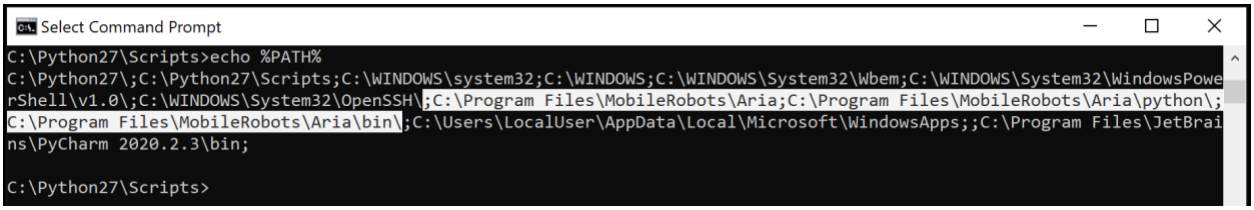


The following few lines need to be added to the system PATH variable, use the EDIT button to add the missing paths. The final result should look like this:



4. To verify that the PATH has been updated do the following in the command prompt terminal (always open a new one when checking the PATH):

   C:\Users\LocalUser>echo %PATH%



Observe that the 3 records do propagate to the system variable PATH:

C:\Program Files\MobileRobots\Aria;C:\Program Files\MobileRobots\Aria\python\;C:\Program Files\MobileRobots\Aria\bin

Installing PyCharm

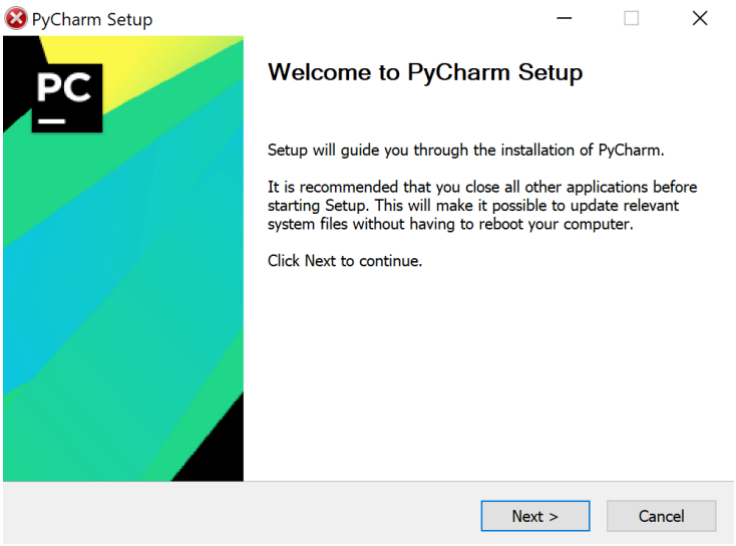
PyCharm is one of the best full-stack IDEs that integrates into one package a few essential development tools including the intelligent editor, debugger, SSH client, and many others which are frequently used as separate entities.

The community edition is free to anyone. The registration process only requires a valid email address. The Professional edition can be installed with your email account if it is associated with an educational institution that uses a dotEDU domain; I'd recommend you to use this opportunity.

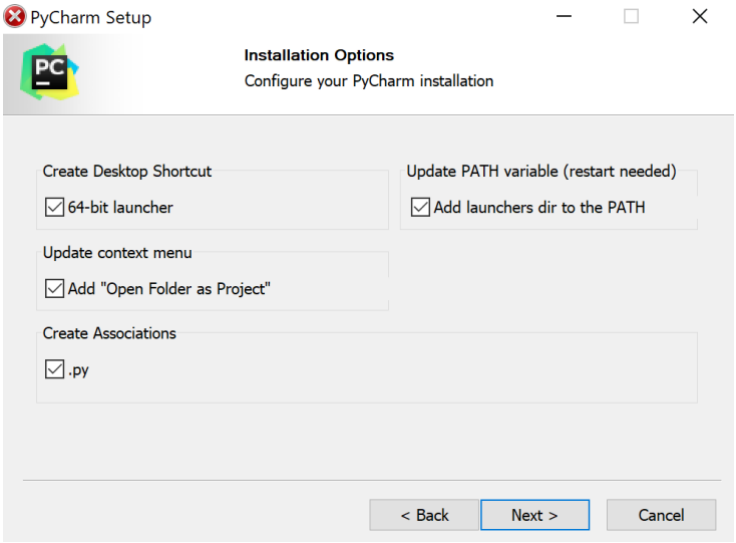
General installation instructions are provided at
https://www.jetbrains.com/help/pycharm/installation-guide.html

1. Both installation packages of a probably previous version of PyCharm are provided. If you are looking for the latest, then using any of the WEB browsers navigate to https://www.jetbrains.com/pycharm/download/#section=windows.

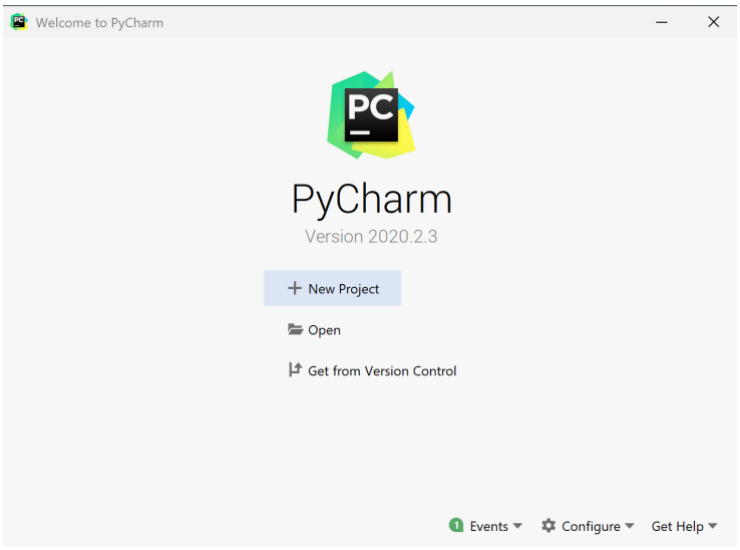
Download the Community edition (at minimum) that should be sufficient for the class; since you have nps.edu associated email you can use this opportunity to download and install the professional edition that features a lot more intelligent coding, formatting, and debugging. Download and install the latest version of PyCharm; any version of recent years should be also sufficient if you already have it installed.



The recommended settings are here:



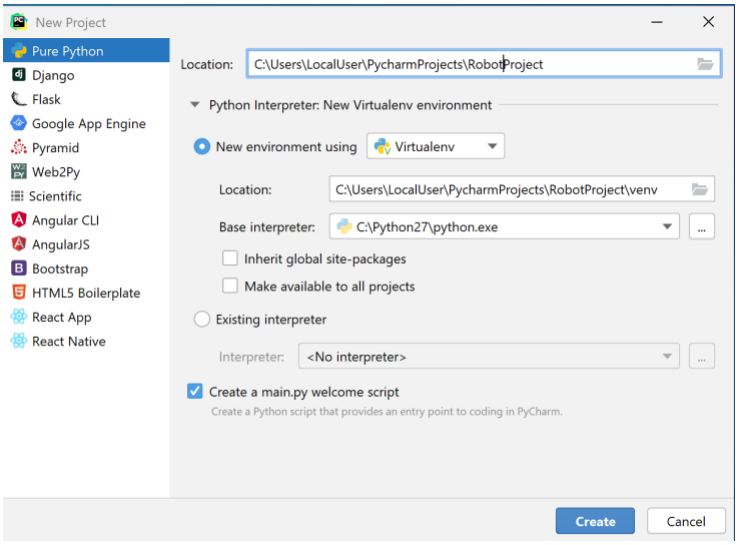
2. When starting PyCharm first time you may want to register your copy. To do that you need to sign in to a free account at the developer's website. Activate or use the evaluation version for free.
3. After activation, we need to create our first project. A lot of configuration steps will be done by the PyCharm behind the scenes; this includes the instantiation of the virtual environment, its sourcing, package management, etc. If you are not familiar yet with the Python virtual environment and the package managers, then let PyCharm do this work for you; very soon you will understand all those details.



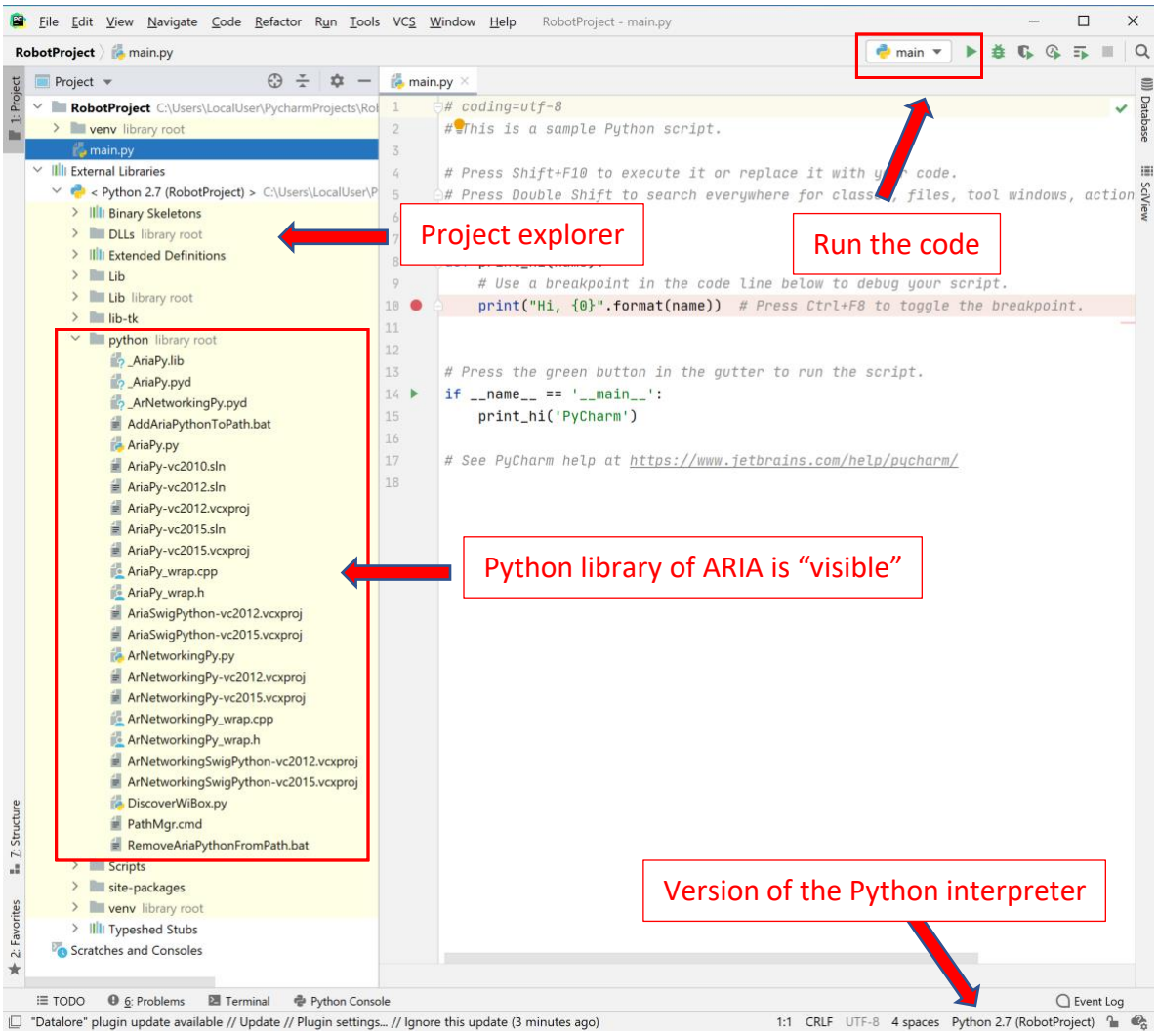
Click on “New Project”. Choose the “Pure Python” type and give a name to your first project at the default location as in

C:\Users\LocalUser\PycharmProjects\RobotProject

Accept the default settings that are discovered for you by the PyCharm. Create the project.



After installing, initializing, and auto-indexing of existing libraries (to be used by the Python virtual environment), the setup ends with a screen similar to the following:



The main.py is the default template of a minimalistic Python code that allows verifying the configuration of the interpreter; you can find it in the root of \robotcert_gnc\ project in the shared OneDrive folder. Run the “main.py” script by hitting the green triangle to obtain the following at the “Run Output” window.

C:\Users\LocalUser\PycharmProjects\RobotProject\venv\Scripts\python.exe
C:/Users/LocalUser/PycharmProjects/RobotProject/main.py

Hi, PyCharm

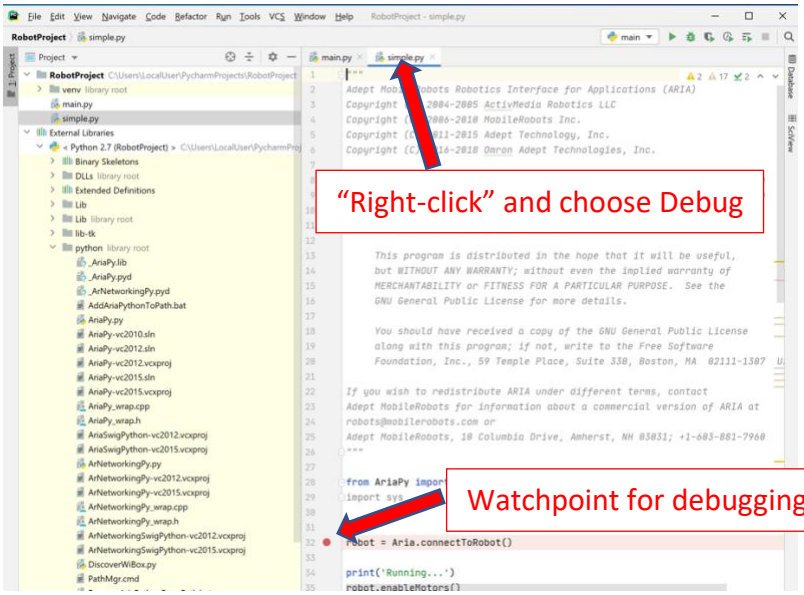
Process finished with exit code 0

What you need to observe/verify is that the project explorer tree (on the left) in the external libraries lists the “python” as the *library root*. This is the globally available Python library of the ARIA package.

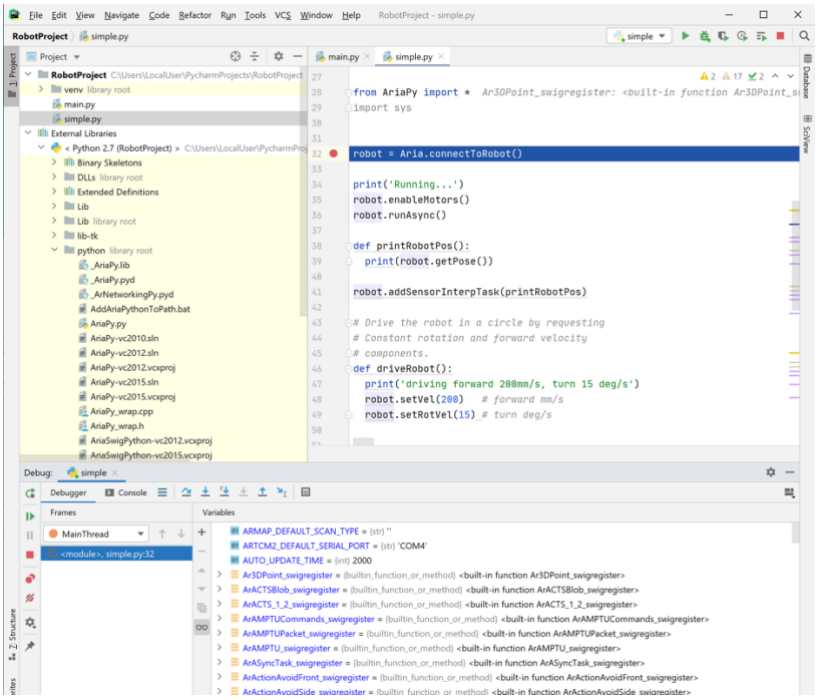
4. To verify that the ARIA libraries are accessible let us *copy&paste* the simplest script that initializes the robot. Navigate to

C:\Program Files\MobileRobots\Aria\pythonExamples

Where you should copy simple.py script; Windows nicely supports *drag&drop*. Paste that script into the RobotProject directory of the newly created Python project.



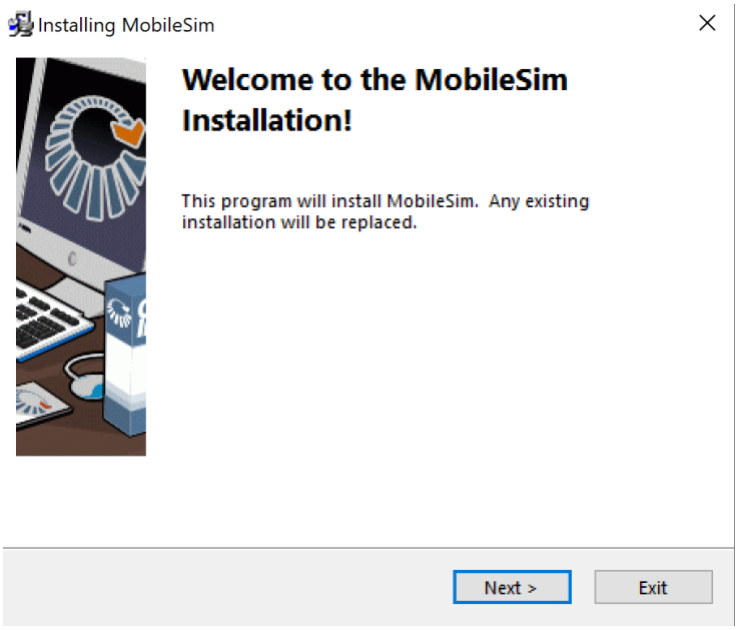
Put a watchpoint at line 32 by clicking to the right of the 32 number on the vertical bar. The idea is to start a debugging session (the red dot is the indicator of a watchpoint) to verify that the very first import of AriaPy is successful. Then, right-click on the simple.py tab and choose DEBUG. If the ARIA interface is accessible, the debugging process should stop at line 32 and no error messages should be displayed in the CONSOLE. The look and feel of the PyCharm IDE should be similar to this:



The result illustrates that the entire content of the ARIA (from AriaPy import *) is available and is accessible in the VARIABLES space.
At this point TERMINATE the debugging session as the Pioneer robot simulator needs to be started.

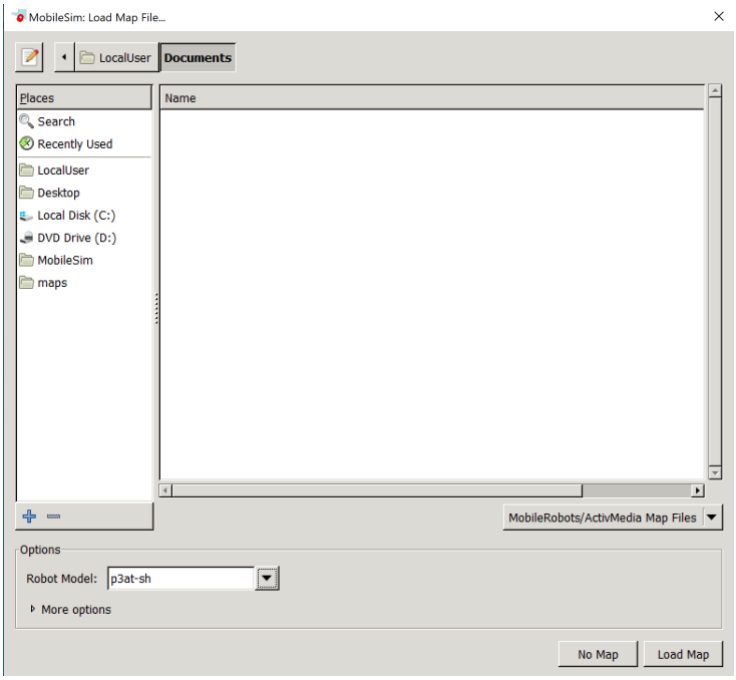
Updating MobileSim (Optional)

1. It is strongly recommended to update the MobileSim software to the MobileSim-0.9.8 version. If you have a previous version installed, then uninstall it and manually verify that PioneerRobotModels.world.inc file is deleted; delete it manually if necessary.
2. Run MobileSim-0.9.8 as an administrator.

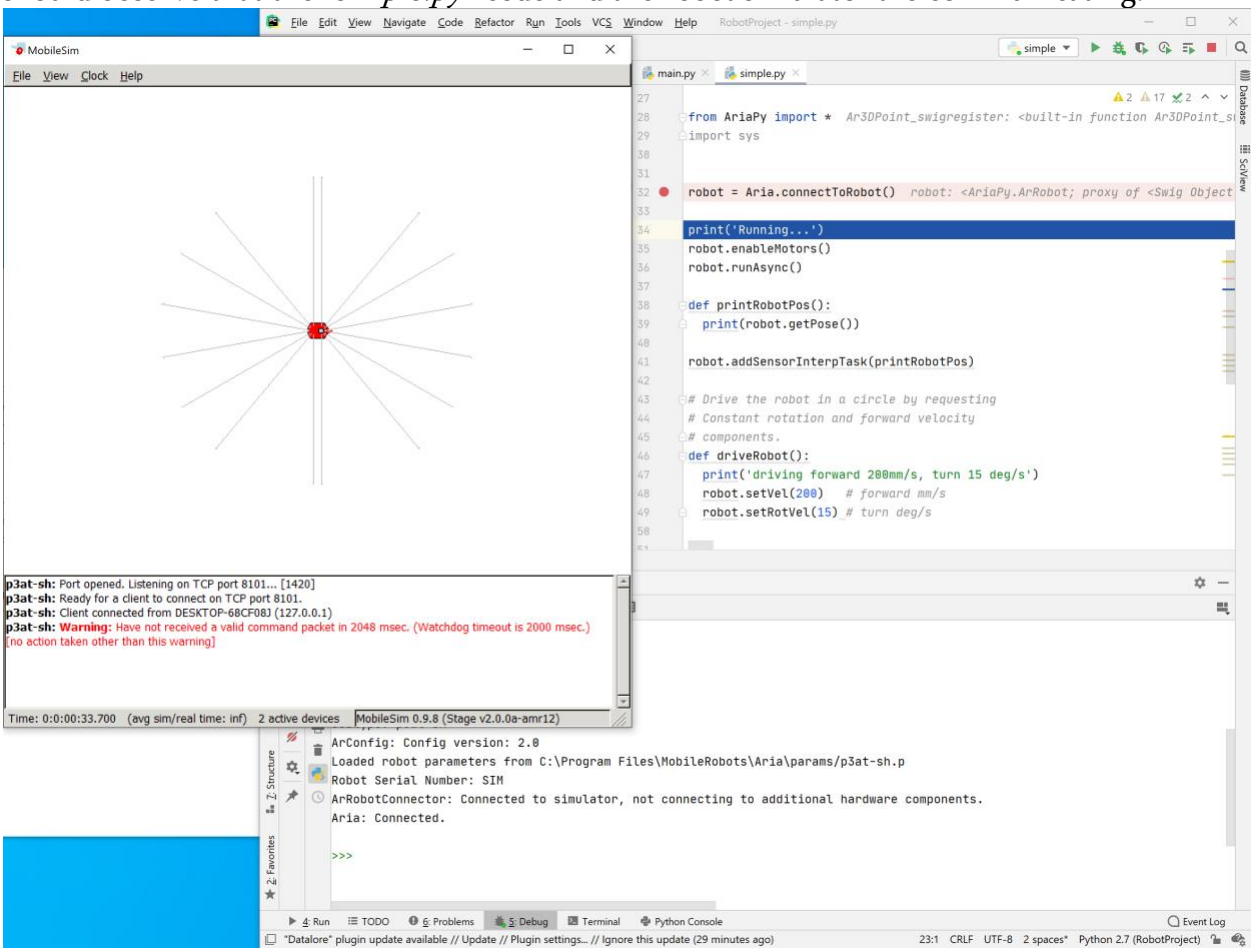


Default location of the MobileSim is *C:\Program Files\MobileRobots\MobileSim*. Note, that it is quite convenient to have a desktop icon for the MobileSim.

3. Start MobileSim with no map and choose the “p3at-sh” model. The model “p3at-sh” will be the default model used in simulations for the duration of this class.



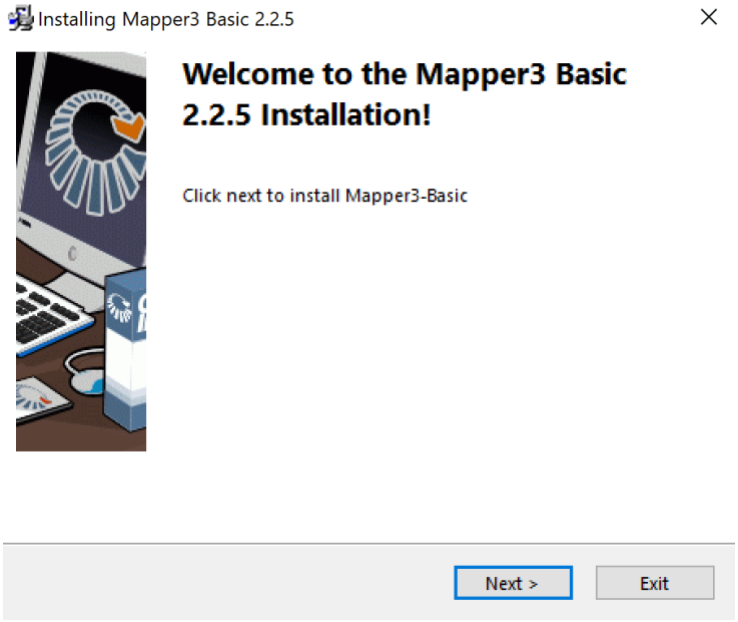
Now if you continue/restart the debugging session in PyCharm with MobileSim running, you should observe that the "*simple.py*" code and the robot simulator are communicating.



This verifies that the key components including the ARIA, Python, PyCharm, and MobileSim are installed properly.

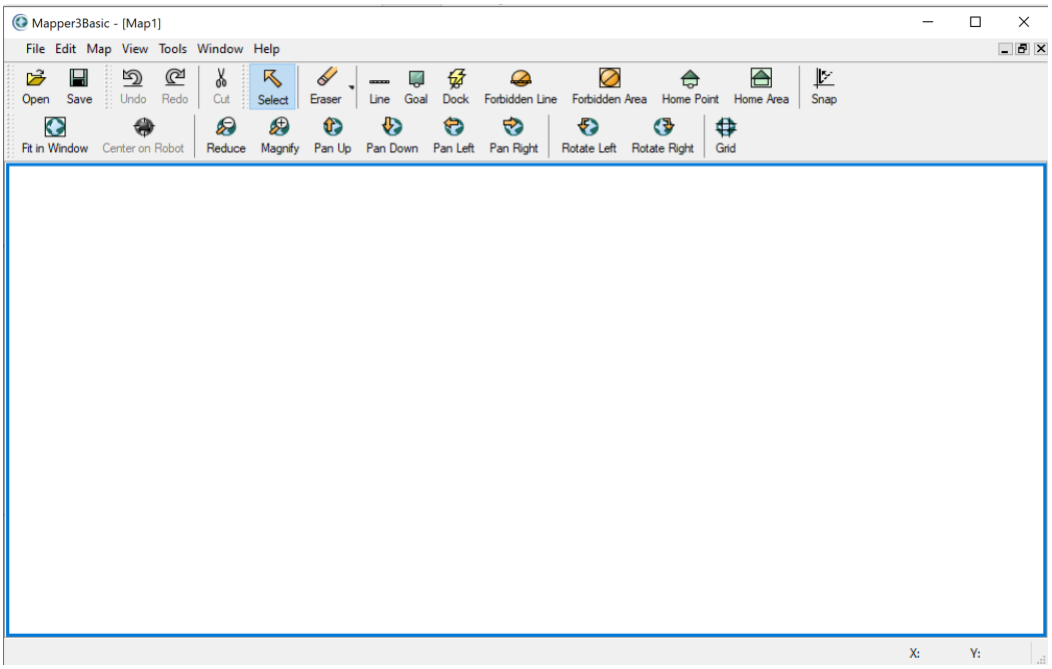
Installing the BasicMapper tool (Optional)

1. Run Mapper3Basic-2.2.5 as an administrator



The defaults installation path is *C:\Program Files\MobileRobots\Mapper3Basic*

2. When starting with a new map design canvas (File\New) the look of the environment should be similar to this:



The successful start and the populated GUI verify the installation.