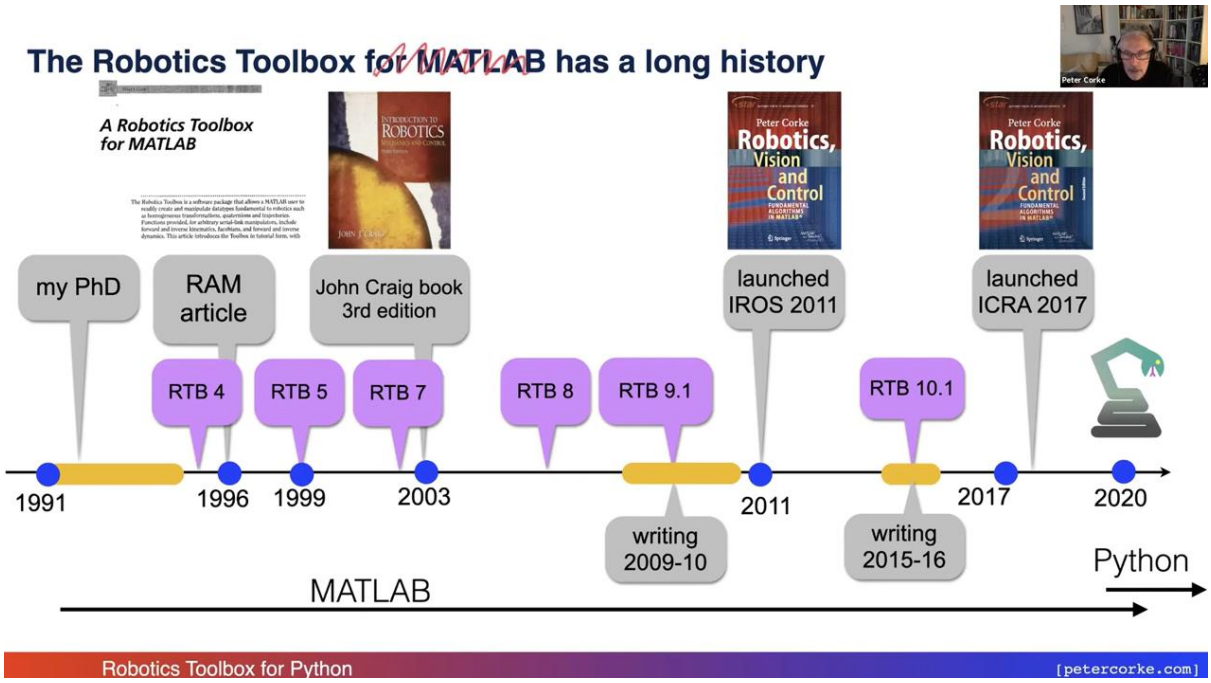
## Robotics Toolbox Guide

**documented by a Robotics and Automation enthusiast from SMME, NUST.**

**V0 dated 9th Nov 2024.**

The following guide concerns the installation and a few tutorial links for the **Robotics Toolbox** by Peter Corke, for both the original MATLAB version and its Python rewrite. The guide is meant for **ME-489 Robotics and Automation** course offered at SMME, NUST for the session fall 2024, although it can be used beyond that, for learners to get up and running into the world of robotics and its real-world tools. Special thanks to **Peter Corke** for developing the toolbox and the respective books **Robotics, Vision & Control**!

https://petercorke.com/toolboxes/robotics-toolbox/




https://www.youtube.com/watch?v=i7OvwbC3tel

**In Peter Corke's words:**

> *I can guarantee that I will not respond to any requests for help with assignments or homework, no matter how urgent or important they might be to you. That's what your teachers, tutors, lecturers and professors are paid to do.*

P. I. Corke, Robotics, Vision & Control: Fundamental Algorithms in MATLAB. Springer, 2011. ISBN 978-3-642 20143-1.

## MATLAB

Get the latest version of MATLAB with a valid student license tied to your work account here:

https://www.mathworks.com/downloads/

Have at least 10GB of free space.

**GitHub Repositories**

https://github.com/petercorke/RVC3-MATLAB

https://github.com/petercorke/robotics-toolbox-matlab

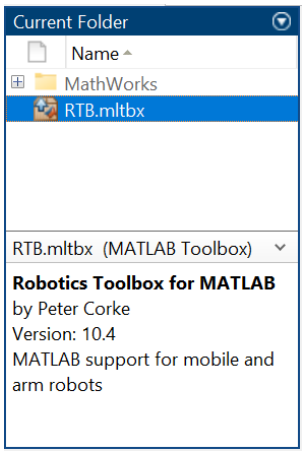
**Install from .mltbx file:**

https://petercorke.com/toolboxes/robotics-toolbox/

1) Ensure MATLAB is installed.
2) From the link above, or directly, download the .mltbx file:

https://petercorke.com/download/27/rtb/1045/rtb10-4-mltbx.mltbx


3) From within the MATLAB file browser double click on the downloaded file, it will install and configure the paths correctly.




4) After installation, run the demo to see what it can do:

```
rtbdemo
```

**Some Tutorials:**

Example codes in the README of the GitHub repository:

https://github.com/petercorke/robotics-toolbox-matlab?tab=readme-ov-file#code-example

LiveScript code for chapters in the book:

https://github.com/petercorke/RVC3-MATLAB/tree/main/book/code

Demos in the repository:

https://github.com/petercorke/robotics-toolbox-matlab/tree/master/demos

Snippets of code, adapted from lecture slides:

https://github.com/mtalirfan/ME-489-Lecture-Code

## Python

### GitHub Repositories

https://github.com/petercorke/RVC3-python

https://github.com/petercorke/robotics-toolbox-python

### A word on IDE, VS Code and Jupyter Notebooks:

**VS Code** is the de-facto industry standard, get it from here:

https://code.visualstudio.com/download

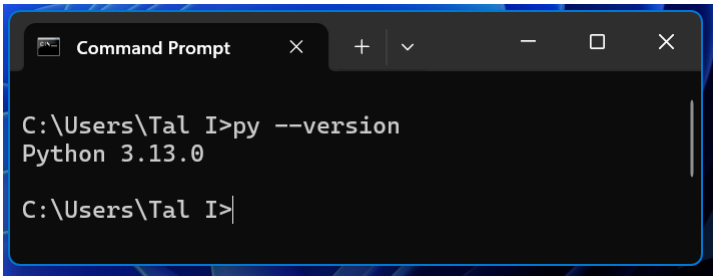
Get the VS Code extension for **Jupyter**:

https://marketplace.visualstudio.com/items?itemName=ms-toolsai.jupyter

### Installation of Python:

1) Get the latest version of Python here: https://www.python.org/downloads/
2) Run the installation.
   **IMPORTANT: CHECK ADD PYTHON.EXE TO PATH,** you'll still go through the process of adding an environment variable to PATH later in the tutorial for MSbuild though.


3) Open CMD and run ***py --version*** to check whether the installation was successful.



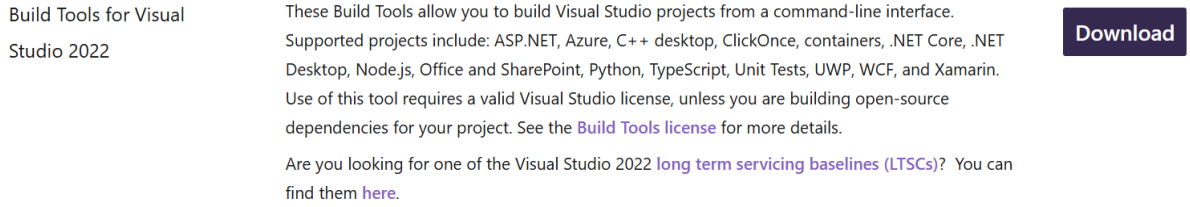
**Installation of Robotics Toolbox for Python:**

Heads-up: This was a very cumbersome process for me as the toolbox package had some dependencies I had not pre-installed. I had to eventually figure it out by searching for fixes, and trial-and-error. Have at least 10GB of free space.

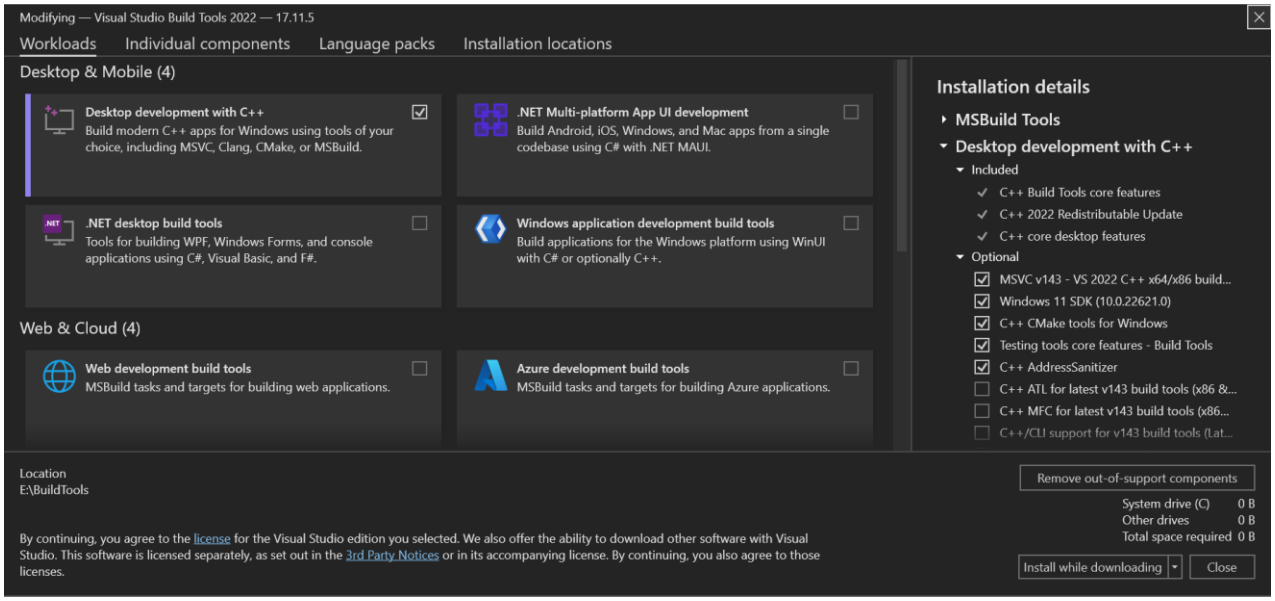
Before you install your toolbox package:

1) Download the installer for **Build Tools for Visual Studio 2022**:

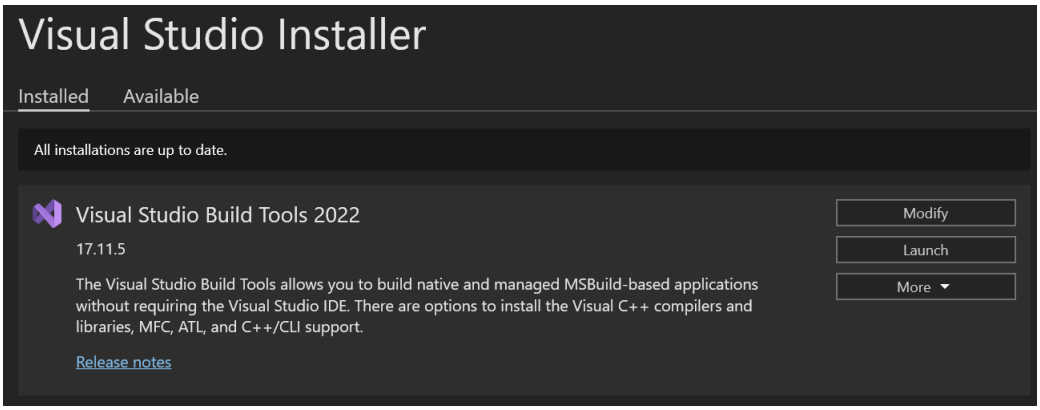
https://visualstudio.microsoft.com/downloads/#build-tools-for-visual-studio-2022




2) Run the installer, let it download and install the initial requirements, then download the Build Tools as follows:



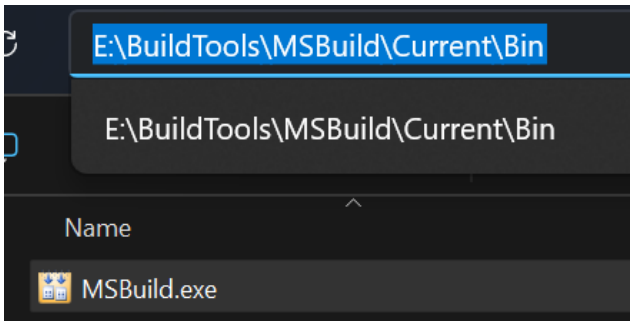

3) When it is downloaded in your desired location, you should have the screen like this:



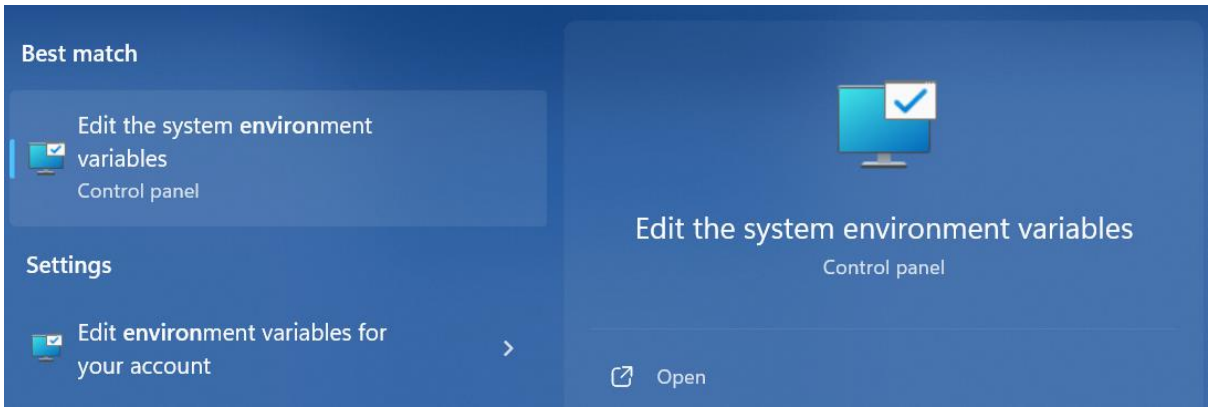
4) Note the installation path and locate MSBuild.exe in the directory since now we need to create an environment variable for MSBuild. It should be in:

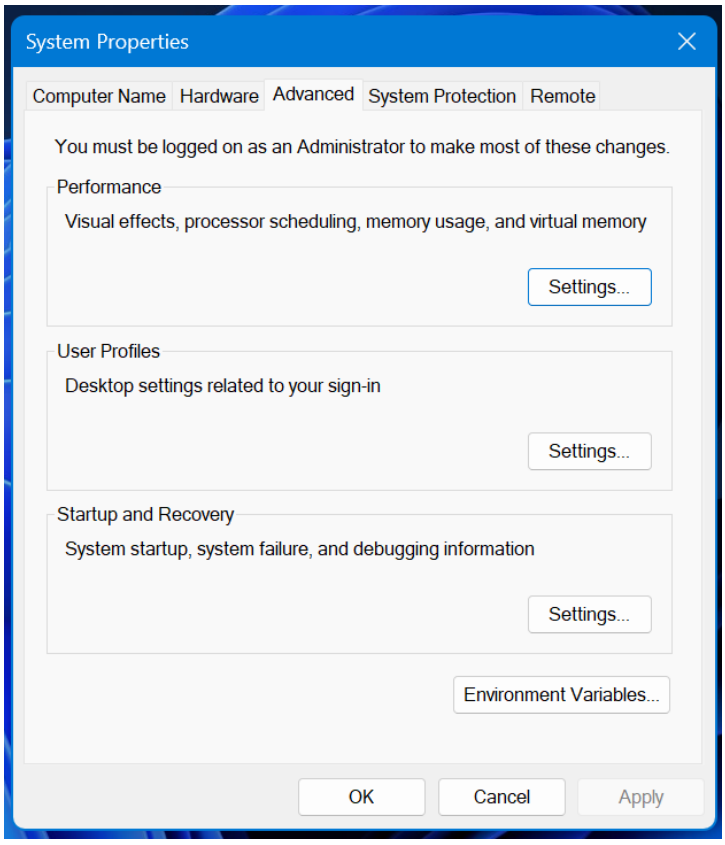
*your_installation_directory\MSBuild\Current\Bin*

Copy this path.

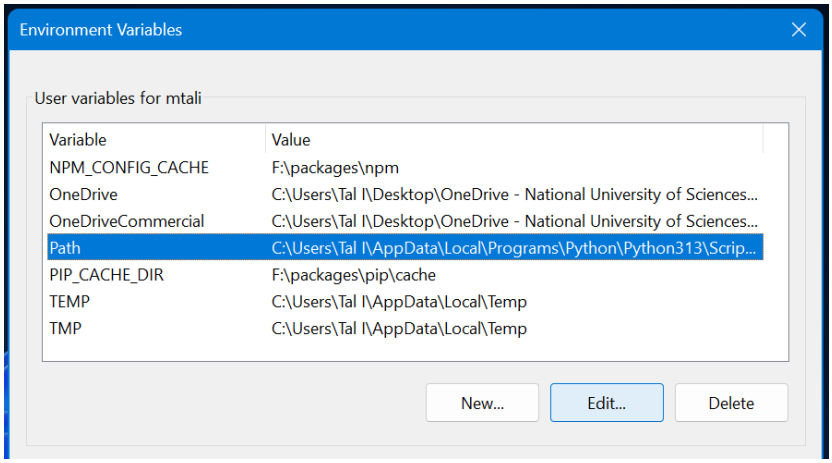



5) In Start Menu, search for the Environment Variables settings:

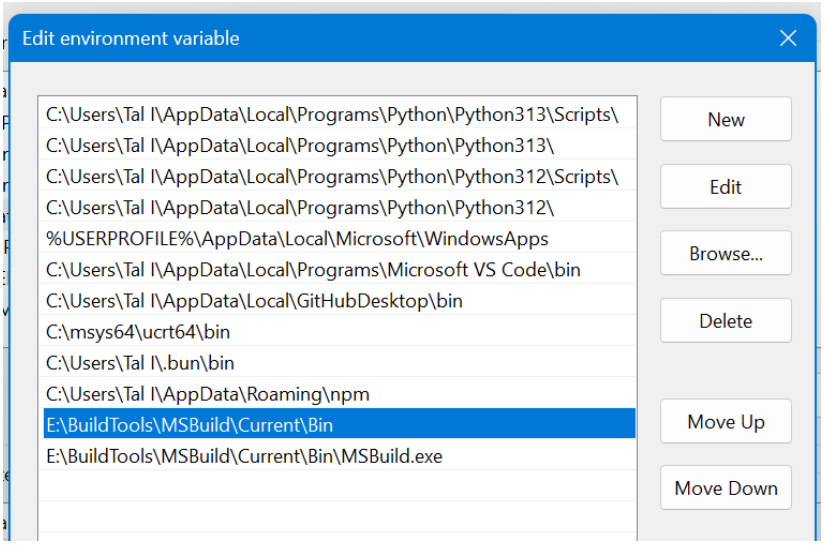


6) Edit the Path variable and create a new one with the MSBuild Path:



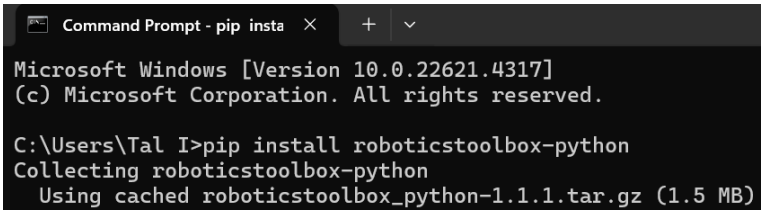

The Python path variables added by the installer are here:




That should be it! Now go to CMD and run the following, and wait until it installs successfully:

```
pip install roboticstoolbox-python
```

(the better option is creating a virtual environment using anaconda to isolate the toolbox environment, skipping it though)




```
Successfully built roboticstoolbox-python spatialgeometry matplotlib numpy swift-sim progress rtb-data
Installing collected packages: rtb-data, progress, distlib, websockets, typing-extensions, six, pyyaml, pyparsing, platformdirs, pill
ow, packaging, numpy, nodeenv, kiwisolver, identify, fonttools, filelock, cycler, colored, cfgv, virtualenv, scipy, python-dateutil,
ansitable, pre-commit, matplotlib, spatialmath-python, spatialgeometry, pgraph-python, swift-sim, roboticstoolbox-python
Successfully installed ansitable-0.11.3 cfgv-3.4.0 colored-2.2.4 cycler-0.12.1 distlib-0.3.9 filelock-3.16.1 fonttools-4.54.1 identif
y-2.6.1 kiwisolver-1.4.7 matplotlib-3.5.1 nodeenv-1.9.1 numpy-1.26.4 packaging-24.2 pgraph-python-0.6.2 pillow-11.0.0 platformdirs-4.
3.6 pre-commit-4.0.1 progress-1.6 pyparsing-3.2.0 python-dateutil-2.9.0.post0 pyyaml-6.0.2 roboticstoolbox-python-1.1.1 rtb-data-1.0.
1 scipy-1.14.1 six-1.16.0 spatialgeometry-1.1.0 spatialmath-python-1.1.13 swift-sim-1.1.0 typing-extensions-4.12.2 virtualenv-20.27.1
 websockets-13.1
```

7) Run ***pip list*** to check your installed packages:

```
C:\Users\Tal I>pip list
Package Version
------- -------
pip     24.3.1
```

```
C:\Users\Tal I>pip list
Package                Version
---------------------- -----------
ansitable              0.11.3
cfgv                   3.4.0
colored                2.2.4
cycler                 0.12.1
distlib                0.3.9
filelock               3.16.1
fonttools              4.54.1
identify               2.6.1
kiwisolver             1.4.7
matplotlib             3.5.1
nodeenv                1.9.1
numpy                  1.26.4
packaging              24.2
pgraph-python          0.6.2
pillow                 11.0.0
pip                    24.3.1
platformdirs           4.3.6
pre_commit             4.0.1
progress               1.6
pyparsing              3.2.0
python-dateutil        2.9.0.post0
PyYAML                 6.0.2
roboticstoolbox-python 1.1.1
rtb-data               1.0.1
scipy                  1.14.1
six                    1.16.0
spatialgeometry        1.1.0
spatialmath-python     1.1.13
```

**Success!**

P.S. Please let me know if you run into issues during the installation process, I will review and update the guide accordingly.

**Some Tutorials:**

Example codes in the README of the GitHub repository:

https://github.com/petercorke/robotics-toolbox-python?tab=readme-ov-file#code-examples

Notebooks for chapters in the book:

https://github.com/petercorke/RVC3-python/tree/main/notebooks

Notebooks in the toolbox repository:

https://github.com/petercorke/robotics-toolbox-python/tree/master/notebooks

Notebooks for **A Tutorial on Manipulator Differential Kinematics**, published in the IEEE Robotics and Automation Magazine: https://github.com/jhavl/dkt