

Pulmonary Toolkit



<https://github.com/tomdoel/pulmonarytoolkit>

Installing the Pulmonary Toolkit

Version 1.5

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Overview

This tutorial covers installing the software you need to run the Pulmonary Toolkit within Matlab, which allows you to develop your own algorithms, and to keep your PTK installation up-to-date using version control.

Topic covered

- Installing Matlab and the Matlab Image Processing Toolbox
- Installing a C++ compiler
- Installing a git client
- Downloading the Toolkit using git
- Updating the Toolkit using git

Requirements

A general understanding of the concepts of git version control, Matlab and C++ compilers. You will need a licence for Matlab version R2010b or later, and the Image Processing Toolbox.

1. Using the Pulmonary Toolkit without Matlab, git or a C++ compiler

If you want to develop your own plugins and scripts, you need to run the Pulmonary Toolkit from Matlab. The rest of this tutorial covers this.

If you **do not** need to develop your own plugins and scripts, you can run the Pulmonary Toolkit without a Matlab license by installing a pre-built release: <https://github.com/tomdoel/pulmonarytoolkit/releases>

Each release has two executables; the PTK GUI runs the full graphical user interface, or you can use PTK Command-Line to run pre-compiled scripts from a command prompt/terminal window or batch file/shell script.

The pre-built releases are compiled using specific versions of Matlab. In order to run them, you will need to install the free Matlab Runtime (MCR) for the exact same version of Matlab. On Windows, you also need to install the free Visual C++ Redistributable. Details are provided on the release page: <https://github.com/tomdoel/pulmonarytoolkit/releases>

Pre-built releases do not provide an update mechanism, and you cannot write your own plugins or scripts.

2. Installing Matlab and the Matlab Image Processing Toolbox

The Pulmonary Toolkit requires **Matlab version R2010b** (also known as release 7.11) or later. The add-on **Matlab Image Processing Toolbox** is also required.

If you don't currently have Matlab installed

Matlab is available for Windows, Linux and Mac. Your IT department may have Matlab licences which you can use on your own machine. You will first need to install Matlab and the Image Processing Toolbox from the Mathworks website (<http://www.mathworks.co.uk>) - this may require you to create a free Mathworks account. You then need to link your account to the licence keys or licence servers provided by your institution.

Installing the Pulmonary Toolkit

If you already have Matlab installed

You can check the Matlab version by typing

```
>> ver
```

in the Matlab command window. You should see something like

```
-----  
MATLAB Version: 8.2.0.701 (R2013b)  
Operating System: Mac OS X Version: 10.8.5 Build: 12F45  
Java Version: Java 1.7.0_11-b21 with Oracle Corporation Java  
HotSpot(TM) 64-Bit Server VM mixed mode  
-----  
MATLAB                               Version 8.2           (R2013b)  
Image Processing Toolbox             Version 8.3           (R2013b)
```

If your Matlab version is less than 7.11, you will need to update. Click on the **Help** menu, and **Check for Updates**.

If your licence is due to expire, you can check for licence updates. In the current version, this is found on the **Home** tab. Click the arrow underneath **Help**, select **Licensing** and click **Update Current Licenses**.

```
$ xcode-select --install
```

3. Installing a C++ compiler

Some parts of the Pulmonary Toolkit require a C++ compiler. Your system may already have a compiler installed, or you may have to install one yourself. Some details are provided below. Please see the Mathworks site <https://uk.mathworks.com/support/compilers.html> for details of which compilers are supported for your version of Matlab.

If you do not install a compiler, some parts of the Toolkit will be very slow, and other parts will not function at all.

Windows

Microsoft provides a free community edition of Visual Studio which can be downloaded from <https://www.visualstudio.com>. Please check supported compiler versions at <https://uk.mathworks.com/support/compilers.html>.

Mac

Apple provides a C++ compiler as part of its free **Command Line Tools**. You can install these from a terminal using the following command:

For older versions of macOS you can install Xcode for free and then install the Command Line Tools from within Xcode. You can also download command line tools from the Apple developer site here: <http://developer.apple.com/downloads>. You may have to create a free developer account.

Warning: when Apple releases a new version of macOS and Xcode, sometimes to get these new compilers to work you need to modify files such as (MATLAB)/bin/maci64/mexopts/clang++_maci64.xml and (MATLAB)/bin/maci64mexopts/clang_maci64.xml and add entries for the new version of the SDK. Mathworks usually update these files in their next Matlab release. Please check the Matlab support sites and Stack Overflow for more information.

Linux

You probably already have the gcc compiler installed - you can check where it is installed by typing the following in a terminal window:

```
$ which gcc
```

Verifying your C++ compiler (optional)

Once you have a C++ compiler installed, you can check that Matlab can find the compiler. To do this, launch Matlab and type the following:

```
>> mex -setup
```

Matlab will attempt to find your compiler. If it successfully finds one or more compilers, they will be listed in the command window. Press the number of the compiler you wish to use.

Compilation problems

The first time you run the Pulmonary Toolkit (see Tutorial 1), it will attempt to run the above command to ensure the C++ compiler is correctly set up. Then it will attempt to automatically compile the C++ files it requires. If there are problems, errors will be reported to the command window. Compilation be attempted a second time when you next run the Toolkit, but if this fails again, then further compilation will not be attempted. Once you fix the compiler you can force the Pulmonary Toolkit to recompile the files using the following commands:

```
>>ptk_main = PTKMain();  
>>ptk_main.Recompile();
```

4. Installing a Git client

The main PTK codebase lives on GitHub: <https://github.com/tomdoel/pulmonarytoolkit>.

git is a common **version control system**. If you have never used version control then I recommend you learn now: <https://git-scm.com/book/en/v2>.

The easiest way to download the Pulmonary Toolkit is to **clone** the repository from GitHub. You can install GitHub Desktop to help you with this, or you can install your own git client. Visual git clients such as SourceTree and GitHub Desktop provide an easy, visual way to download and manage your git repositories. Or if you like using the terminal, you can use the standard git terminal commands that come with git.

I don't recommend downloading the sources as a zip file, because then you lose all the benefits of version control that git provides. If you download the git repository, PTK will offer to automatically update itself when a new version is released, giving you the latest features and bug fixes. This isn't possible if you only download the zip files.

Windows

SourceTree (<https://www.sourcetreeapp.com>) is free but you need to create a free Atlassian account. GitKraken (<https://www.gitkraken.com>) also provides a free version. TortoiseGit integrates directly into Windows Explorer - <https://tortoisegit.org>.

Mac

SourceTree (<https://www.sourcetreeapp.com>) is free but you need to create a free Atlassian account. GitKraken (<https://www.gitkraken.com>) also provides a free version. macOS also includes a command line git client but advanced users may wish to install a newer version using a package manager such as homebrew.

Linux

Linux usually includes a command-line version of git, but you may wish to install a guy such as GitKraken (<https://www.gitkraken.com>). See here: <https://git-scm.com/book/en/v2/Getting-Started-Installing-Git>

5. Downloading the Toolkit using git

Using GitHub Desktop

- Go to GitHub: <https://github.com/tomdoel/pulmonarytoolkit>
- Click **Clone or Download**
- Click **Open in Desktop**
- Select a folder to store your local clone

Using SourceTree

- Open SourceTree
- From the **File** menu, click **New / Clone**.
- Click **+ New Repository**
- Click **Clone from URL**
- In the Source URL, enter <https://github.com/tomdoel/pulmonarytoolkit>
- Choose a destination path
- Click **Clone**

Installing the Pulmonary Toolkit

Using a command-line git client

You can download the Toolkit into a folder called “pulmonarytoolkit” using the following command:

```
$ git clone https://github.com/tomdoel/pulmonarytoolkit.git
```

6. Updating the Toolkit using git

You can update the Toolkit at any time using your git client. Updating will obtain the latest changes to the code, including new features and bug fixes. Updating will preserve any changes you have made to the code on your machine.

```
$ git pull
```

If you have made local changes this could lead to conflicts - please see documentation for git or your git client on how to resolve conflicts.

Automatic updates

If you are on the master branch, PTK will offer to update your code when a new version comes out. PTK will use the git update process so your local changes will be preserved. Please follow the prompts. Updating the .m files might confuse Matlab so if you encounter any problems, restart Matlab after updating.

Using GitHub Desktop

- Open GitHub Desktop.
- Select the Pulmonary Toolkit project
- Click **Update from master**

Using a SourceTree

- Open SourceTree.
- Select the Pulmonary Toolkit project
- Click **pull** to obtain the latest version

7. Running the Toolkit

- Ensure you have Matlab installed and the Matlab Image Processing Toolbox
- Ensure you a C++ compiler installed and working with Matlab
- Clone the latest version of the pulmonarytoolkit repository from GitHub
- Start Matlab
- Navigate to the root folder of the pulmonarytoolkit project (the one containing ptk.m)
- Run the PTK graphical interface using:

```
>> ptk
```

If everything is installed correctly, it will compile the C++ files and you can then import data using the **Import Data** button.