

A manual for installing FASTCORE, COBRA Toolbox V3, IBM CPLEX 12.10 & MATLAB R2019b for MacOS

Due to the multiple issues with CPLEX-MATLAB, [guaranteed comptability versions](#) are recommended (This manual will use the latest comptability **MATLAB R2019b** + **CPLEX 12.10**)

1- Installing MATLAB R2019b

1. Go to <https://nl.mathworks.com/> and create an account using your student/academic email.
2. Sign-in to the same website using your account.
3. Open <https://nl.mathworks.com/downloads/> then click on “Show more” on the left side.
4. Choose R2019b version then download MATLAB installer.
5. Check these MATLAB toolboxes during installing:

Bioinformatics Toolbox (required)
Curve Fitting Toolbox (required)
Optimization Toolbox
Parallel Computing Toolbox
Signal Processing Toolbox
SimBiology
Statistics and Machine Learning Toolbox
Symbolic Math Toolbox

2- Installing CPLEX Optimization Studio 12.10 :

2.1 Downloading CPLEX Optimization Studio 12.10 :

Go to <https://www.ibm.com/academic/topic/data-science>

Register an IBM account with an academic email.

Go back to <https://www.ibm.com/academic/topic/data-science>, and sign in with your account.

Scroll down then click on “Software” on the Left

Click on the arrow below “ILOG CPLEX Optimization Studio “

Click on “Download”

Click on “Search for Software” on the left side.

Search for “IBM ILOG CPLEX Optimization Studio 12.10 for OSX Multilingual (CNZM6ML) “

Click on “HTTP”, then click the checkbox for the OSX version.

Choose “I agree”, the “Download Now”

2.2 Install CPLEX pre-requisites:

Visual Studio for Mac :

<https://visualstudio.microsoft.com/>

Install Python3 through HomeBrew as documented here:

<https://docs.python-guide.org/starting/install3/osx/>

Oracle Java SDK/JRE/JDK

The complete list pre-requisites can be found here:

<http://pic.dhe.ibm.com/infocenter/prodguid/v1r0/clarify-reports/report/html/softwareReqsForProduct?deliverableId=E57328F0919E11E8A5E6A380334DFF95&osPlatform=Mac%20OS>

2.3. Install the CPLEX from the downloaded installer:

-Sometimes a folder (**/Applications/CPLEX_Studio1210/cplex/matlab/x86-64_osx/@Cplex**) is deleted during installation into the *Bin* folder.

So check the parent folder manually (**/Applications/CPLEX_Studio1210/cplex/matlab/x86-64_osx**), and if the @Cplex folder is missing, Please uninstall then reinstall Cplex

Then run this line in MATLAB

```
addpath(genpath('/Applications/CPLEX_Studio1210/cplex/matlab/x86-64_osx/'))
```

If CPLEX is correctly installed, you should find “Cplex” command in MATLAB.

3 Install COBRA Toolbox

1- Download COBRA toolbox from <https://github.com/opencobra/cobratoolbox>

either using git:

➤ `git clone --depth=1 https://github.com/opencobra/cobratoolbox.git cobratoolbox`

Or manually:

> from « Code », click on “Download ZIP”

2- From MATLAB

```
addpath('/PATH OF THE DOWNLOADED COBRA TOOLBOX /')
initCobraToolbox
```

If CPLEX is correctly installed and detected by COBRA Toolbox, you should find this line

```
“ibm_cplex    active          1      1      1      1      ”
```

3- If Cobratoolbox keeps not recognizing CPLEX after restarting MATLAB with
`changeCobraSolver("IBM_CPLEX")`

Create a MATLAB script “CPLEX_fix.m” and add the next 4 lines:

```
rmpath(genpath('/Applications/CPLEX_Studio1210/cplex/matlab/x86-64_osx/'))
changeCobraSolver("glpk"),
addpath('/Applications/CPLEX_Studio1210/cplex/matlab/x86-64_osx/')
changeCobraSolver("IBM_CPLEX")
```

It should return logical 1

Copy these 4 lines in the beginning of any COBRAtoolbox scripts.

4 Download FASTCORE:

Either using git:

○ Git clone <https://github.com/sysbiolux/rFASTCORMICS>

Or manually:

> from « Code », click on “Download ZIP”

From MATLAB:

```
addpath(genpath('/PATH OF THE DOWNLOADED rFASTCORMICS /'))
```

If you are able to call the following functions (and more related functions) in the command window of MATLAB then the installation is done.

- `fastcc_fastcore` (from the fastcore folder)
- `fastcc_4_fastcormics` (from the fastcormics for microarray data folder)
- `fastcormics_RNAseq` (from the fastcormics for RNA-seq data folder)

Debugging the installation

Problem: Failed installation with crashing MATLAB

Solution: you may need to remove *cobratoolbox* and *cplex* paths, and add them again using

```
% Restoring all default paths, please note this would remove paths for other non-default
MATLAB tools
restoredefaultpath
% Adding the CPLEX path
addpath("/Applications/CPLEX_Studio1210/cplex/matlab/x86-64_osx/")
setenv('ILOG_CPLEX_PATH', ("/Applications/CPLEX_Studio1210/cplex/matlab/x86-
64_osx/"))
Cplex % should return Logical 1
% Checking if there is only this path for setfield command:
% "/Applications/MATLAB_R2019b.app/toolbox/matlab/datatypes/setfield.m "
which -all setfield
% Saving permanently the new paths
Savepath
```

Problem: MATLAB is still not detecting Cplex command

1.1 Go to Edit the System Environment Variables (Quickly: enter 'env' in the windows search bar)

Click on Environment Variables...

1.2 In the second box named System variables, check for variables named CPLEX DIR or CPLEX BINARY, click on it and remove it.

Click on New...

1.3 Add the following variable:

Name: ILOG_CPLEX_PATH

Value: /actual/path/to/your/cplex/installation

1.4 Click ok to save the variable.

2.1 Open MATLAB R2019b or below

In the Home/Environment tab, click on Set Path

2.2 Verify that NO path to IBM CPLEX is in the list, else remove it.

At that step, you can also double check that cobratoolbox and rFASTCORMICS folder are properly added.

Click on save to close the Set Path panel.

2.3 In the MATLAB terminal, first load the GLPK solver with `changeCobraSolver('glpk')`, ignore the warnings.

You should receive the logical 1 as a result.

2.4 Add your actual IBM path to MATLAB with the following code:

`addpath('/actual/path/to/your/cplex/installation')` (note: `genpath` is not necessary here and might also be the reason of causing path conflicts)

2.5 Now change the solver to `ibm_cplex` by using `changeCobraSolver('ibm_cplex')`

This should give you a logical 1 as answer and you are ready to go.

2.6 Happy modeling.

The steps of 2.1 - 2.3 need to be repeated in each new MATLAB session (from the command window if you are using live script) if you plan to use the `ibm_cplex` solver.

Problem: COBRA toolbox is not detecting git during installation

In the terminal: run

```
sudo xcode-select --reset
```

Problem: Version compatibility (MATLAB is crashing due to version compatibility with CPLEX)

Solution: Other MATLAB [guaranteed compatibility versions](#) can be also tested:

CPLEX 12.10 + MATLAB 2019b (or older till 2015b 8)

CPLEX 12.9 + MATLAB 2018b (or older till 2015b 8)

CPLEX 12.8 + MATLAB 2017b 9.3 (or older till 2015b 8)

Problem: MATLAB is crashing without printing error message about CPLEX

Solution: Run MATLAB as superuser (Not recommended, Be careful of possible security vulnerability)

```
sudo "/Applications/MATLAB_R2019b.app/bin/matlab"
```