

Tutorial category: Normal mode

Installation & first startup



Version 1.2

Date 10/02/2020

Official MadAnalysis 5 website : <https://launchpad.net/madanalysis5/>

Goals of this tutorial

- Having a release of MadAnalysis 5 installed on your machine and working properly.
- Understanding the initialization sequence at the MadAnalysis startup
- Editing the installation_options card if necessary.
- Installing Zlib, FastJet, Delphes or the PAD with the MadAnalysis 5 console.

Requirements

- An access to Internet.



Part 1

Dependencies

Mandatory dependencies

- MadAnalysis 5 required several programs for working. These programs must be installed *a priori* on your system.

Mandatory packages	Release	Link
PYTHON	2.6 or a more recent version (but not the 3.X series)	https://www.python.org/
GNU GCC compiler	4.X.X or more recent version	https://gcc.gnu.org/
Makefile	No trouble	https://www.gnu.org/software/make/

Optional dependencies for histogramming

- MadAnalysis 5 can use the functionalities of other programs if they are installed. These packages are called “optional dependencies” in the sense that if they are not detected, MadAnalysis 5 will deactivate the corresponding functionality.

Optional packages	Release	Link
MATPLOTLIB	1.0.1 or more recent version	http://matplotlib.org/
ROOT	5.27 or a more recent version	https://root.cern.ch/
GNUPLOT AVAILABLE SOON	4.6 or more recent version	http://www.gnuplot.info/
LATEX/PDFLATEX	x	x

Optional dependencies for data processing

- MadAnalysis 5 can use the functionalities of other programs if they are installed. These packages are called “optional dependencies” in the sense that if they are not detected, MadAnalysis 5 will deactivate the corresponding functionality.

Optional packages	Release	Link
ZLIB	-	https://www.zlib.net/
FASTJET / FJETCONTRIB	-	http://fastjet.fr/
ROOT	5.27 or a more recent version	https://root.cern.ch/
DELPHES	To be installed from the MadAnalysis 5 console	https://cp3.irmp.ucl.ac.be/projects/delphes

Optional dependencies for reinterpretation

- MadAnalysis 5 can use the functionalities of other programs if they are installed. These packages are called “optional dependencies” in the sense that if they are not detected, MadAnalysis 5 will deactivate the corresponding functionality.

Optional packages	Release	Link
SCIPY	-	https://www.scipy.org/
PAD	To be installed from the MadAnalysis 5 console	http://madanalysis.irmp.ucl.ac.be/wiki/PublicAnalysisDatabase
PADFORSF	To be installed from the MadAnalysis 5 console	http://madanalysis.irmp.ucl.ac.be/wiki/PublicAnalysisDatabase
PYHF (HISTFACTORY)	-	https://scikit-hep.org/pyhf/index.html

Part 2

Downloading MadAnalysis 5

First way: downloading a tarball

- The package can be download from the **Launchpad** framework: <https://launchpad.net/madanalysis5>

MAD Analysis 5 MadAnalysis 5

Overview Code Bugs Blueprints Translations Answers

Registered 2013-04-13 by Eric Conte

MadAnalysis 5 is a framework for phenomenological investigations at particle colliders. Based on a C++ kernel, this program allows to efficiently perform, in a straightforward and user-friendly fashion, sophisticated physics analyses of event files such as those generated by a large class of Monte Carlo event generators.

MadAnalysis 5 can also be used for the recasting of existing LHC analyses. These features are documented on the MA5 PAD (public analysis database), together with instructions to implement new analyses (see <http://madanalysis.irmp.ucl.ac.be/wiki/PublicAnalysisDatabase>).

Download

The latest stable version of the MadAnalysis 5 package can be obtained in two ways:

- directly from the Bazaar versioning system by typing in a shell:
`bzr branch lp:madanalysis5`
- as a tarball (to be downloaded from the right side of this page).

The v1.4 main improvements are:

- Root is now optional and Pyroot is not a requirement anymore; this should solve all the compilation issues we had in the past.
- Matplotlib can be used as a plotting module if root is not present.
- The layout of the figures generated in the normal mode of running of the code has been improved.
- The recasting module and the associated PAD installation and running have been simplified.
- The necessary developments for a full embedding in MadGraph5 has been performed. This should become public shortly.

Installation

Change details
Sharing
Subscribe to bug mail
Edit bug mail

Get Involved

Report a bug
Ask a question
Help translate

Configuration Progress

Configuration options

Downloads

Latest version is v1.4
MadAnalysis5_v1.4.tar.gz
released on 2016-07-20

First way: downloading a tarball

- Then unpacking the tarball

```
tar xvzf MadAnalysis5_v1.X.tgz  
cd V1.X
```

Second way: using Bazar

- Checking that Bazar is installed on your system.

```
bzr version
```

- You can download the latest stable public release of MadAnalysis 5 by issuing the following command:

```
bzr branch lp:madanalysis5  
cd madanalysis5  
chmod +X bin/ma5
```

- This technique will allow you to update usually your version of MadAnalysis 5 with a Bazar command (to to inside the `madanalysis5` folder):

```
bzr up
```

Third way: from MG5_aMC@NLO

MadAnalysis 5 can install directly from the console of MG5_aMC@NLO. Assuming that MG5_aMC@NLO is installed on your machine and you launch the program, you have to type the command line:

```
MG5_aMC>install MadAnalysis5
```

When you create a new job, you have the possibility to activate MadAnalysis 5.

```
The following switches determine which programs are run:
/===== Description =====|===== values =====|===== other options =====\
| 1. Choose the shower/hadronization program      | shower = OFF                | Pythia8                | |
| 2. Choose the detector simulation program        | detector = Not Avail.       | Please install module  |
| 3. Choose an analysis package (plot/convert)    | analysis = MadAnalysis5     | OFF                    |
| 4. Decay onshell particles                      | madspin = OFF               | ON|onshell             |
| 5. Add weights to events for new hypp.         | reweight = OFF              | ON|indirect            |
\=====
```

Third way: from MG5_aMC@NLO

And to edit cards corresponding to different levels of simulation:

- Parton level
- Hadron level
- Detector level

```
Do you want to edit a card (press enter to bypass editing)?  
/-----\  
| 1. param           : param_card.dat      |  
| 2. run             : run_card.dat        |  
| 3. madanalysis5_parton : madanalysis5_parton_card.dat |  
\-----/
```

Part 3

First startup of MadAnalysis

Initialization of MadAnalysis 5

- Then MadAnalysis will begin its sequence of initialization.
- This phase is split in different parts:
 1. *Operator system detection*
 2. *Reading of user settings*
 3. *Package detection*
 4. *Choice of the graphical renderer*
 5. *Core library (SampleAnalyzer) building* (done only the first time the program is run)
 6. *Loading of particle labels*

Package detection, step 1

- Then MadAnalysis will detect automatically the packages installed on your system.

```

MA5: Platform: Linux 2.6.18-404.el5 [Linux mode]
MA5: Reading user settings ...
MA5: Checking mandatory packages:
MA5:     - Python [OK]
MA5:     - GNU GCC g++ [OK]
MA5:     - GNU Make [OK]
MA5: Checking optional packages devoted to data processing:
MA5:     - Zlib [OK]
MA5:     - FastJet [OK]
MA5:     - Root [OK]
MA5:     - Delphes [OK]
MA5:     - Delphes-MA5tune [DISABLED]
  
```

} If one of these programs is not installed, MA5 cannot run. Big problem!

} If one of these programs is not installed, MA5 can run. Don't worry!

Core library compilation

- MadAnalysis 5 is based on a core library written in C++ and called “SampleAnalyzer”. At the first run, the program will compile automatically the core library and launch tests to be sure that everything works properly.

```

MA5: Checking the MadAnalysis 5 core library:
MA5:  => First time that MadAnalysis 5 is launched.
MA5:
MA5:  *****
MA5:                Building SampleAnalyzer libraries
MA5:  *****
MA5:  How many cores for the compiling? default = max = 16
MA5:  => Number of cores used for the compilation = 16
MA5:  Writing the setup files ...
MA5:  Writing all the Makefiles ...
MA5:  *****
MA5:  Component 1/13 - test program: SampleAnalyzer configuration
MA5:    - Cleaning the project before building the test program ...
MA5:    - Compiling the source files ...
MA5:    - Linking the test program ...
MA5:    - Checking that the test program is properly built ...
MA5:    - Cleaning the project after building the test program ...
MA5:    - Running the test program ...

```

Core library compilation

- MadAnalysis 5 is based on a core library written in C++ and called “SampleAnalyzer”. At the first run, the program will compile automatically the core library and launch tests to be sure that everything works properly.
- This compilation is done only one time. If you restart MadAnalysis 5, no more compilation is needed.
- Besides, at the beginning of each session, MadAnalysis 5 detects if your system has changed since the last compilation. If MadAnalysis 5 detects any relevant change, it will build automatically the library.

Package detection, step 2

- MadAnalysis 5 requires extra programs for applying recast LHC-experiment analyses and reinterpreting experimental results. . It will detect automatically the presence of such programs.

```
MA5: Checking optional packages devoted to reinterpretation:
MA5:      - SciPy                [OK]
MA5:      - PAD                  [OK]
MA5:      - PADForMA5tune        [DISABLED]
MA5:      - PADForSFS           [OK]
MA5:      - pyhf                 [OK]
```

- Unlike to the previous packages, the presence or the non presence of these packaga does not have an influence on the SampleAnalyzer library.

Package detection, step 3

- MadAnalysis 5 requires extra programs for producing plots. It will detect automatically the best programs to use for this goal. If none of this programs are found, no plots will be produced.

```
MA5: Checking optional packages devoted to histogramming:  
MA5:      - Root                      [OK]  
MA5:      - Matplotlib                 [OK]  
MA5:      - gnuplot                    [OK]  
MA5:      - pdflatex                   [OK]  
MA5:      - latex                       [OK]  
MA5: Package used for graphical rendering: Root
```

- If several programs are detected (among Matplotlib, ROOT and gnuplot), MadAnalysis 5 will choose a default one for the plots according to the following hierarchy:
1. ROOT, 2. Matplotlib, 3. Gnuplot
- Of course, thisS automated choice can be modified by user.

Loading particle labels

- In MadAnalysis 5, each particles are named by a label. These labels are defined in text files that the program loads at the beginning of the session.

```

*****
MA5: Particle labels exported from madanalysis/input/particles_name_default[...]
MA5:  => 87 particles successfully exported.
MA5: Multiparticle labels exported from madanalysis/input/multiparticles_[...]
MA5:  => Creation of the label 'invisible' (-> missing energy).
MA5:  => Creation of the label 'hadronic' (-> jet energy).
MA5:  => 8 multiparticles successfully exported.

```

- If MadAnalysis 5 initialization is finished normally, the MA5 prompt appears at the screen, inviting the user to type commands.

```

ma5>

```


Part 4

User settings related to installation

Installation_options card

- The user should edit the configuration card:

```
madanalysis/input/installation_options.dat
```

```
# WARNING! MA5 SHOULD DETECT AUTOMATICALLY YOUR CONFIGURATION
# IF THIS AUTOMATED MODE FAILS, YOU CAN FORCE SOME
# OPTIONS THROUGH THIS FILE

# ----GENERAL----
# tmp_dir = /tmp/ma5/
# download_dir = /tmp/downloadma5/
# webaccess_veto = 0 # 0=No, 1=Yes

# -----ROOT-----
# root_veto      = 0 # 0=No, 1=Yes
# root_bin_path = /home/root/bin

# -----MATPLOTLIB-----
# matplotlib_veto = 0 # 0=No, 1=Yes

# -----GNUPLOT-----
# gnuplot_veto = 1 # 0=No, 1=Yes

# -----DELPHES-----
# delphes_veto      = 0 # 0=No, 1=Yes
# delphes_includes = /home/delphes/delphes/include/
# delphes_libs      = /home/delphes/delphes/lib/
```

Installation_options card

```
# -----DELPHESMA5TUNE-----  
# delphesMA5tune_veto      = 0 # 0=No, 1=Yes  
# delphesMA5tune_includes = /home/delphesMA5tune/include  
# delphesMA5tune_libs     = /home/delphesMA5tune/lib  
  
# -----ZLIB-----  
# zlib_veto      = 0 # 0=No, 1=Yes  
# zlib_includes = /home/zlib/include/  
# zlib_libs     = /home/zlib/lib/  
  
# -----FASTJET-----  
# fastjet_veto      = 0 # 0=No, 1=Yes  
# fastjet_bin_path = /home/fastjet/build/bin/  
  
# -----PAD-----  
# pad_veto = 0 # 0=No, 1=Yes  
# pad_build_path = /home/PAD/build/  
  
# -----PADForMA5Tune-----  
# padma5_veto = 0 # 0=No, 1=Yes  
# padma5_build_path = /home/PADForMA5tune/build/  
  
# -----PDFLATEX-----  
# pdflatex_veto = 0 # 0=No, 1=Yes  
  
# -----LATEX-----  
# latex_veto = 0 # 0=No, 1=Yes  
  
# -----SCIPY-----  
# scipy_veto = 0 # 0=No, 1=Yes
```

- Piece of text following a '#' character is a comment.
- Case insensitive except for path names.

Installation_options card

- MadAnalysis 5 can generate a new installation_options card with default values by typing at the prompt the command:

```
./bin/ma5 --installcard
```

or equivalently:

```
./bin/ma5 -i
```

Part 5

Installing extensions with the MadAnalysis console

The install command

- Many extensions to MadAnalysis 5 could be installed very easily and quickly with the install command.
- Start a new session of MadAnalysis 5 and issue the command line at the prompt:

```
ma5> install <package name>
```

List of package name :

```
samples  
fastjet  
zlib  
delphes  
delphesMA5tune  
PAD  
PADForSFS  
PADForMA5tune
```

- For some packages, MadAnalysis 5 can ask to restart the session.

Example

- For achieving the next tutorials, it is advised to install the extension called 'samples' containing some example samples.

```

MA5:
MA5: *****
MA5:             Installing samples
MA5: *****
MA5: Detecting a previous installation ...
MA5: => no
MA5: Creating a devoted folder ...
MA5: Downloading the package ...
MA5:   - 1/4 http://madananalysis.irmp.ucl.ac.be/raw-
      attachment/wiki/samples/ttbar_sl_1.lhe.gz ...
      Download 391.24K of 391.24K (100.0%)
MA5:   - 2/4 http://madananalysis.irmp.ucl.ac.be/raw-
      attachment/wiki/samples/zz.lhe.gz ...
      Download 240.34K of 240.34K (100.0%)
MA5:   - 3/4 http://madananalysis.irmp.ucl.ac.be/raw-
      attachment/wiki/samples/ttbar_fh.lhe.gz ...
      Download 389.05K of 389.05K (100.0%)
MA5:   - 4/4 http://madananalysis.irmp.ucl.ac.be/raw-
      attachment/wiki/samples/ttbar_sl_2.lhe.gz ...
      Download 391.26K of 391.26K (100.0%)
MA5:   Checking the installation ...
MA5:   Installation complete.
MA5:   => Status: [OK]
MA5: *****

```




About this document

- The present document is a part of the tutorial collection of the package MadAnalysis 5 (MA5 in abbreviated form). It has to be conceived to explain in a practical and graphical way the functionalities and the various options available in the last public release of MA5.
- The up-to-date version of this document, also the complete collection of tutorials, can be found on the MadAnalysis 5 website :

<https://madanalysis.irmp.ucl.ac.be/wiki/tutorials>

- Your feedback interests ourselves (bug reports, questions, comments, suggestions). You can contact the MadAnalysis 5 team by the email address : ma5team@iphc.cnrs.fr

