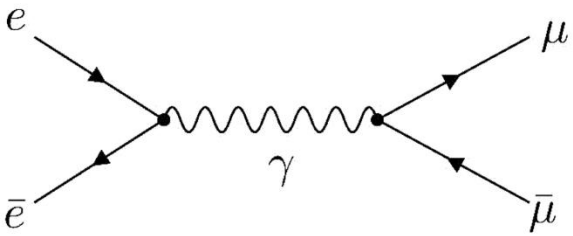
FEYNRULES, FEYNARTS AND FEYNCALC. INSTALLATION AND LAUNCH

AN INTRODUCTION TO MATHEMATICA TOOLS FOR HEP

MARTÍNEZ MARTÍN, JAVIER



- Wolfram Mathematica for High-Energy Physics
- FeynRules, FeynCalc, FeynArts
- MadGraph5_aMC@NLO

13-16 June 2025
UCM-IPARCOS, Madrid

Organization (UCM-IPARCOS):
Javier Martínez Martín
Carlos Quezada Calonge
Alexandre Salas-Bernárdez
Juan José Sanz Cillero

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FEYNRULES

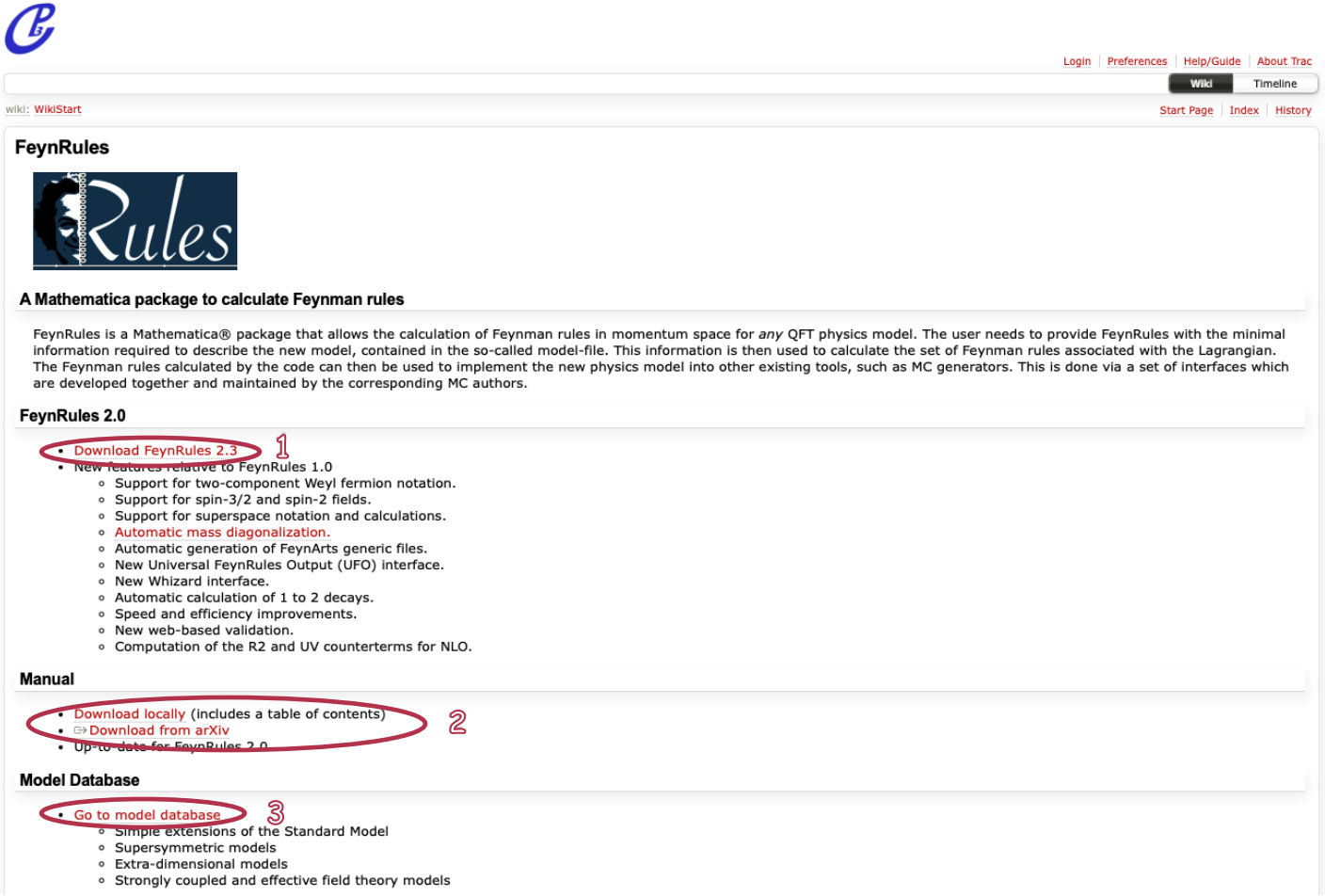
INSTALLATION

FEYNRULES. INSTALLATION

- Access the web:

https://feynrules.irmp.ucl.ac.be

FEYNRULES. INSTALLATION



1. Download the FeynRules package

For later:

2. Download the Manual

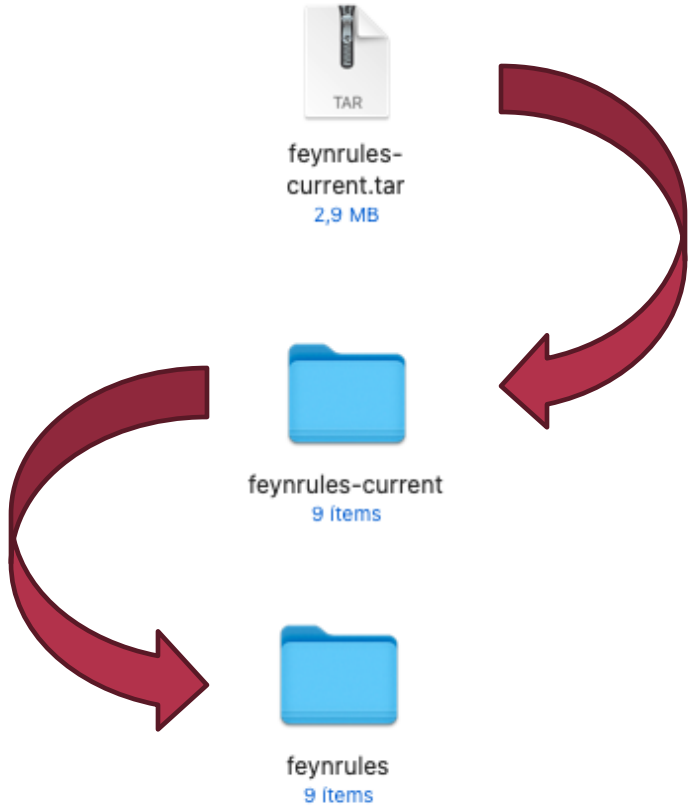
3. Find pre-built QFT

FEYNRULES. INSTALLATION

- Unzip the feynrules-current.tar file

- Rename the new folder to feynrules

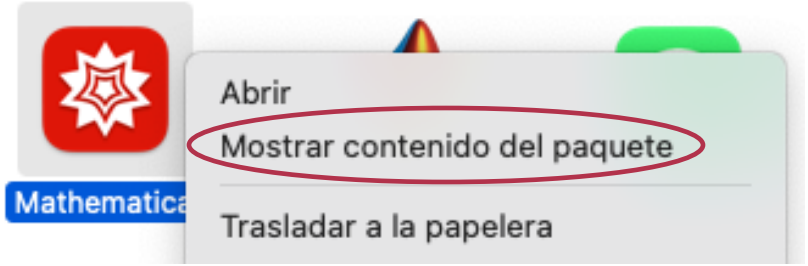
  (You can choose another one actually later)



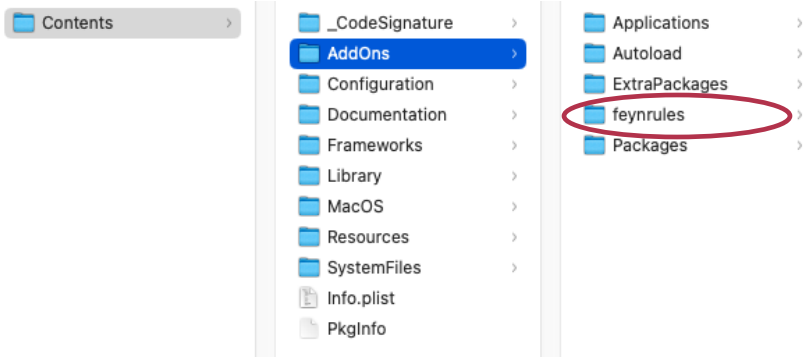
FEYNRULES. INSTALLATION

MacOS

- Copy the feynrules folder



- Access the contents of your Mathematica installation



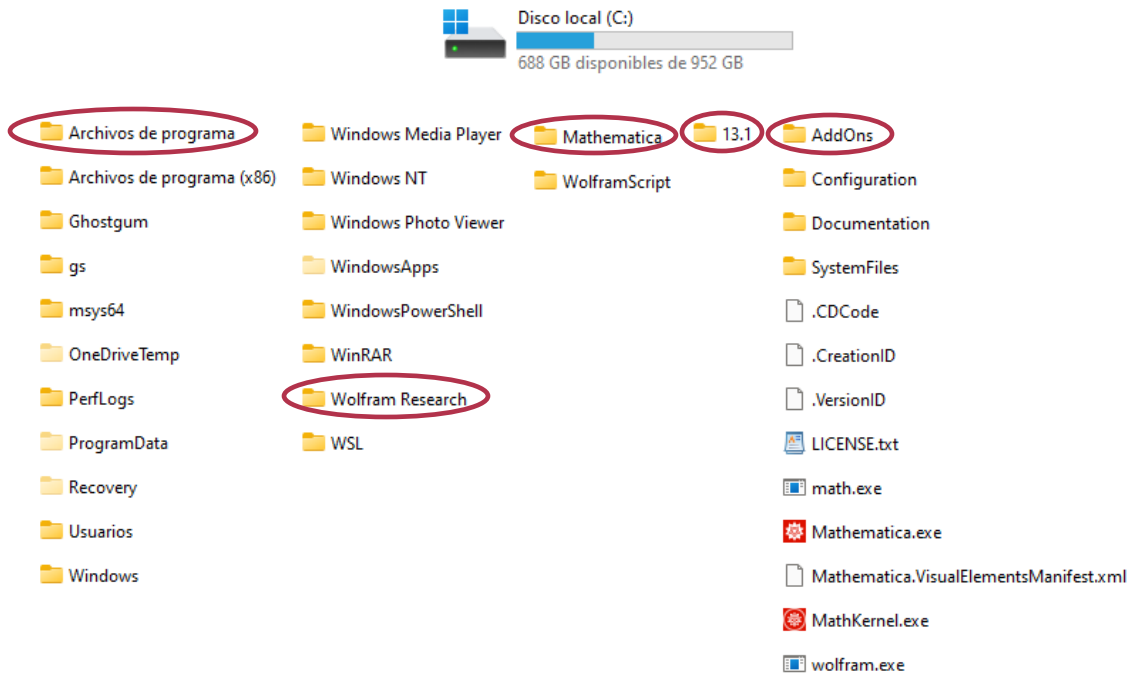
- Go to Contents > AddOns and paste it there

DONE!

FEYNRULES. INSTALLATION

- Copy the feynrules folder
- Access the contents of your Mathematica installation
- Go to Contents > AddOns and paste it there

Windows



DONE!

FEYNRULES. INSTALLATION

- Copy the feynrules folder

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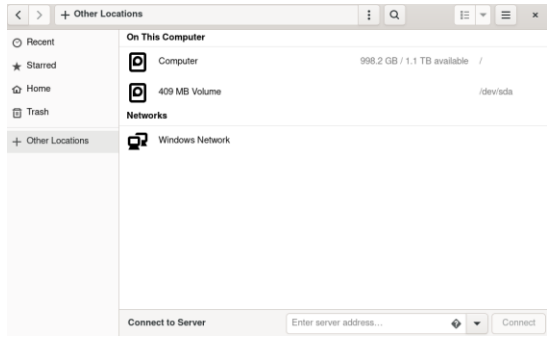
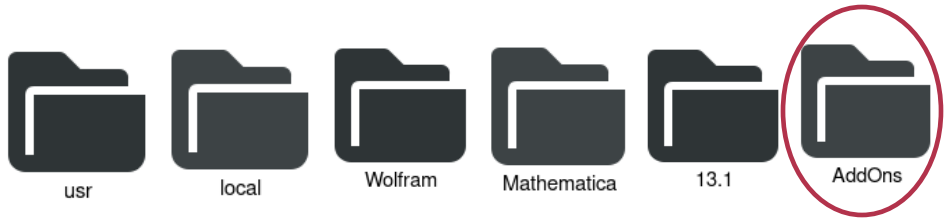
Linux





DONE!

FEYNRULES

LAUNCH

MACOS - WINDOWS - LINUX

FEYNRULES. LAUNCH

- Open a new Mathematica notebook

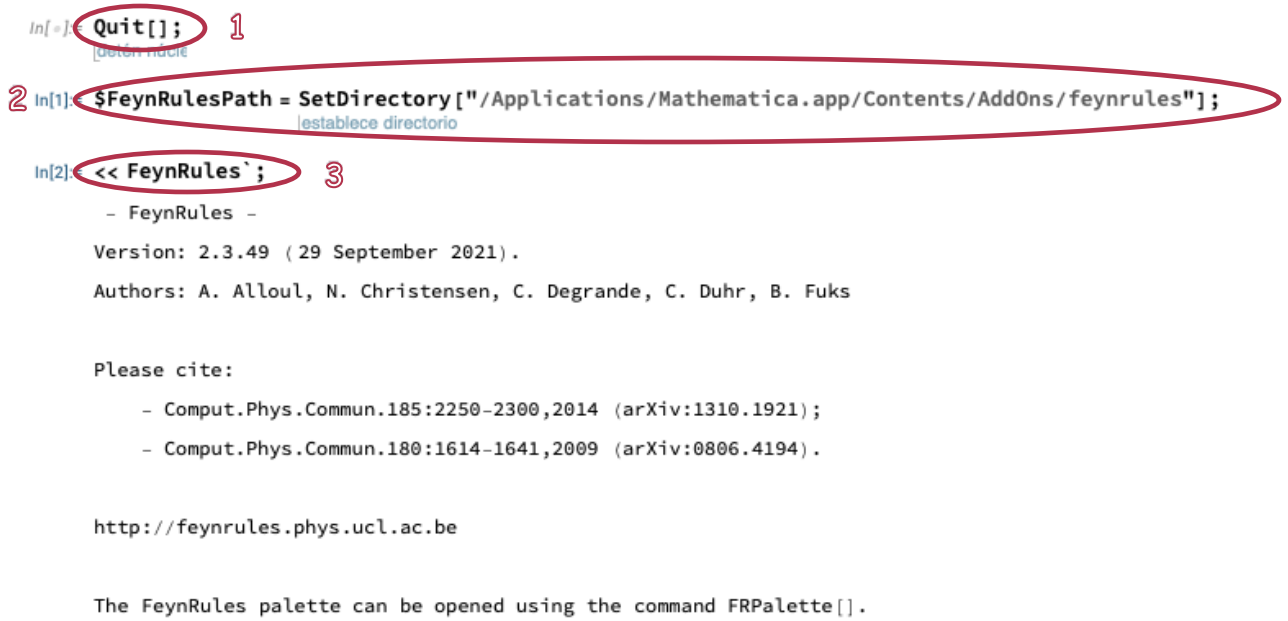
1. Write and execute the command

```
Quit[];
```

This will terminate the kernel, losing any definitions previosly made

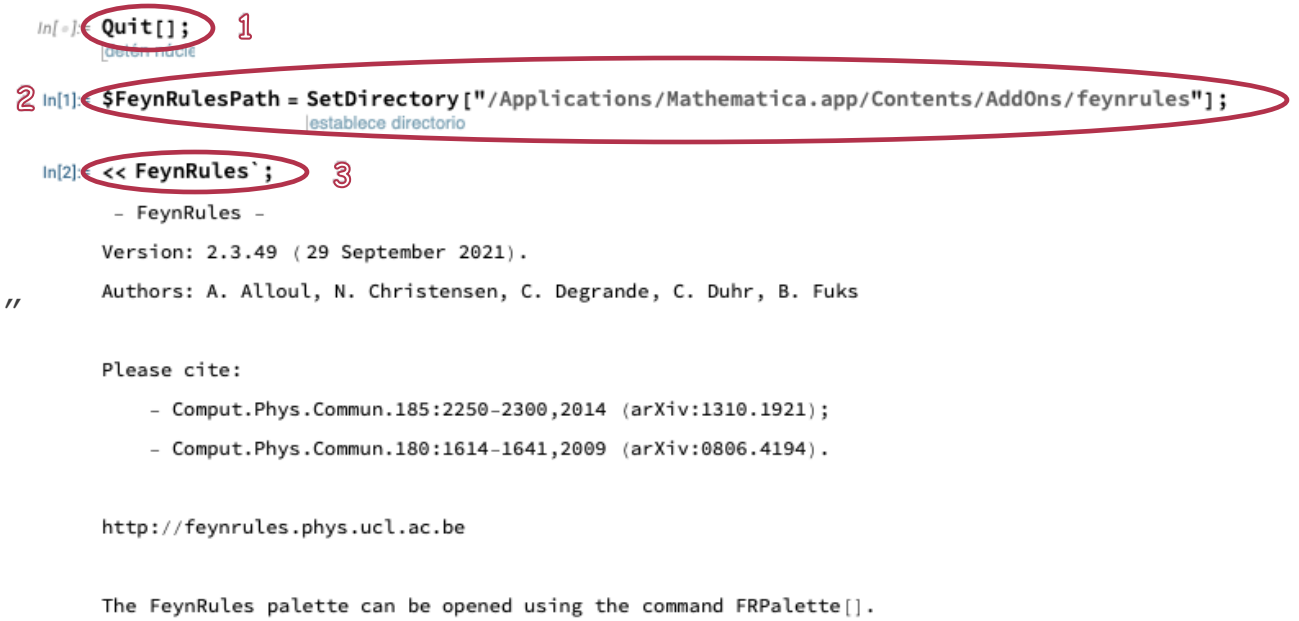
It is needed because FeynRules needs to be executed clean

MacOS



FEYNRULES. LAUNCH

MacOS



2. Write and execute the command

   `$FeynRulesPath = SetDirectory["…/feynrules"`

This will tell the notebook where to look for the FeynRules installation

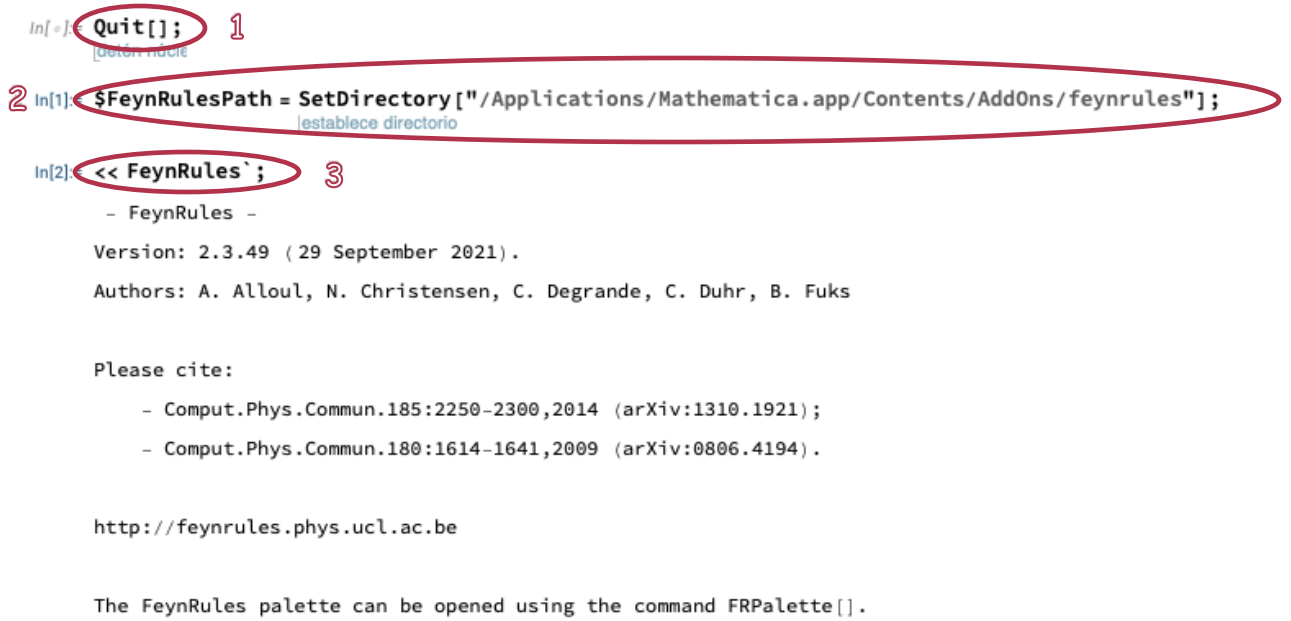
FEYNRULES. LAUNCH

3. Write and execute the command

```
<< FeynRules`;
```

This will launch FeynRules

MacOS



DONE!

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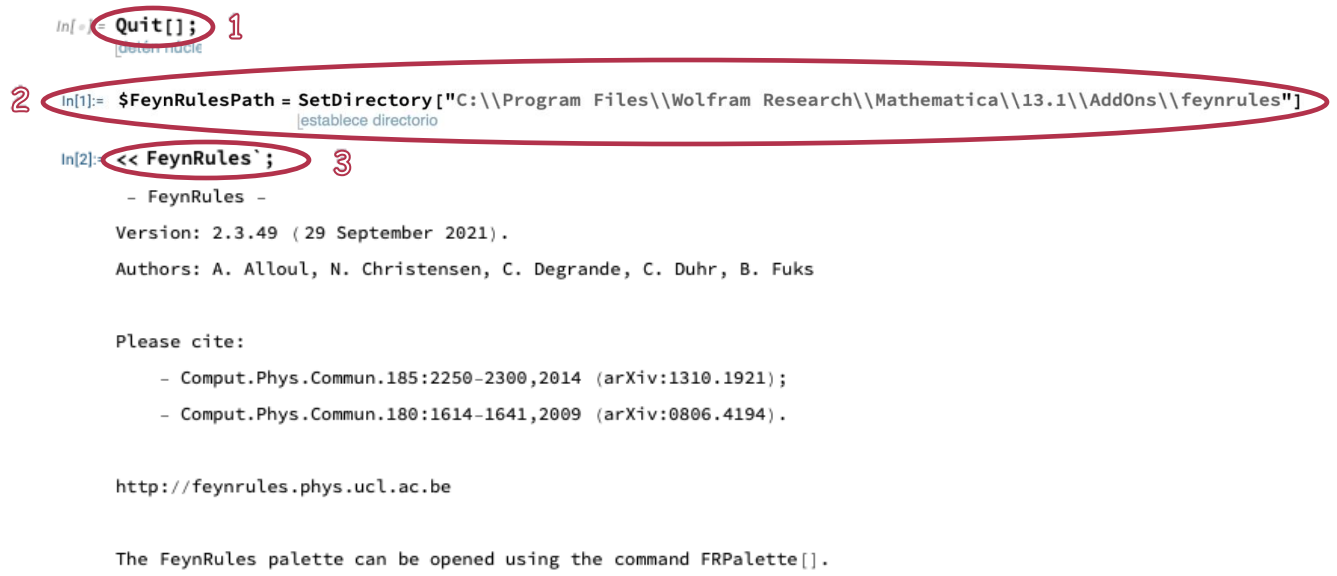
Windows



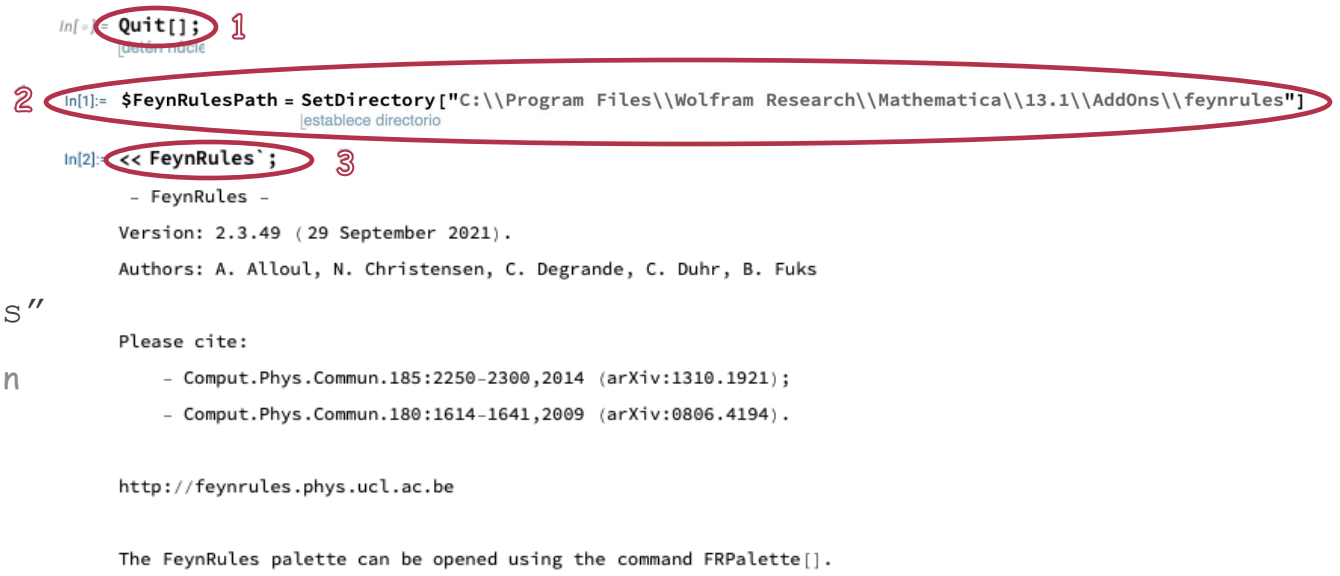
FEYNRULES. LAUNCH

2. Write and execute the command

   `$FeynRulesPath = SetDirectory["…/feynrules"`

This will tell the notebook where to look for the FeynRules installation

Windows



FEYNRULES. LAUNCH

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```
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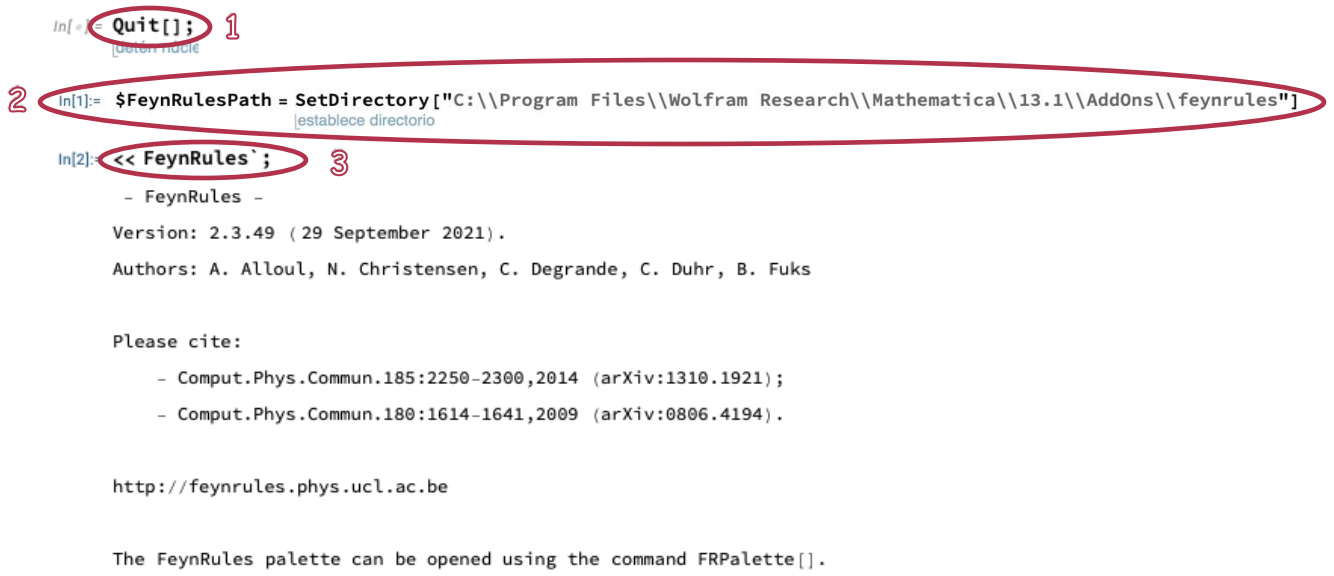
Windows



DONE!

FEYNRULES. LAUNCH

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Quit[];
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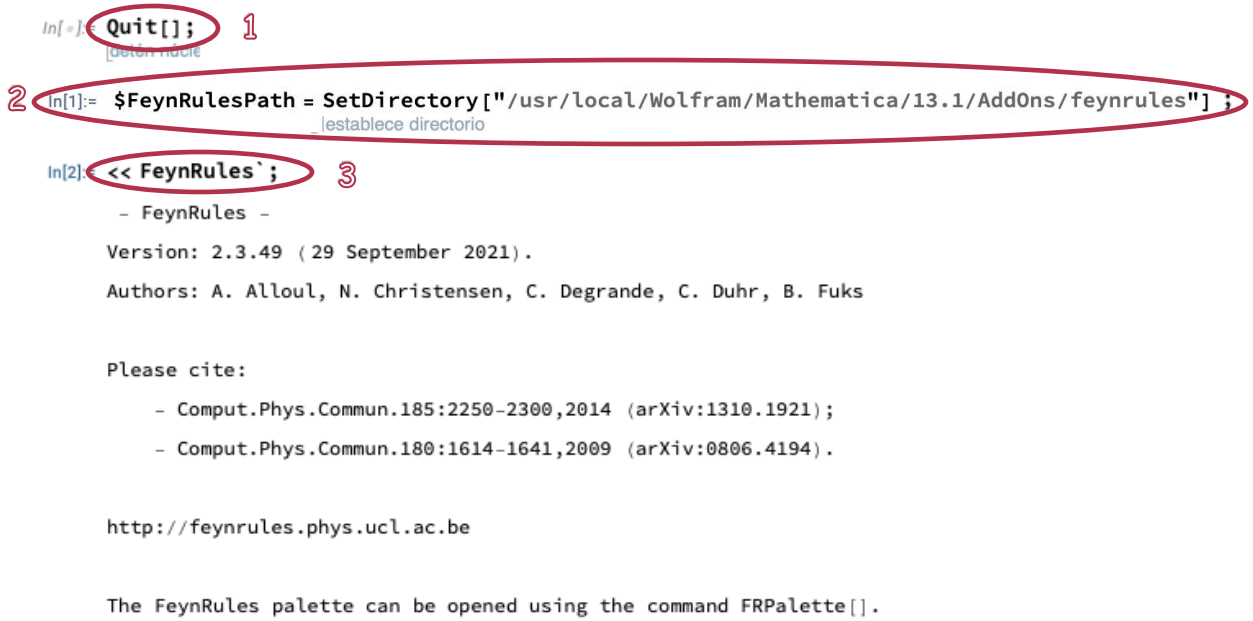
Linux



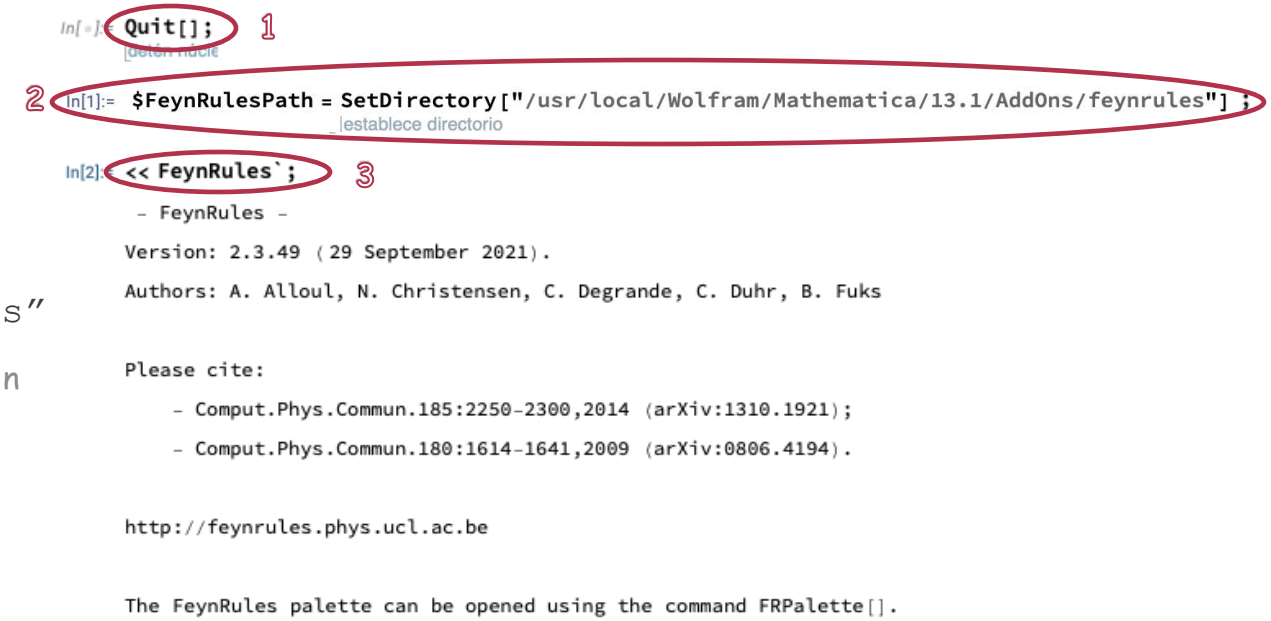
FEYNRULES. LAUNCH

2. Write and execute the command

```
$FeynRulesPath =  SetDirectory["…/feynrules"
```

This will tell the notebook where to look for the FeynRules installation

Linux



FEYNRULES. LAUNCH

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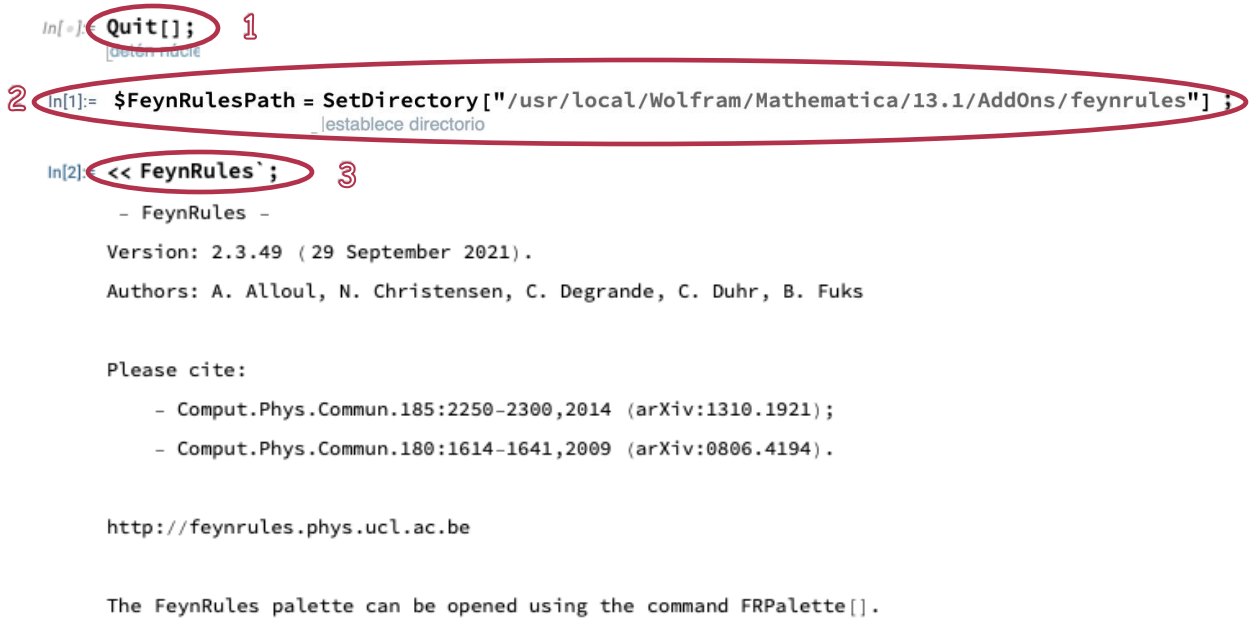


DONE!

FEYNARTS

INSTALLATION

FEYNARTS. INSTALLATION

- Access the web:

https://feynarts.de

FEYNARTS. INSTALLATION

Downloads (hover over download link for MD5):

- FeynArts-3.11.tar.gz [3.15 MB] of 25 Mar 22 NEW! 1
  - Added ~~FermionSign~~ function to help trace signs of diagrams with external fermions.
- FeynArts-3.10.tar.gz [2.55 MB] of 21 Jan 2019
- FeynArts-3.9.tar.gz [2.48 MB] of 23 Sep 2015
- FeynArts-3.8.tar.gz [1.6 MB] of 9 Jul 2013
- FeynArts-3.7.tar.gz [1.6 MB] of 4 Dec 2012
- FeynArts-3.6.tar.gz [1.54 MB] of 28 Mar 2011
- FeynArts-3.5.tar.gz [1.39 MB] of 16 Apr 2010
- FeynArts-3.4.tar.gz [1.36 MB] of 29 Jun 2009
- FeynArts-3.3.tar.gz [1.34 MB] of 21 Jan 2008
- FeynArts-3.2.tar.gz [1.32 MB] of 6 Mar 2007
- FeynArts-3.1.tar.gz [664 kB] of 7 Apr 2003
- FeynArts-3.0.tar.gz [578 kB] of 19 Oct 2001
- FeynArts-2.2.tar.gz [397 kB] of 30 May 2000
- FeynArts-2.1.tar.gz [432 kB] of 27 Mar 1996
- FeynArts-1.2.tar.gz [279 kB] of 1 Dec 1997

Requirements:

- Mathematica 3 or above,
- with Mathematica versions before 5.0, a Java VM and the J/Link package are needed for the topology editor. Both ingredients can be obtained free of charge from http://www.wolfram.com/solutions/mathlink/jlink (J/Link) and https://www.java.com (Java). Note that many systems (e.g. Windows) have a Java VM pre-installed. Follow the instructions that come with J/Link for installation on the various platforms.

To install FeynArts, simply unpack the archive **FeynArts-*n.m*.tar.gz**.
More detailed instructions are given in the manual contained in the FeynArts distribution.
You can obtain the manual of the current version here. 2

1. Download the FeynArts package

For later:

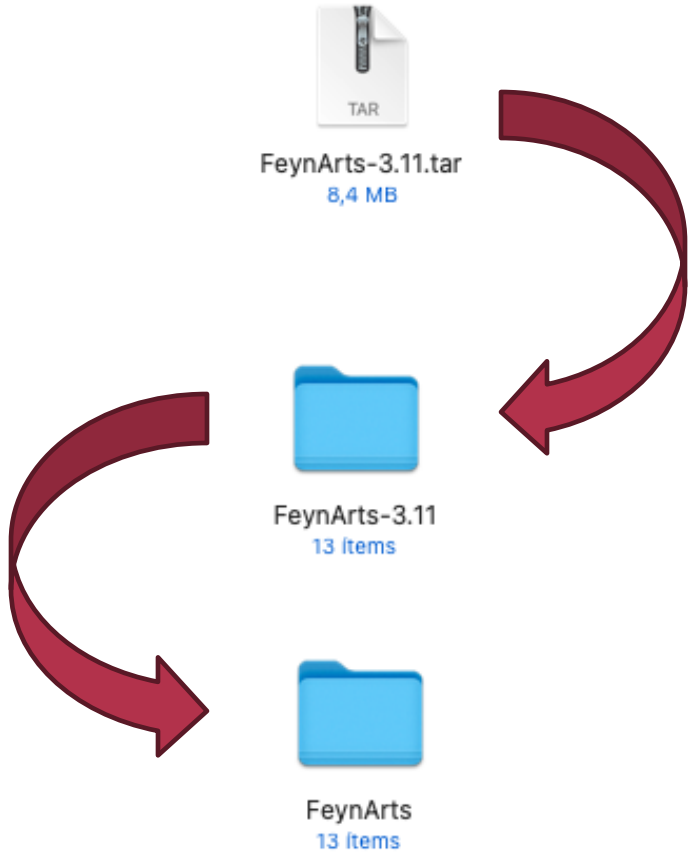
2. Download the Manual

FEYNARTS. INSTALLATION

- Unzip the FeynArts-3.11.tar file

- Rename the new folder to FeynArts

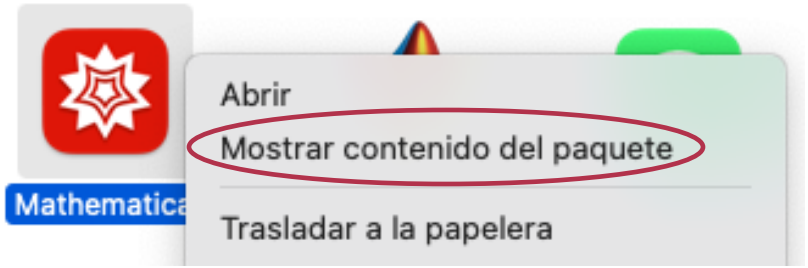
  (You can choose another one actually later)



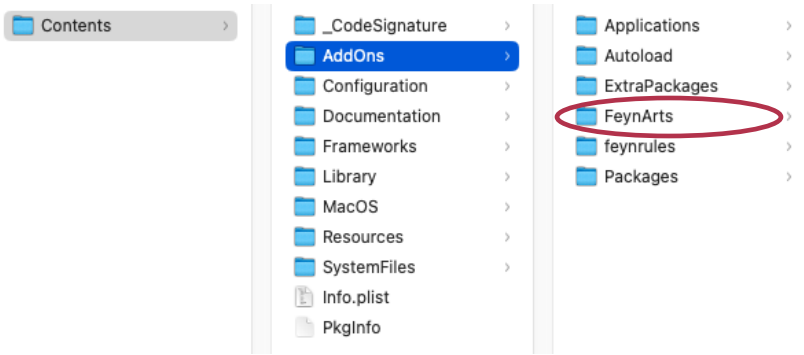
FEYNARTS. INSTALLATION

MacOS

- Copy the FeynArts folder



- Access the contents of your Mathematica installation



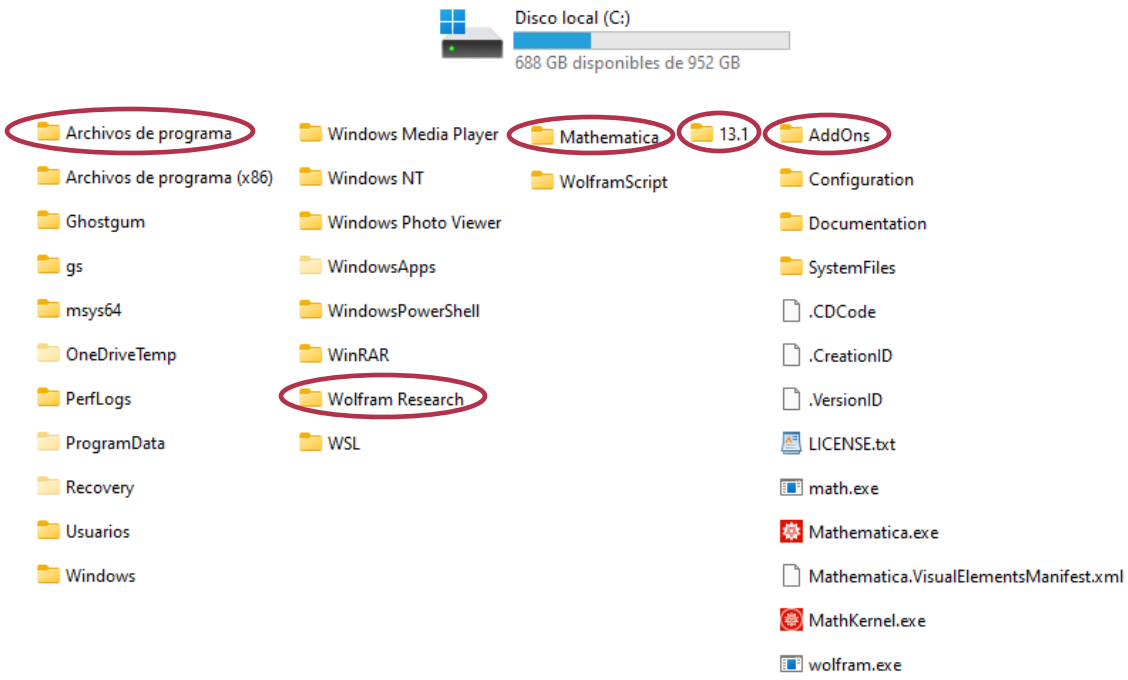
- Go to Contents > AddOns and paste it there

DONE!

FEYNARTS. INSTALLATION

- Copy the FeynArts folder
- Access the contents of your Mathematica installation
- Go to Contents > AddOns and paste it there

Windows



DONE!

FEYNRARTS. INSTALLATION

- Copy the FeynArts folder

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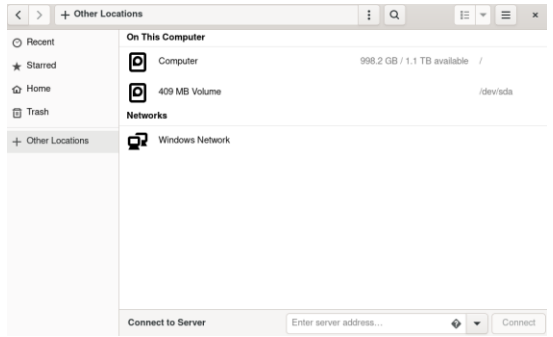
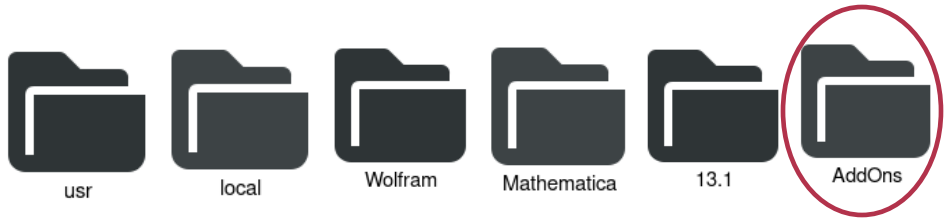
- Go to Contents > AddOns and paste it there

Linux





DONE!

FEYNARTS

LAUNCH

MACOS - WINDOWS - LINUX

FEYNARTS. LAUNCH

MacOS

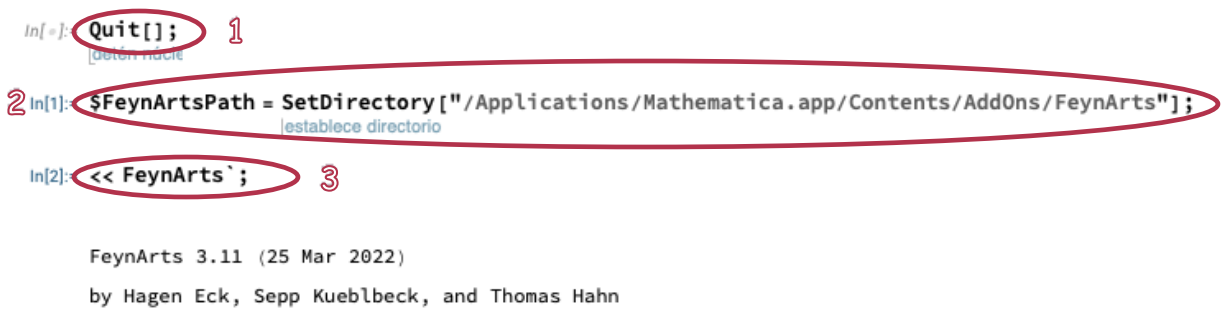
- Open a new Mathematica notebook

1. Write and execute the command

```
Quit[];
```

This will terminate the kernel, losing any definitions previosly made

It is needed because FeynArts needs to be executed clean



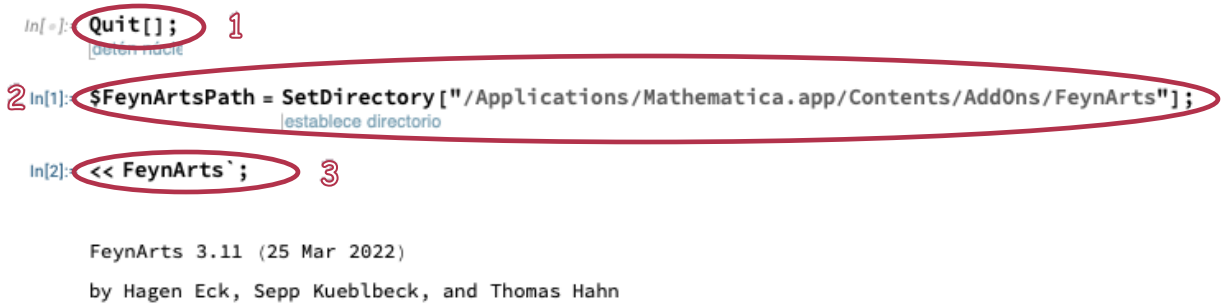
FEYNARTS. LAUNCH

MacOS

2. Write and execute the command

```
$FeynArtsPath =  SetDirectory["…/FeynArts"];
```

This will tell the notebook where to look for the FeynArts installation



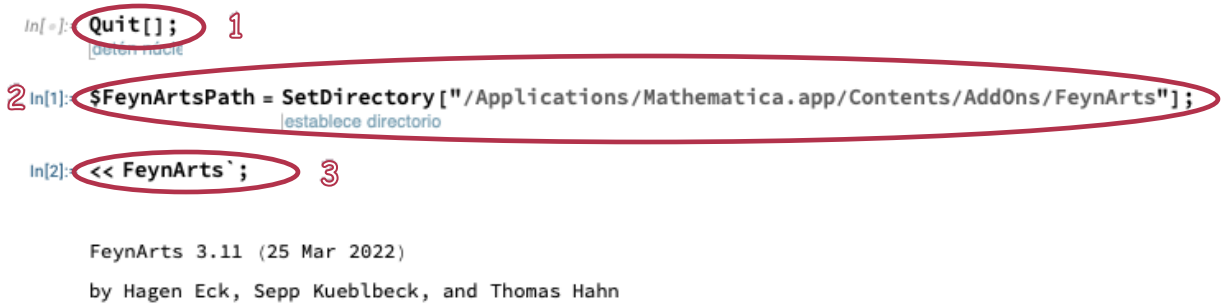
FEYNARTS. LAUNCH

MacOS

3. Write and execute the command

```
<< FeynArts`;
```

This will launch FeynArts



DONE!

FEYNARTS. LAUNCH

- Open a new Mathematica notebook

1. Write and execute the command

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Quit[];
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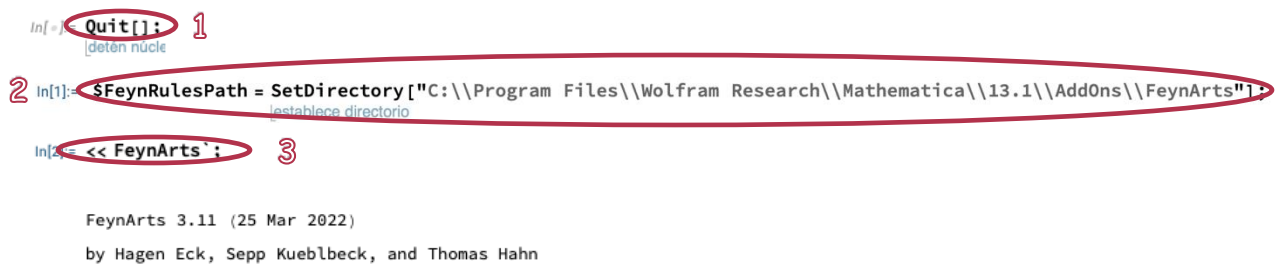
Windows



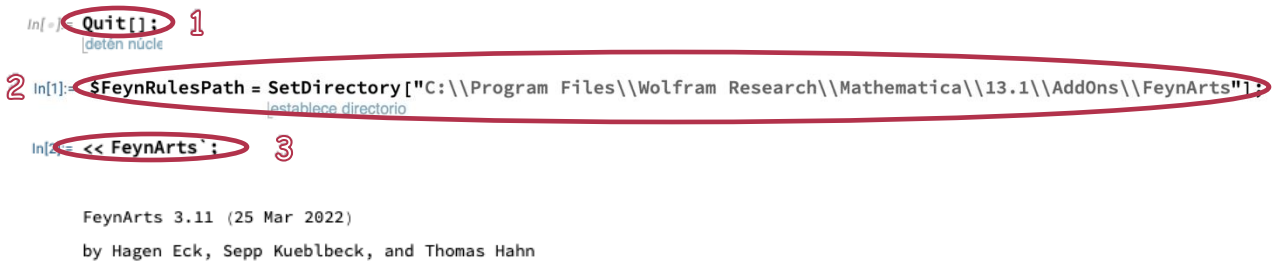
FEYNARTS. LAUNCH

Windows

2. Write and execute the command

```
$FeynArtsPath =  SetDirectory["…/FeynArts"];
```

This will tell the notebook where to look for the FeynArts installation



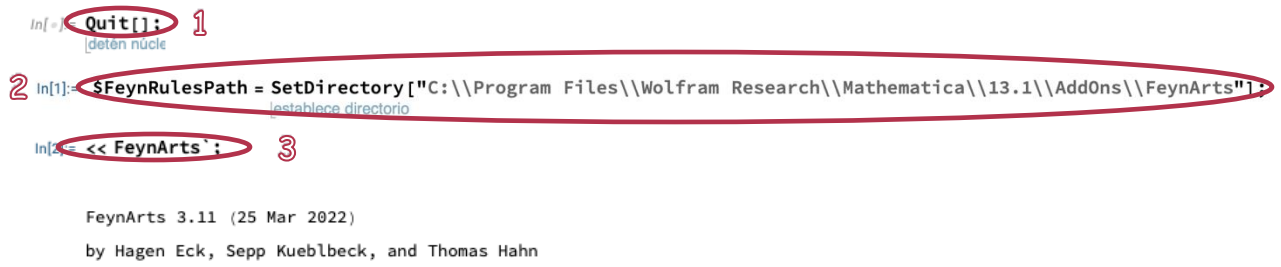
FEYNARTS. LAUNCH

Windows

3. Write and execute the command

```
<< FeynArts`;
```

This will launch FeynArts



DONE!

FEYNARTS. LAUNCH

Linux

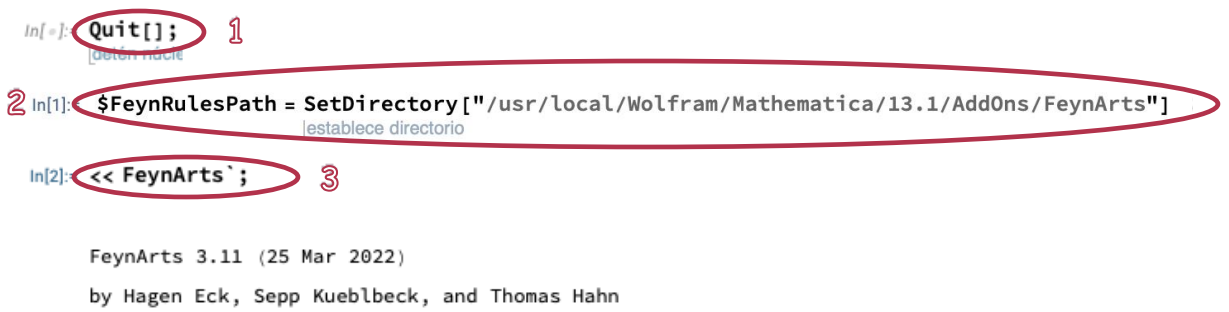
- Open a new Mathematica notebook

1. Write and execute the command

```
Quit[];
```

This will terminate the kernel, losing any definitions previosly made

It is needed because FeynArts needs to be executed clean



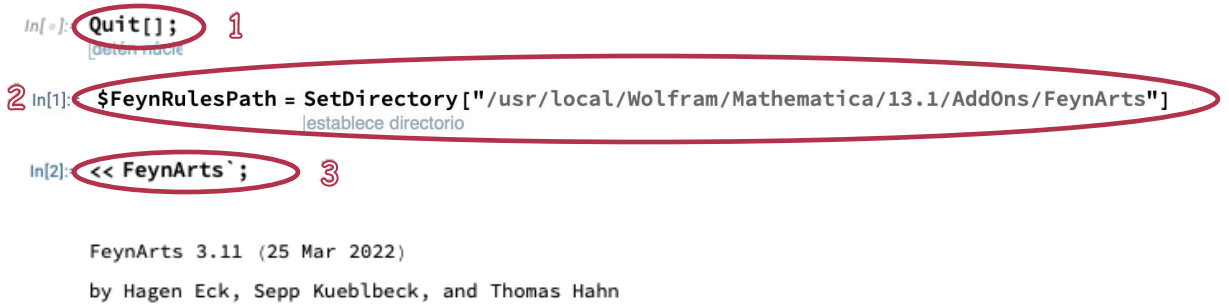
FEYNARTS. LAUNCH

Linux

2. Write and execute the command

```
$FeynArtsPath =  SetDirectory["…/FeynArts"];
```

This will tell the notebook where to look for the FeynArts installation



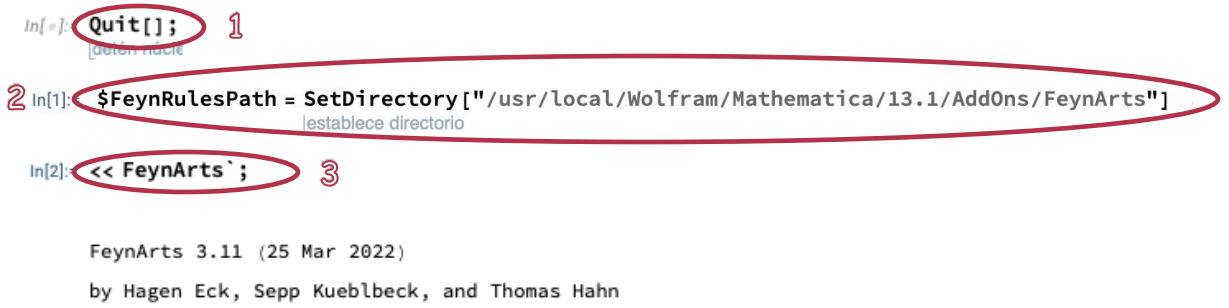
FEYNARTS. LAUNCH

Linux

3. Write and execute the command

```
<< FeynArts`;
```

This will launch FeynArts



DONE!

FEYNCALC

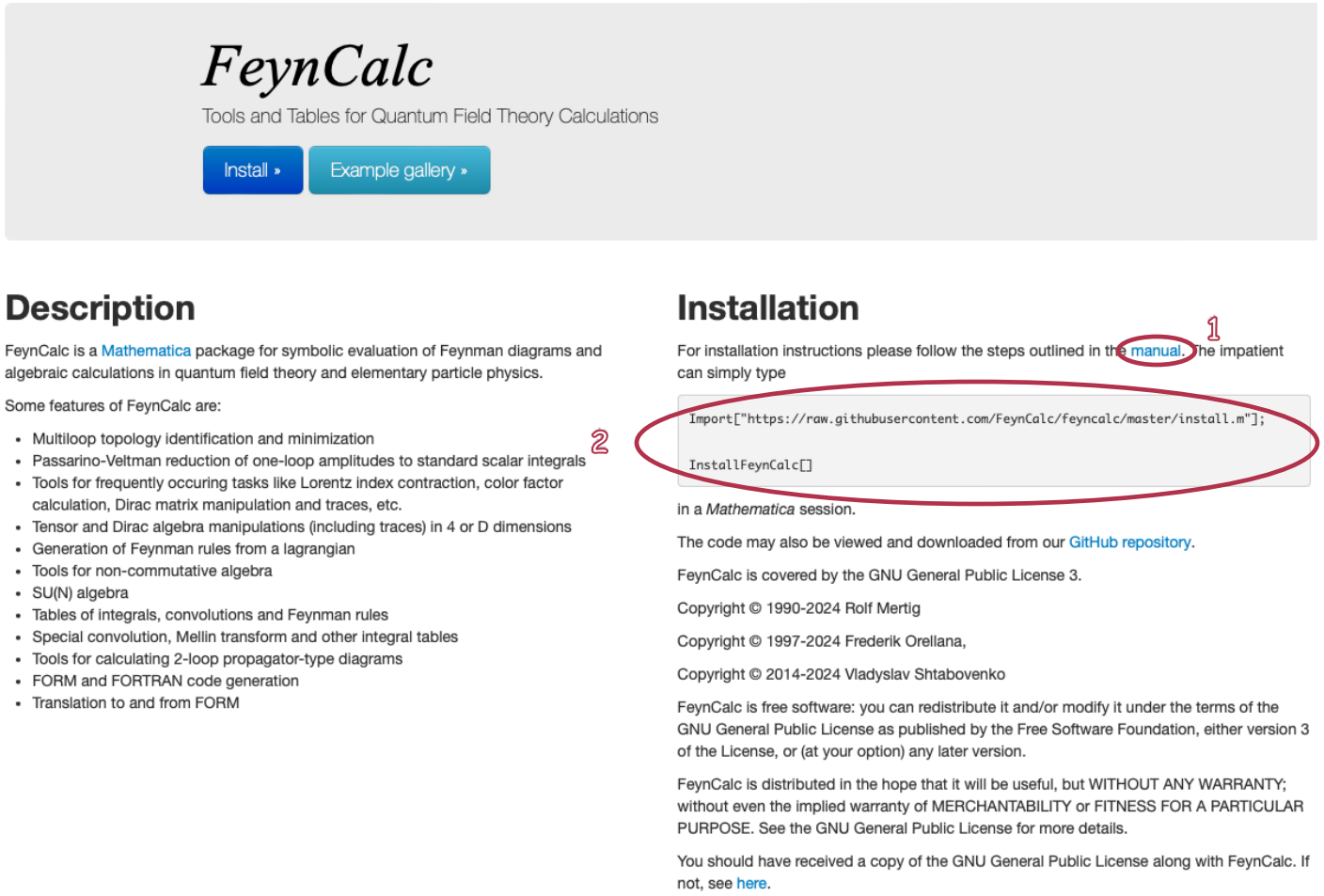
INSTALLATION

FEYNCALC. INSTALLATION

- Access the web:

https://feyncalc.github.io

FEYNCALC. INSTALLATION



FeynCalc

Tools and Tables for Quantum Field Theory Calculations

Install » Example gallery »

Description

FeynCalc is a Mathematica package for symbolic evaluation of Feynman diagrams and algebraic calculations in quantum field theory and elementary particle physics.

Some features of FeynCalc are:

- Multiloop topology identification and minimization
- Passarino-Veltman reduction of one-loop amplitudes to standard scalar integrals
- Tools for frequently occuring tasks like Lorentz index contraction, color factor calculation, Dirac matrix manipulation and traces, etc.
- Tensor and Dirac algebra manipulations (including traces) in 4 or D dimensions
- Generation of Feynman rules from a lagrangian
- Tools for non-commutative algebra
- SU(N) algebra
- Tables of integrals, convolutions and Feynman rules
- Special convolution, Mellin transform and other integral tables
- Tools for calculating 2-loop propagator-type diagrams
- FORM and FORTRAN code generation
- Translation to and from FORM

Installation

1

For installation instructions please follow the steps outlined in the manual. The impatient can simply type

2

```
Import["https://raw.githubusercontent.com/FeynCalc/feyncalc/master/install.m"];

InstallFeynCalc[]
```

in a *Mathematica* session.

The code may also be viewed and downloaded from our GitHub repository.

FeynCalc is covered by the GNU General Public License 3.

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Copyright © 1997-2024 Frederik Orellana,

Copyright © 2014-2024 Vladyslav Shtabovenko

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FeynCalc is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with FeynCalc. If not, see here.

For later:

1. Access the Manual

2. Copy the FeynCalc installation commands

FEYNCALC. INSTALLATION

- Open a new Mathematica notebook
- Paste the installation commands
- Execute the code

```
In[1]:= Import["https://raw.githubusercontent.com/FeynCalc/feyncalc/master/install.m"];
        importa

        InstallFeynCalc[]

        Welcome to the automatic FeynCalc installer brought to you by the FeynCalc developer team!

        • To install the current stable version of FeynCalc (recommended for productive use), please evaluate
          InstallFeynCalc[]
```

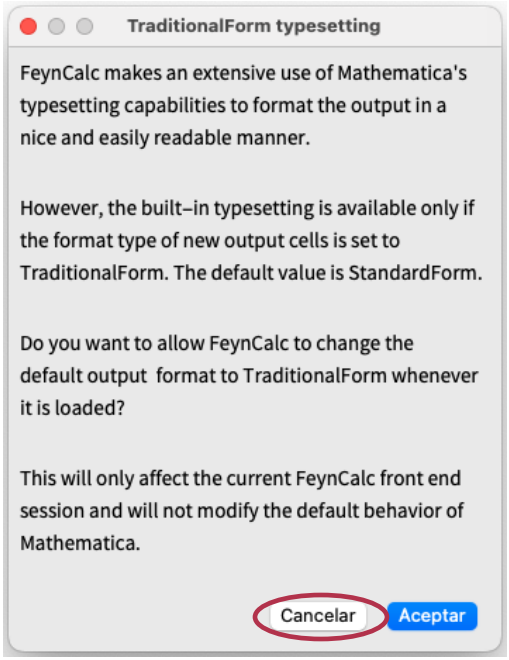
FEYNCALC. INSTALLATION

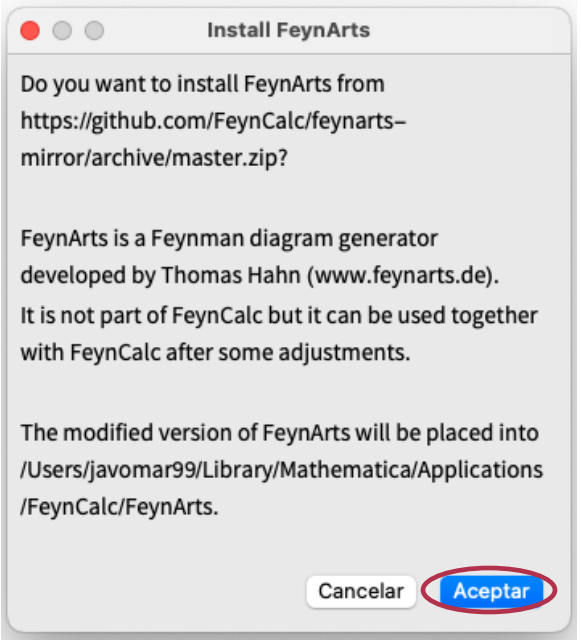
- Press Cancel for the first prompt

We will keep using StandardForm without problem

- Press Accept for the second prompt

This will install a compatible version of FeynArts ready to use within the same FeynCalc session





DONE!

FEYNCALC

LAUNCH

FEYNCALC. LAUNCH

- Open a new Mathematica notebook

1. Write and execute the command

```
Quit[];
```

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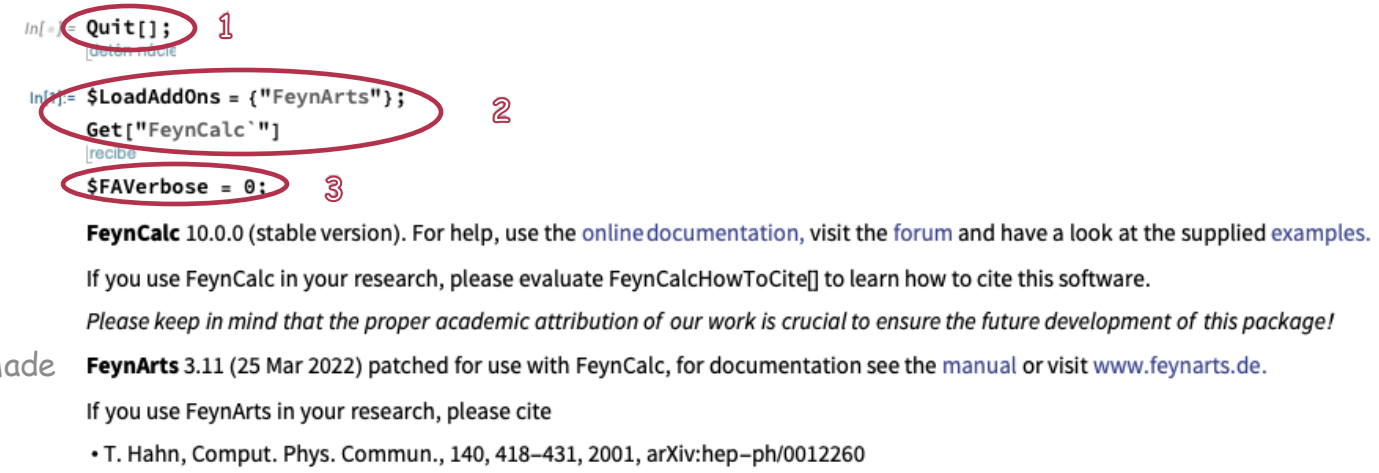


FEYNCALC. LAUNCH

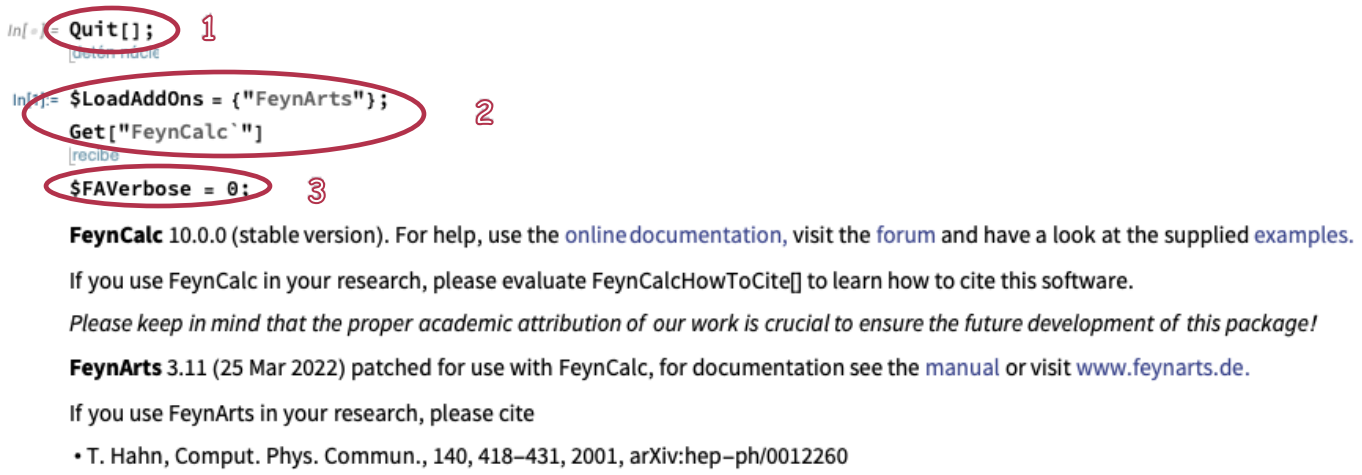
2. Write and execute the commands

```
$LoadAddOns = {"FeynArts"};
```

This will load FeynArts like and AddOn for FeynCalc

```
Get["FeynCalc`"]
```

This will launch FeynCalc (same as `<<FeynCalc`)`



FEYNCALC. LAUNCH

3. Write and execute the command

```
$FAVerbose = 0;
```

This will delete the progress messages of FeynArts

```
In[ ]:= Quit[];                                   1

In[ ]:= $LoadAddOns = {"FeynArts"};               2
        Get["FeynCalc`"]

        $FAVerbose = 0;                           3
```

FeynCalc 10.0.0 (stable version). For help, use the online documentation, visit the forum and have a look at the supplied examples.

If you use FeynCalc in your research, please evaluate FeynCalcHowToCite[] to learn how to cite this software.

Please keep in mind that the proper academic attribution of our work is crucial to ensure the future development of this package!

FeynArts 3.11 (25 Mar 2022) patched for use with FeynCalc, for documentation see the manual or visit www.feynarts.de.

If you use FeynArts in your research, please cite

• T. Hahn, Comput. Phys. Commun., 140, 418–431, 2001, arXiv:hep–ph/0012260

DONE!

You are now ready to start using FeynRules