



Application Note #29 Anaconda3 environment for Stardist V4D 3.4 or latest versions only

How to : «install the Anaconda3 setup for Stardist»

The application-note goal is to guide the user in the correct installation of the Anaconda3 Python package and all the Stardist modules. Stardist is a cell/nuclei detection algorithm, based on the deep learning approach, for microscopy images with star-convex shape priors. More information can be gathered from the following articles: <u>Star-convex Polyhedra for 3D Object Detection and Segmentation in Microscopy</u>. <u>Cell Detection with Star-convex Polygons</u>.

Warnings

Vision4D runs the deep learning applications (e.g. Stardist) using external and independent Python libraries and tools produced by third parts.

These tools must be installed by the user under its responsibility, strictly following the instruction on this document.

Arivis has tested the setup protocol on several computers, however, due to the different and not predictable hardware and software configuration of each computer, the results can be different case by case.

Therefore, arivis declines any responsability concerning the correct tools installation and setup on the user computer.

arivis cannot be blamed about any malfunctioning or failure of the deep learning environment setup.

Arivis will not give technical support on the setup task as well as on any deep learning application.

Both activities are totally on the user charge.

Arivis also declines any responsibility about the scientific results gathered from the deep learning application.



Application Flowchart



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Note :

V4D 3.4 Python environment is compatible with the Python 3.x version.



1. Download the Anaconda Package

Step 1.1

Open the Anaconda web pages using the following link:

https:/anaconda.org

Step 1.2

Select the Download Anaconda item.

anaconda.org

CLOUD Gallery About Anaconda Help

Download Anaconda

Step 1.3 Click on **Download** The Individual Edition is Open source and freely distributable



With over 20 million users worldwide, the open-source Individual Edition (Distribution) is the easiest way to perform Python/R data science and machine learning on a single machine. Developed for solo practitioners, it is the toolkit that equips you to work with thousands of open-source packages and libraries.







2. Install the Anaconda package

Step 2.1

Open the *Download folder* and locate the Anaconda3 setup file.

O Anaconda3-2020.07-Windows-x86_64.exe

Step 2.2 Run it and press the <u>Next</u> button on the setup dialog



Note : The Python release must be the 3.8.

2. Install the Anaconda package

Step 2.3

Click on the **"I Agree" button** to accept the License Agreement terms.

Anaconda3 2020.07 (64-	bit) Setup		-		×
	License Agreer	ment			
ANACONDA.	Please review th 2020.07 (64-bit)	ie license terms l	before installing	Anaconda3	i -
Press Page Down to see th	e rest of the agree	ment.			
End User License Agreeme	nt - Anaconda Indi	vidual Edition			^
Copyright 2015-2020, Ana	conda, Inc.				
All rights reserved under t	he 3-dause BSD Lic	ense:			
This End User License Agre	ement (the "Agree	ment") is a legal	agreement bet	ween you	
and Anaconda, Inc. ("Ana (which was formerly know	conda") and goverr 1 as Anaconda Dist	ns your use of A ribution).	naconda Individ	lual Edition	~
, If you accept the terms of	the agreement, did	k I Agree to con	itinue. You must	t accept the	
agreement to install Anaco	nda3 2020.07 (64-1	bit).			
aconda Inc				_	
aconacy and					
		< Pack	1 Agree	Can	COL

Step 2.4 Select the "Just Me" option.



Step 2.5

Press the "Next" button to complete the installation.



2. Install the Anaconda package

Step 2.6

Leave the default install path. Usually it is located under the users directory

C:\Users\xxxxx\Anaconda3

O Anaconda3 2020.07 (64-	bit) Setup		_		×
O ANACONDA.	Choose Install L Choose the folder	.ocation r in which to inst	all Anaconda3 20)20.07 (64-b	it).
Setup will install Anaconda folder, click Browse and se	3 2020.07 (64-bit) in lect another folder. (the following fo Click Next to con	lder. To install in tinue.	a different	
Destination Folder			_		
C:\Users\Maurizio\ana	conda3		Brov	vse	
Space required: 2.7GB					
Space available: 63.3GB					
Anaconda, Inc. ————		< Back	Next >	Cancel	
		< buck	HEAC 2	Concer	

Step 2.7

Enable the option «Register Anaconda3 as my default Pythoon 3.8» package. Press «Install» to start the installation.





3. Install the Anaconda modules

Step 3.1

Open the Anaconda console interface (Power Shell). Click on the Window icon

-

Step 3.1.1 Click on the Window icon and select the *Anaconda PowerShell Prompt* item.





Step 3.2 Create the Stardist environment

Step 3.2.1

digit «conda create -n stardist python=3.8» and press return

📰 Anaconda Powershell Prompt (anaconda3)

(base) PS C:\Users\Maurizio> conda create -n stardist python=3.8_

Note :

To install the Anaconda modules, the computer must be connected to internet.

3. Install the Anaconda modules

Step 3.2.2

Activate the new enviroment (*stardist*)

digit «conda activate stardist» and press return.

The (stardist) enviroment name is now shown at the beginning of each row.

Anaconda Powershell Prompt (anaconda3)

(base) PS C:\Users\Maurizio> conda activate stardist
(stardist) PS C:\Users\Maurizio>

Step 3.3

Install the *numpy* module.

Step 3.3.1

digit «conda install numpy» and press return.

Anaconda Powershell Prompt (anaconda3)

(base) PS C:\Users\Maurizio> conda activate stardist
(stardist) PS C:\Users\Maurizio> conda install numpy

Press Yes (Y) to confirm the installation

Step 3.4

Install the *pywin32* module.

Step 3.4.1

digit «conda install pywin32» and press return.

Anaconda Powershell Prompt (anaconda3) (stardist) PS C:\Users\Maurizio> conda install pywin32_

Press Yes (Y) to confirm the installation

Note :

To install the Anaconda modules, the computer must be connected to internet.

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4. V4D preferences setup

Step 4.1

Run Vision4D (3.4 and next release) select the Preferences item from the Extras menu.

	Extr	as	Window	Help
e	Ø	Preferences		
	-12	🛯 Plug-in Manager		
		Task Monitor		

Preferences - Scripting

Step 4.2

On the left panel, click on the "*Scripting*"item.

Step 4.3

Enable the "Anaconda Enviroment" option. Browse the Anaconda3 installation folder and select the *stardist* environment previously created.

By default, the new enviroments are stored under the **\envs** folder located in the Anaconda3 installation folder

e.g. C:\users\xxxxx\Anaconda3\envs\stardist.

~	General
	Advanced
	Keys
1	Analysis
1	Color Gradients
3	Content Types
	New Files & Import
1	Personal WebView
	Scripting
-	Viewers
	2D Viewer
	✓ 4D Viewer
	Data Settings
	General Settings
	Render Settings
	Scalebar

0	Built-in Python Use the built-in Python environment that comes with Vision4D.			
0	External Python Interpreter			
	C:\Anaconda3\python.exe			
	Configure the path to the Python.exe.			
۲	Anaconda Environment			
۲	Anaconda Environment C:\Anaconda3\envs\stardist			
۲	Anaconda Environment C:\Anaconda3\envs\stardist Configure the path to the environment folder.			



4. V4D preferences setup

Step 4.4

Install the arivis package

Test Environment Install ariv	is package Uninstall arivis package
Step 4.5 Run the Compatibility test	
Test Environment Install ariv	is package Uninstall arivis package
	Progress 43% × Python Compatibility Test Step 4: Required packages Cancel
Test completed successfully	arivis Vision4D Python Package Installation X Installing the Python package succeeded. Details OK
Test failed	arivis Vision4D Python Test Result X Scripting test for the conda environment failed. Failed: Connect to Vision4D. Required packages missing. Details OK

Note :

If the left above error message is issued, try again to install the arivis python package.

Note :	
Apply the settings and close the preferences pane	· I .

5. Install the Stardist modules

Step 5.1

Stardist installation requires the Microsoft VisualStudio tool release 2014 or later.

The VisualStudio 2019 is strongly suggested.

Step 5.1.1

Open the Microsoft VisualStudio download page using the following link: <u>https://visualstudio.microsoft.com/en/downloads/</u>

Download the *Community* version

Tips :

Accordingly with the country from which you are downloading the VS2019, the correct web page language is applied.

Visual Studio 2019

Note sulla versione >

Community

IDE avanzato, gratuito per studenti, collaboratori open source e singole persone



Step 5.1.2

Once the download is completed, click on the setup and follow the instructions. Leave all the options as default.



Note :

To install the VisualStudio 2019, the computer must be connected to internet.



5. Install the Stardist modules

Step 5.1.3

During the installation setup, the following options must be set to install the required VS support for python.





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5. Install the Stardist modules

Step 5.2

Using the Anaconda console interface (Power Shell), execute the following instructions. Be sure to be in the Stardist environment. Install the **tensorflow** module.

Step 5.2.1

digit «*pip install tensorflow==2.2.0*» and press *return.*



Press Yes (Y) to confirm the installation

Step 5.2.2

```
digit «pip install flowdec==1.1.0» and press return
```



Press Yes (Y) to confirm the installation

```
Step 5.2.3
```

digit «pip install csbdeep==0.6.1» and press return



Press Yes (Y) to confirm the installation

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5. Install the Stardist modules

Step 5.2.4 digit «*pip install stardist==0.6.1*» and press *return.*

Anaconda Powershell Prompt (anaconda3)
(stardist) PS C:\Users\Maurizio> pip install stardist==0.6.1

Press Yes (Y) to confirm the installation

Tips : To install the Stardist modules, the PIP command must be used. Don't use the CONDA statement

If any error is issued during the modules installation, please stop the setup.

Note : To install the Anaconda modules, the computer must be connected to internet.

6. Test the Stardist package

In order to test the script, a dataset must be opened in V4D. We suggest a simple 2D, single channel image with a XY resolution of about 1000x 1000 pixels.



Small, roundish objects must be present in the image (e.g. Nuclei stained with DAPI)



6. Test the Stardist package

Step 6.1

Open Python Script Editor.

From the «*Extra*» menu, select the «*Script Editor*» item.

Ext	ras	Window	Help
Ф	Pr	eferences	
-12	Plu	ug-in Manag	jer
Ŀ	Task Monitor		
1	Run Script		
1	Sc	Script Editor	



New

Open...

Close

Open Sample

Ctrl+N

Ctrl+O

Ctrl+F4

Step 6.2

Open the *Stardist_run_vision3.4_standalone.py*.

Step 6.3

Press "*Run Script*" (F5) and check the output message area.

Script output Emor messages Starting script... Found model '2D_demo' for 'StarDist2D'. Loading network weights from 'weights_best.h5'. Loading thresholds from 'thresholds.json'. Using default values: prob_thresh=0.486166, nms_thresh=0.5. Processing timepoint=1/1 Wrote 1 tiles to imagesets resampled_stardist_ch0 Created 347 objects Script finished.

Once the script is successfully completed, the here above message is shown

	👍 Script Editor - Script1		
Note: The output message area is shown	File Edit View Script		
pressing the "Show Output Panel" command.	🖵 Run Script 💁 Show Output Pane		
	Arivis		

6. Result of the Stardist test



-	
Name	Volume, Volume (µm³)
Segment #001	40,291
Segment #002	50,524
Segment #003	26,861
Segment #004	39,012
Segment #005	75,466
Segment #006	106,164
Segment #007	84,420
Segment #008	39,652
Segment #009	77,385
Segment #010	53,722
Segment #011	122,153
Segment #012	89,536
Segment #013	115,118
Segment #014	52,443
Segment #015	68,431
Segment #016	69,710
Segment #017	94,652







A startup package, including the python script, the technical instructions and the test image is available on request Contact the arivis local area sales manager to get more information about how to get the python script mentioned here.

Contact the arivis application support to receive additional technical details about the topic described in the application note, or how to adapt the application workflow to your requirements.

"The quantitative analysis of the images represents the art of transforming a visual sensation into its schematic and discrete form allowing its univocal description, classification and mathematical and logical interpretation of its spatial and temporal components"

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