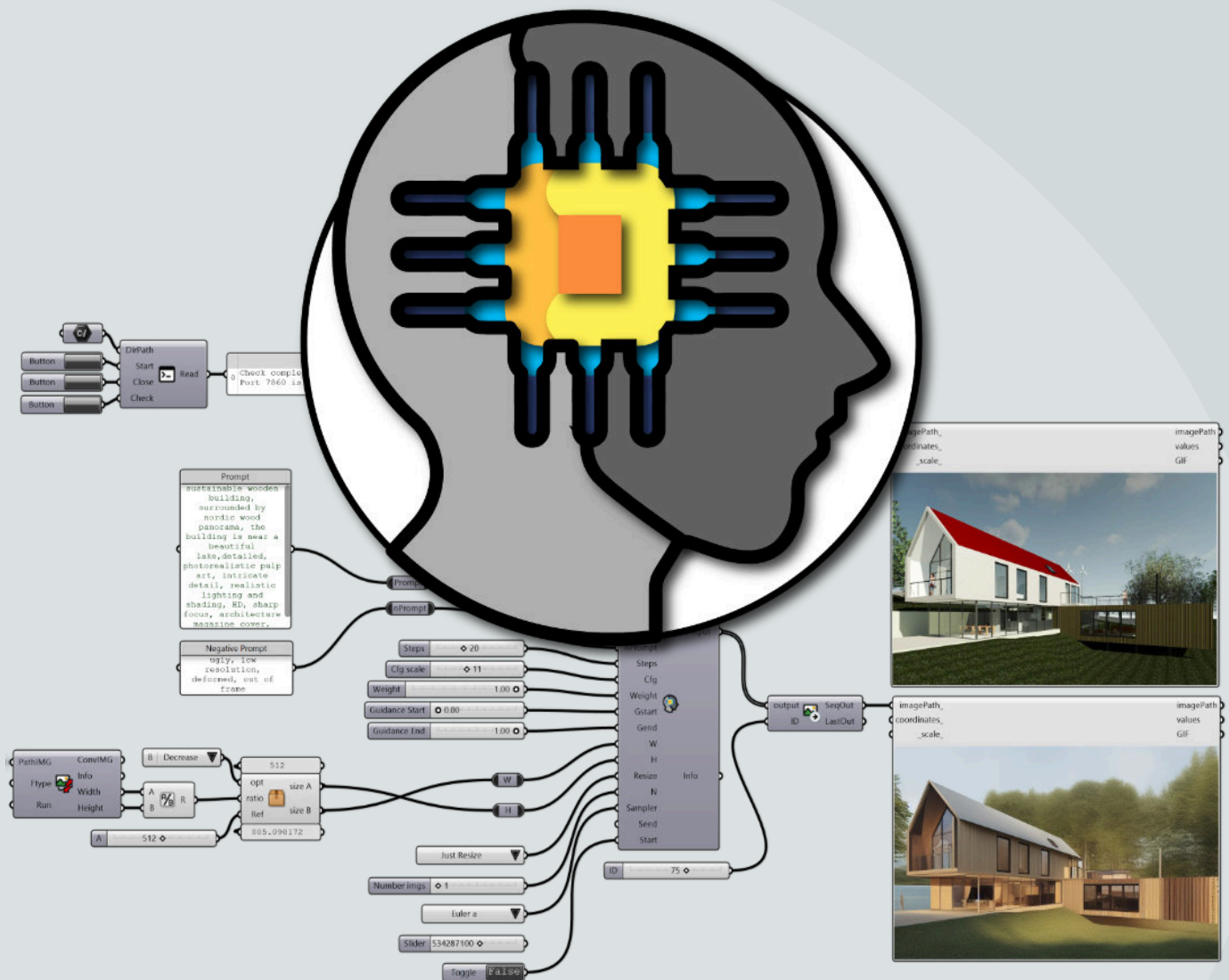




Ambrosinus Toolkit

Atk user guide v1.0



A **Grasshopper plugin** with a subcategory dedicated to **AI and Stable Diffusion (project A1111)**

Requirements - Installation User Guide

by Luciano Ambrosini

General info



Ambrosinus Toolkit latest v1.2.9

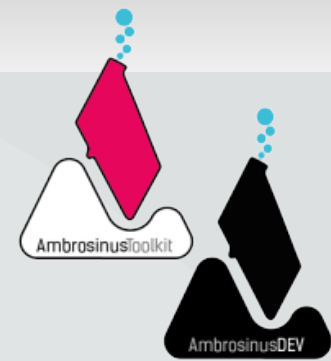
Main development and most tested on:

Rhino v7 SR37

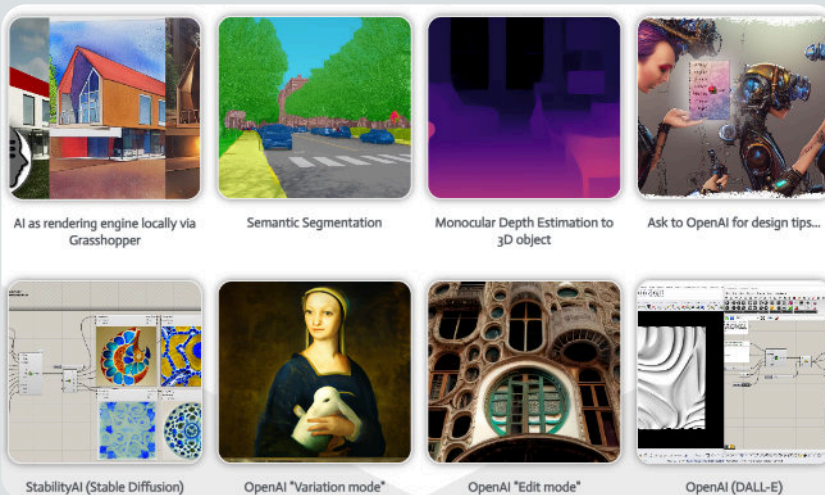
Grasshopper v7.35.23346.11001

It also runs on Rhino v8

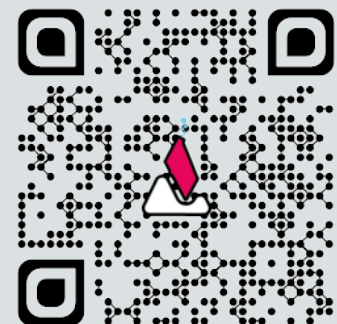
[Read the Changelog](#) of the latest version (May 2024)



Please intend this project as a Work in Progress



You can find a full description of all components on my [GitHub Wiki page](#) and on this [Research page](#).



About the Author (Brief)

Luciano Ambrosini is an architect, researcher, and innovator at the intersection of technology and design. With a Master's in Architecture (cum laude) and a PhD in Sustainable Technologies from the University of Naples "Federico II", his academic path started in aerospace engineering before shifting to architecture. His career spans roles as R&D manager at i-Mesh Architextile, environmental design analyst at Foster & Partners, and consultant for the design of Apple Developer Academy. Ambrosini specializes in computational design, environmental analysis and AI integration in architec-

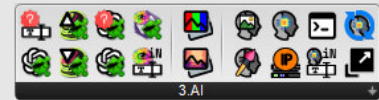
ture, developing cutting-edge tools like an AI toolkit for Grasshopper VPL. As an independent researcher and frequent lecturer at institutions recently at Politecnico di Milano and Georgia Tech, OneWorks etc. he pushes the boundaries of data-driven design in the AEC industry. With scientific publications and coded projects to his name, Ambrosini continues to pioneer innovative approaches that enhance architectural design through advanced technologies and collaborative workflows.

Keep in contact!

Foreword

Ambrosinus Toolkit (Atk) Overview

Subcategory AI



As an architect and computational designer, I've always been drawn to the bleeding edge where creativity, technology, and cultural evolution intersect. The Ambrosinus Toolkit (ATk) for Grasshopper is not just a product of this fascination, but a bold step into uncharted territory—a pioneering experiment in bridging the gap between parametric design and the rapidly advancing world of AI-generated imagery and text.

Throughout my career, I've witnessed the transformative power of computational design in architecture. However, I've also recognized a growing need to push beyond the boundaries of traditional parametric modeling. As AI and machine learning technologies began to revolutionize various fields, I saw an unprecedented opportunity to redefine the very nature of architectural conceptualization and representation.

All these AI-powered tools represent a paradigm shift in our approach to design. **By integrating Stable Diffusion (SD), Open AI, and Stability AI technologies with Grasshopper, we're not just enhancing a workflow—we're opening a portal to a new dimension of creative possibility.** This integration marks ATk as the first experiment of its kind ([read more here](#)), placing the immense potential of AI-generated imagery and, crucially, Large Text Generative Models (LTGMs) directly into the hands of architects and designers within their familiar Grasshopper environment.

I was particularly surprised by **the vibrant community that has formed around it.** This toolkit is as much a product of collective imagination and shared knowledge as it is of individual effort. I am profoundly grateful and continually inspired by all the supporters, users,

architects and designers who have demonstrated interest in ATk and shared fundamental feedback on how to implement and improve it. Your insights, questions, and creative applications of the toolkit have been invaluable in shaping its evolution.

It's important to note that ATk is still very much a work in progress. While many tools have been born or will be developed in this exciting new space, ATk remains the first attempt to integrate LTGMs into Grasshopper since their explosion onto the AEC scene.

It's crucial to understand the context in which ATk has been developed. **I've chosen to develop it primarily in my spare time, driven by passion rather than commercial interests.** This approach comes with its own set of challenges – I frequently need to monitor any updates on the Stable Diffusion side that might affect the operation of certain components, ensuring ATk remains functional and up-to-date.

In the broader landscape, there are many powerful and likely more sophisticated projects than ATk that require purchase. **The introduction of the A1111 project was a game-changer in this regard, democratizing access to these technologies.** Similarly, well-defined projects like ComfyUI that build upon A1111 are incredibly valuable in their own right. However, what sets ATk apart is its direct integration with Grasshopper (free of charge) – a feature not offered by these other tools. This integration is what makes ATk unique, bridging the gap between the world of AI-generated imagery and the Grasshopper environment familiar to architects and designers.

Enjoy your design exploration,
Luciano Ambrosini

Machine side

A step by step guideline to install on your PC/laptop (Win) Python and Git module

Since ATk is developed using a hybrid approach with programming languages such as C# (NET framework), Python, and native Grasshopper scripts, users must "prepare" their PC/laptop (Windows) to execute the developed tools correctly.

Step 1

Install the [Python release 3.10.6](#) (this is the version I have tested and currently use - amd64) – It is really important to accept the default settings and tick this option

Add python.exe to PATH (Fig.1);

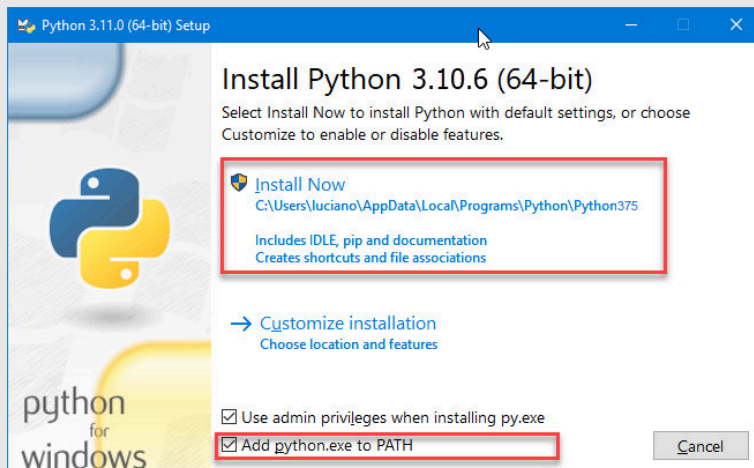


Fig. 1

Step 2

Check your pip installation you should read a list of commands and general options – if it is your case jump to Step 3:

Launch the command prompt window:

Press **Windows Key + X**

Click **Run**

Type in **cmd.exe** and hit enter

In cmd.exe type: **pip help**

```
C:\Users\luciano usr>pip help
'pip' is not recognized as an internal or external command,
operable program or batch file.
```

Fig. 2

Extra info

To be more accurate I have installed also the version 3.11.x version on different machines and I had no problem with **openai** and **stability-sdk** python libraries, BUT if you want to install also my Grasshopper components for **Stable Diffusion AI (A1111)**, please install the 3.10.6 – if you have tried the latest version and no errors occurred, please let me know

Sometimes some machines **do not have the pip protocol installed** ([full source here](#)).

Extra info

Pip is the package manager for Python, allowing users to install and manage software packages and libraries **from the Python Package Index (PyPI)**. Its full name can be interpreted as "Preferred Installer Program" or "Pip Installs Packages"

To run the **DPTto3D component** and **DPTSemSeg component** (subcategory AI) some Python libraries are necessary as the other AI tools. **I have coded a Python library named [atoolkitdpt v0.0.2](#)** as part of [Ambrosinus Toolkit project](#).

Here the **official page** of [Git Module for Windows \(32-bit Setup](#) or [64-bit Setup](#))

If you encounter this issue execute these steps:

Launch a command prompt if it isn't already open. To do so, open the Windows search bar, type `cmd` and click on the icon.

Then, run the following command to download the get-pip.py file: `curl https://bootstrap.pypa.io/get-pip.py -o get-pip.py`

Step 3

Install following libraries in order to run **OpenAI**, **StabilityAI** and **Atk** Grasshopper components:

From `cmd.exe` viewport text these commands:

```
pip install openai  
Press Enter (wait until done)
```

```
pip install stability-sdk  
Press Enter (wait until done)
```

So, always from `cmd.exe` viewport launch this command:

```
pip install atoolkitdpt  
Press Enter (wait until done)
```

Step 4

The designer/user is now ready to set up their Windows PC or laptop for the installation of the Stable Diffusion (A1111) project. To do this, it is necessary to [download this Git module application](#) (64bit), which enables the cloning of the repository folder where the project is hosted on its official GitHub page.

Stable Diffusion Installation

A step by step guideline to install on your PC/laptop (Win) Stable Diffusion (A1111) project with ControlNet module

Let's move on to installing the core component that allows users to locally execute some of the most significant features offered by the AI for image generation

Step 1

Create an empty folder wherein you want to install Stable Diffusion from the A1111 project, in my case, it was this: `D:\Desktop\SDlocal\`
I suggest to choose a folder located in your HDD that not requires any Administrative privilege.

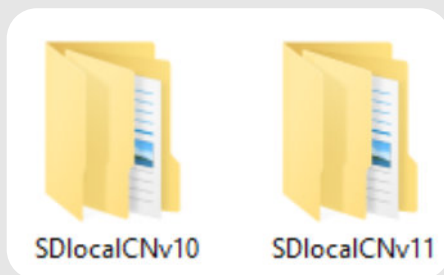


Fig. 1

Step 2

From the above folder (open it before) type this shortcut:

`ALT + F + S + A`

to launch Windows Powershell as Administrator (it is the same if you run CMD.exe as Admin) and type this command to clone the Automatic1111 repository directly in that folder (in my case it is):

```
D:\Desktop\SDlocal\stable-diffusion-webui>git
clone https://github.com/AUTOMATIC1111/stable-
diffusion-webui.git
```

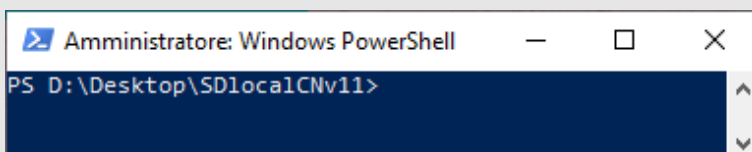


Fig. 2

After the installation you got this:

```
D:\Desktop\SDlocalCNv11\stable-diffusion-webui
```

Extra info

For instance, **I have set up two separate folders for the two versions of ControlNet** (Fig. 1), v1.0 and v1.X (it is advisable to use the most recent version). However, if you wish to experiment with the initial version, I recommend maintaining two distinct installations. For example, using the "mlsd" annotator with v1.0 on Stable Diffusion's FastAPI does not cause any issues.

So that's why we need the **Git module** to be installed

Extra info

Inside the folder as shown at the end of the Step 2 you find the "webui.bat" and "webui-user.bat" files. The latter will be customized through Atk grasshopper components

The local IP address (url) will be shown at the end of Step 3 procedure

Be mindful of the specific ControlNet you choose to install on your machine. I generally recommend using CN v1.X (the latest version) because it has nearly full support from SD FastAPI.

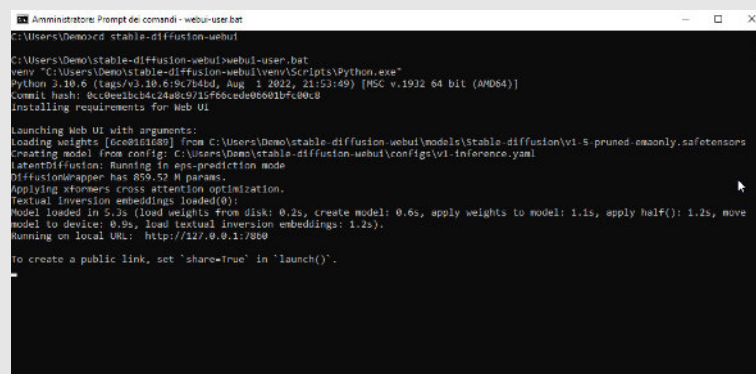
I have recorded a [video tutorial for Step 3 and Step 4](#) feel free to watch it

Step 3

Run on Windows OS

webui.bat (or **webui-user.bat**) file in CMD.exe as Administrator credentials. The process could take a while if it is the first run.

If all the process was successful you should see on the screen something similar to the Fig. 3 below (if the commit hash value is "None" something went wrong):



```
Administrator: Prompt de comandi - webui-user.bat
C:\Users\Demo>cd stable-diffusion-webui
C:\Users\Demo\stable-diffusion-webui>webui-user.bat
venv "C:\Users\Demo\stable-diffusion-webui\venv\Scripts\Python.exe"
python 3.10.6 (tags/v3.10.6:9c7b4bd, Aug 4 2022, 21:53:49) [MSC v.1932 64 bit (AMD64)]
Commit hash: 0c0ee1bcb4c24d8c9/15f6cde0e0011fc00:0
Installing requirements for Web UI
Launching Web UI with arguments:
Loading weights [0c0ee1bcb4c24d8c9] from C:\Users\Demo\stable-diffusion-webui\models\stable-diffusion\v1.5-pruned-emaonly-safetensors
Creating model from config: C:\Users\Demo\stable-diffusion-webui\configs\v1-inference.yaml
InstantDiffusion: Running in app-prediction mode
DiffusionWrapper has 859.52 M params.
Applying xformers cross attention optimization.
Textual Inversion embeddings loaded(0):
Model loaded in 5.3s (load weights from disk: 0.2s, create model: 0.6s, apply weights to model: 1.1s, apply half(): 1.2s, move
model to device: 0.9s, load textual inversion embeddings: 1.2s).
Running on local URL: http://127.0.0.1:7860
To create a public link, set 'share=True' in 'launch()'.
```

Fig. 3

Step 4

Go to the local URL: **http://127.0.0.1:7860** and from the WebUI "Extensions tab" and copy and paste this address directly in the "Install from URL tab" specifically inside the text box "URL for extension's github repository":

<https://github.com/Mikubill/sd-webui-controlnet>

Finally, click on "Install" and restart UI (you can restart also from the Installed tab).

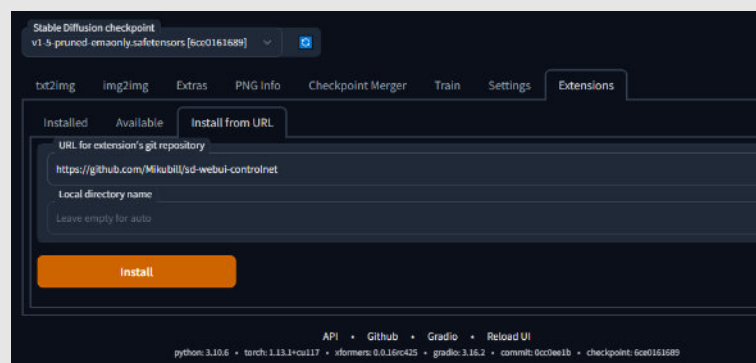


Fig. 4

This will install the **ControlNet v1.X** (the latest one). If you want to install the **ControlNet v1.0** you need copy and paste in the same position above this URL:

<https://github.com/lllyasviel/webui-controlnet-v1-archived.git>

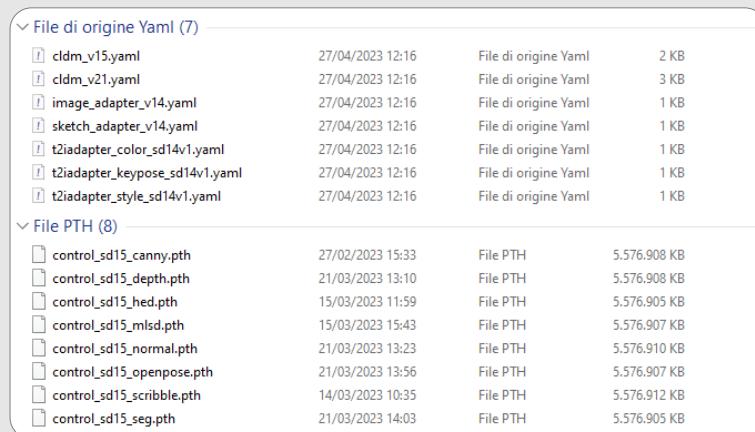
ControlNet checkpoint models

Download the right CN checkpoint models for v1.0 and/or v1.X (such as canny, mlssd, hed, open pose etc...)

CN v1.0

For manipulating images it is necessary [download these checkpoint models](#) (.pth files ~5GB each one) and place them here:

`D:\Desktop\SDlocalCNv10\stable-diffusion-webui\extensions\webui-controlnet-v1-archived\models`



File di origine Yaml (7)			
cldm_v15.yaml	27/04/2023 12:16	File di origine Yaml	2 KB
cldm_v21.yaml	27/04/2023 12:16	File di origine Yaml	3 KB
image_adapter_v14.yaml	27/04/2023 12:16	File di origine Yaml	1 KB
sketch_adapter_v14.yaml	27/04/2023 12:16	File di origine Yaml	1 KB
t2iadapter_color_sd14v1.yaml	27/04/2023 12:16	File di origine Yaml	1 KB
t2iadapter_keypose_sd14v1.yaml	27/04/2023 12:16	File di origine Yaml	1 KB
t2iadapter_style_sd14v1.yaml	27/04/2023 12:16	File di origine Yaml	1 KB

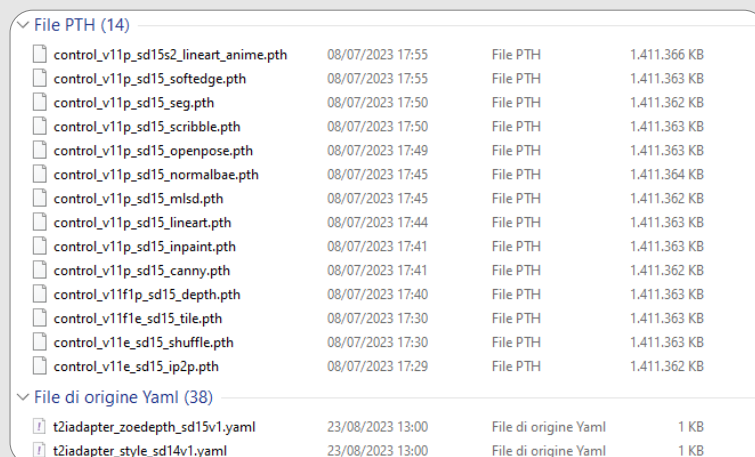
File PTH (8)			
control_sd15_canny.pth	27/02/2023 15:33	File PTH	5.576.908 KB
control_sd15_depth.pth	21/03/2023 13:10	File PTH	5.576.908 KB
control_sd15_hed.pth	15/03/2023 11:59	File PTH	5.576.905 KB
control_sd15_mlssd.pth	15/03/2023 15:43	File PTH	5.576.907 KB
control_sd15_normal.pth	21/03/2023 13:23	File PTH	5.576.910 KB
control_sd15_openpose.pth	21/03/2023 13:56	File PTH	5.576.907 KB
control_sd15_scribble.pth	14/03/2023 10:35	File PTH	5.576.912 KB
control_sd15_seg.pth	21/03/2023 14:03	File PTH	5.576.905 KB

Fig. 1

CN v1.X

For manipulating images it is necessary [download these checkpoint models](#) (only .pth files ~1.45GB each one) and place them here:

`D:\Desktop\SDlocalCNv11\stable-diffusion-webui\extensions\sd-webui-controlnet\models`



File PTH (14)			
control_v11p_sd15s2_linear_anime.pth	08/07/2023 17:55	File PTH	1.411.366 KB
control_v11p_sd15_softedge.pth	08/07/2023 17:55	File PTH	1.411.363 KB
control_v11p_sd15_seg.pth	08/07/2023 17:50	File PTH	1.411.362 KB
control_v11p_sd15_scribble.pth	08/07/2023 17:50	File PTH	1.411.363 KB
control_v11p_sd15_openpose.pth	08/07/2023 17:49	File PTH	1.411.363 KB
control_v11p_sd15_normalbae.pth	08/07/2023 17:45	File PTH	1.411.364 KB
control_v11p_sd15_mlssd.pth	08/07/2023 17:45	File PTH	1.411.362 KB
control_v11p_sd15_linear.pth	08/07/2023 17:44	File PTH	1.411.363 KB
control_v11p_sd15_inpaint.pth	08/07/2023 17:41	File PTH	1.411.363 KB
control_v11p_sd15_canny.pth	08/07/2023 17:41	File PTH	1.411.362 KB
control_v11f1p_sd15_depth.pth	08/07/2023 17:40	File PTH	1.411.363 KB
control_v11f1e_sd15_tile.pth	08/07/2023 17:30	File PTH	1.411.363 KB
control_v11e_sd15_shuffle.pth	08/07/2023 17:30	File PTH	1.411.363 KB
control_v11e_sd15_ip2p.pth	08/07/2023 17:29	File PTH	1.411.362 KB

File di origine Yaml (38)			
t2iadapter_zoedepth_sd15v1.yaml	23/08/2023 13:00	File di origine Yaml	1 KB
t2iadapter_style_sd14v1.yaml	23/08/2023 13:00	File di origine Yaml	1 KB

Fig. 2

Extra info

this string:
"D:\Desktop\SDlocalCNv10\
will be replaced with your custom
folder location **as specified at page 3**

this string:
"D:\Desktop\SDlocalCNv11\
will be replaced with your custom
folder location **as specified at page 3**

I generally recommend using CN v1.X (the latest version) because it has nearly full support from SD FastAPI.

Stable Diffusion trained database

Download your preferred trained database, as it determines the quality and style of the final image

Extra info

Here a selection of the [most popular trained database](#) for Architecture & Design. The following is merely an example:

- RealisticVisionV51_v51VAE
- Epicrealism_pureEvolutionV5
- Deliberate_v2
- Cyberrealistic_v41
- Mjrnry-v4
- ArchitectureRealMix

many more have been implemented

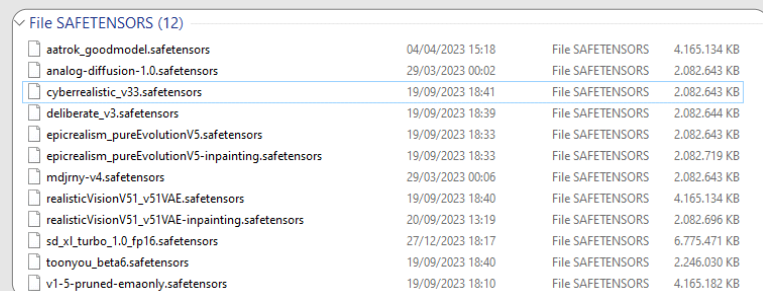
This is especially true when using the ATk "Aloutpaint" component, it is important to properly set up a trained database for inpainting.

There are various trained models available, among which the following are the most commonly utilized: [UltraSharp](#), [NMKD](#), [SwiniR](#), etc...

CivitAI Repository

It is the most renowned and comprehensive repository where you can download numerous trained databases at no cost. After selecting the databases that interest you the most, you must download and install them in this folder:

D:\Desktop\SDlocal(Nvll)\stable-diffusion-webui\models\Stable-diffusion



File SAFETENSORS (12)			
<input type="checkbox"/>	aatrok_goodmodel.safetensors	04/04/2023 15:18	File SAFETENSORS 4.165.134 KB
<input type="checkbox"/>	analog-diffusion-1.0.safetensors	29/03/2023 00:02	File SAFETENSORS 2.082.643 KB
<input type="checkbox"/>	cyberrealistic_v33.safetensors	19/09/2023 18:41	File SAFETENSORS 2.082.643 KB
<input type="checkbox"/>	deliberate_v3.safetensors	19/09/2023 18:39	File SAFETENSORS 2.082.644 KB
<input type="checkbox"/>	epicrealism_pureEvolutionV5.safetensors	19/09/2023 18:33	File SAFETENSORS 2.082.643 KB
<input type="checkbox"/>	epicrealism_pureEvolutionV5-inpainting.safetensors	19/09/2023 18:33	File SAFETENSORS 2.082.719 KB
<input type="checkbox"/>	mdjrnry-v4.safetensors	29/03/2023 00:06	File SAFETENSORS 2.082.643 KB
<input type="checkbox"/>	realisticVisionV51_v51VAE.safetensors	19/09/2023 18:40	File SAFETENSORS 4.165.134 KB
<input type="checkbox"/>	realisticVisionV51_v51VAE-inpainting.safetensors	20/09/2023 13:19	File SAFETENSORS 2.082.696 KB
<input type="checkbox"/>	sd_xl_turbo_1.0_fp16.safetensors	27/12/2023 18:17	File SAFETENSORS 6.775.471 KB
<input type="checkbox"/>	toonyou_beta6.safetensors	19/09/2023 18:40	File SAFETENSORS 2.246.030 KB
<input type="checkbox"/>	v1-5-pruned-emaonly.safetensors	19/09/2023 18:10	File SAFETENSORS 4.165.182 KB

Fig. 3

About Inpainting...

When utilizing diffusive techniques like **inpainting** or **outpainting**, ensure you first acquire the trained database labeled with "inpainting" and place it inside the aforementioned folder.

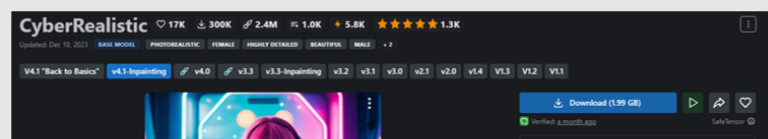
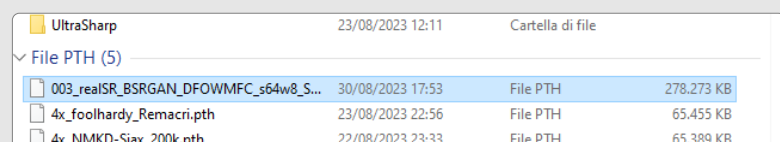


Fig. 4

About Upscaling...

Upscaling is a process that enables the **enlargement of an image while minimizing resolution loss**. Download and install them in this folder: **D:\Desktop\SDlocal(Nvll)\stable-diffusion-webui\models\ESRGAN**



File PTH (5)			
<input type="checkbox"/>	003_realSR_BSRGAN_DFOWMFC_s64w8_S...	30/08/2023 17:53	File PTH 278.273 KB
<input type="checkbox"/>	4x_foolhardy_Remacri.pth	23/08/2023 22:56	File PTH 65.455 KB
<input type="checkbox"/>	4x_NMKD-Siax_200k.pth	22/08/2023 23:33	File PTH 65.389 KB

Fig. 5

Grasshopper side

Ambrosinus Toolkit Grasshopper installation and Python requirements

Step 1

Download the latest version of ATK directly from [Food4Rhino](#) (Fig. 1) which requires manual installation like all common **.gha files**, or through the **Rhino Package Manager** (Fig. 2) for an automated procedure. The components that become available after installation are all coded in C# (.NET Framework).

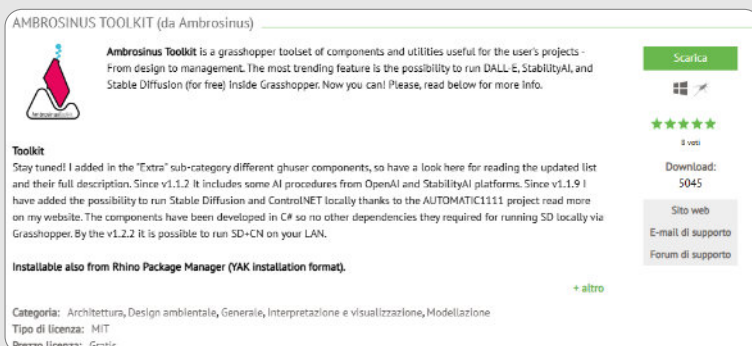


Fig. 1

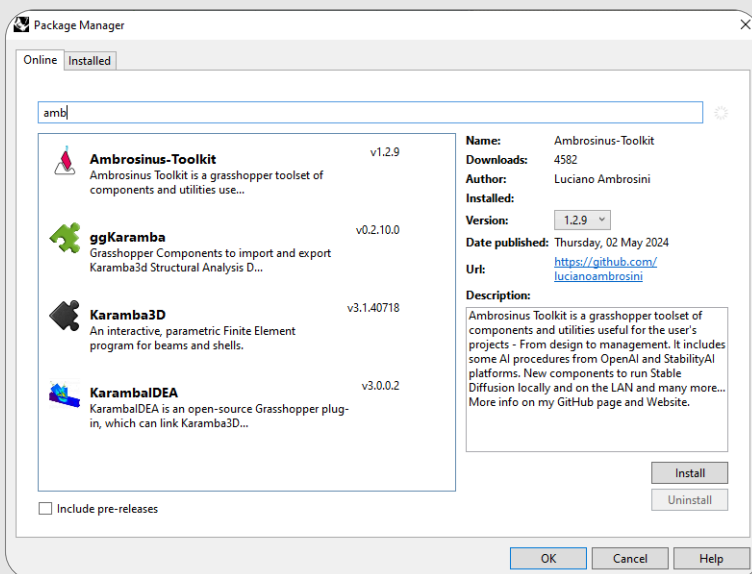


Fig. 2

If you want to get further info about ATK and in which languages each component has been coded, [please have a look at Dev Atk main page](#)

Extra info

Like all the manual installations of the .gha files, make sure that at this address ..

`\AppData\roaming\Grasshopper\libraries`
.gha and .dll files are "Unlocked"

This page provides the development register (dev log) for all components and tracks the ongoing progress of the plugin's development. Please note that ATK is perpetually a work in progress.

Extra info

This step is crucial because the plugin enables the import of external libraries essential for executing certain components of ATK in Grasshopper's IronPython. In Rhino V8, this is no longer required by default, as it can handle Python libraries not included in IronPython. Nevertheless, **it is recommended to await additional updates** on this matter from ATK Dev.

From [GitHub official page](#) it is possible to download the **.ghuser** and all **.gh demo files**. In the ATK toolbar, components can be identified by their naming structure: "LA_CompName_bXXX", where the suffix denotes the build version.

DPTto3D component exploits the MiDaS trained "weights model" (8 available). DPTSemSeg component exploits ADE20k trained "weights model" (2 available)

Step 2

To execute certain ATK Python-coded components, it is necessary to [install the GH_CPython Plugin](#) (Fig. 3), ensuring it is "Unblocked" as outlined in Step 1 (it has a black Python icon)

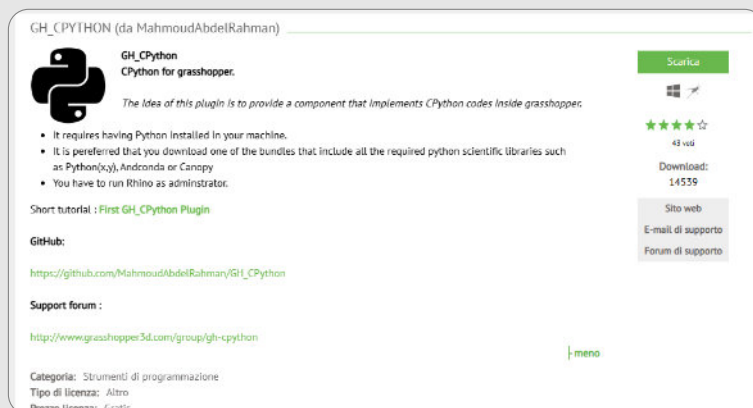


Fig. 3

Step 3

ATk has undergone extensive testing on Rhino V7 and is also compatible with Rhino V8. However, since some components are developed in Python and are external to the initial package installation (**.ghuser** format), they must be downloaded from the GitHub official page:

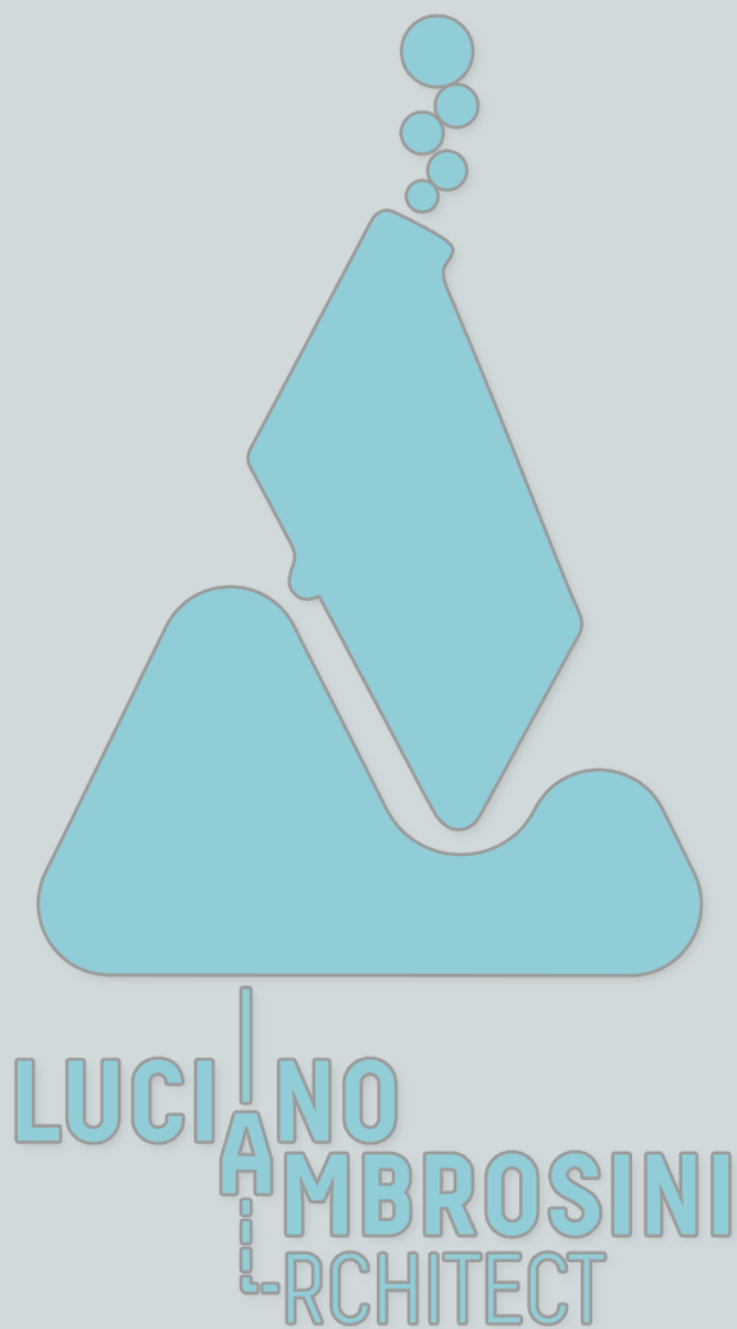
[Extra AI components](#)

[Extra Image components](#)

[Extra components](#) (generally pastime funny)

Step 4

To run components such as **DPTto3D** and **DPTSemSeg**, in addition to installing the Atoolkitdpt library (latest version 0.0.2) as outlined in the "Machine Side" section, **it is essential to download the databases trained by Intel researchers**. The "Weights Model" can be downloaded from the bottom of the [AtoolkitDpt repository's Github page](#).



lucianoambrosini.it

2024