



# FIX YOUR FILES FOR 3D PRINTING

Get started with the best free tools to repair your 3D files



# TABLE OF CONTENTS

## INTRODUCTION

At Sculpteo, we all know ONE thing: 'Designing a 3D file is fine. But designing a printable 3D file is a different story.' This led us to ask Alvis, one of our favorite 3D Printing Product Designers, to summarize in this ebook the essential things one needs to know when preparing or repairing a 3D file in order to 3D print it.

With a couple of thousand checked-and-repaired 3D files to his credit, Alvis has made an inventory of the most common mistakes and the simplest solutions to fix them. He has selected and reviewed several must-have resources - from Sculpteo tools to free 3D software - to make good use of the incredible possibilities offered by 3D printers. And how to avoid wasting your time on a rebellious 3D file.

In a nutshell, the purpose of this ebook is to present the most common mistakes that you will need to repair, how to get your 3D files repaired and improved on Sculpteo and how you can perform these very important operations in free software yourself. Let's get started.

## SUMMARY

p.2	<a href="#"><u>COMMON MISTAKES IN 3D FILES</u></a>
p.4	<a href="#"><u>AUTOMATIC REPAIR AND OPTIMIZATION ON SCULPTEO</u></a>
p.8	<a href="#"><u>FREE SOFTWARE TO FIX YOUR FILES BEFORE UPLOADING</u></a>
p.9	<a href="#"><u>NetFabb Basic</u></a>
p.11	<a href="#"><u>Meshmixer</u></a>
p.13	<a href="#"><u>MeshLab</u></a>
p.15	<a href="#"><u>MiniMagics</u></a>
p.17	<a href="#"><u>3D-Tool-Free</u></a>
p.19	<a href="#"><u>Comparison Chart</u></a>

# COMMON MISTAKES IN 3D FILES

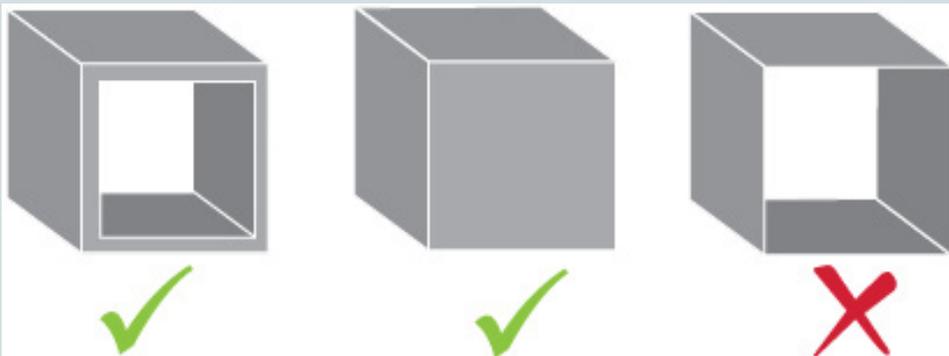
## IS YOUR FILE WATERTIGHT?

The most common issue for 3D printing is whether or not your model is watertight. This means that your model has to be **closed**. All edges need to be connected to one another. There can be no edges or vertices that do not create a closed surface because it will have no thickness for 3D printing. You can however **overlap geometry** as long as all the surfaces are closed.

## DOES YOUR DESIGN HAVE VOLUME?

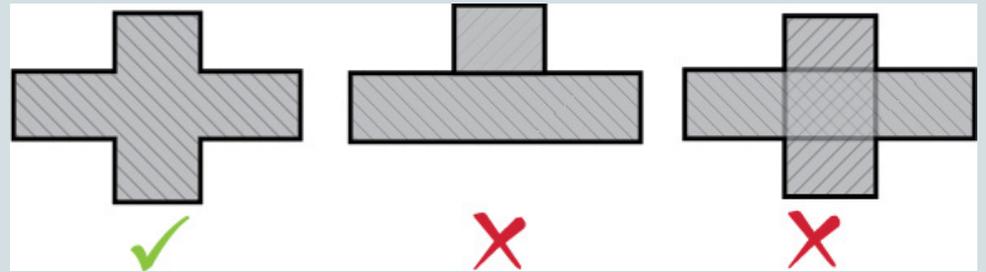
Another common mistake which can arise when exporting files (particularly files exported from a game) is that they will not have volume. Gaming models, for example, are optimized for rendering not 3D printing, even if this means “cheating” a little with geometry. Hair, for instance, is sometimes modeled as simple textured faces with no volume. Such elements cannot be 3D printed.

Try to imagine a flat surface as an object: if it exists in real life, it necessarily has at least some **thickness**. To prepare a model for 3D printing, you must first give volume to your surfaces, for example by extruding them.



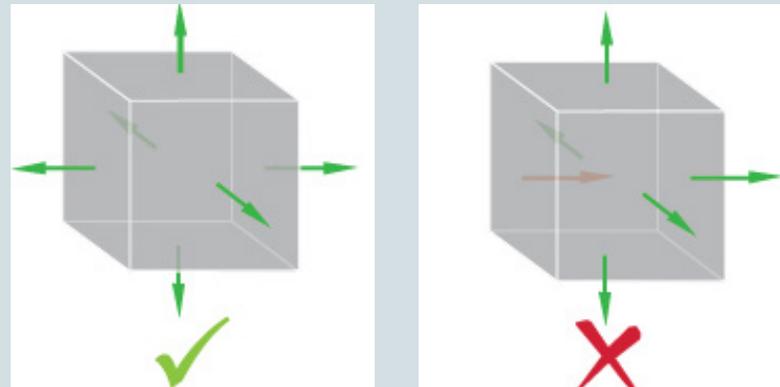
## DOES YOUR FILE HAVE AUTO-INTERSECTIONS?

As you create your 3D model, there may be a point where two or more volumes cut into each other. These intersections create an ambiguous model with uninterpretable volumes. The functions that can merge these elements are **Boolean operations**. They help you to unify, subtract or differentiate volumes.



## CORRECTLY ORIENT YOUR MODEL'S SURFACES

In most 3D modeling software, surfaces are oriented with an inside and an outside to help determine the model's volume. If one of the faces of an object is oriented in the wrong direction, its volume may be indeterminate. It is important to ensure that each face is oriented in the correct direction in order to avoid this type of problem.

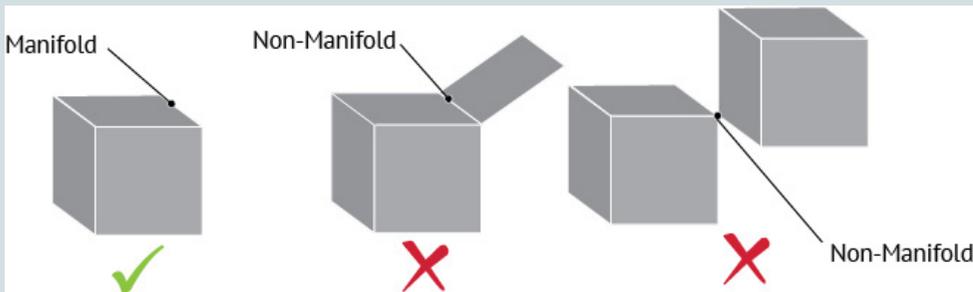


# COMMON MISTAKES IN 3D FILES

## IS YOUR MESH FULLY “TWO MANIFOLD?”

During the conception of your 3D file, certain operations may create unattached, ambiguous surfaces which do not connect. Other operations may separate surfaces, creating singular points of connection. These singularities can prevent our online tools from determining the volume of the model.

To define a clear volume, each edge must be connect two and only two adjacent faces. Similarly, singular points must arrive at the collection of multiple faces. If two or more faces, in different volumes, share a single point (as shown in the image below), the model is considered “**non-manifold**” and will not be able to be 3D printed. These singularities can be eliminated by either disconnecting the non-manifold surface and giving it volume, or by deleting it completely.



## WILL YOUR OBJECT BE SOLID?

A 3D model that looks great on the computer screen will sometimes not translate very well to the real world. So, you must adhere to the minimum requirements for the specific 3D printing process you choose to use. 3D models that have really thin features could break, especially if that thin area were to support a large or heavier 3D printed surface. So every 3D model that will be 3D printed must have a **minimum shell** or **wall thickness** to 3D print.

Minimum shell or wall thickness is dependent on which **material** you decide to 3D print with. However, if you go too thin, your 3D print will be fragile and you could

create holes in your geometry without knowing it. By abiding to the minimum wall thickness, you can avoid unnecessary breakage and avoid printer errors when trying to 3D print. Smaller details such as whiskers, wires or cables can be very fragile, or even impossible to print, if they are not thick enough.

To avoid these kinds of misadventures, several tools are extremely useful:

- **Check of the physical constraints** of a 3D print (like 3D print solidity check, discussed later)
- **Thickening tools** (to make fragile parts printable)
- **Manual inspection of the mesh** (like a cutaway view, measurement tools, and thickness analysis)

## IS YOUR FILE OPTIMIZED?

These operations push it a bit further to achieve a better quality or price.

- **Hollowing tools** (to remove the inside of a volume - and save money on the 3D print)
- **Smoothing tools** (for rough or noisy areas)
- **File size reduction tools** (to reduce the number of triangles for better performance)

# AUTOMATIC REPAIR AND OPTIMIZATION ON SCULPTEO

When a non-printable file is uploaded to our site, it is automatically analyzed and corrected by our repair algorithms. There are few problems which our algorithms are not able to repair.

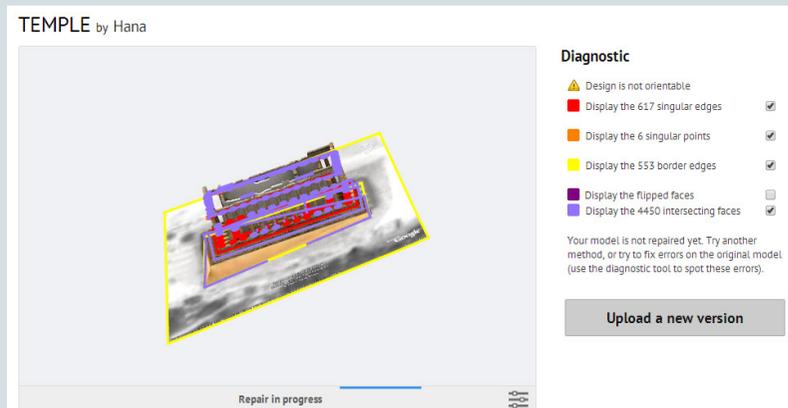
That being said our repairs may drastically alter your model, depending on the severity of your file's issues. However when a file is repaired, we also offer different repair methods giving you a choice of how your file will be repaired.

## 3D FILE DIAGNOSTIC

You can see the 3D file diagnostic in the **top right corner of your screen**. The diagnostic will point out the errors in your 3D file and will show you exactly where those problems arise in the 3D viewer. The file then updates according to the repair options you choose. Choosing "None" in the drop-down menu will show your original file and you will be able to visualize each of the errors detected by our software.

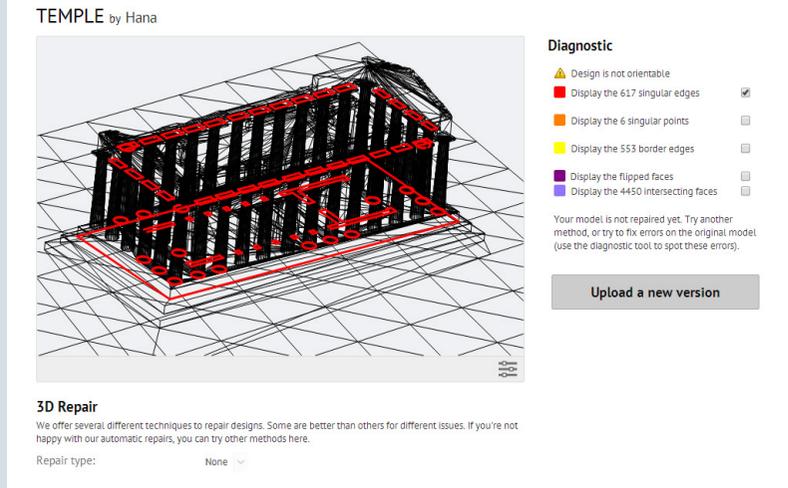
The diagnostic check will show the following errors.

- **Singular Edges** (surfaces that do not contribute to the border of a volume)
- **Singular sides and points** (non-manifold)
- **Intersecting Faces** (auto-intersections)
- **Inverted Faces** (orientation)



## 3D Repair

We found some potential printing issues with your design and are trying to fix it. This could take a few seconds or a few minutes depending on what kind of repairs we need to do. We'll let you know when we're done.



Check the different diagnostic categories to display them in the viewer. For more screenshots and examples, you can check out our [dedicated page](#).

# AUTOMATIC REPAIR AND OPTIMIZATION ON SCULPTEO

## SEMI-AUTOMATIC REPAIR

Based on the astronomic quantity of 3D files that we receive on a daily basis, we have developed the following repair functions:

- **Automatic:** A series of repair methods are applied in a specific order to detect which one is the most appropriate without degrading your original design too much. This proven function is optimized for most file types, so is the default option.
- **Plugging:** This algorithm fixes each problem in the file independently (holes, gaps, duplicate faces...). It modifies the mesh only at the place of the problems, so is a good choice for files with a limited number of issues. Good for CAD models
- **Reconstruction:** This global method combines several volumetric approaches to create a new mesh that overlaps parts of the original mesh and fills any gaps when needed. Great for architectural models
- **Restrained reconstruction :** We first separate the good connected components from the mesh, while leaving the bad ones. Then we apply a reconstruction algorithm only to the bad parts. This method is recommended for CAD and architectural models
- **Visible reconstruction:** This method will totally 're-mesh' your 3D file using a Poisson reconstruction algorithm. It is relevant for miniatures or small non-mechanical objects.
- **Hybrid Reconstruction:** This method is a combination of several methods. First it separates the input mesh from its connected components, and then it tries to repair each separately. Good for models made of multiple parts.

## SOLIDITY CHECK

Verification of strength is automatically activated when you click on the "Review" tab. This functionality is simple to use thanks to a green to red heatmap illustrating the strength of the 3D object.

Sculpteo's automatic solidity Check lets you review and verify any risk areas before 3D printing. If it's green, you can print without risk, otherwise, you should try to print in another size or with different materials. This tool is dynamic, if you change the material or the scale of the 3D print, the strength test will change accordingly. This allows you to adjust the ratio of size-to-strength-to-material.

The screenshot displays the Sculpteo interface for a 3D model titled "CableHolder\_FIX" by user "no2foket". The model is shown in a 3D view with a green heatmap, indicating good strength. A scale bar shows 2cm and 500mil. A legend indicates "Too thin" (red) and "Looks good" (green). The interface includes a "Review" tab, "Solidity Check" settings (material: Plastic, color: Grey, finish: Raw, scale: 32 x 32 x 18 mm), and "3D Print Settings" (unit price: €11.72, ships on Dec. 5, 2014). A "Review & Checkout" button is visible.

# AUTOMATIC REPAIR AND OPTIMIZATION ON SCULPTEO

## CUTAWAY VIEW

“Cutaway view” is used to view the inside of a 3D model. This allows control of two things:

- Ensuring that a 3D model is **correctly hollowed** and that the holes (placed by you with our ‘hollowing’ tool) are effectively placed to allow the removal of excess powder.
- Check that there is indeed a **gap** between different volumes that make up a moving or articulated object.

To use cutaway view, simply enable this feature by clicking on the **ON / OFF** toggle.

The screenshot shows the Sculpteo interface for a 3D model named 'CableHolder\_FIX' by 'no2foket'. The main view displays a grey 3D model of a cable holder with a cutaway view enabled, showing the internal structure. A 'Cutaway Position' slider is visible at the bottom of the model view. To the right, the 'Unit Price' is €11.72, and the '3D Print Settings' are listed: Material: Plastic, Color: Grey, Finish: Raw, Scale: 32 x 32 x 18 mm. Below the model view, there are three tabs: 'Materials', 'Optimize', and 'Review'. Under the 'Optimize' tab, there are two panels: 'Solidity Check' (with a threshold of around 1mm) and 'Cutaway View' (with a toggle set to 'ON'). Below these, there is a 'Thickening' panel (Beta) with a toggle set to 'OFF'.

## AUTOMATIC THICKENING

When the material and the selected size do not allow the 3D print to have sufficient strength, “thickening” can be used to thicken the parts that may break and allow 3D printing your file without any remodelling. To enable this feature, simply switch the button “OFF” to “ON”. Our algorithms will then create a wrap around the thin areas to make them thicker. The changes should create minimal deformation and fit harmoniously with the original model.

In case you feel that your 3D model has undergone too many changes, you can always disable this tool by toggling it off again. Like ‘hollowing’, thickening adapts to any changes in scale or material.

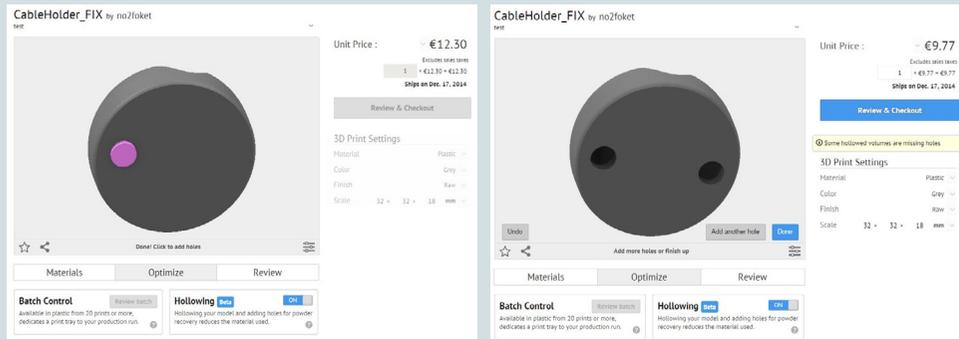
The ‘thickened’ files are **saved** to your objects library by adding them to your shopping basket even if the order is not finalized. Once the objects are in your shopping basket, the thickened version is added as a ‘version’ of the original file.

The screenshot shows the Sculpteo interface for a 3D model named 'FILTER DISC' by 'arthur\_sculpteo'. The main view displays a green 3D model of a circular filter disc with a thickening effect applied to its spokes. A color scale legend at the bottom of the model view indicates 'Too thin' (red) and 'Looks good' (green). To the right, the 'Unit Price' is €6.26, and the '3D Print Settings' are listed: Material: Plastic, Color: White, Finish: Raw, Scale: 89 x 89 x 5.5 mm. Below the model view, there are three tabs: 'Materials', 'Optimize', and 'Review'. Under the 'Optimize' tab, there are two panels: 'Solidity Check' (with a threshold of around 1mm) and 'Cutaway View' (with a toggle set to 'OFF'). Below these, there is a 'Thickening' panel (Beta) with a toggle set to 'OFF'.

# AUTOMATIC REPAIR AND OPTIMIZATION ON SCULPTEO

## HOLLOWING

“Hollowing” lets you hollow any of the 3D models you have uploaded. You’ll just need to activate it in the **Optimize** section of the **“Print Page”**. Once the model has been hollowed, add two or more holes to help us remove the unused material and you’re good to go.



We’ve designed this feature so that it automatically chooses the best settings for your model and **updates** every time you change the material or the size of your model. Want to switch your 3D print to multicolor and make the print smaller? No worries, everything updates automatically so that your 3D print is not rejected after the order is passed. Therefore, each hole placed on your model has the exact minimum width we need to clean out the model.

There are two major upsides of this feature:

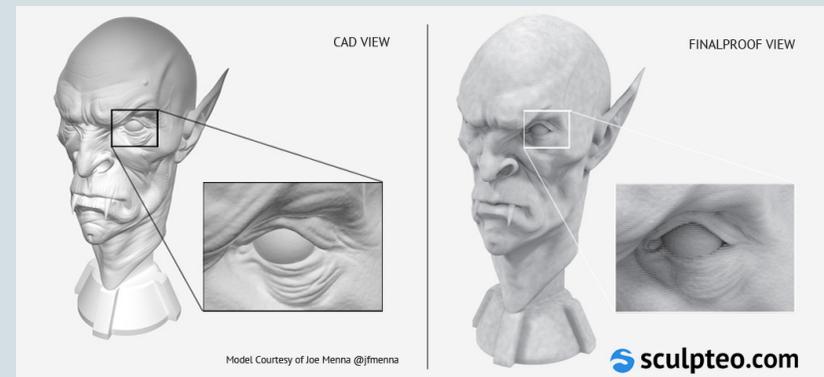
- **You save on your 3D prints.** The less material we use for 3D printing means the less you pay for your 3D print.
- It can also come in handy when you want to make your print **lighter** or for certain materials where bulk can be a problem, like ceramic.

## FINALPROOF

FinalProof is a **high definition rendering of your 3D object**. Unlike the traditional 3D viewer, FinalProof shows what the individual layers of your object will look like at the scale you’ve chosen.

FinalProof is available through the **Review Tab** of the **Print Page**. You’ll find a section that calls you to **“Get Your 3D Print Dossier”** from there it’s just a click away. The dossier offers you all types of information from pricing, detailed blueprints and legal information, and of course, a high definition render. That render provides a lot of key information when it comes to the final version of your object. For example, if you’re creating an object with an embossing or engraving, FinalProof will provide you with a visual as to whether or not those details will be visible. It could mean the difference between a successful 3D print and a wasted one!

For a smaller, rounded object (like a miniature 8 ball), the layers will be more visible than on a large square with 90 degree angles. The layering effect is unavoidable and is a result of all 3D printing technologies today (however it is least visible on resin prints). SLS printing technologies, which we use for our plastic prints, offers a minimal amount of layering when compared with traditional FDM 3D printing techniques. Typically an SLS layer is 100 microns thick but can be reduced to 60 microns on the Print Page on Sculpteo (and it can even be polished for a finish similar to injection molding).



## FREE SOFTWARE TO FIX YOUR FILES BEFORE UPLOADING

Home-made is often the best way to produce good stuff. If you have time, we highly recommend spending a few hours on checking and optimizing your file before uploading.

In this section we would like to compare what we think are the best FREE tools available at the moment to get the best result when preparing your files for 3D printing.

- **Netfabb Basic:** great to quickly verify the printability of a model (its red warning sign is a great rule of thumb), retrieve specific information about it and attempt automatic repairs.
- **Meshmixer:** handy when you want to manually modify and correct a mesh and it integrates a wide range of 3D printers and 3D printing services (including Sculpteo).
- **MeshLab:** can also be used to manually edit a 3D file. It includes more options than Meshmixer, but has a pretty steep learning curve.
- **MiniMagics** and **3D-Tool-Free:** effectively basic and easy to use .stl viewers, providing basic information about the mesh

Many features are the same as what Sculpteo provides but will give you more control and will satisfy more expert users. The desktop solutions are fantastic if you like to spend time to test and if you feel that the repair phase is an important interactive element for the work on your 3D file. Whereas Sculpteo will help you to get the final touch on your design to make it 3D printable with automatic features, these software tools give you more in-depth access to parameters and let you apply

a fine tuning to their features. Some of them offer very intuitive user experiences and some others can be better described as an endless treasure chest for skilled 3D designers. So we chose to evaluate them on 12 features and summarize our findings in a [comparison chart](#) (page 19). Our evaluation criteria include:

- **supported files**
- **mesh analysis**
- **colors / texture apply**
- **optimization tools like hollowing, thickening or smoothing**
- **reducing triangles feature**
- **boolean operations**

None of those free tools will allow you to do everything you need in the same interface, and you might have to juggle with a few of them to achieve the perfect 3D file for 3D printing. We hope this chapter will help you to determine which interface suits you best.



FREE SOFTWARE TO FIX YOUR FILES BEFORE UPLOADING

# NETFABB

DOWNLOAD LINK

<http://www.netfabb.com/downloadcenter.php?basic=1>

usability: ●●● range of functionality: ●●○ analyze/repair: ●●● edit/optimize: ●○○

## FEATURED TOOLS

supported files: .stl, .x3d, .x3db, .3ds, .gts, .zip, .ply, .amf, .wrl, .fitproj, .fitlist, .ncm, .obj, .3mf, .sli, .cli, .cls, .slc, .usf, .clf, .slm, .mtt, .ssl, .binvox

	mesh analysis - visual	✓		desktop application	✓
	mesh analysis - descriptive	✓		online application	✗

	measurement tools	✓		automatic repair	✓
	snap to mesh elements	✓		manual repair	✓

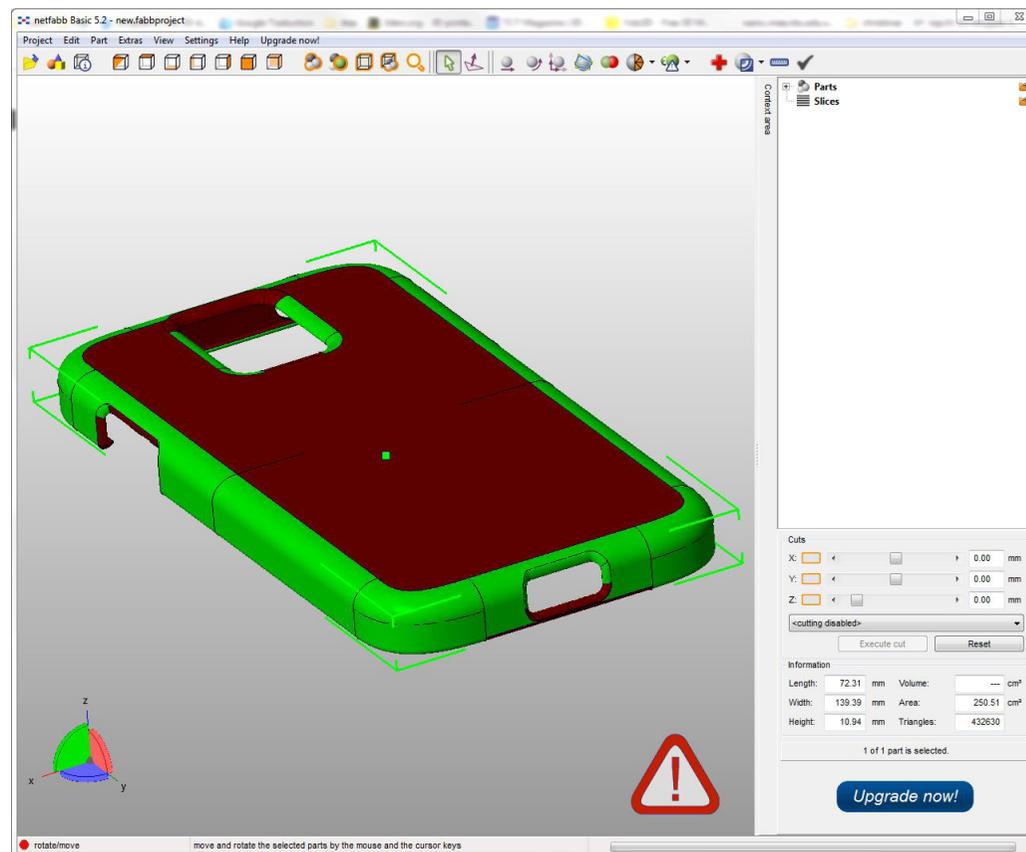
	colors	✓		textures	✓
	apply	✗		apply	✗

	hollowing	✗		smoothing	✗
--	-----------	---	--	-----------	---

	cutaway view	✓		thickening	✗
--	--------------	---	--	------------	---

	planar cut	✓		reduce triangles	✗
--	------------	---	--	------------------	---

	boolean operation	✗			
--	-------------------	---	--	--	--





## ABOUT

Netfabb is a classic when it comes to 3D printing. Probably one of the most used pieces of software out there. In a few words, Netfabb is a mesh repair and editing software. It's available for free in a version called Basic.

It is mainly used to perform 4 tasks: **analyse the printability** of a model, **repair** it if necessary, **measure** and **scale** it.

When one is looking to repair a 3D file, Netfabb is there to do the job pretty easily. It has a powerful **automatic repair** function, that works in most cases with common issues such as unstitched edges, holes and incoherently oriented triangles.

The **measurements tools** present in Netfabb are very complete, they allow you to directly measure wall thickness or snap to faces, edges and points to check distances, angles and radii. Unfortunately there are a few downsides to using a free version. It doesn't allow you to perform any automatic **thickness analyses**.

Many **mesh formats** are supported (.stl, .x3d, .x3db, .3ds, .gts, .zip, .ply, .amf, .wrl, .fitproj, .fitlist, .ncm, .obj, .3mf, .sli, .cli, .cls, .slc, .usf, .clf, .slm, .mtt, .ssl, .binvox), also including textures and colors. Although the latest are not visible in the viewer, you will see them in the exported files (Such as .Obj or .Wrl). There is no tool to **apply colors** or **textures** to the mesh though.

**Cutaway view** is very handy and useful to visually analyze the model inside and out. It's also possible to perform a **planar cut** of the model, dividing it into 2 parts.

Another cool feature is its **selection methods**: single triangles, faces or shells can be detected and selected on the model, separated from the rest and exported as new parts if necessary.

On the other hand, the software is very limited (At least in its free version) when it comes to topological modifications: **boolean** and intersect operations are not possible, and neither are **hollowing**, **smoothing**, **thickening** or **triangle reduction**.

Another limitation is the fact that the free software is limited to 2 GB of RAM, meaning that fairly big meshes (More than 1.5 million triangles normally) won't be able to be processed.



FREE SOFTWARE TO FIX YOUR FILES BEFORE UPLOADING

# MESHMIXER

DOWNLOAD LINK

<http://meshmixer.com/>

usability: ●●○ range of functionality: ●●● analyze/repair: ●●○ edit/optimize: ●●●

## FEATURED TOOLS

supported files: .obj, .stl, .ply .amf

 mesh analysis - visual <input checked="" type="checkbox"/>	 desktop application <input checked="" type="checkbox"/>
mesh analysis - descriptive <input checked="" type="checkbox"/>	online application <input checked="" type="checkbox"/>

 measurement tools <input checked="" type="checkbox"/>	 automatic repair <input checked="" type="checkbox"/>
snap to mesh elements <input checked="" type="checkbox"/>	manual repair <input checked="" type="checkbox"/>

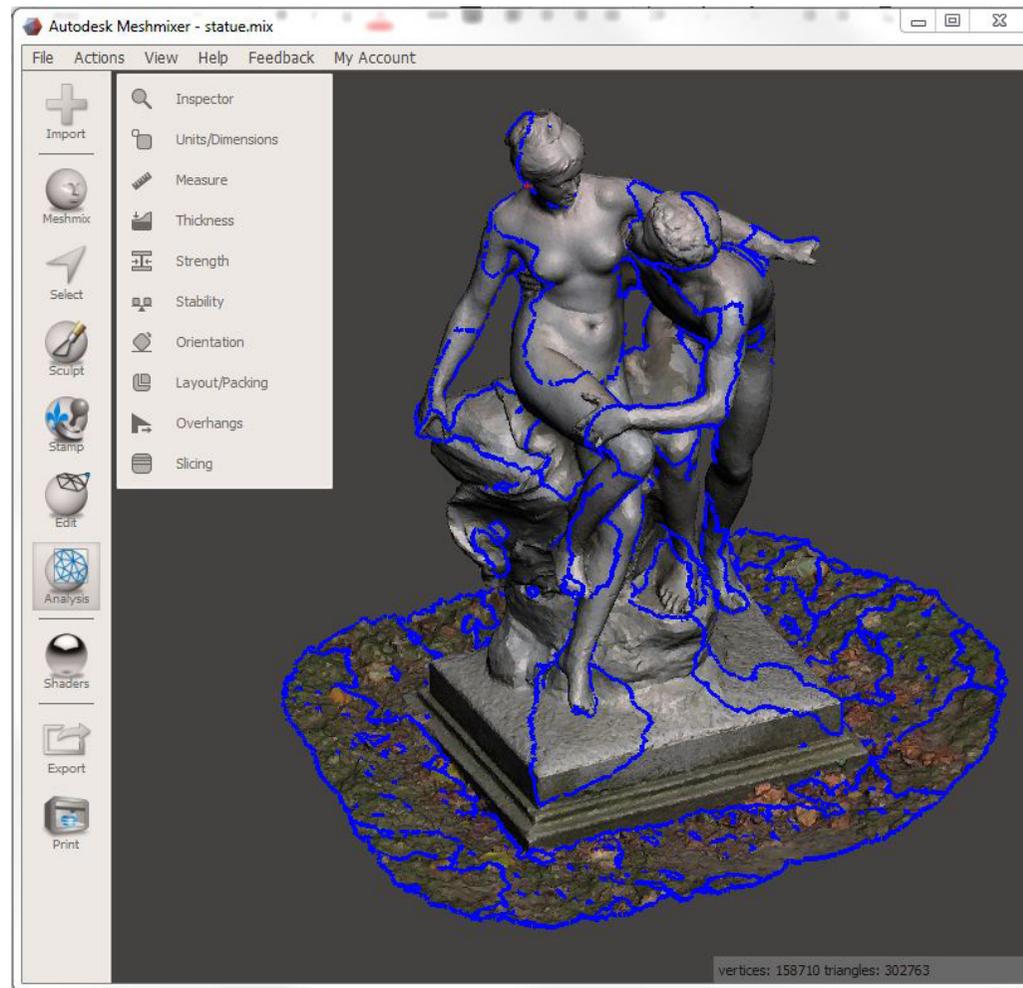
 colors <input checked="" type="checkbox"/>	 textures <input checked="" type="checkbox"/>
apply <input checked="" type="checkbox"/>	apply <input checked="" type="checkbox"/>

 hollowing <input checked="" type="checkbox"/>	 smoothing <input checked="" type="checkbox"/>
---	---

 cutaway view <input checked="" type="checkbox"/>	 thickening <input checked="" type="checkbox"/>
--	--

 planar cut <input checked="" type="checkbox"/>	 reduce triangles <input checked="" type="checkbox"/>
--	--

 boolean operation <input checked="" type="checkbox"/>
---





## ABOUT

It might be surprising to find Meshmixer in this rundown of software since it's a tool tailored for 3D mashups, remixes or even to sculpt 3D files. However it is also incredibly useful for performing a number of small tasks to transform a 3D file into something 3D printable. Meshmixer is free software provided by Autodesk. It is particularly valued for its friendly interface and easy learning curve in relation to its number of features. The major upside of Meshmixer is also that it has been created with 3D printing in mind and there are a few cool tricks that are really easy to do.

Meshmixer is mainly **used to modify topology** in existing .stl and .obj files, combine them to create new shapes and optimize the result for 3d printing through several dedicated features.

A real limitation of Meshmixer is the limited **filetypes** that can be imported (.obj, .stl, .ply, .amf). It does support colors though and textures can be added while uploading the 3D files. If your file has none, it's also possible to **apply colors** (not textures) to the mesh thanks to the painting brush.

If you're looking for an automatic repair tool, Meshmixer might not be the best solution. While some errors in the mesh can be detected, the **analysis** is only displayed visually, and you won't get a very powerful **automatic repair**.

Even if it's not the most complete (since it does not allow you to measure angles and radii), Meshmixer's **measurement tool** can be quite useful if you need to check the bounding box dimension or resize a 3D model. There is a very useful and fast automatic **thickness analysis** tool, pointing out areas thinner than a chosen threshold. Its results might need to be taken with a pinch of salt since it tends to highlight almost all right angle edges, confusing them as thin areas.

A **cutaway view** is missing, but a **plane cut** can be performed to delete an unwanted side of the model precisely and fill the hole created in the process (To create a flat base for example).

**Selection methods** in Meshmixer are intuitive but they don't allow for any automatic recognition of faces, surfaces or shells like one has with Netfabb.

The main strength of Meshmixer is the presence of tools to interactively modify the geometry of the mesh, specifically conceived to produce 3D printable models. This is very difficult to find in any other free desktop application that has this range of uses and friendly interface.

Also present is a **boolean operation** tool. It comes in handy when you're looking to merge, subtract or intersect a geometry of two different models. Also the "remeshing" tool (called 'make solid') is able to **unify all the shells** that your model might be composed of.

After a few trial runs, you'll be able to set the correct parameter to obtain good results. (Note that this feature will destroy any textures you might have imported) Meshmixer can also be helpful if you're looking at making an empty 3D model. The application provides a decent **hollowing tool** allowing you to remove unnecessary material from the interior of the model, providing a quick way to reduce weight and cost of the 3D print.

Ways to interactively **smoothen** and **thicken** areas of the model are provided by the software, however they aren't automatically executed.

Last but not the least, you'll find Meshmixer a great companion if you're looking at **reducing the number of triangles** of your 3D model, both locally on a certain section of the file or on the overall geometry.

In general, Meshmixer is still a bit unstable (It crashes quite often) and it slows down with fairly big files, but its numerous dedicated features make it an **excellent free tool to optimize your file for 3D printing**.



FREE SOFTWARE TO FIX YOUR FILES BEFORE UPLOADING

# MESHLAB

DOWNLOAD LINK

<http://meshlab.sourceforge.net>

usability: ●○○ range of functionality: ●●● analyze/repair: ●●○ edit/optimize: ●●●

## FEATURED TOOLS

supported files: .ply, .stl, .off, .obj, .3ds, .dae, .ptx, .v3d, .pts, .apts, .xyz, .gts, .tri, .asc, .x3d, .x3dv, .vrml, .aln

	mesh analysis - visual <input checked="" type="checkbox"/>		desktop application <input checked="" type="checkbox"/>
	mesh analysis - descriptive <input checked="" type="checkbox"/>		online application <input checked="" type="checkbox"/>

	measurement tools <input checked="" type="checkbox"/>		automatic repair <input checked="" type="checkbox"/>
	snap to mesh elements <input checked="" type="checkbox"/>		manual repair <input checked="" type="checkbox"/>

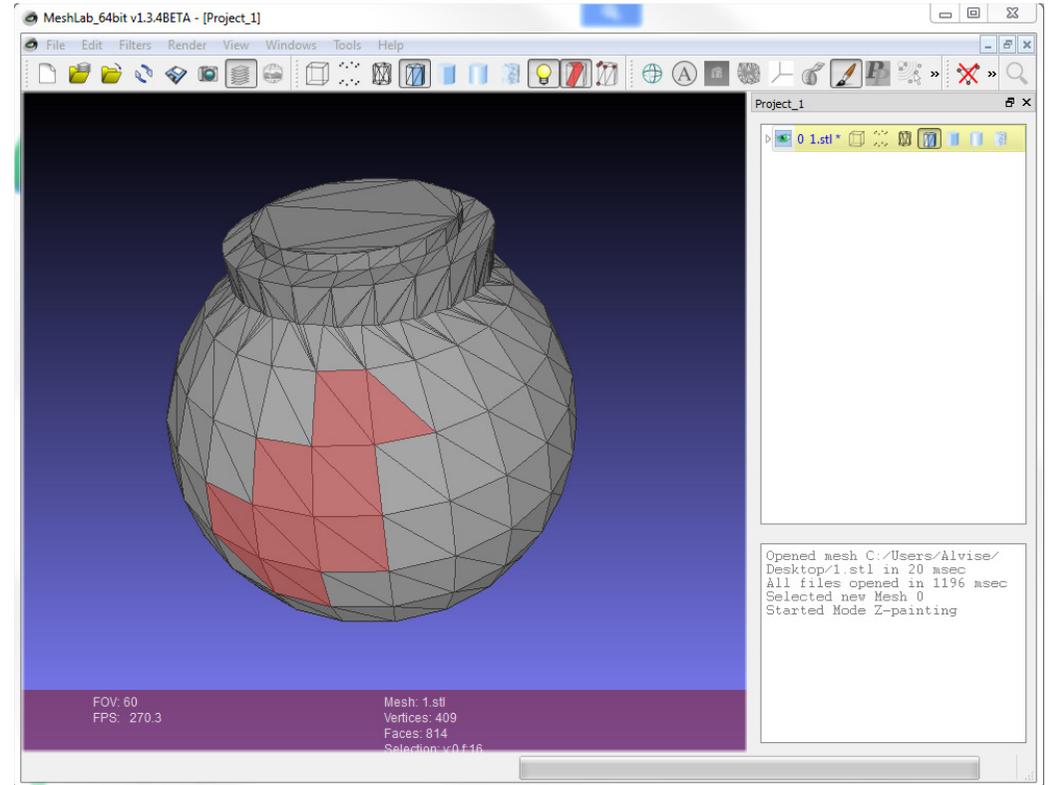
	colors <input checked="" type="checkbox"/>		textures <input checked="" type="checkbox"/>
	apply <input checked="" type="checkbox"/>		apply <input checked="" type="checkbox"/>

	hollowing <input checked="" type="checkbox"/>		smoothing <input checked="" type="checkbox"/>
---	---	---	---

	cutaway view <input checked="" type="checkbox"/>		thickening <input checked="" type="checkbox"/>
---	--	---	--

	planar cut <input checked="" type="checkbox"/>		reduce triangles <input checked="" type="checkbox"/>
---	--	---	--

	boolean operation <input checked="" type="checkbox"/>		
---	---	--	--





## ABOUT

Meshlab is another very complete mesh fixing and editing software, free to download in its full version.

It is particularly appreciated by more professional users for its many mesh and point cloud processing functions, and its ability to manage even very large files, making it suitable for use with **high quality scan data**.

Many file formats are supported (.ply, .3dv, .vrml, .aln), making it worth having even just for its conversion capabilities. You can import .ply, .stl, .off, .obj, .3ds, .dae, .ptx, .v3d, .pts, .apts, .xyz, .gts, .tri, .asc, .x3d, .x3dv, .vrml, .aln

**Colored and textured files** can be imported and correctly seen in the viewer, while colors can also be applied directly to the model with a nice “Painting tool”. Very interesting are also the **color conversion** tools, to transform vertex colors into face colors and vice versa, or textures into vertex colors.

Its vast set of “Filters”, i.e. the processing tools in Meshlab, include mesh **analysis** and “**cleaning**” of errors, **remeshing**, like **surface reconstructions**, an **automatic smoothing** algorithm and visual “**inspection**” tools. The **triangle reduction** filter (Quadric Edge Collapse Decimation) works great, letting you set the target number of triangles to reach and other useful options to preserve textures and topology.

Meshlab also lets you **interactively smoothen** or

**engrave** areas of the mesh with a brush tool, whose size and strength can be adjusted.

The manual triangles **selection tools** in Meshlab are well developed: rectangular areas, freeform areas (using a brush) and single shells can be selected.

The “**Fill Hole**” tool lets you select the holes in the mesh independently and close them maintaining control of the new triangles’ shape.

A **measurement tool** is also present, but no way to snap to specific elements of the mesh is provided.

Among the missing features for us are the boolean operations, planar cuts, thickness analysis and automatic thickening and hollowing tools.

Even though you might find in Meshlab many of the tools you need to process and optimize your file for 3D printing, a very “unfriendly” (to say the least) user interface combined with limited documentation can make the first encounter with this software quite frustrating for non professional users.



FREE SOFTWARE TO FIX YOUR FILES BEFORE UPLOADING

# MINIMAGICS

DOWNLOAD LINK

<http://software.materialise.com/minimagics>

usability: ●●● range of functionality: ●○○ analyze/repair: ●○○ edit/optimize: ○○○

## FEATURED TOOLS

 supported files: .stl

 mesh analysis - visual   
mesh analysis - descriptive

 desktop application   
online application

 measurement tools   
snap to mesh elements

 automatic repair   
manual repair

 colors   
apply

 textures   
apply

 hollowing

 smoothing

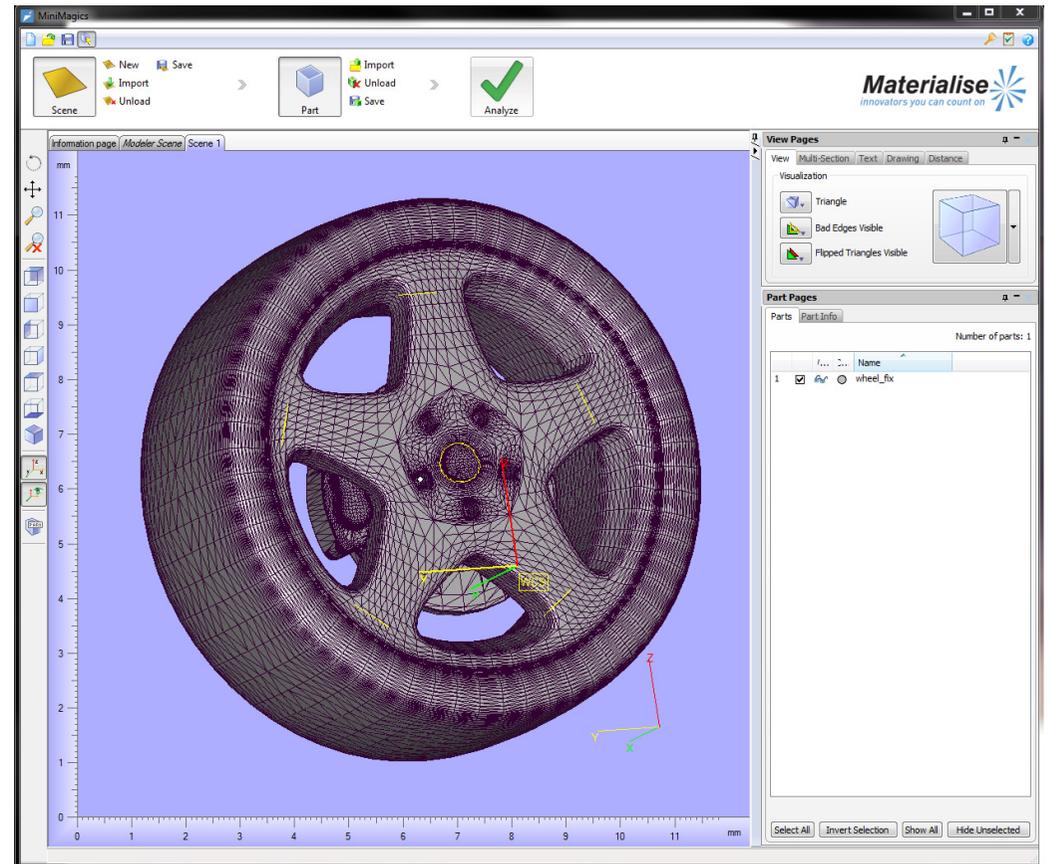
 cutaway view

 thickening

 planar cut

 reduce triangles

 boolean operation





## ABOUT

Minimagics is the free, light, version of the famous software for additive manufacturing Magics, developed by Materialise.

It is basically just an STL viewer (other formats are not even importable), useful for checking the printability of your model.

Its **analyze** function detects inverted edges, bad normals and shells in the model, both visually and analytically, but doesn't provide any tools for repairing these problems.

The **measurement** tool is present but doesn't snap to mesh features.

It has a very useful **cutaway viewer** tool, called multisection tool, to visually analyze the internal features of your model.

It's possible to **annotate** specific parts of the model.

All other editing and optimization tools are missing, so it's a very basic software, useful to quickly view and analyze the basic status of a model, and perhaps share comments about it.



FREE SOFTWARE TO FIX YOUR FILES BEFORE UPLOADING

# 3D-TOOL-FREE

DOWNLOAD LINK

[http://www.3d-tool.com/en\\_free-viewer-download.htm](http://www.3d-tool.com/en_free-viewer-download.htm)

usability: ●●● range of functionality: ●○○ analyze/repair: ●○○ edit/optimize: ○○○

## FEATURED TOOLS

supported files: .stl

	mesh analysis - visual	✗		desktop application	✓
	mesh analysis - descriptive	✗		online application	✗

	measurement tools	✓		automatic repair	✗
	snap to mesh elements	✓		manual repair	✗

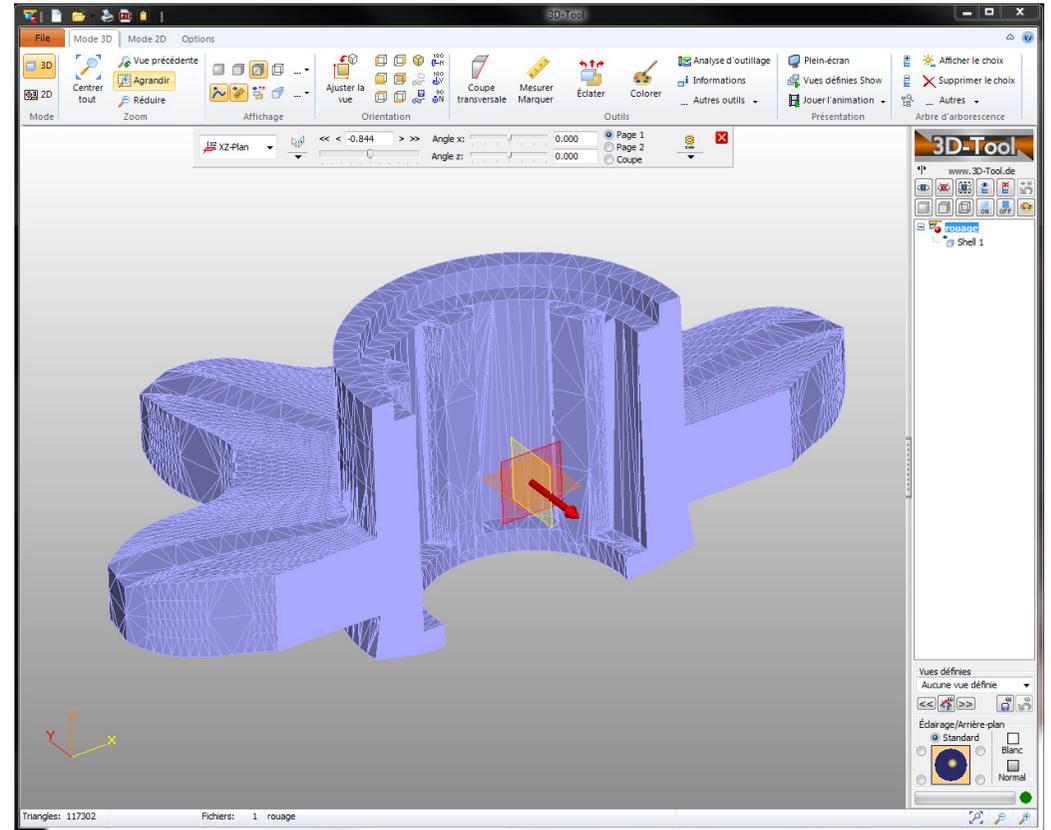
	colors	✗		textures	✗
	apply	✗		apply	✗

	hollowing	✗		smoothing	✗
--	-----------	---	--	-----------	---

	cutaway view	✓		thickening	✗
--	--------------	---	--	------------	---

	planar cut	✓		reduce triangles	✗
--	------------	---	--	------------------	---

	boolean operation	✗
--	-------------------	---





## ABOUT

3D Tool is another free .stl file viewer and analyzer, no other formats can be imported, and even then only one at a time.

The range of **Measurement tools** is broad, with the possibility to snap to every kind of mesh feature and measure thicknesses, distances, angles and diameters. The **cutaway tool** is also well developed, allowing you to also change the angle of the cutting plane. This software offers a good tool for automatic **thickness analysis**, shown through the use of graduated colors directly on the mesh.

No quality inspection is provided, neither for editing nor optimization of the model. It's a nice program though to view the model, analyze its solidity and inner features and share comments about it.

## COMPARISON TABLE

		Netfabb Basic	Meshmixer	MeshLab	MiniMagics	3D Tool-Free
	 desktop application	✓	✓	✓	✓	✓
	 online application	✗	✗	✗	✗	✗
CHECK PRINTABILITY	 mesh analysis - visual	✓	✓	✓	✓	✗
	 mesh analysis - descriptive	✓	✗	✓	✓	✗
	 automatic repair	✓	✓	✓	✗	✗
	 manual repair	✓	✓	✓	✗	✗
	 measurement tools	✓	✓	✓	✓	✓
	 snap to mesh elements	✓	✓	✗	✗	✓
OPTIMIZE	 cutaway view	✓	✗	✗	✓	✓
	 planar cut	✓	✓	✗	✗	✓
	 boolean operation	✗	✓	✗	✗	✗
	 hollowing	✗	✓	✗	✗	✗
	 smoothing	✗	✓	✓	✗	✗
	 thickening	✗	✓	✗	✗	✗
	 reduce triangles	✗	✓	✓	✗	✗
	 colors apply	✓ ✗	✓ ✓	✓ ✓	✗ ✗	✗ ✗
	 textures apply	✓ ✗	✓ ✗	✓ ✗	✗ ✗	✗ ✗

## Think additive & Gain an adaptive advantage for your business.

Access to a one-stop-shop of resources to discover your Additive Advantage and develop a strategy that will **put game-changing technology into your hands**.

Use it to unlock the full potential of 3D printing, and:

- **Create room for innovation,**
- **Scale your production,**
- **Make adaptability one of your greatest strengths.**

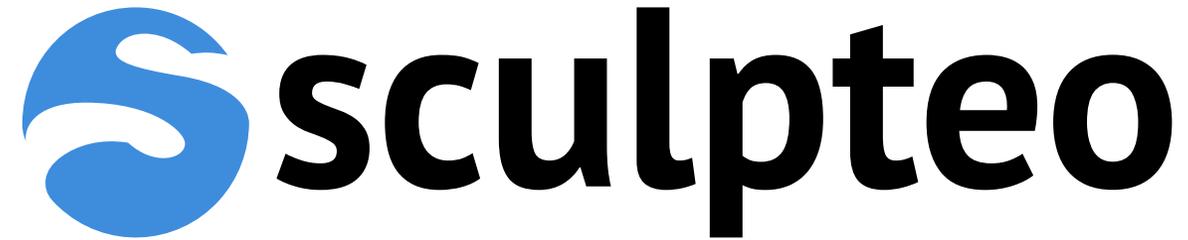
We've compiled our best ebooks, playbooks, guides, and customers' stories, made for professionals who want new additive manufacturing opportunities

...all in one place.

# MAKE YOUR BUSINESS THRIVE WITH 3D PRINTING

Access our **MasterClass resources** and develop your AM strategy





A brand of BASF - We create chemistry

PARIS

10 Rue Auguste Perret,  
94800 Villejuif, France

+ 33 1 83 64 11 22

US

The Port Workspaces  
344 20th Street STE 209  
Oakland, CA 94612

1-800 814-1270

[hello@sculpteo.com](mailto:hello@sculpteo.com)

[sculpteo.com](https://sculpteo.com)