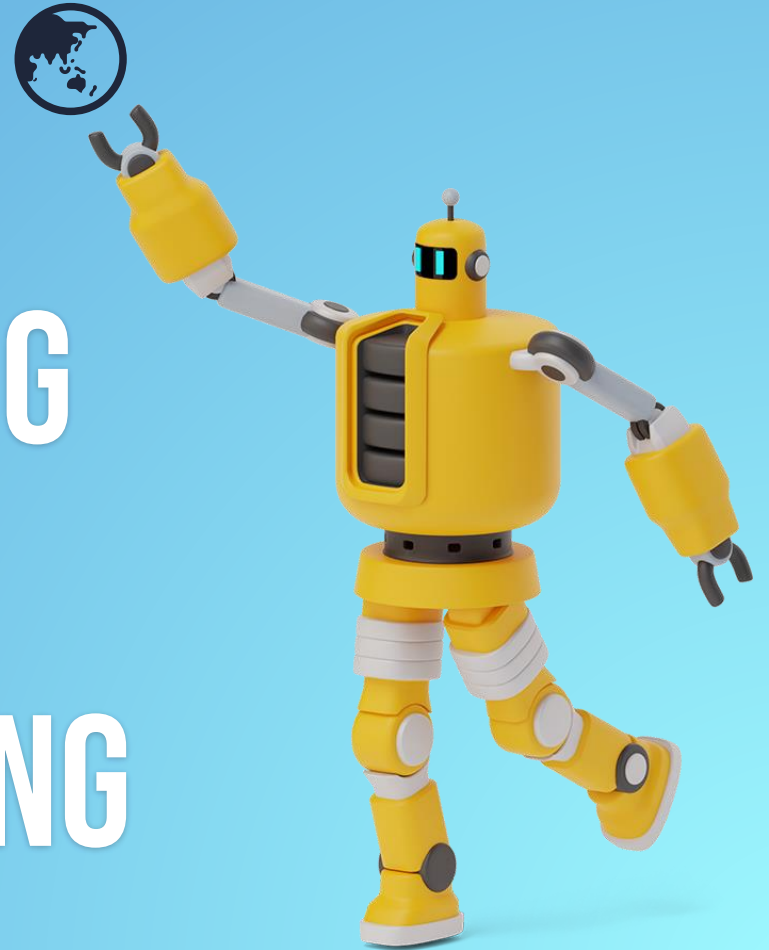




3D PRINTING AND 3D MODELLING



WHAT ARE WE GOING TO TALK ABOUT

Introduction to 3D printing

- Types of 3D printers;
- Types of slicers, filaments and drawing software;

Drawing on Onshape

- Creating an account;
- Drawing some examples;
- Creative challenge;

Working with Cura

- Strategies to work with cura;
- Definitions on cura to have a good printing;

Working with 3D printers

- How to level the printer;
- How to change the filaments;

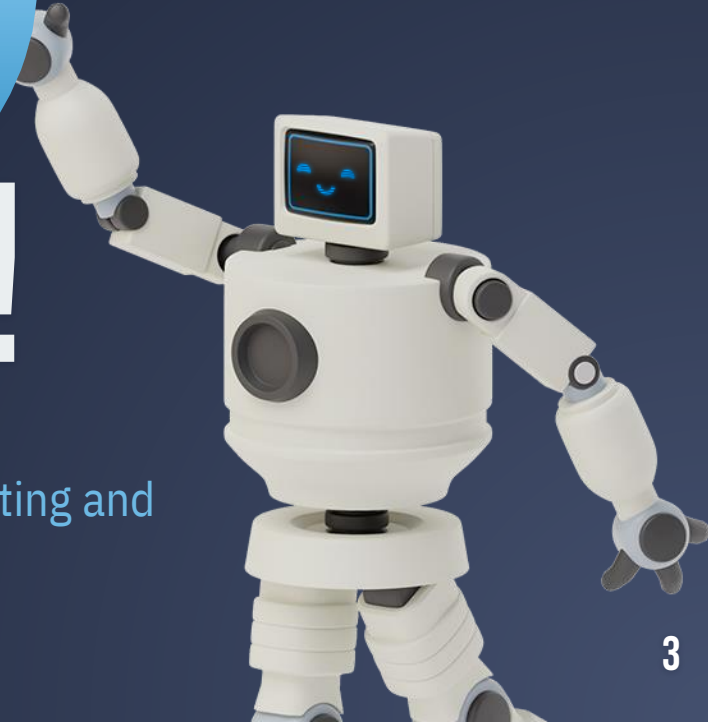


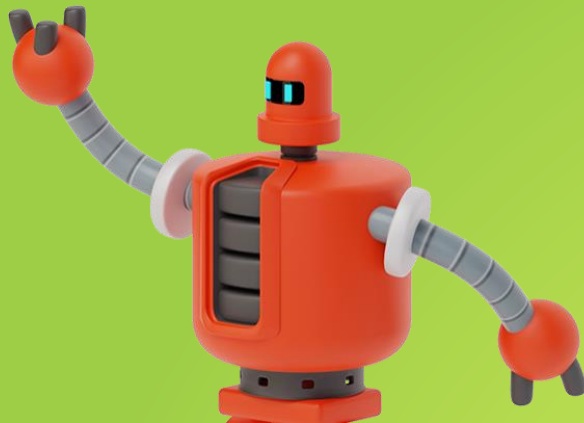


HELLO!

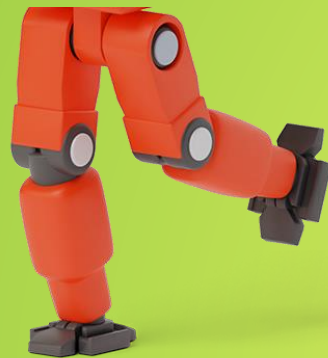
I am Lara Costa

I am here because I love 3D printing and modeling.





ICE BREAKING GAME

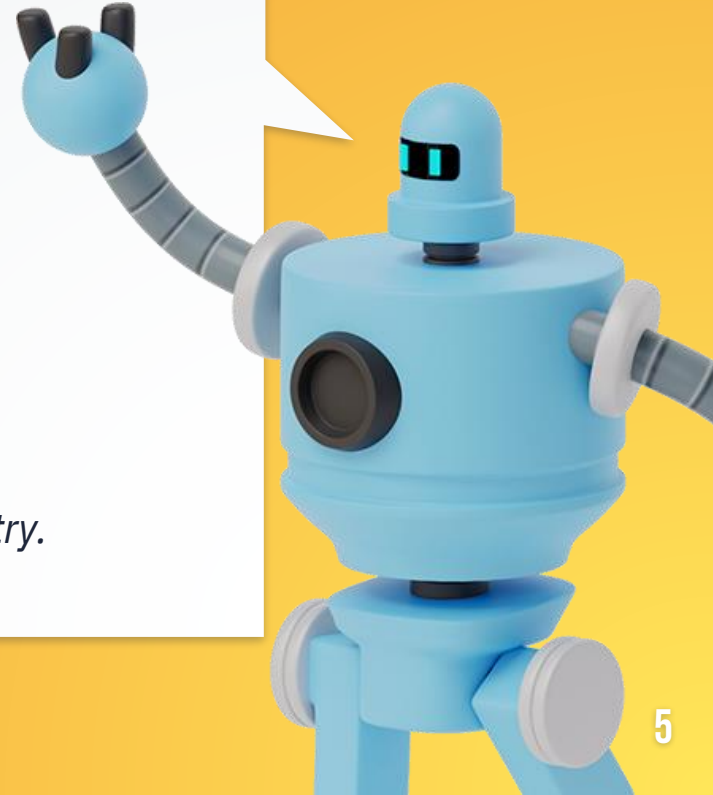


How will it work:

There is a ball that will start at someone.

This person introduces himself/herself saying his/her:

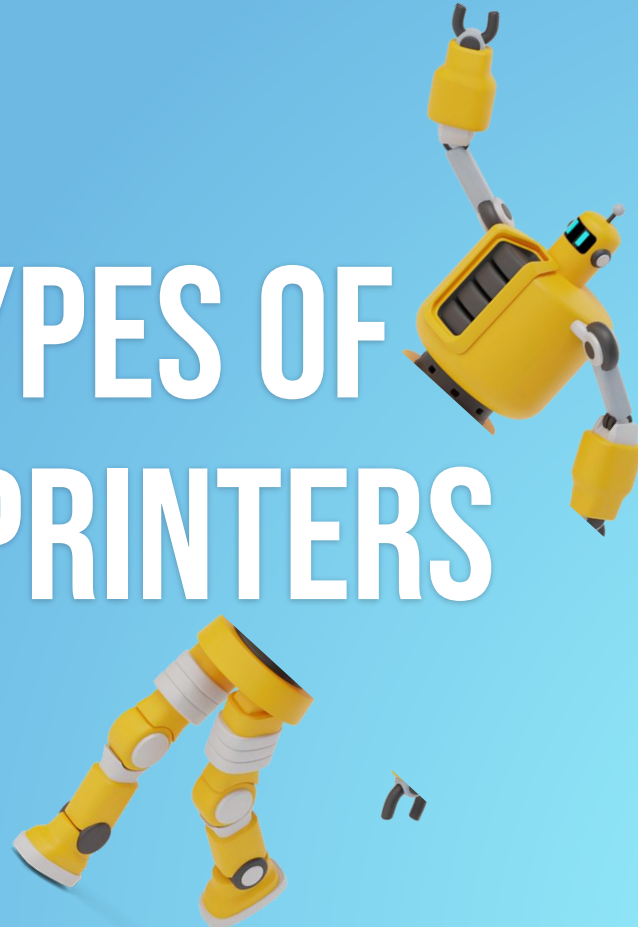
- *Name*
- *Age*
- *Country*
- *Course*
- *And other interesting things about you or your country.*



INTRODUCTION

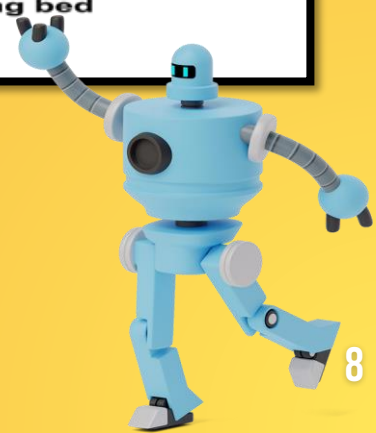
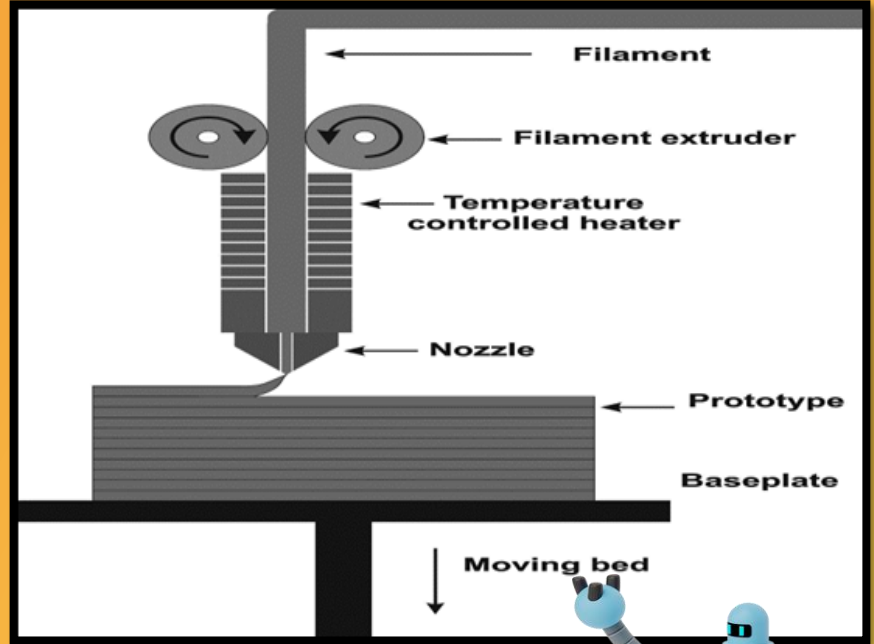


TYPES OF 3D PRINTERS



FUSED DEPOSITION MODELING (FDM)

The most affordable 3D printing technology of all, with the most popularity on the market, works by applying materials layer by layer, creating three-dimensional patterns like an extremely accurate hot glue gun.



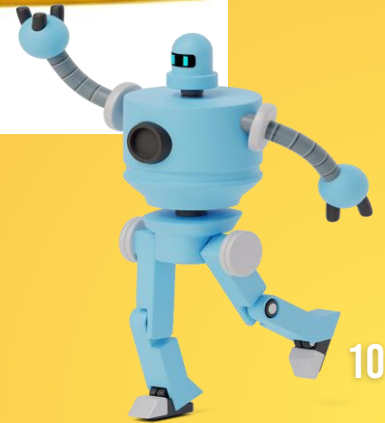
STEREOLITHOGRAPHY (SLA)

The SLA exposes a layer of photosensitive liquid resin to an ultraviolet laser beam so that the resin hardens and becomes solid. The object is printed layer by layer and each layer builds on the previous one.



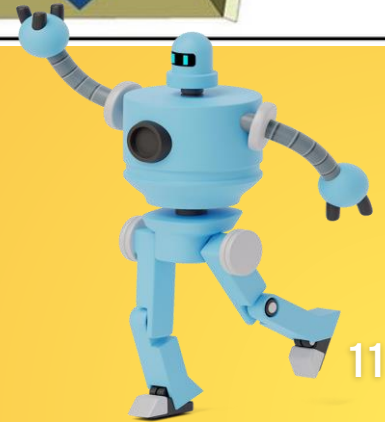
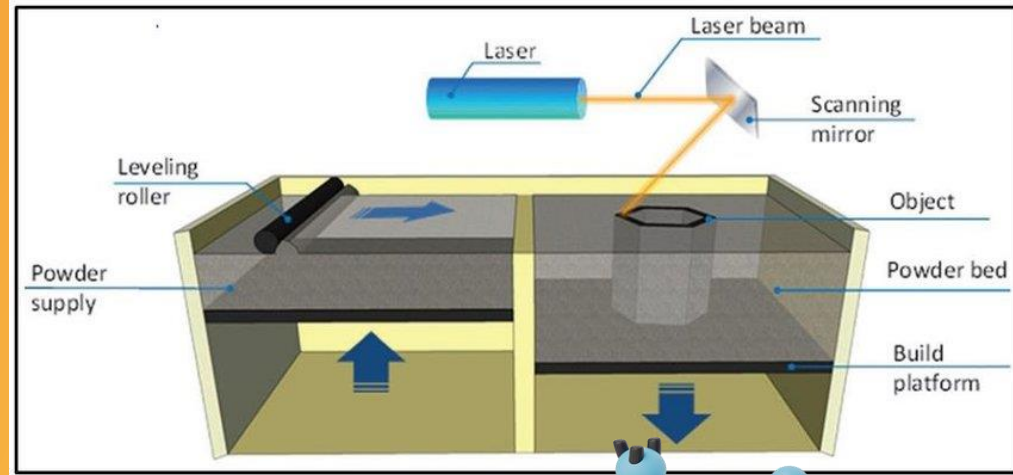
DIGITAL LIGHT PROCESSING (DLP)

Digital light processing is similar to SLA in that it cures the liquid resin using light. The main difference between the two technologies is that DLP uses a digital light projector screen, while SLA uses a UV laser.



SELECTIVE LASER MELTING (SLM)

SLM uses a high powered laser beam to fully melt metallic powders into solid three-dimensional objects. The object is printed layer by layer. Typical materials used are stainless steel, aluminum, titanium and cobalt chromium.



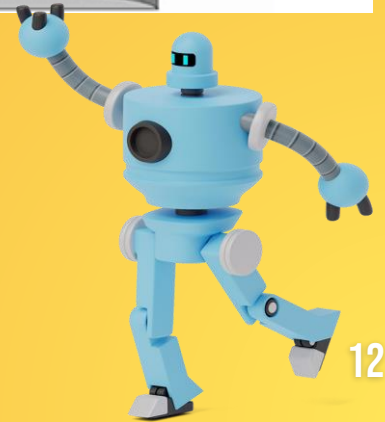
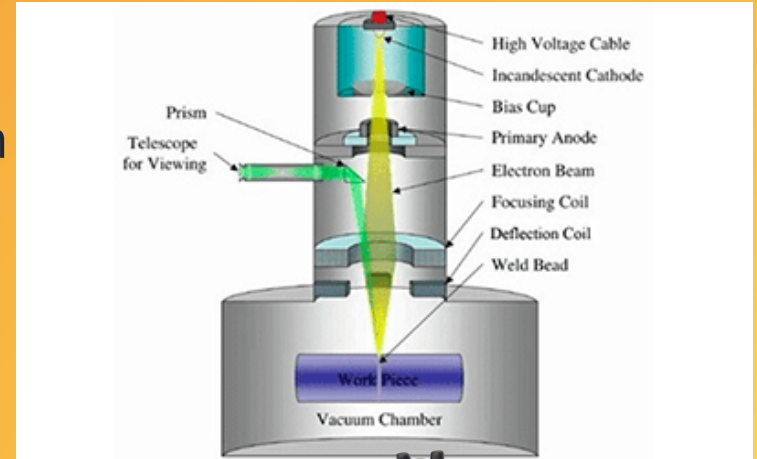
ELECTRON BEAM MELTING

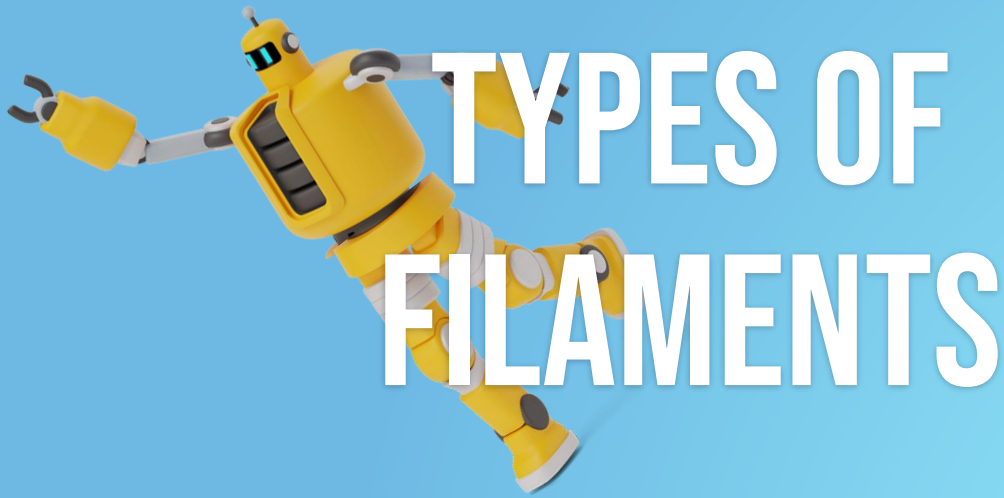
The EBM uses an electron beam under high vacuum to fully melt metallic powder at high temperatures up to 1000 °C.

The object is printed layer by layer.

This type of 3D printer can use metals like pure titanium, Inconel718 and Inconel625 to manufacture aerospace parts and medical implants.

This type of technology is slower and more expensive than the previous ones.





PLA (LACTIC POLYACID)

This biodegradable material is one of the most used in 3d printing.



PETG (POLYETHYLENE GLYCOL TEREPHTHALATE)

The PETG filament is one of the strongest and most durable of all filaments.

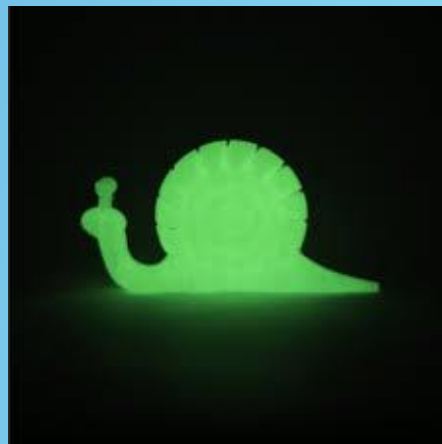


TPU (POLYESTER POLYURETHANE)

TPU filament is abrasion resistant, can withstand impacts and is resistant to many chemicals. It is versatile and used in many different industries.



OTHERS



TYPES OF SLICERS



TYPES OF SLICERS

- In 3D printing, it is necessary to have a file with a 3D model (the drawing in 3D format). The most common files are STL and OBJ.
- Afterwards, it is necessary to convert the file into a special code (G code) that can be read by the 3D printer. This type of encoding is done by slicing software and the process is called slicing.

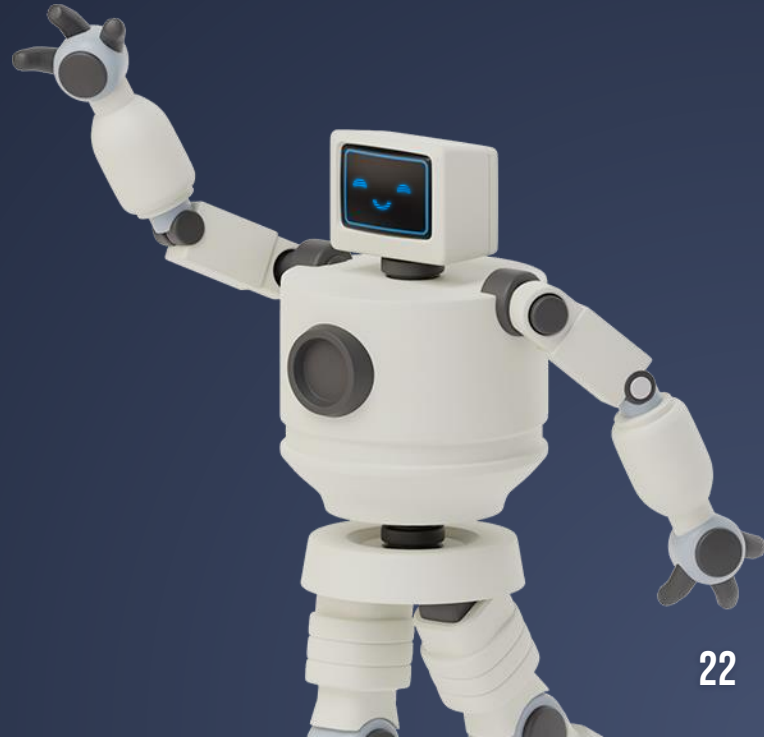
CHOSING A SLICER

- At the end of the slicing process, the user can send the file directly to a 3D printer or save it on an SD card or pen drive, for example. Nowadays we can also send the file via wi-fi.
- The user has many options to choose from as there are several slicing software for 3D printing.

EXAMPLES OF SLICERS



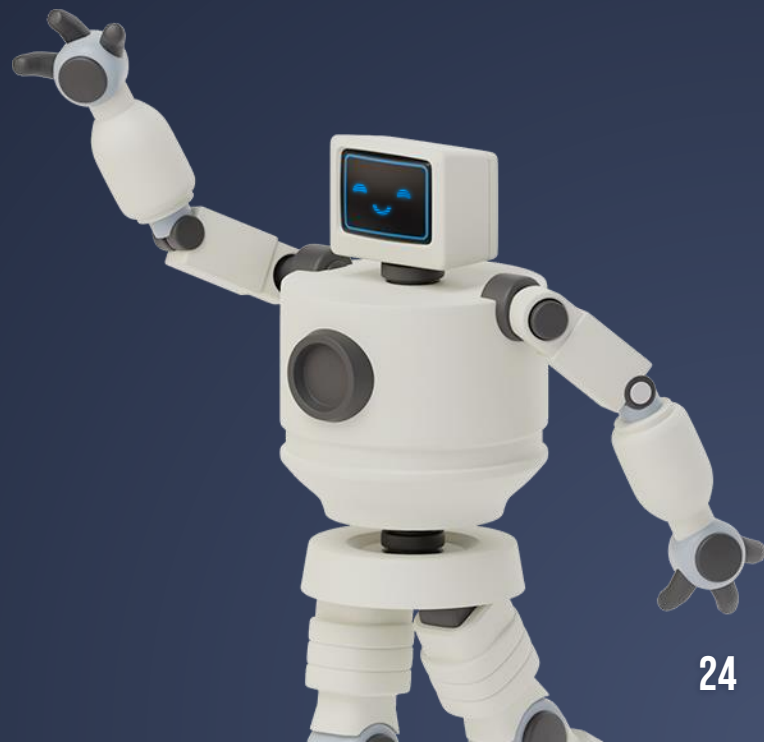
TYPES OF 3D DRAWING SOFTWARE



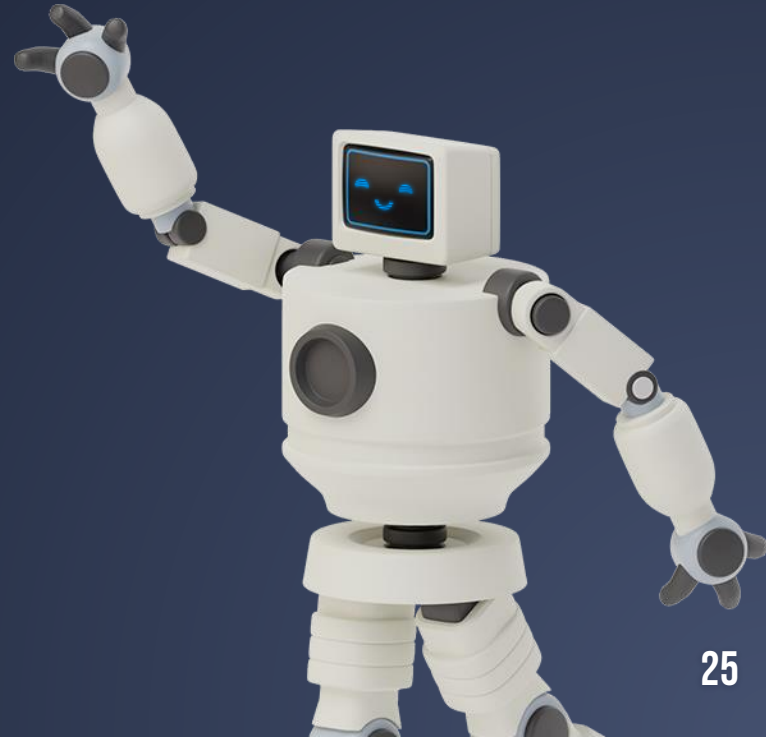
TYPES OF 3D DRAWING SOFTWARE

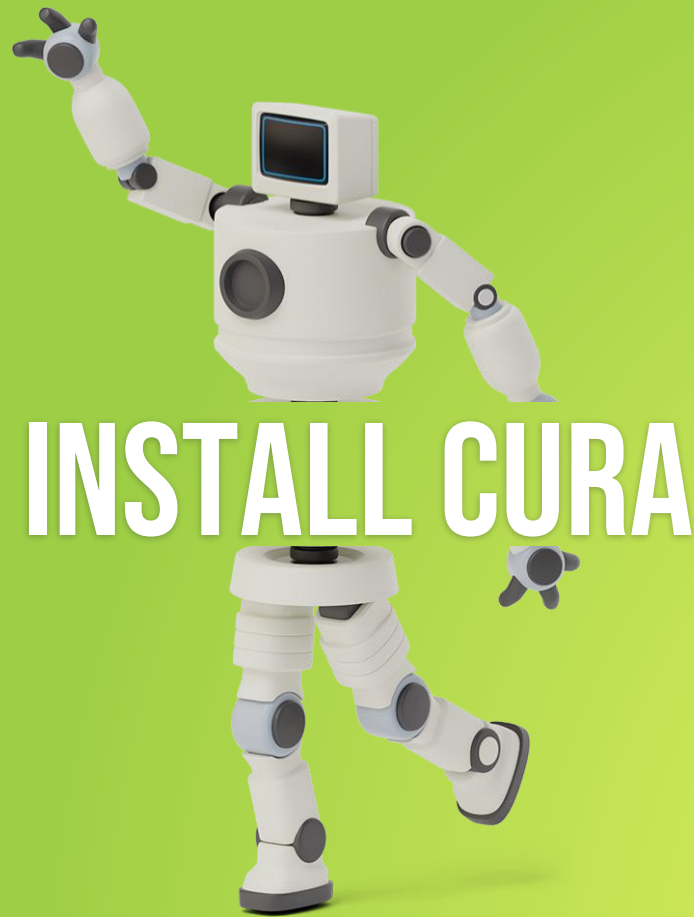


ONSHAPE



CREATION OF AN ACCOUNT





INSTALL CURA

INSTALL CURA

Copy and paste the link (<https://ultimaker.com/software/ultimaker-cura>) on your browser to download Cura Software.

Ultimaker Cura

Trusted by millions of users, Ultimaker Cura is the world's most popular 3D printing software. Prepare prints with a few clicks, integrate with CAD software for an easier workflow, or dive into custom settings for in-depth control.



Ultimaker Cura 4.11

[Download for free](#)

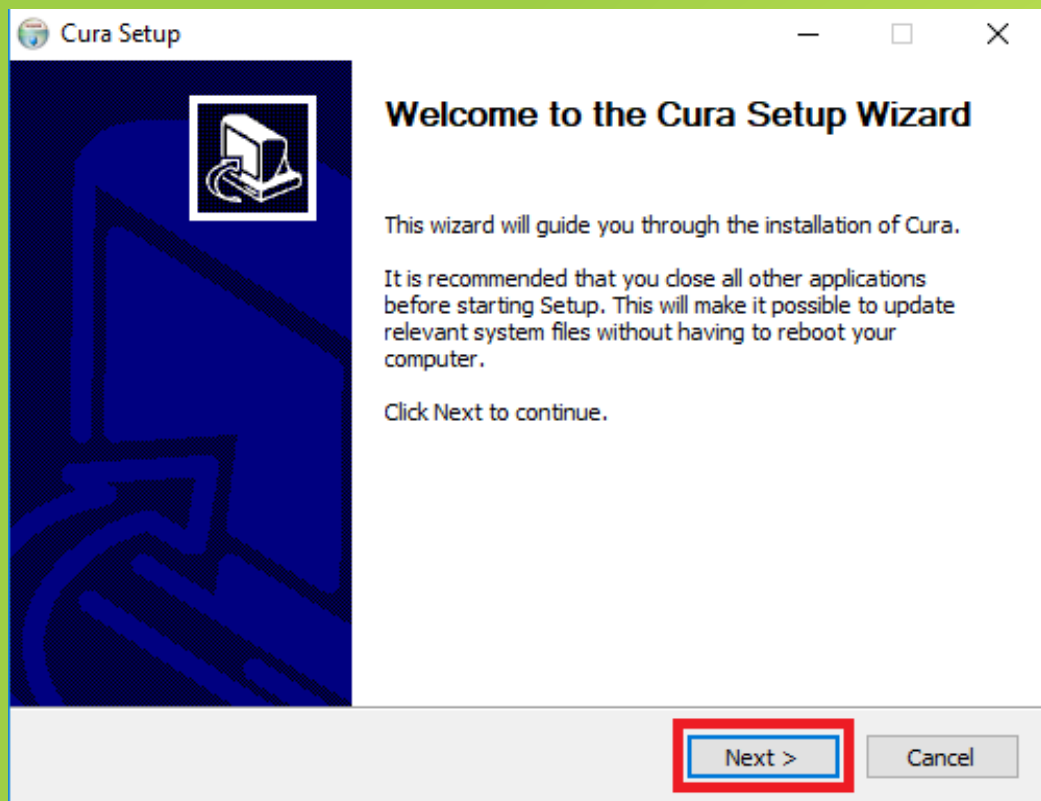
[Own an Ultimaker?](#)

[Find previous versions](#)

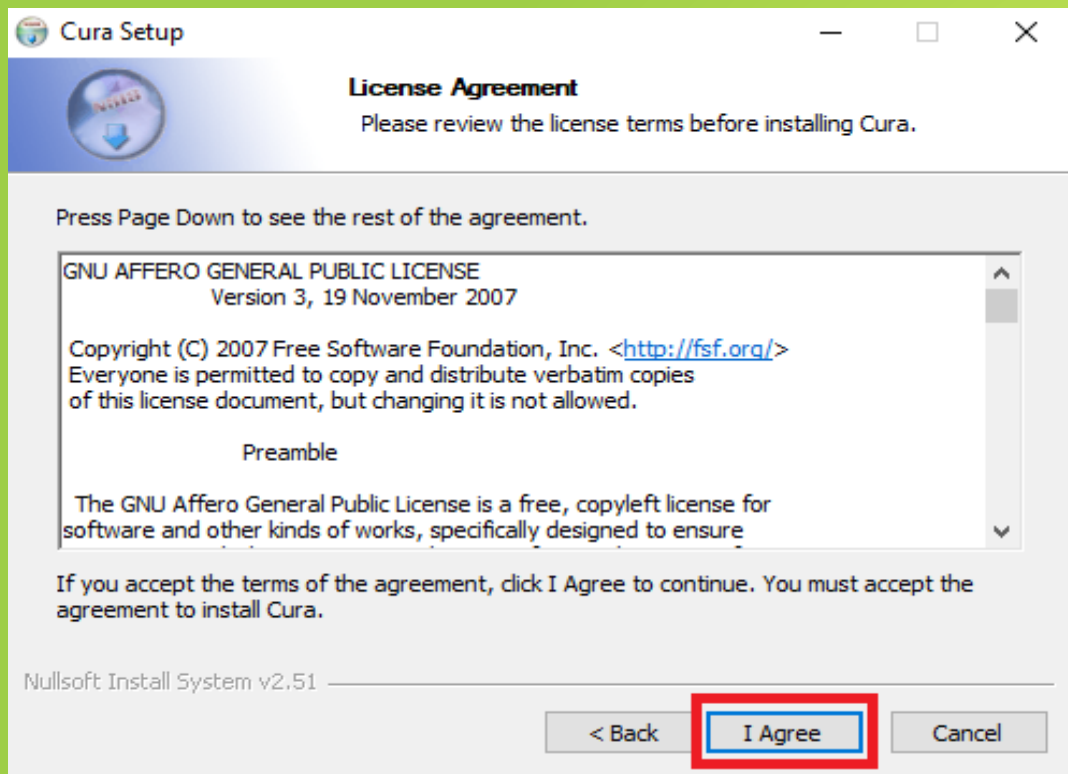
[System requirements](#)



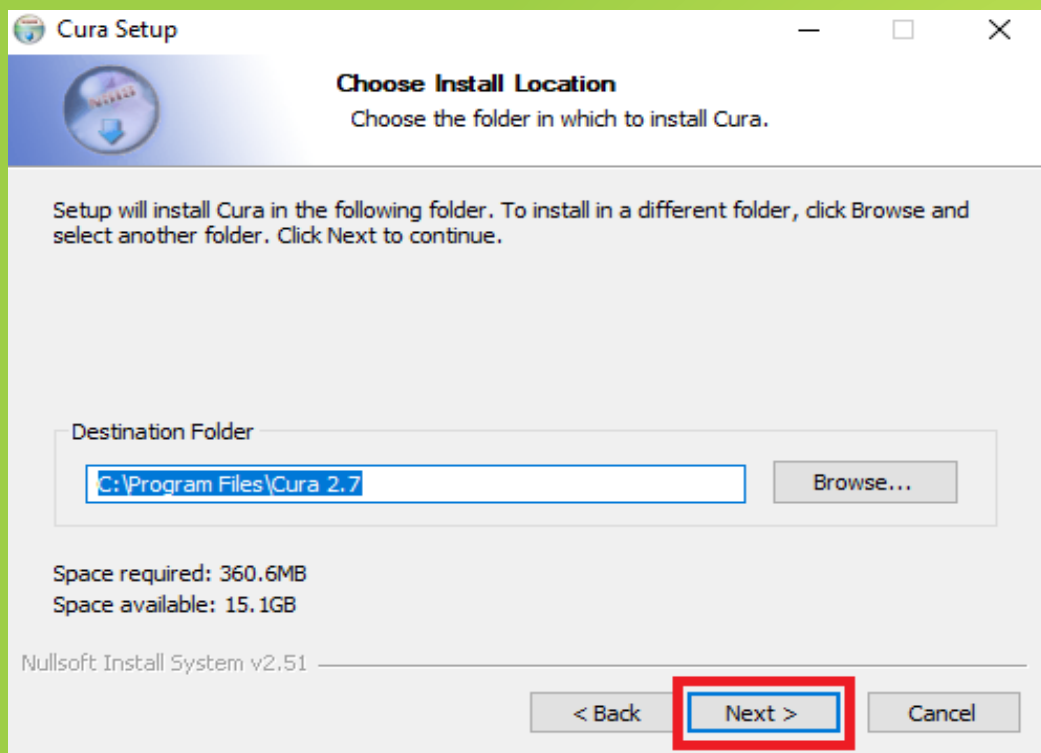
INSTALL CURA



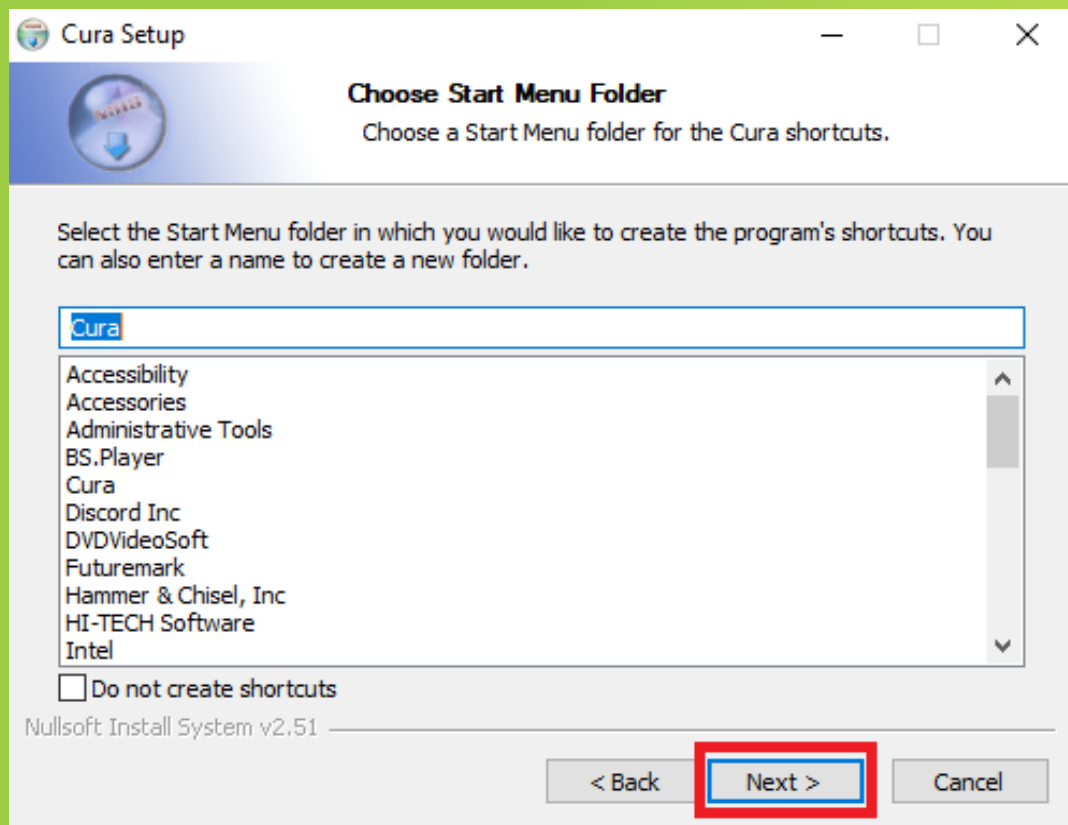
INSTALL CURA



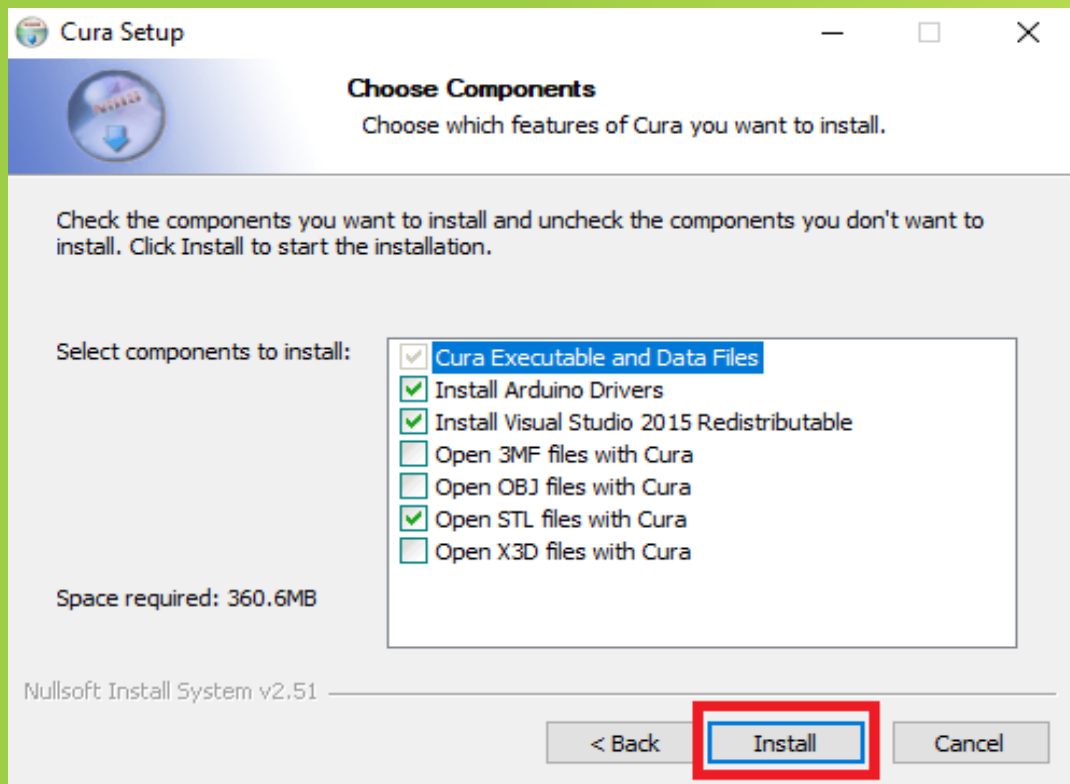
INSTALL CURA



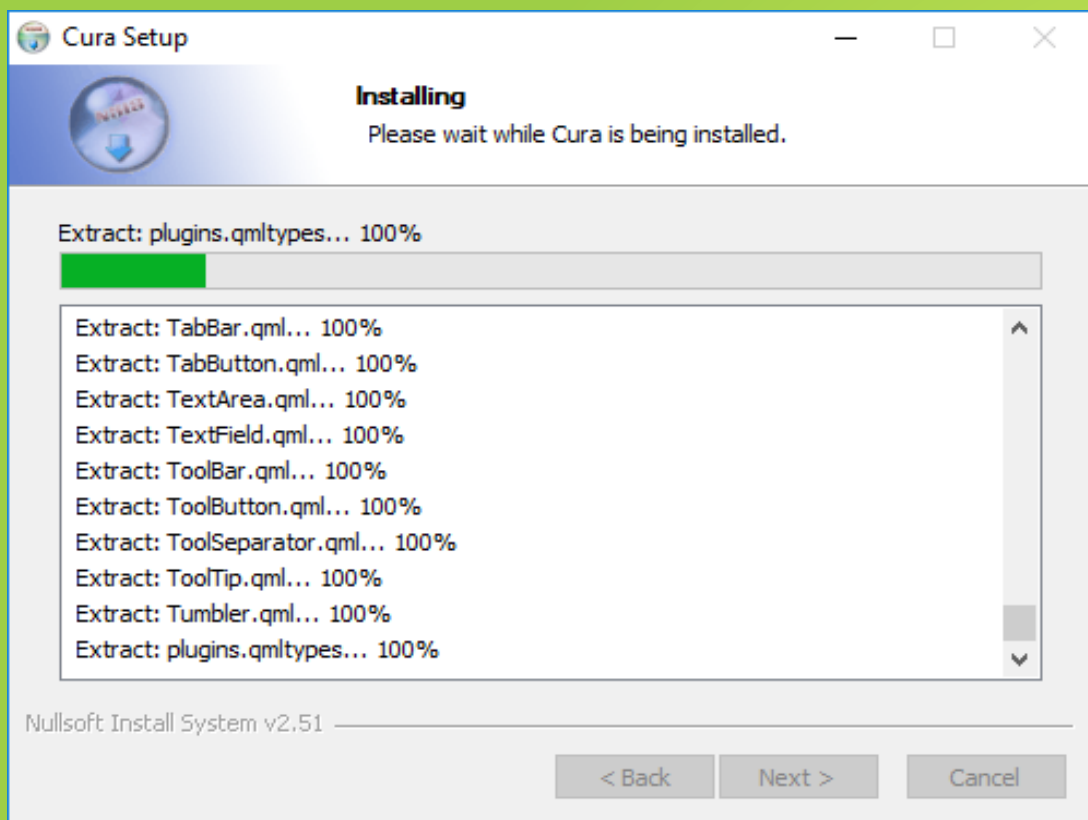
INSTALL CURA



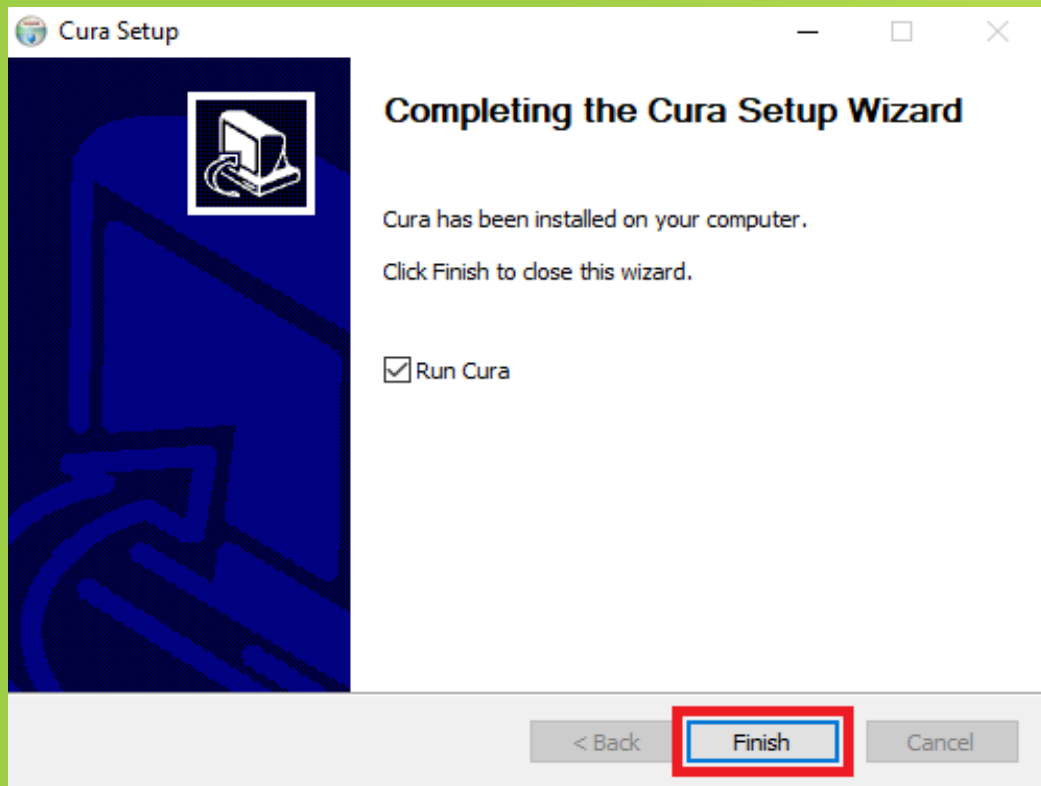
INSTALL CURA



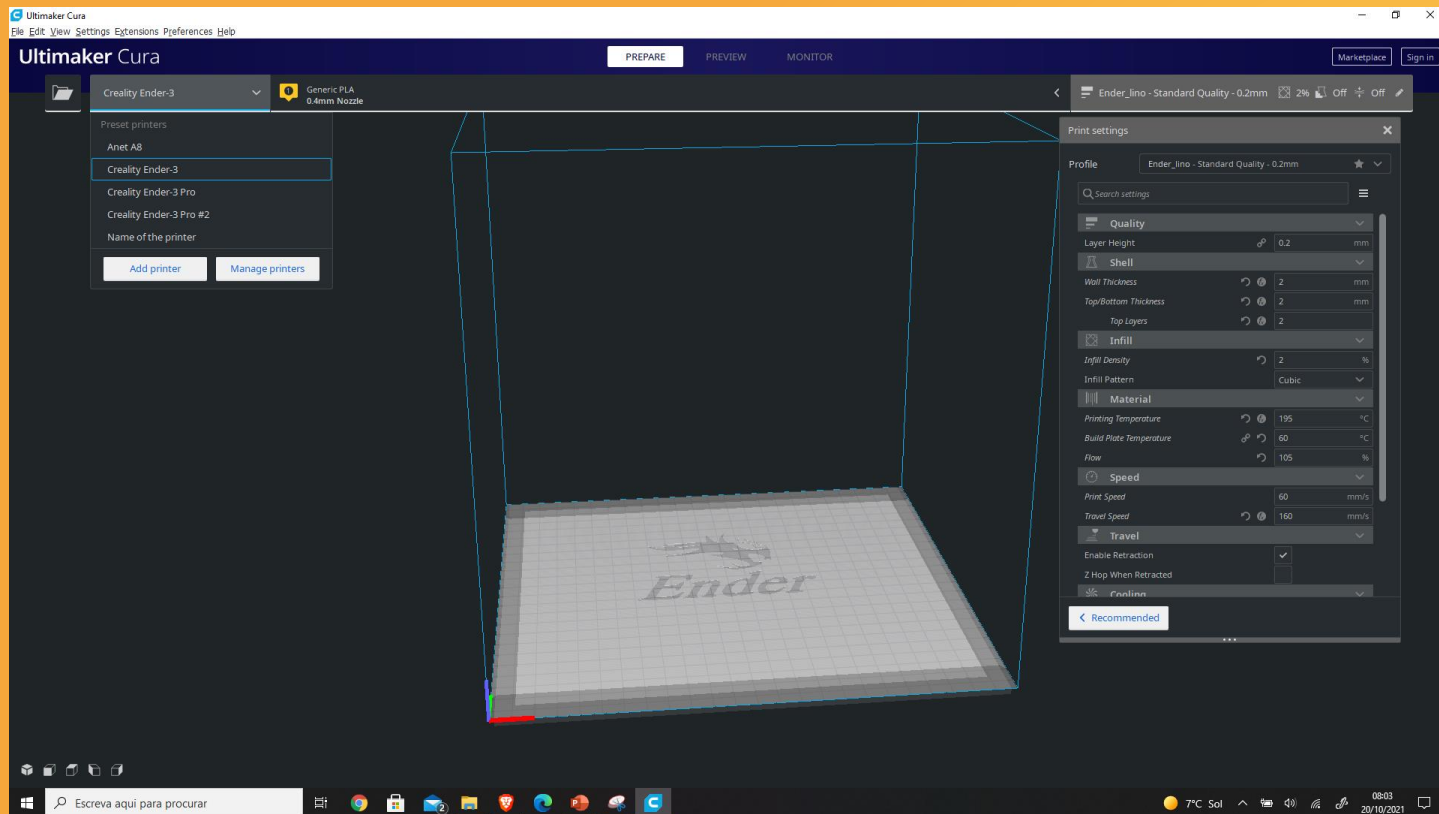
INSTALL CURA



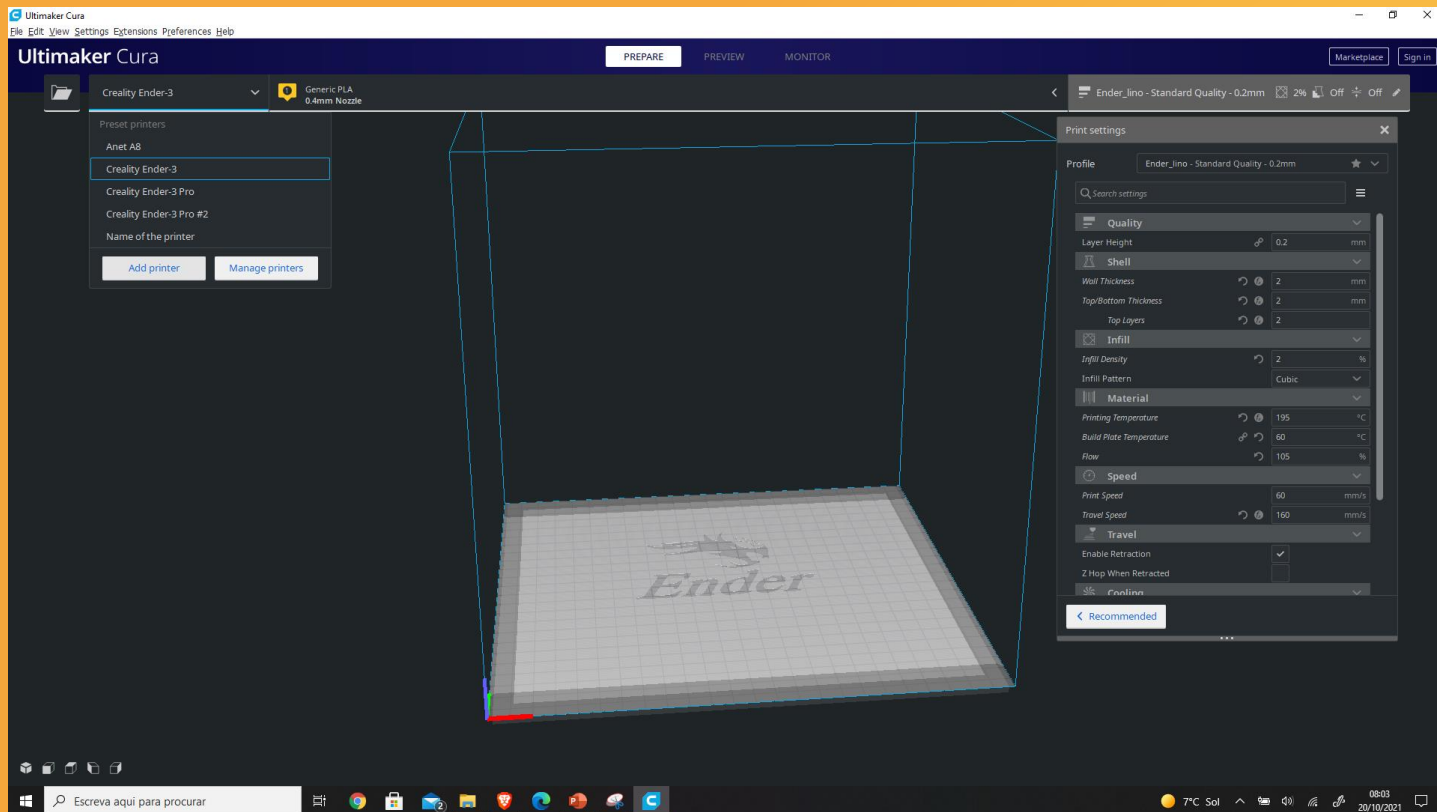
INSTALL CURA



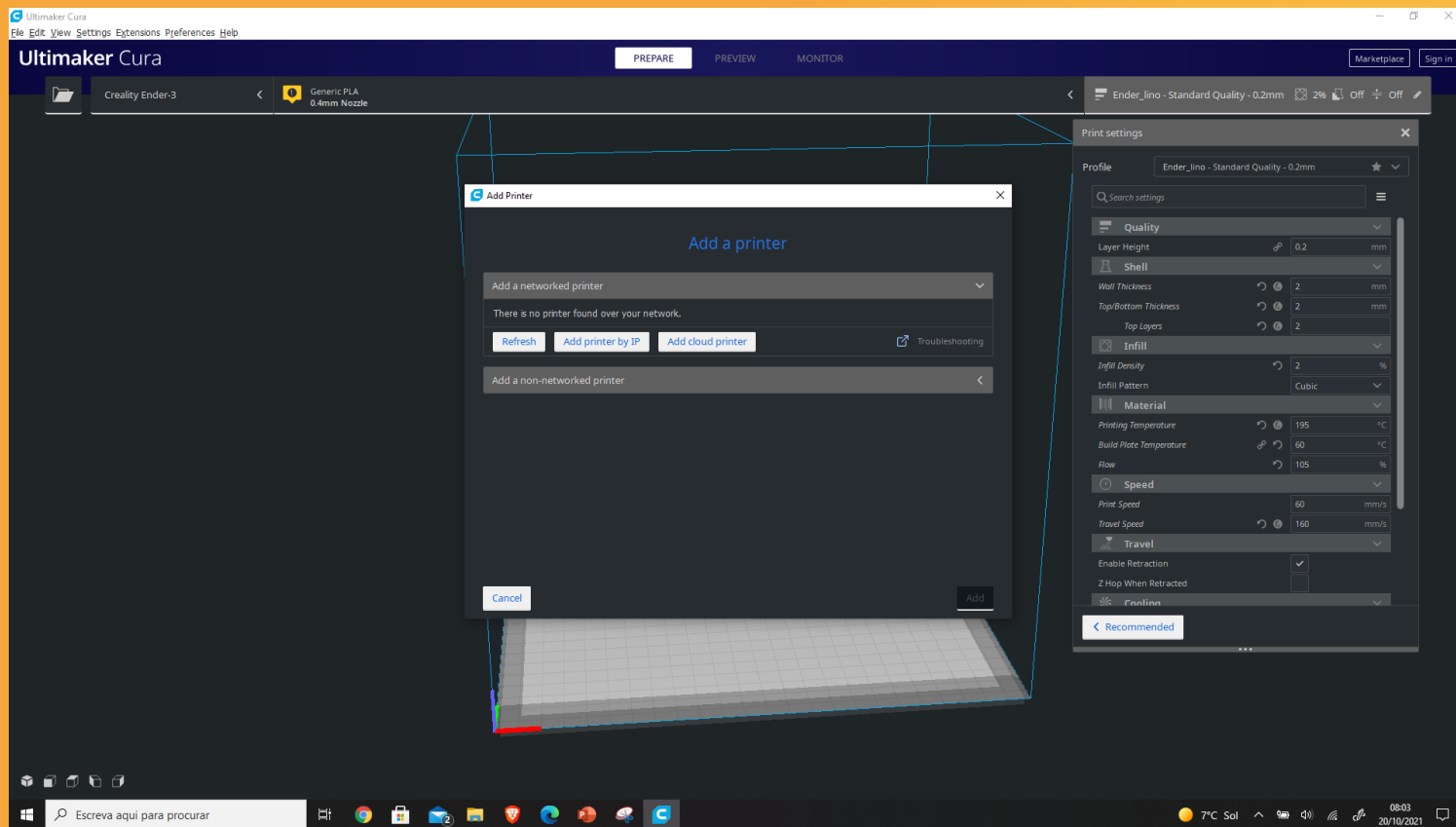
ADD THE PRINTER TO CURA



ADD THE PRINTER TO CURA



ADD THE PRINTER TO CURA



ADD THE PRINTER TO CURA

The image shows the Ultimaker Cura software interface. At the top, the title bar reads "Ultimaker Cura" with menu options: File, Edit, View, Settings, Extensions, Preferences, Help. Below the title bar, there are tabs for "PREPARE", "PREVIEW", and "MONITOR". The main workspace shows a 3D model of a printer bed with a grid. A dialog box titled "Add Printer" is open in the center, with the text "Add a printer" and two sections: "Add a networked printer" and "Add a non-networked printer". Under "Add a non-networked printer", a list of printer models is shown, with "Ultimaker S5" selected. To the right of the list, details for "Ultimaker S5" are displayed: Manufacturer: Ultimaker B.V., Profile author: Ultimaker, and Printer name: Ultimaker S5. At the bottom of the dialog are "Cancel" and "Add" buttons. On the right side of the interface, the "Print settings" panel is open, showing a profile named "Ender_lino - Standard Quality - 0.2mm". The settings are organized into sections: Quality (Layer Height: 0.2 mm), Shell (Wall Thickness: 2 mm, Top/Bottom Thickness: 2 mm, Top Layers: 2), Infill (Infill Density: 2 %, Infill Pattern: Cubic), Material (Printing Temperature: 195 °C, Build Plate Temperature: 60 °C, Flow: 105 %), Speed (Print Speed: 60 mm/s, Travel Speed: 160 mm/s), and Travel (Enable Retraction: checked, Z Hop When Retracted: checked). At the bottom of the print settings panel is a "Recommended" button. The Windows taskbar is visible at the bottom, showing the search bar with the text "Escreva aqui para procurar" and various application icons. The system tray shows the date and time: 08:03, 20/10/2021.

ADD THE PRINTER TO CURA

The image shows the Ultimaker Cura software interface. At the top, the window title is "Ultimaker Cura" and the menu bar includes "File", "Edit", "View", "Settings", "Extensions", "Preferences", and "Help". The main interface has a dark blue header with "Ultimaker Cura" on the left, "PREPARE" in the center, and "PREVIEW" and "MONITOR" on the right. Below the header, there are navigation buttons for "Creality Ender-3" and "Generic PLA 0.4mm Nozzle".

In the center, a 3D model of a printed part is visible on a grid. Overlaid on this is a white "Add Printer" dialog box. The dialog has a search bar and two sections: "Add a networked printer" and "Add a non-networked printer". Under "Add a non-networked printer", there is a list of Creality printer models. The "Creality CR-10" model is selected, and its details are shown on the right: Manufacturer: Creality3D, Profile author: trouch.com, and Printer name: Creality CR-10. There are "Cancel" and "Add" buttons at the bottom of the dialog.

On the right side of the interface, the "Print settings" panel is open. It shows the current profile "Ender_lino - Standard Quality - 0.2mm". The settings are organized into sections: Quality, Shell, Infill, Material, Speed, and Travel. The "Quality" section includes Layer Height (0.2 mm). The "Shell" section includes Wall Thickness (2 mm), Top/Bottom Thickness (2 mm), and Top Layers (2). The "Infill" section includes Infill Density (2 %) and Infill Pattern (Cubic). The "Material" section includes Printing Temperature (195 °C) and Build Plate Temperature (60 °C). The "Speed" section includes Print Speed (60 mm/s) and Travel Speed (160 mm/s). The "Travel" section includes Enable Retraction (checked) and Z Hop When Retracted (checked). There is a "Recommended" button at the bottom of the panel.

At the bottom of the screen, there is a Windows taskbar with a search bar containing "Escreva aqui para procurar" and several application icons. The system tray shows the temperature as 7°C, the date and time as 08:03 20/10/2021, and various system icons.

ADD THE PRINTER TO CURA

The image shows the Ultimaker Cura software interface. The main window displays a 3D model of a printer bed with a grid. A dialog box titled "Add Printer" is open in the center, showing a list of printers under the heading "Add a non-networked printer". The printer "Creality Ender-3" is selected, and its details are shown on the right: Manufacturer: Creality3D, Profile author: trough.com, and Printer name: Creality Ender-3. There are "Cancel" and "Add" buttons at the bottom of the dialog. To the right of the dialog, the "Print settings" panel is visible, showing various settings for the "Ender_1no - Standard Quality - 0.2mm" profile, including Quality, Shell, Infill, Material, Speed, and Travel settings. The Windows taskbar is visible at the bottom, showing the search bar and system tray.

Ultimaker Cura

File Edit View Settings Extensions Preferences Help

PREPARE PREVIEW MONITOR

Marketplace Sign in

Creality Ender-3 Generic PLA 0.4mm Nozzle

Ender_1no - Standard Quality - 0.2mm 2% Off + Off

Print settings

Profile Ender_1no - Standard Quality - 0.2mm

Search settings

Quality

Layer Height 0.2 mm

Shell

Wall Thickness 2 mm

Top/Bottom Thickness 2 mm

Top Layers 2

Infill

Infill Density 2 %

Infill Pattern Cubic

Material

Printing Temperature 195 °C

Build Plate Temperature 60 °C

Flow 105 %

Speed

Print Speed 60 mm/s

Travel Speed 160 mm/s

Travel

Enable Retraction

Z Hop When Retracted

Recommended

Creality Ender-3

Manufacturer: Creality3D

Profile author: trough.com

Printer name: Creality Ender-3

Cancel Add

Escreva aqui para procurar

7°C Sol 20/10/2021

ADD THE PRINTER TO CURA

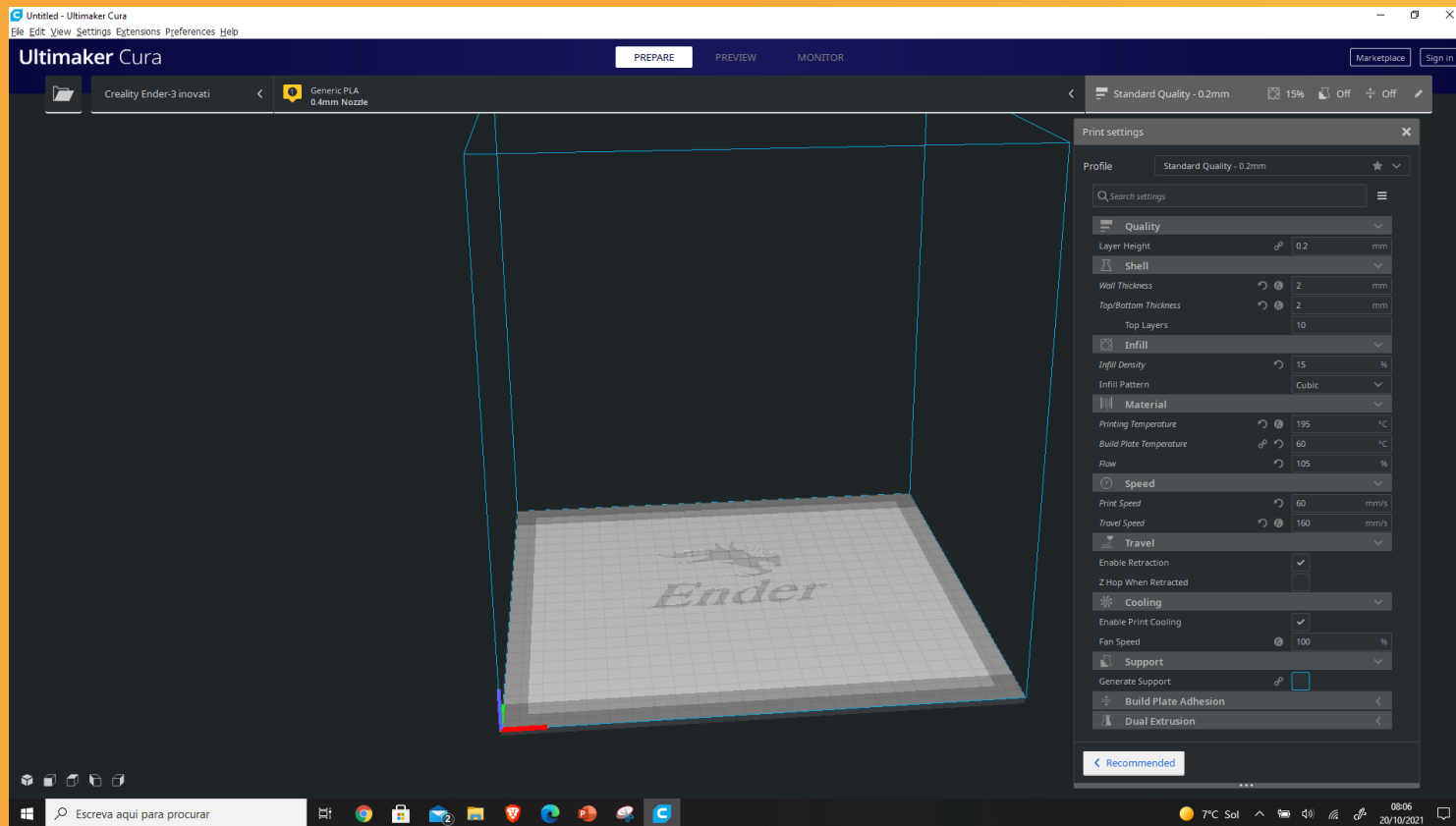
The screenshot displays the Ultimaker Cura interface. At the top, the window title is 'Untitled - Ultimaker Cura' with a menu bar containing 'File', 'Edit', 'View', 'Settings', 'Extensions', and 'Preferences Help'. The main header shows 'Ultimaker Cura' and navigation buttons for 'PREPARE', 'PREVIEW', and 'MONITOR'. A 'Marketplace' button and a 'Sign in' link are also present.

The main workspace shows a 3D model of a printer bed with a grid. A blue wireframe box highlights the 'Add Printer' dialog box, which is titled 'Add Printer' and contains 'Machine Settings'. The dialog is divided into two main sections: 'Printer' and 'Extruder 1'. The 'Printer' section includes 'Printer Settings' (X Width: 235 mm, Y Depth: 235 mm, Z Height: 250 mm, Build plate shape: Rectangular, Origin at center, Heated bed: checked, Heated build volume, G-code flavor: Marlin) and 'Start G-code' (Ender 3 Custom Start G-code, G92 E0 ; Reset Extruder). The 'Extruder 1' section includes 'Printhead Settings' (X min: -26 mm, Y min: -32 mm, X max: 32 mm, Y max: 34 mm, Gantry Height: 25 mm, Number of Extruders: 1) and 'End G-code' (G91 ;Relative positioning, G1 E-2 F2700 ;Retract a bit). A 'Next' button is at the bottom right of the dialog.

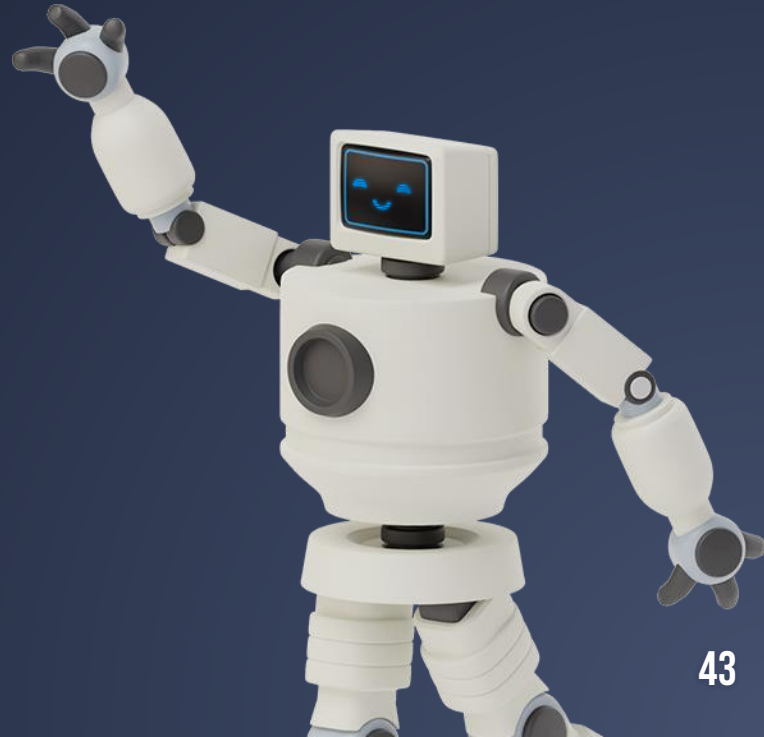
On the right side, the 'Print settings' panel is open, showing a 'Standard Quality - 0.2mm' profile. It includes a search bar and several expandable sections: 'Quality' (Layer Height: 0.2 mm), 'Shell' (Wall Thickness: 0.8 mm, Top/Bottom Thickness: 0.8 mm, Top Layers: 4), 'Infill' (Infill Density: 20 %, Infill Pattern: Cubic), 'Material' (Printing Temperature: 200 °C, Build Plate Temperature: 50 °C, Flow: 100 %), 'Speed' (Print Speed: 50.0 mm/s, Travel Speed: 150.0 mm/s), and 'Travel' (Enable Retraction: checked, Z Hop When Retracted). A 'Recommended' button is at the bottom left of the panel.

The Windows taskbar at the bottom shows the search bar with the text 'Escreva aqui para procurar', several application icons, and system information including '7°C Sol', '08:04', and '20/10/2021'.

ADD THE PRINTER TO CURA

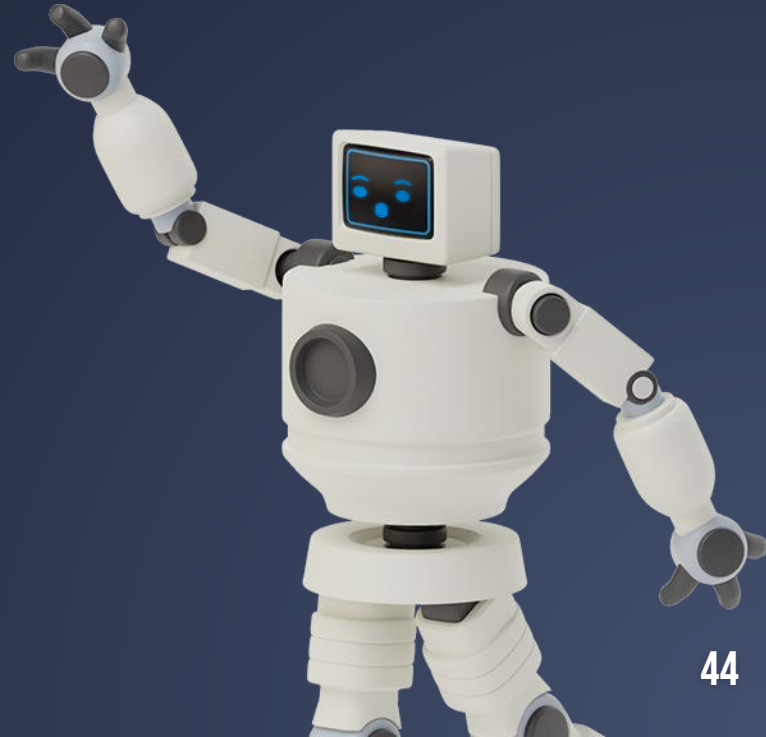


PLACING YOUR PART

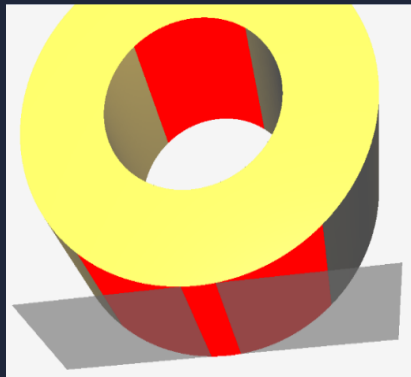
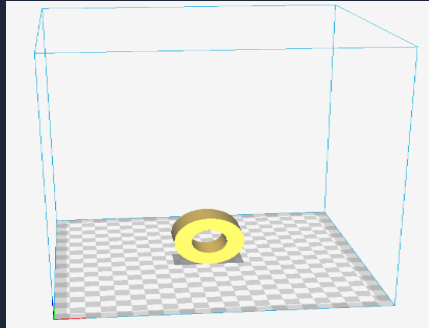


PLACING YOUR PART

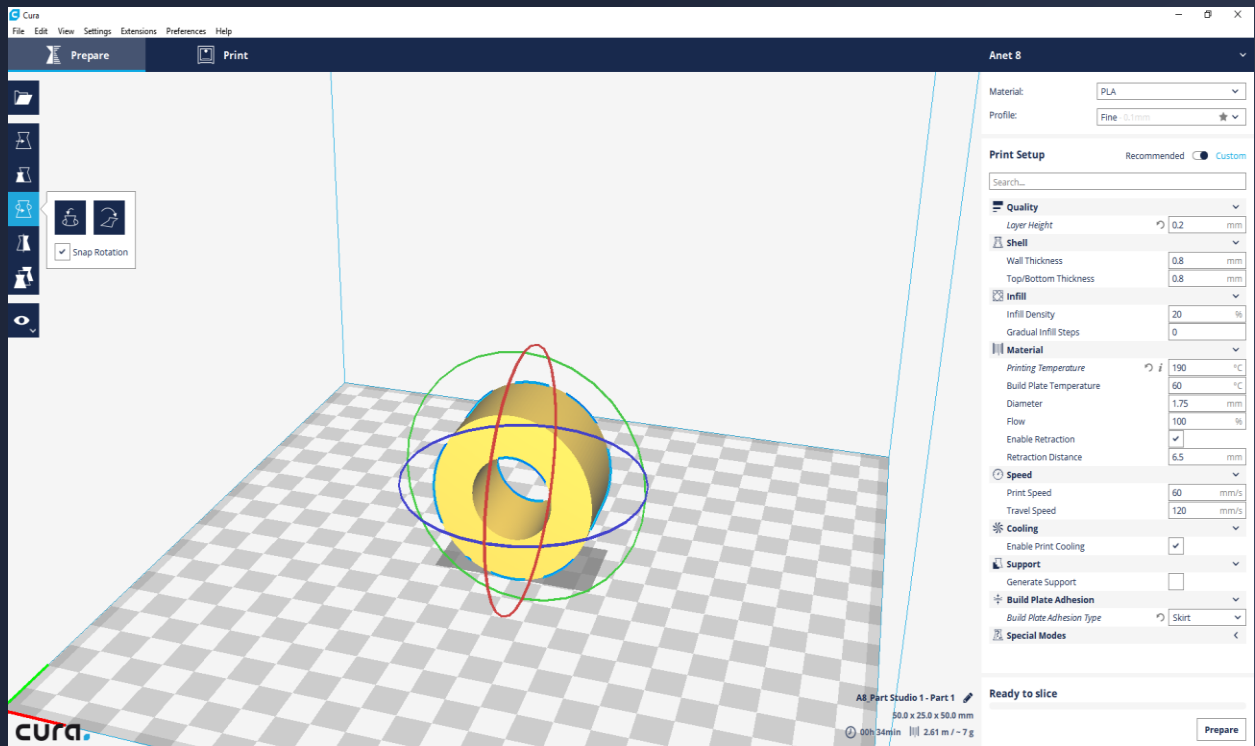
Placing a part / object on a slicer is a process that requires attention because, due to gravity, an object cannot be printed at any given angle. Gravity must always be taken into account as this type of printing deposits the fill layer by layer and the selected printer operates from the bottom up.



PLACING YOUR PART



PLACING YOUR PART



PLACING YOUR PART

Cura

File Edit View Settings Extensions Preferences Help

Prepare Print

Anet 8

Material: PLA

Profile: Fine - 0.1mm

Print Setup Recommended Custom

Search...

Quality

Layer Height 0.2 mm

Shell

Wall Thickness 0.8 mm

Top/Bottom Thickness 0.8 mm

Infill

Infill Density 20 %

Gradual Infill Steps 0

Material

Printing Temperature 190 °C

Build Plate Temperature 60 °C

Diameter 1.75 mm

Flow 100 %

Enable Retraction

Retraction Distance 6.5 mm

Speed

Print Speed 60 mm/s

Travel Speed 120 mm/s

Cooling

Enable Print Cooling

Support

Generate Support

Build Plate Adhesion

Build Plate Adhesion Type Skirt

Special Modes

AA_Part Studio 1 - Part 1

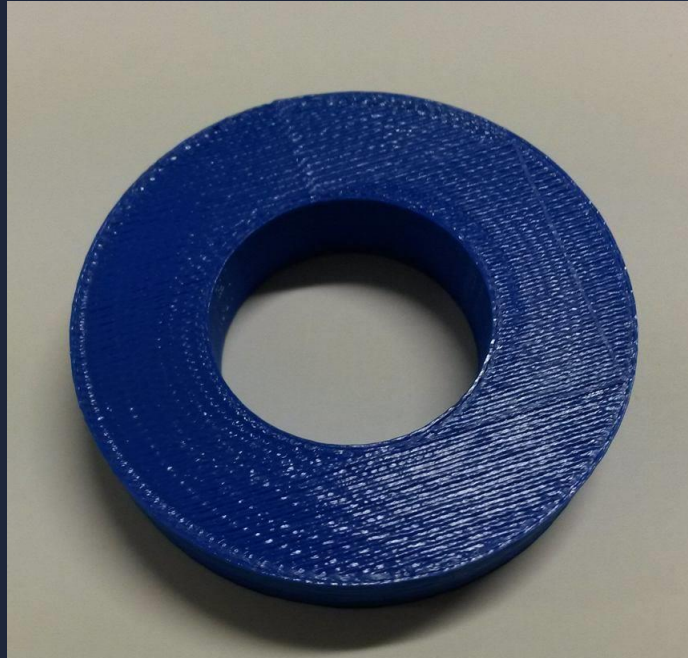
50.0 x 50.0 x 25.0 mm

00h 34min || 2.61 m / - 7 g

Ready to slice

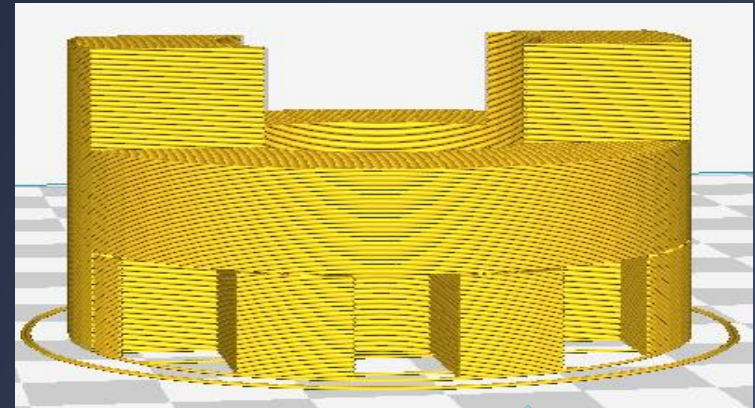
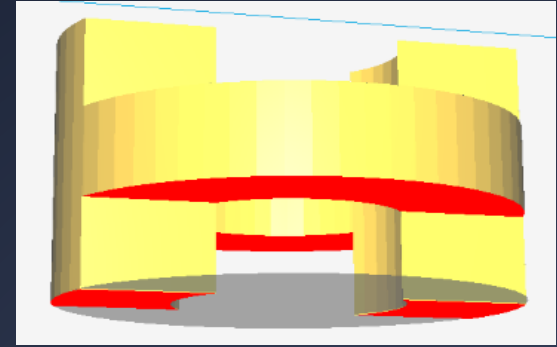
Prepare

PLACING YOUR PART



SUPPORT STRUCTURES

A support structure is an aid to the success of 3D printing when the contact surface of the part is insufficient. This causes poor print quality. To overcome this, supporting structures can be added to the original object and then removed.



HOW TO APPLY SUPPORT STRUCTURES

Print settings

Profile: Standard Quality - 0.2mm

Search settings

Quality

Layer Height: 0.2 mm

Shell

Wall Thickness: 2 mm

Top/Bottom Thickness: 2 mm

Top Layers: 10

Infill

Infill Density: 15 %

Infill Pattern: Cubic

Material

Printing Temperature: 195 °C

Build Plate Temperature: 60 °C

Flow: 105 %

Speed

Print Speed: 60 mm/s

Travel Speed: 160 mm/s

Travel

Enable Retraction:

Z Hop When Retracted:

Cooling

Enable Print Cooling:

Fan Speed: 100 %

Support

Generate Support:

Build Plate Adhesion:

Dual Extrusion:

< Recommended

Support

Generate Support

Support

Generate Support

Support Placement: Everywhere

Support Pattern: Zig Zag

Support Density: 5 %