

3D Printing & Designing Workshop

by Sunway Robotics Club

Introduction

- How is 3D printing utilised
- Types of 3D printers
- Types of printing materials
- Common printing issues
- Types of file formats

Tinkercad Setup

- Account Creation
- Fiddling with Tinkercad web interface

Hands on Designing

- Learn to create a small ice cream keychain
- Do-it-yourself session

Printing Application

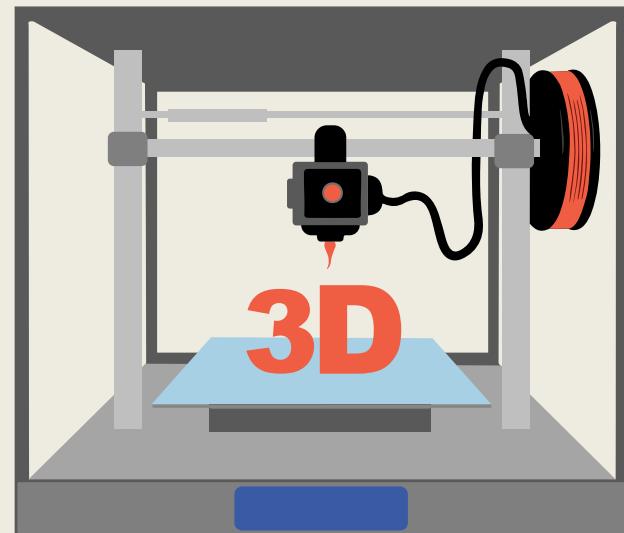
- Understanding Cura's printing menu
- Common Settings to look out for
- Do's and Don'ts during printing

01

02

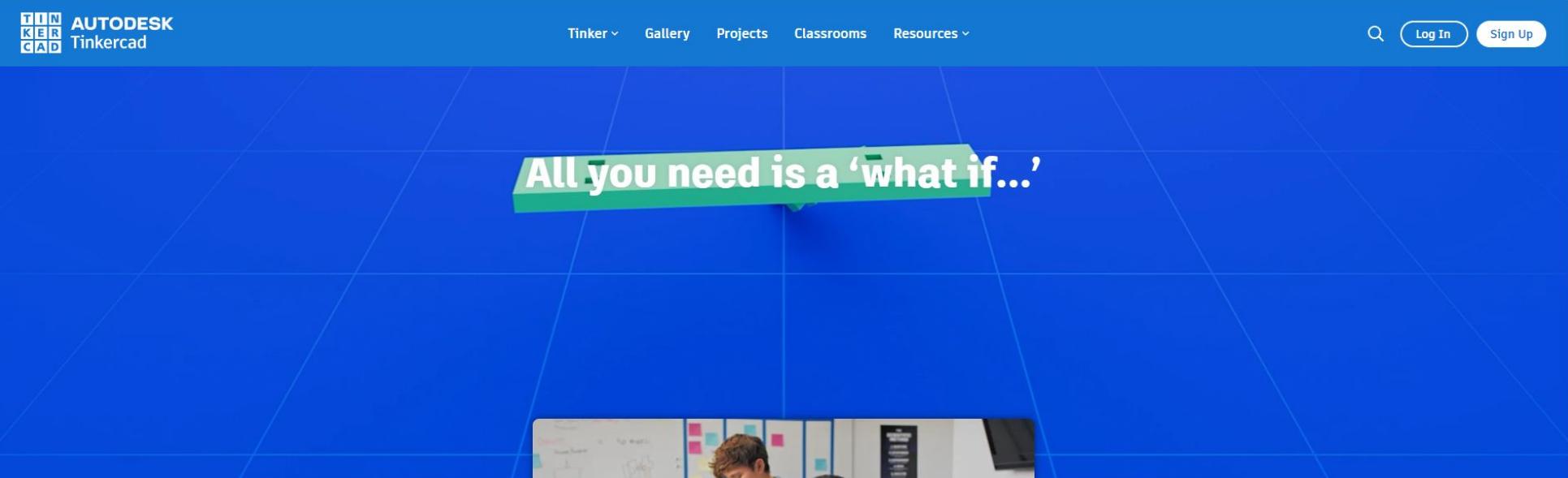
03

04



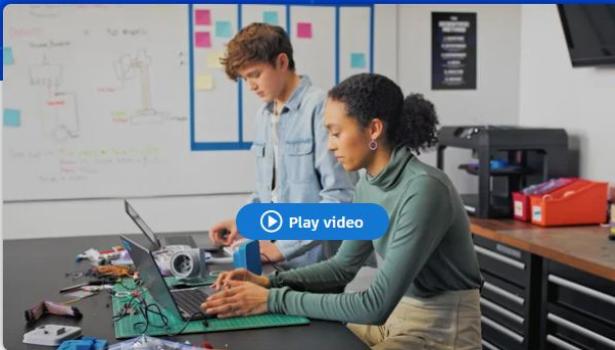
Tinkercad Setup

www.tinkercad.com



The screenshot shows the Tinkercad homepage with a blue header bar. On the left is the Autodesk Tinkercad logo. In the center are navigation links: Tinker (with a dropdown arrow), Gallery, Projects, Classrooms, and Resources (with a dropdown arrow). On the right are a search icon, a Log In button, and a Sign Up button.

All you need is a ‘what if...’



A thumbnail image shows two individuals, a man and a woman, working together on a laptop in what appears to be a classroom or workshop environment. A whiteboard in the background has various diagrams and text, including "All you need is a 'what if...'". A blue button labeled "Play video" is overlaid on the bottom left of the thumbnail.

Tinkercad is a free web app for 3D design, electronics, and coding, trusted by over 50 million people around the world.

Sign Up in Tinkercad

Welcome back

How do you use Tinkercad?

In school

[Educators](#)

[Students with Class Code](#)

[Student accounts](#)

On your own

[Personal accounts](#)

Don't have an account yet?

[Join Tinkercad](#)

[Children's Privacy Statement](#)

[Privacy settings](#)

Sign in

Email or Username

20040457@mail.sunway.edu.my

[NEXT](#)

OR [SIGN IN USING SOCIAL PROVIDERS](#)

NEW TO AUTODESK? [CREATE ACCOUNT](#)

Understanding TinkerCAD

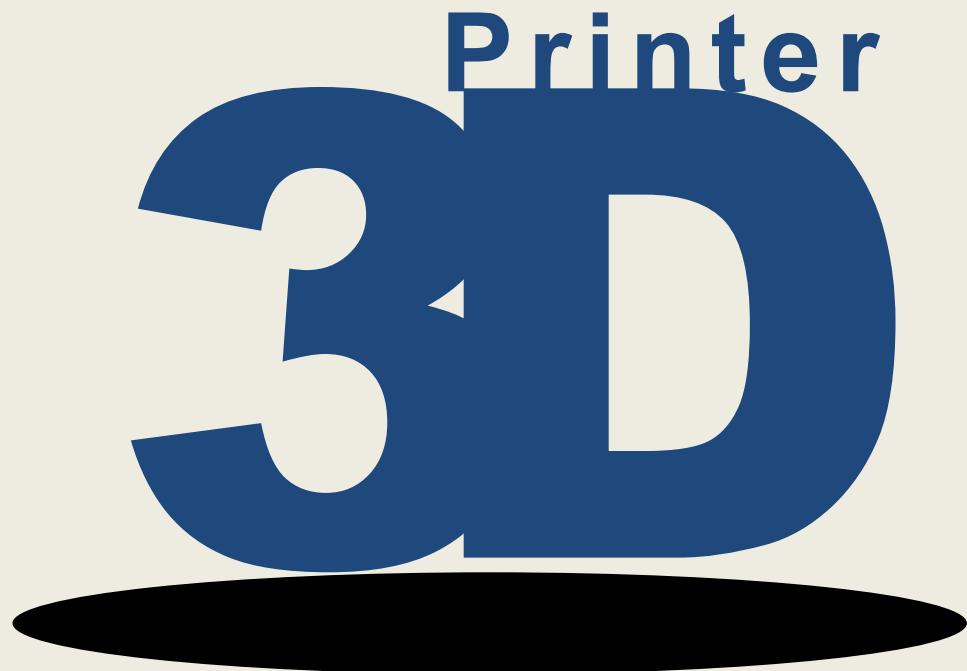
Always, Losing you game pieces(dice and chess pawns)? Never again! Today we will be designing a simple 6 sided die and a chess pawn!

Hands On Designing Session

Utilizing the functionalities shown earlier,
have fun designing a model of your choice
within the measurements of
4cm x 4cm x 4cm!



(Maybe an Among Us Character?)



How can I get started?

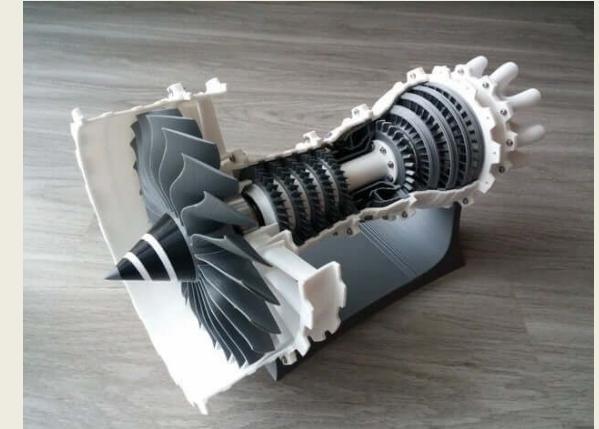
How is 3D printing utilised?



Medical Applications



Figurine/Art Models



Prototype for Real World Applications

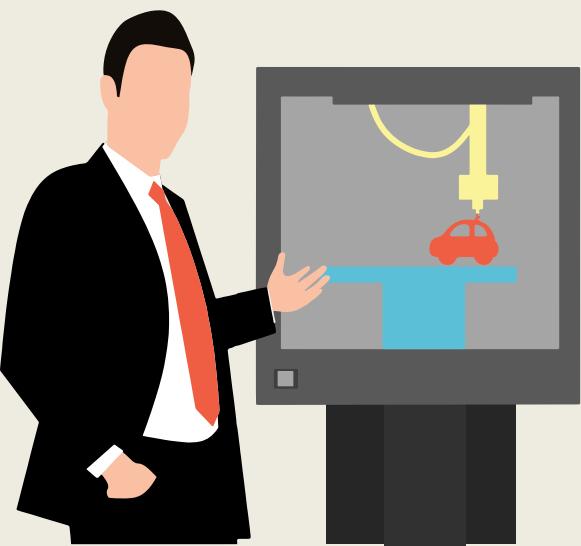


Functional Prints



Food

Questions to ask before starting 3D printing?



What is it used for?



Is it a complex design? Or is it a simple design?



Is this for prototyping purposes?

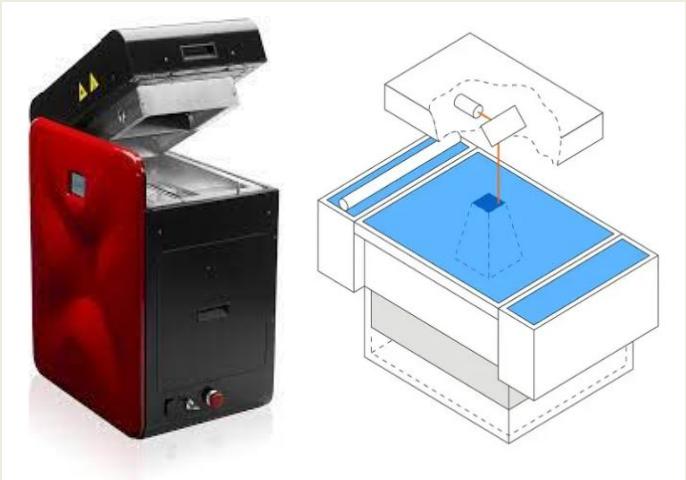


How long do I want it to last?



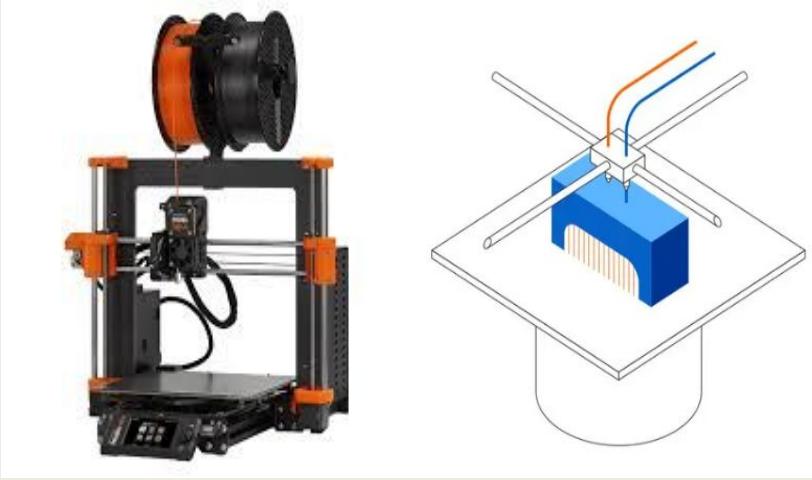
How tough or brittle should the print be?

Types of Printers



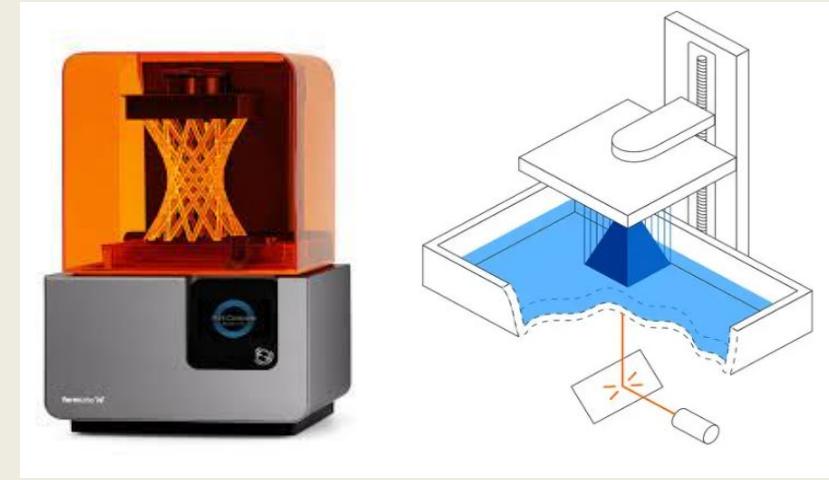
SLS Printer

- Utilizes laser to fuse polymer powder
- Most expensive printer and materials over time
- Excellent print integrity
- For functional prototyping and end-use production
- No support needed



FDM Printer

- Deposits filaments layer by layer
- Cheapest printer and materials
- Lowest Resolution and Accuracy
- Usually for prototypes
- Support needed



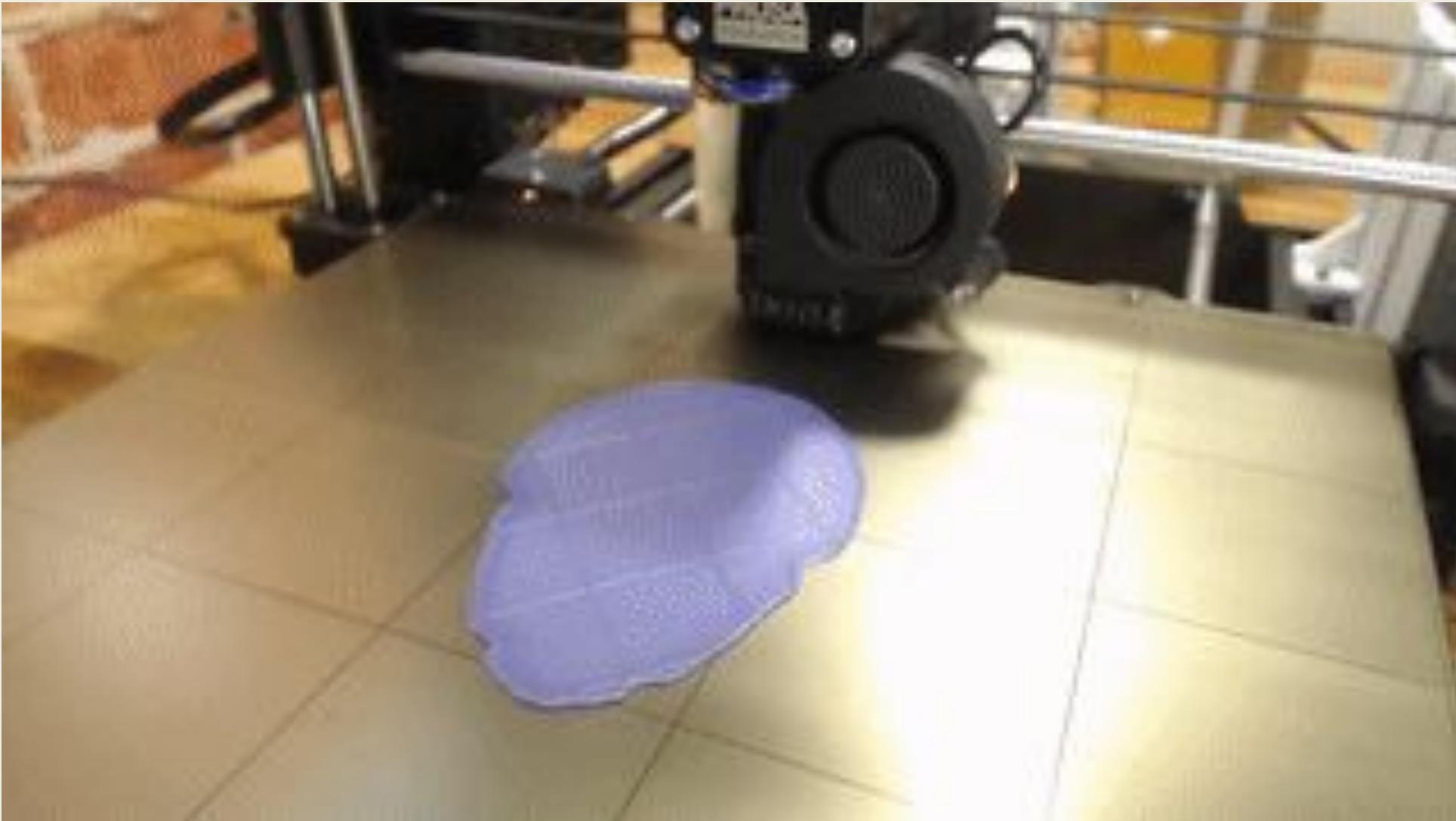
SLA Printer

- Laser cured resin liquid
- High printer and material cost
- Highest resolution and accuracy and fine details
- For functional prototyping, molds and tools
- Support needed

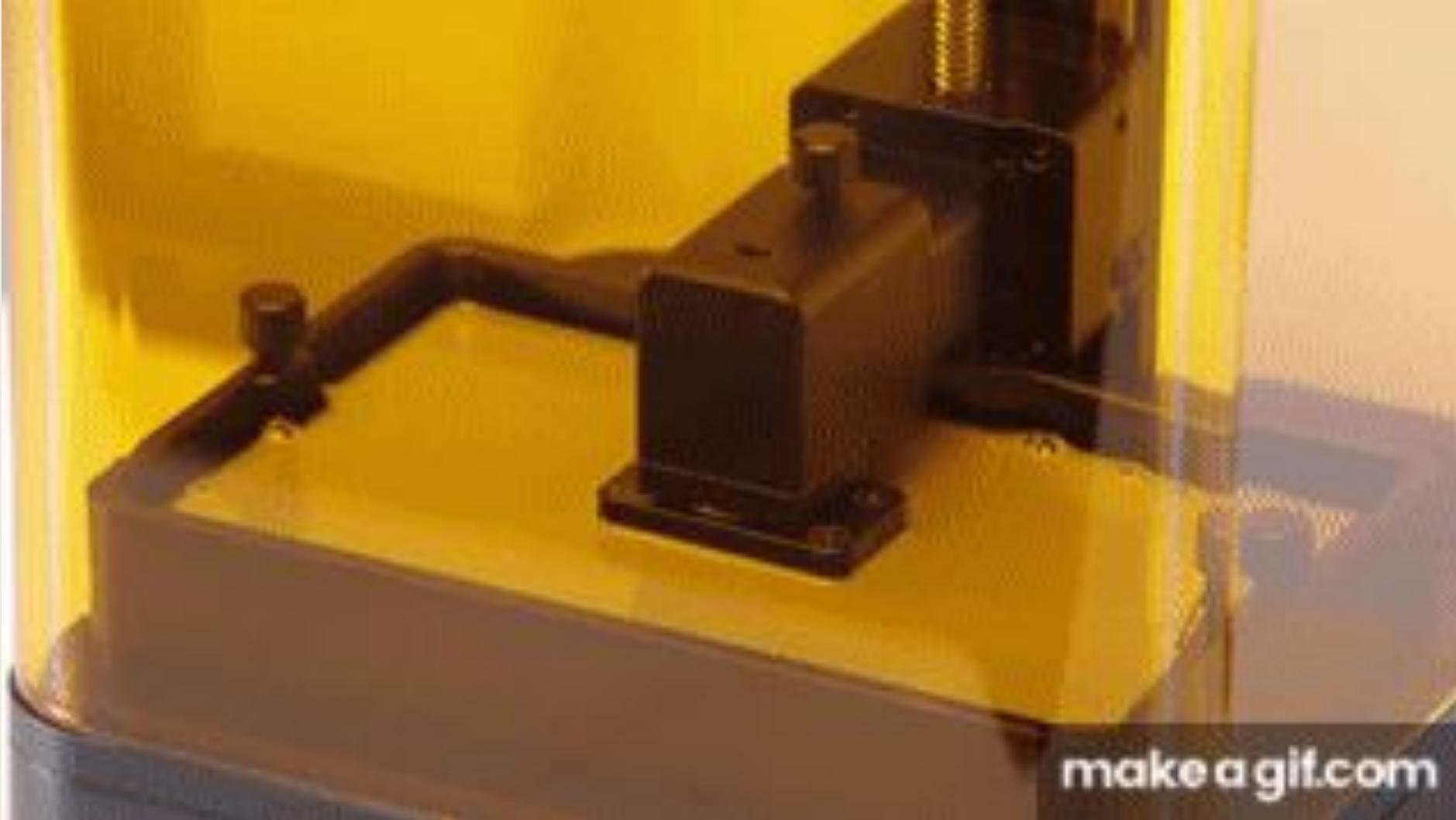
Types of Printers (SLS Printer)



Types of Printers (FDM Printer)



Types of Printers (Resin Printer)



makeagif.com

Types of Commonly Used Materials



Thermoplastics

- PLA
- ABS
- PETG

Can be broken down and
re-printed!



Thermosetting Plastics

- Clear/Draft Resins
- Medical Resins
- Nylon Composites

Cannot be broken down and
re-used!

Comparison of Thermoplastic properties

High Quality Filament for 3d Printer



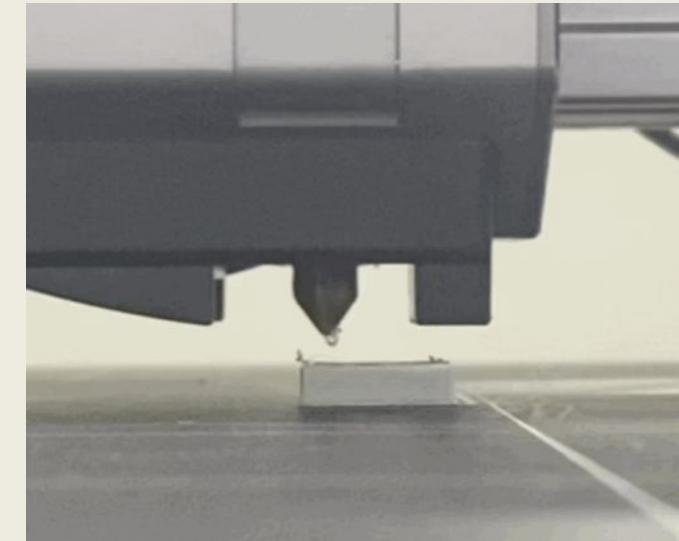
-  Minimal Warping
-  No Heating Bed Required
-  Little to No Odor
-  No Bubbles

Material	ABS	PLA	PETG
Diameter	1.75mm	1.75mm	1.75mm
Print Temperature	200-250 °C	190-230 °C	220-250 °C
Print Speed	50-100m/s	50-100mm/s	50mm/s
N.W.	1kg(2.2lbs)/Roll	1kg(2.2lbs)/Roll	1kg(2.2lbs)/Roll
Platform Temperature	100-120 °C	60-80°C	95°C

Common Printing Issues

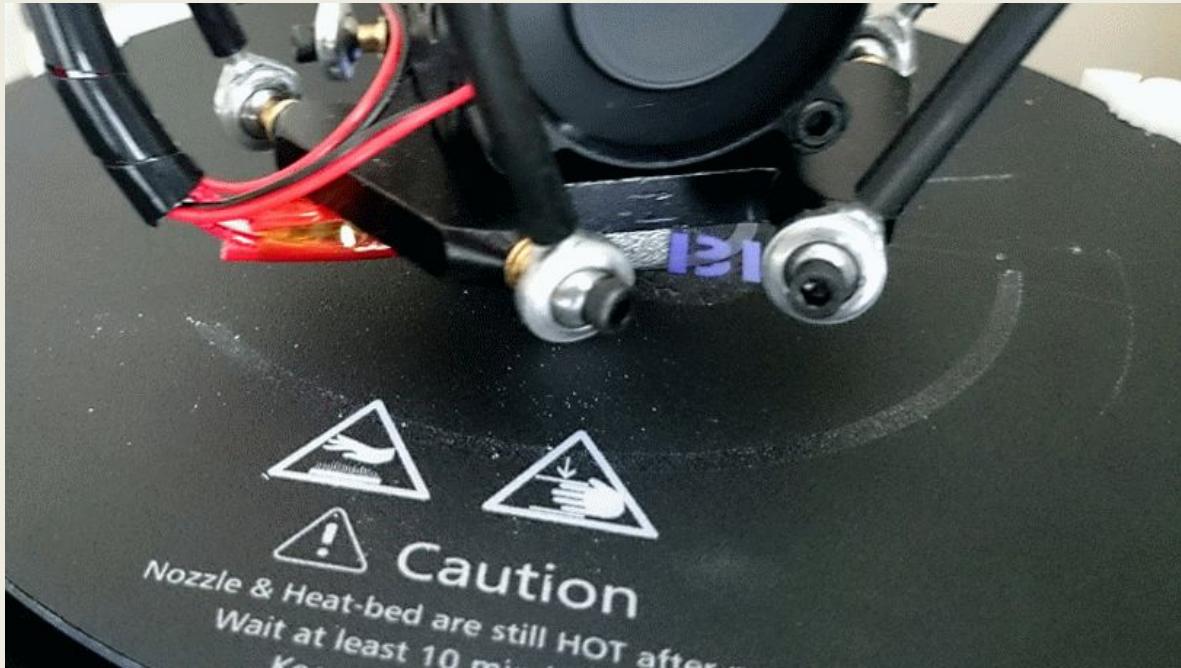


Stringing



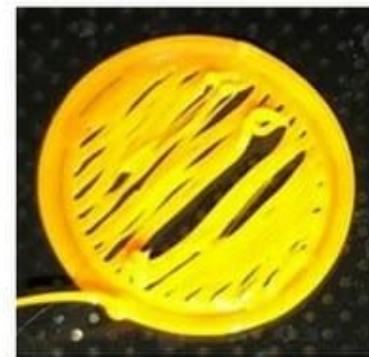
Nozzle Blocked

Common Printing Issues

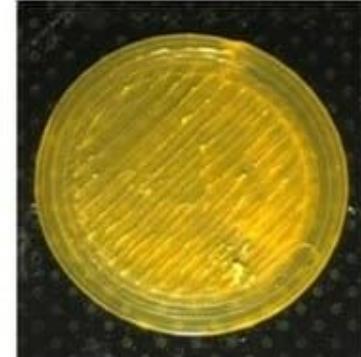


Nozzle grinding

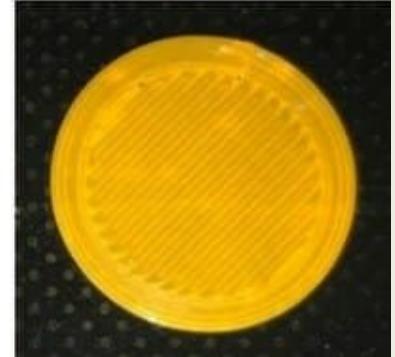
Nozzle too
far from bed



Nozzle too
near to bed



Good ✓



Common Printing Issues



Warping

Types of File Formats

[Most Commonly Used]



.Obj File

- Stores 3D geometry data
- Widely supported & easy to work with
- Does not store unit measurements



.Stl File

- Similar to Obj, doesn't store color, texture, material information
- Widely supported



.3MF File

- Stores color, texture, material information and geometry
- Supports advanced features (multi-material models)
- Machine and human readable



.AMF File

- Allows for advanced features & highly versatile
- Suitable for industry based usage
- Not yet widely supported

Websites for 3D prints



www.thingiverse.com

- Community Driven
- Widely Free
- Modelers may sell their designs
- Wider user base, ranging from beginners to professionals



www.cults3d.com

- 3D Printing Marketplace
- Mostly paid
- Attracts more professional and hobbyists



www.cgtrader.com

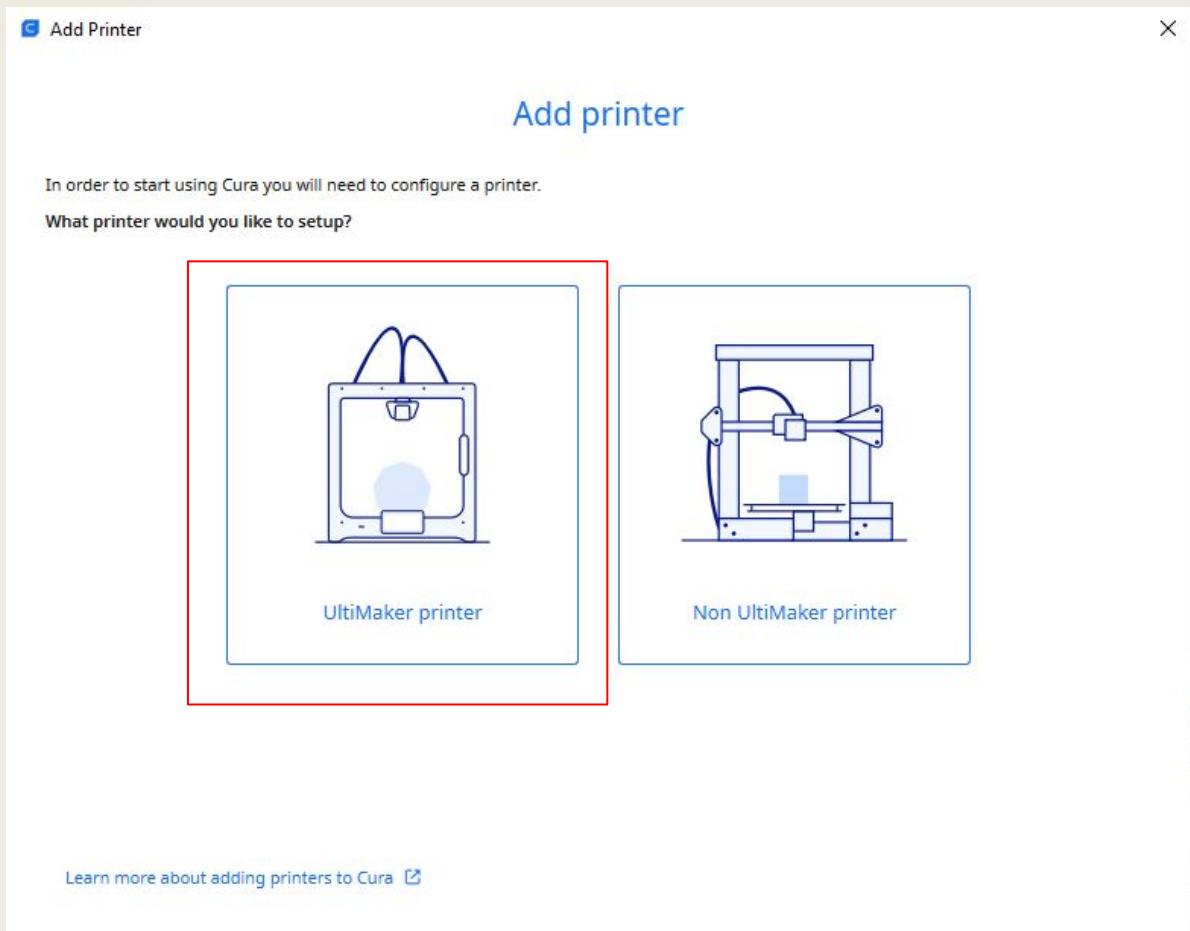
- 3D printing, gaming models, architecture models marketplace
- Mostly paid
- Used by Professional Modellers, Companies, Designers

Introduction to Cura's Printing Menu

Ultimaker Cura Set Up

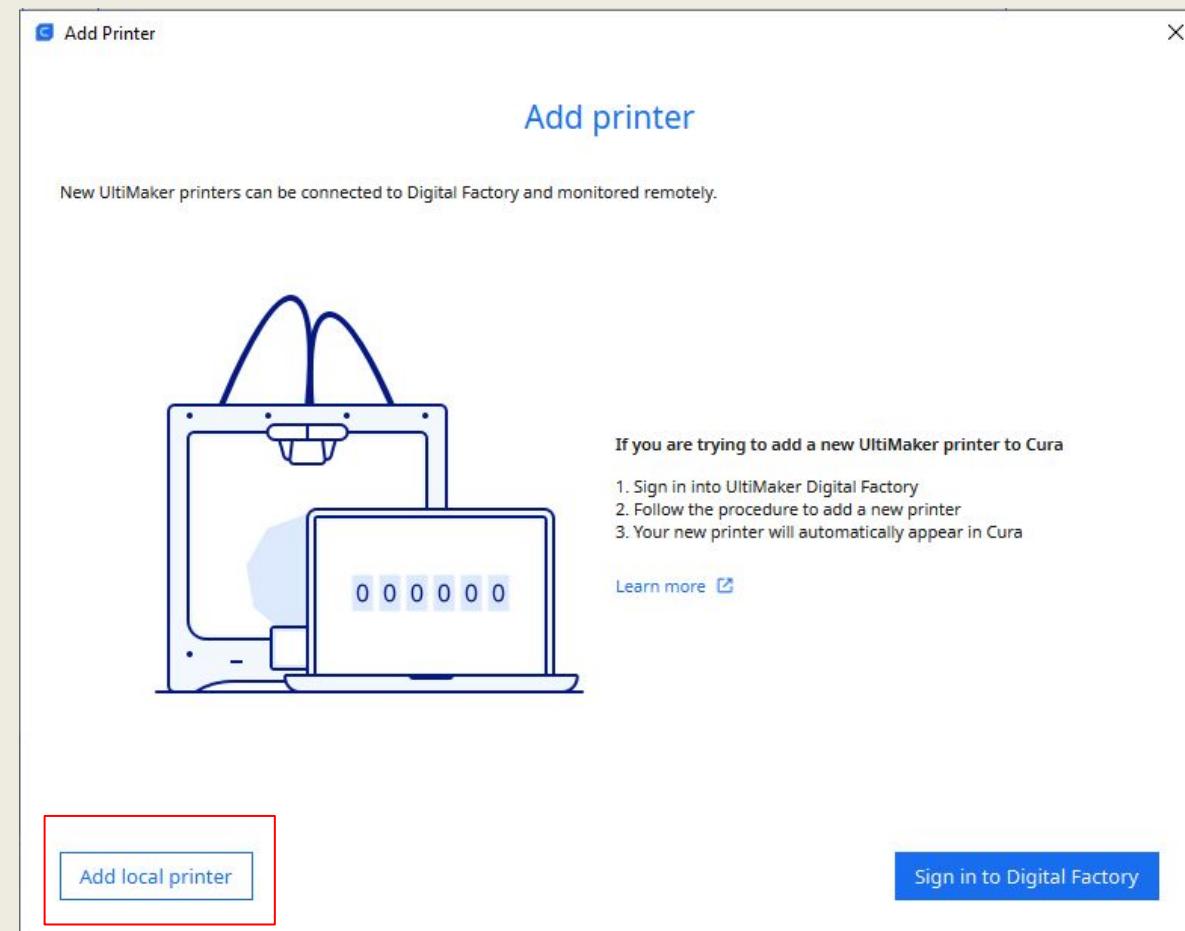
Step 1

Select:
Ultimaker Printer



Step 2

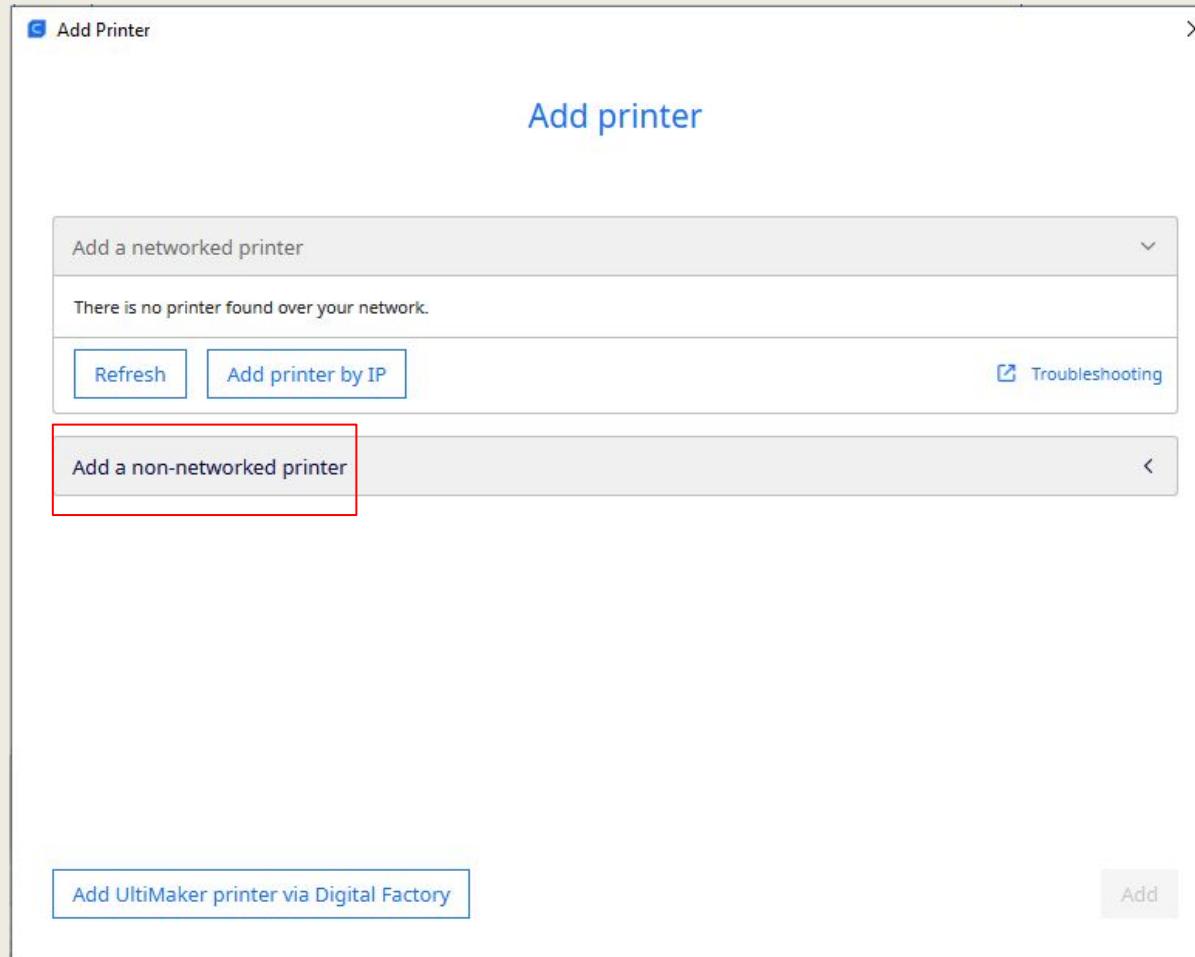
Select:
Add Local Printer



Step 3

Select:

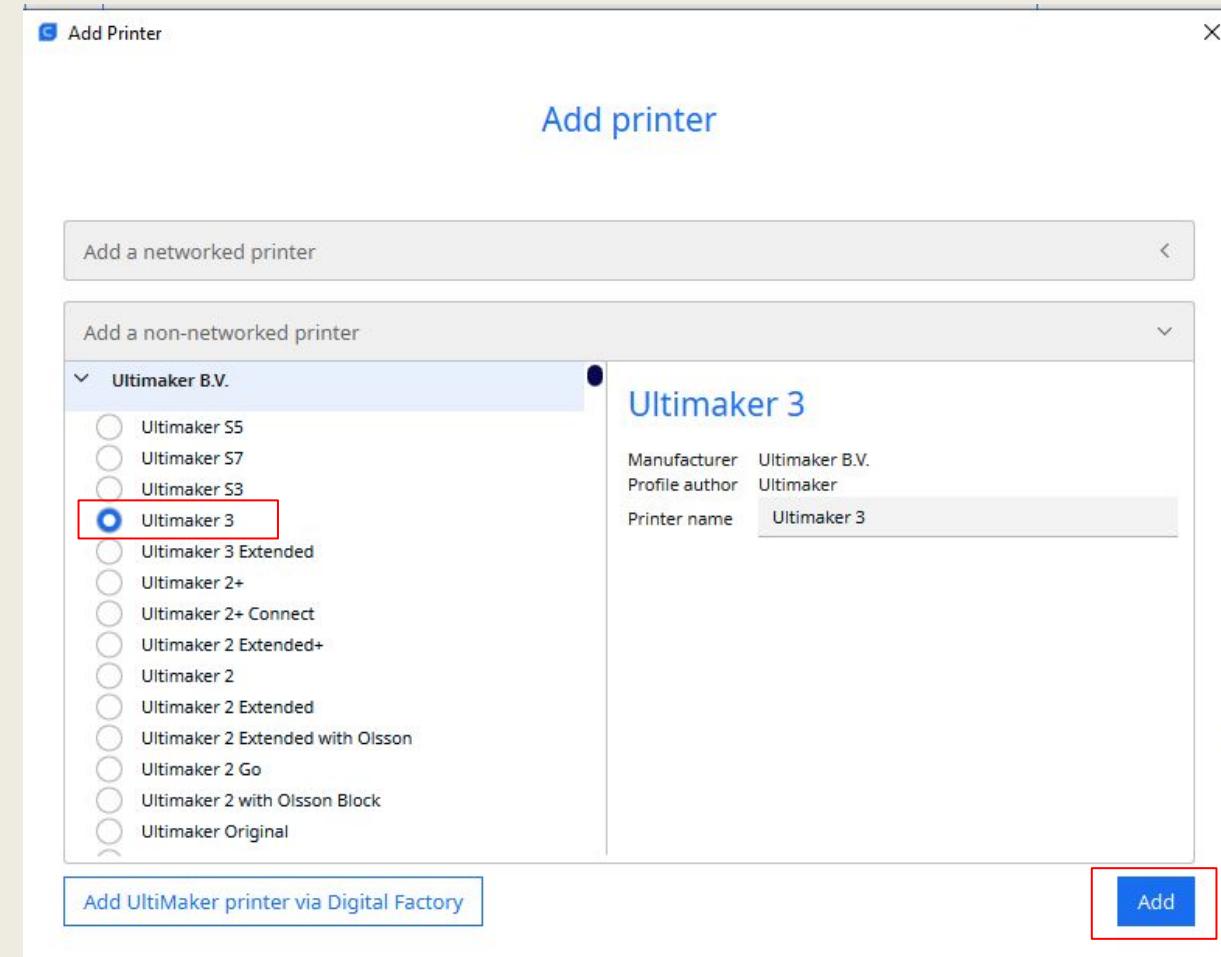
"Add a non-networked printer"



Step 4

Select:

"Ultimaker 3 & Add"



A Guide to Infill

Print settings

Profiles

Resolution: Normal - 0.15mm

! Recommended settings (for Normal) were altered.

Recommended print settings

Show Custom

Strength

- Infill Density: 20%
- Infill Pattern: Grid
- Shell Thickness: 0.8 mm / 1.0 mm

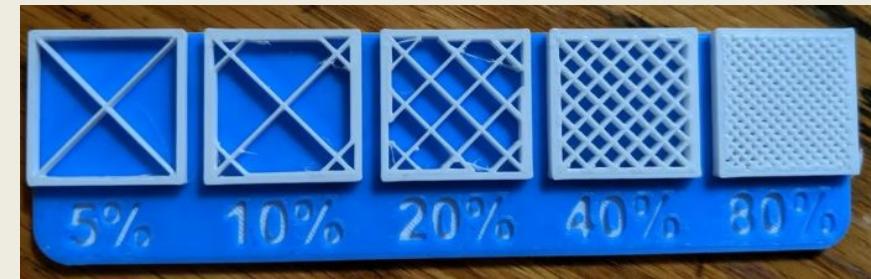
Support

- Support Type: Normal
- Print with: ① ②
- Placement: Everywhere

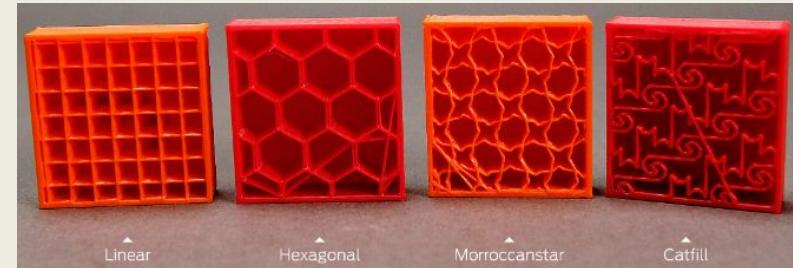
Adhesion

Infill refers to “material that fills a space or hole”

Density



Pattern



Shell



A Guide to Supports

Print settings

Profiles

Resolution: Normal - 0.15mm

! Recommended settings (for Normal) were altered.

Recommended print settings

Show Custom

Strength

Infill Density: 20%

Infill Pattern: Grid

Shell Thickness: 0.8 mm / 1.0 mm

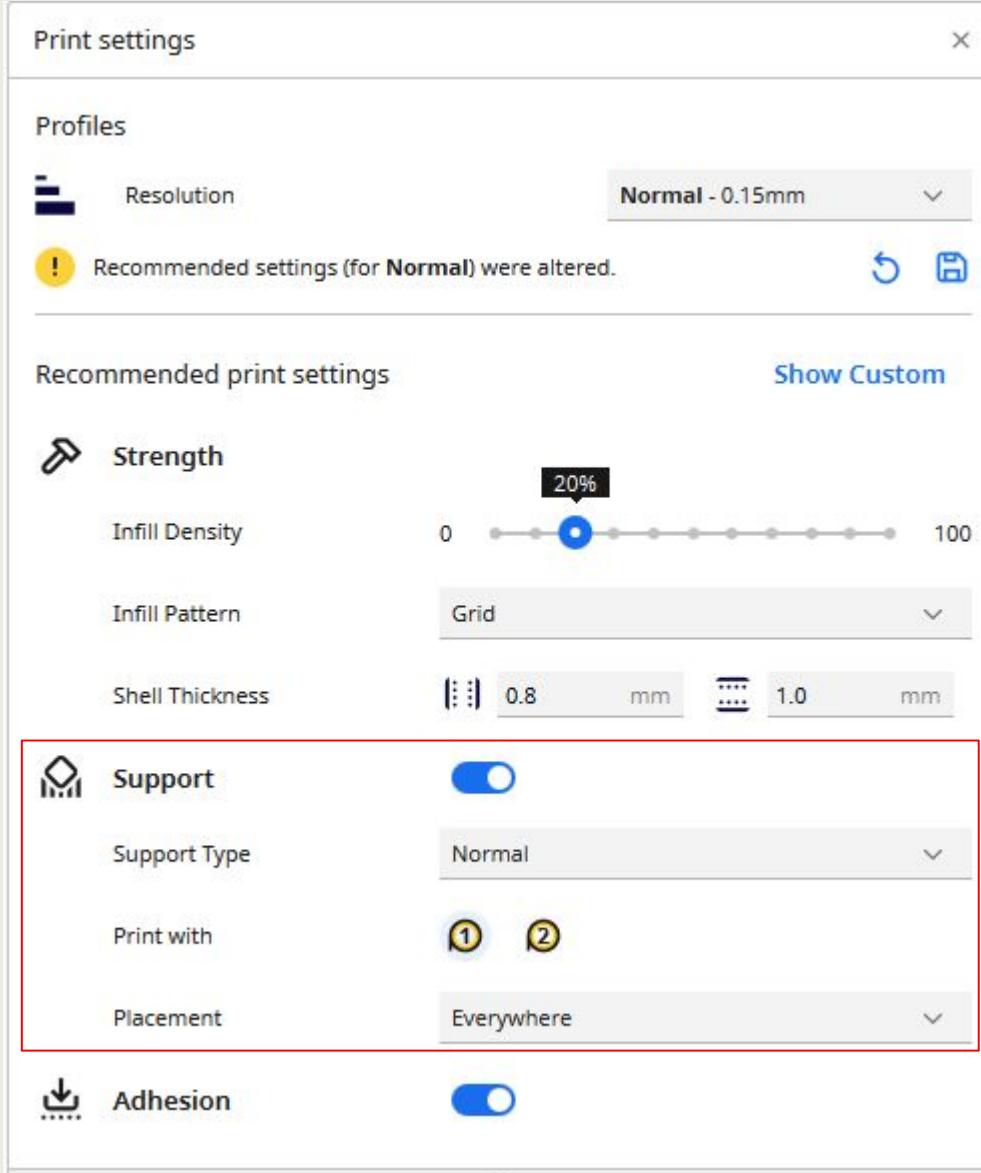
Support

Support Type: Normal

Print with: ① ②

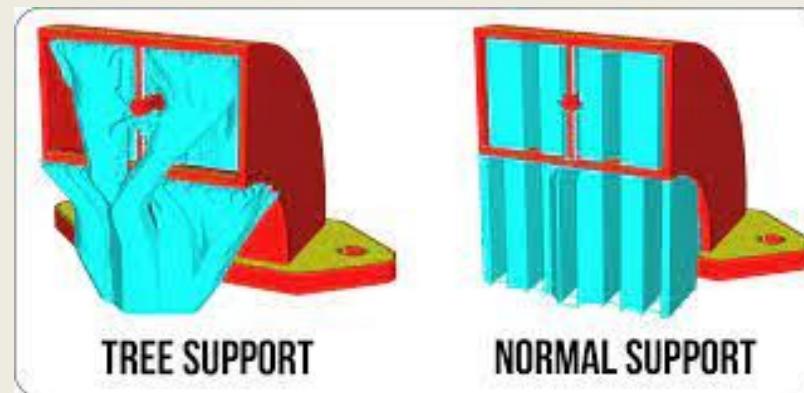
Placement: Everywhere

Adhesion



A support structure is the “added part that supports the overhanging structure or bridge structure when slicing the model, which needs to be removed after printing”

Support Types



Placement Types

- Touching build plate: Support material is only printed from the build plate up.
- Everywhere: Support material is printed below every part that needs support, which means that it can also be placed on or inside a model.

A Guide to Adhesion

Print settings X

Profiles

Resolution Normal - 0.15mm ▼

! Recommended settings (for Normal) were altered. ↻ ↻

Recommended print settings Show Custom

🔧 Strength 20%

Infill Density 0 100

Infill Pattern Grid ▼

Shell Thickness 0.8 mm 1.0 mm

elihood Support

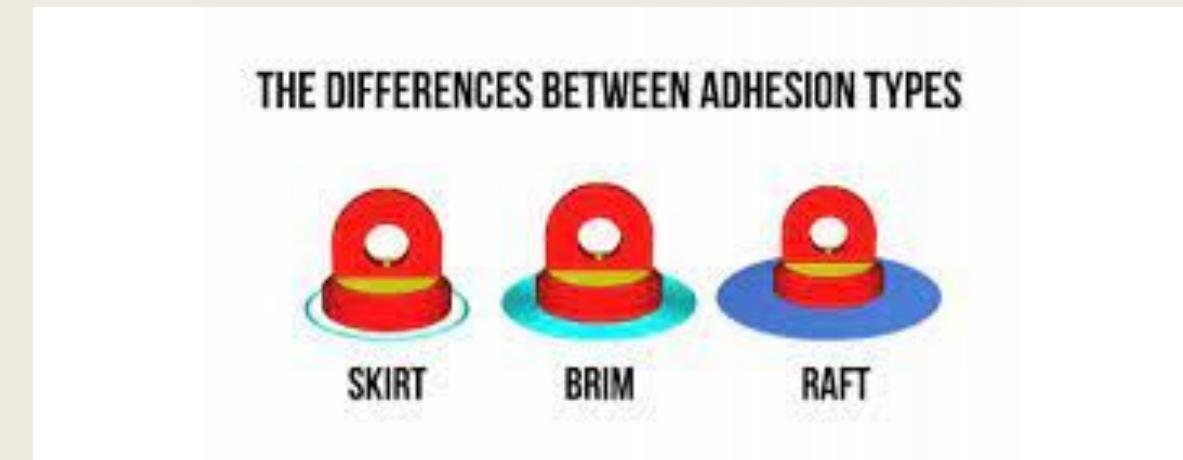
Support Type Normal ▼

Print with

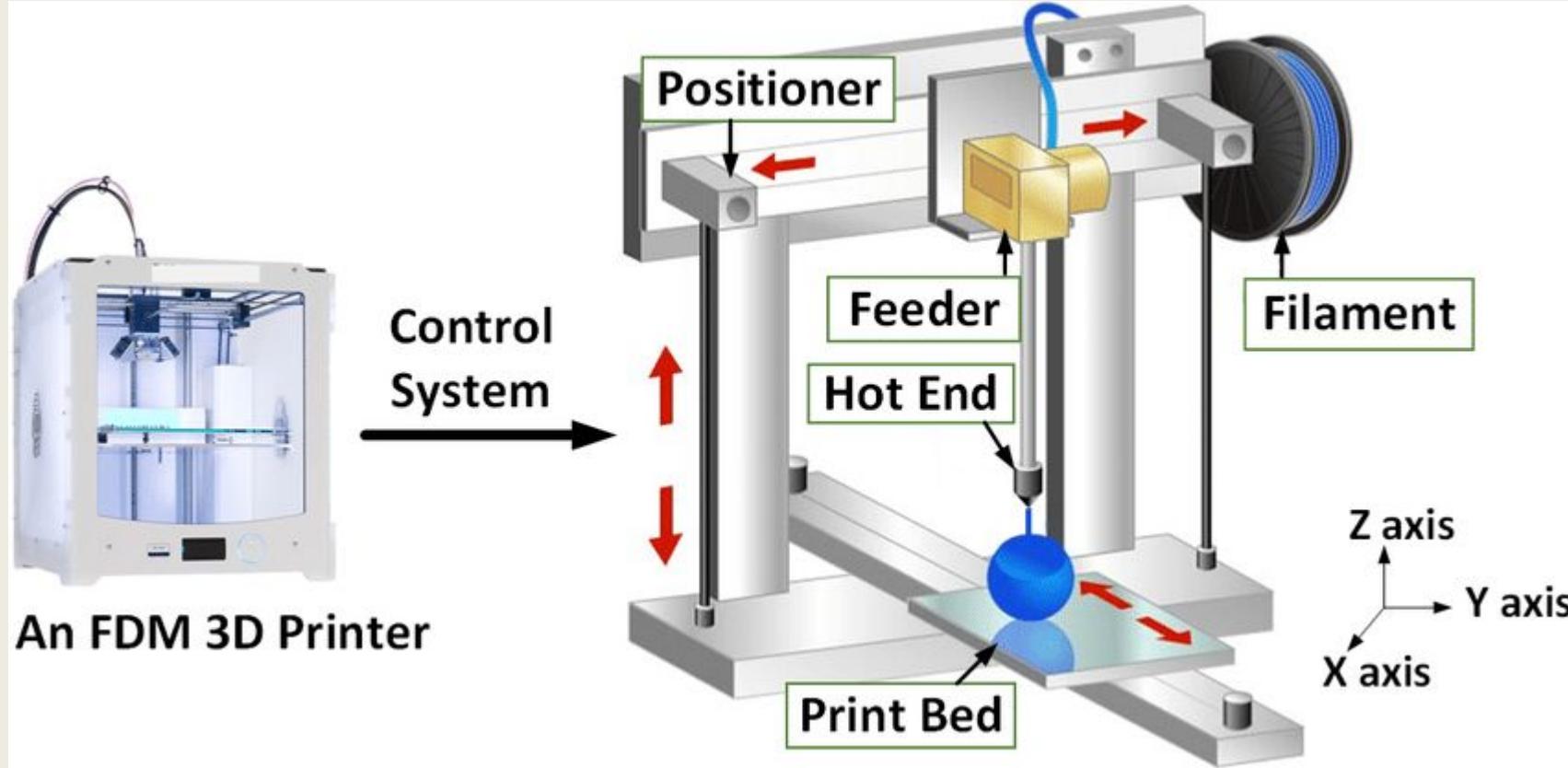
Placement Everywhere ▼

Adhesion

Adhesions are used to ensure your prints are stuck onto the build plate safely and prevents it from being deformed during extraction or cooling.



Printing Application



Do's and Dont's During Printing

Do's

1. Understand the printer's tolerance
2. Calibrate and check your printer's settings
3. Check the print's clearances and tolerances

Dont's

1. Print your prints in the wrong direction
2. Design prints that are not suitable to be printed by the printer
3. Forget printer maintenances

Thank you for joining us today!



**submit your feedback and your
design in the link!**



SunwayRobotics



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