



Digital scanning and advancing AI technologies are making it possible to custom design orthotics and prosthetics with more accuracy and fewer hospital visits.

limb or part of the body
a few minutes.

3D Design and Printing for Prosthetics

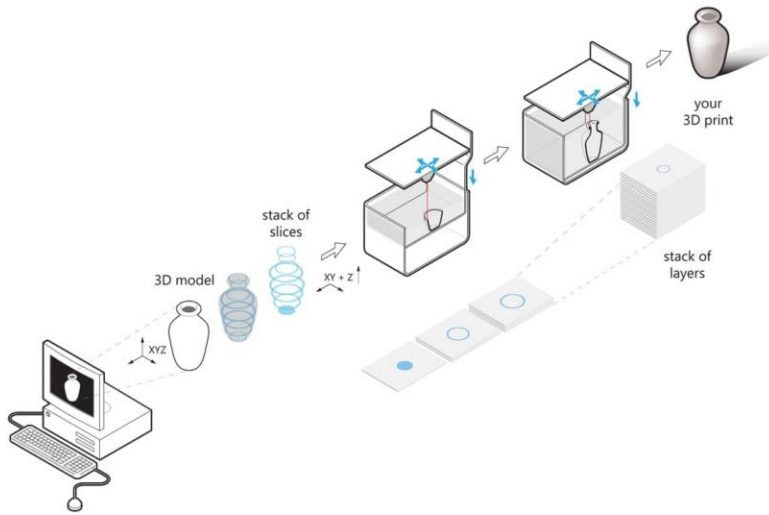
With Marc Bragdon (mbragdon@unb.ca)

For KIN 4164, Fall 2026



Globe and Mail Sept 16, 2026
TogetherWeDare.ca

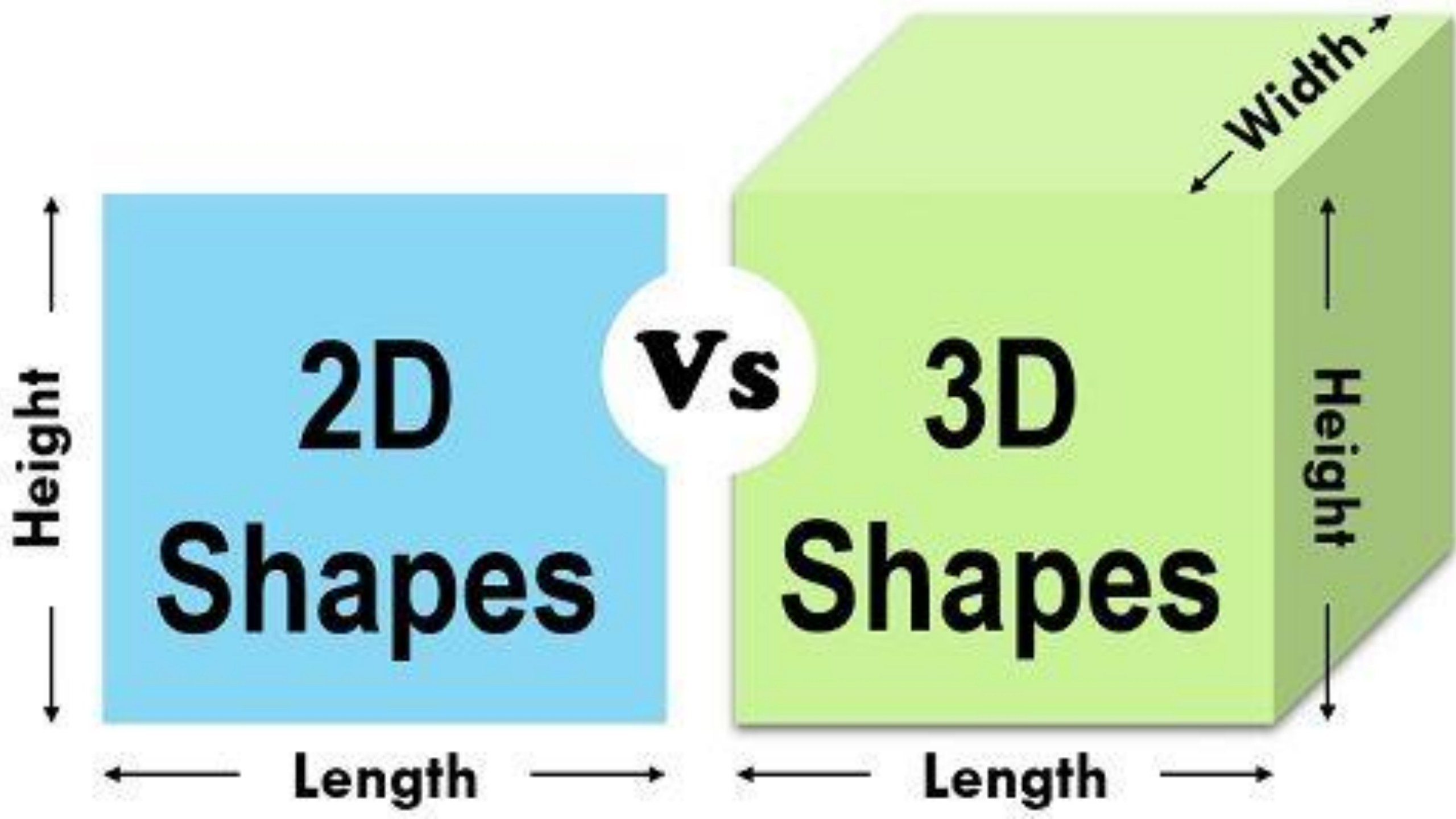
THE 3D PRINTING PROCESS

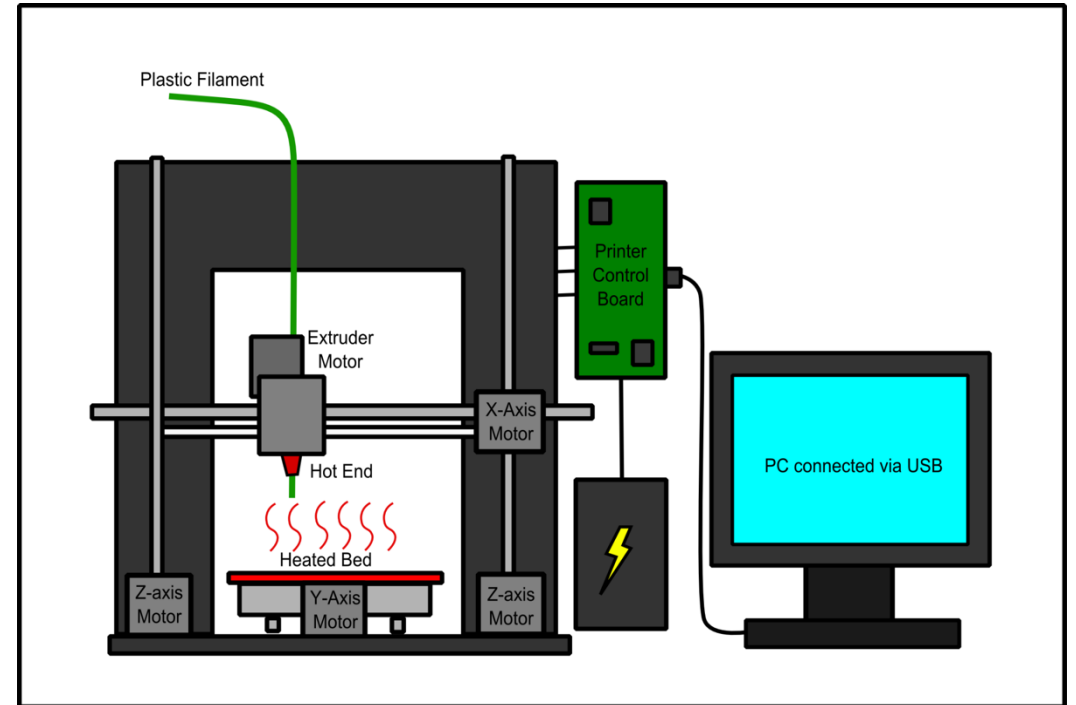


What is 3d Printing?

At its core 3D printing is about turning digital 3D models into physical ones with a few different methods.

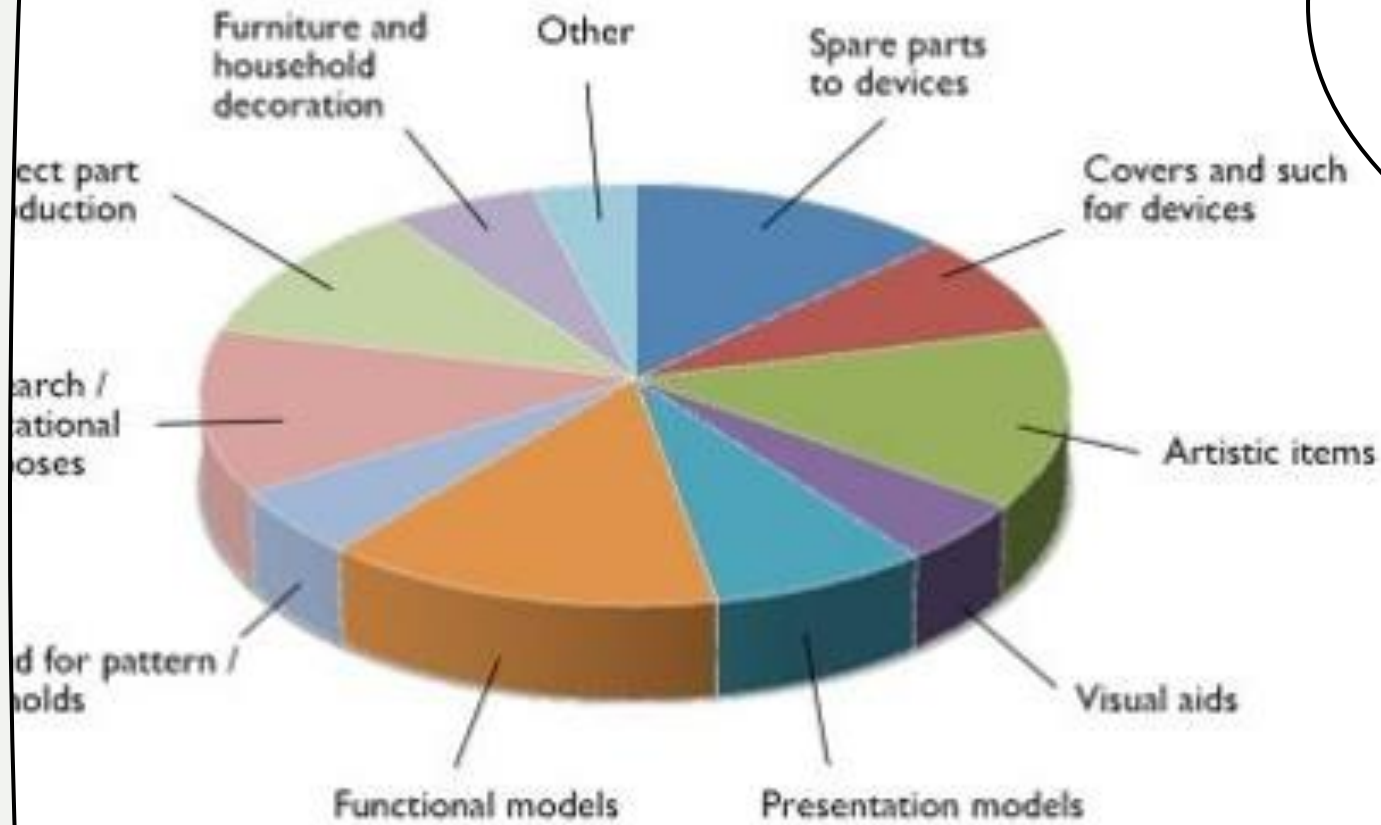
The most popular method being Fused-Deposition Modelling (FDM) which works by ejecting melted plastic along a predetermined path.





WHAT SOME 3D PRINTERS LOOK LIKE

For what usage do you use 3D printing?



WHY 3D PRINTING?

- It's fun
- It can save you money
- It's very handy when things break
 - Which can help create a more sustainable economy
- It can change how the world thinks and does manufacturing
- Extending modeling to non STEM fields for knowledge mobilization and new collaboration
- It's not going anywhere
- It has applications for nearly every job field

❑ FUTURE APPLICATIONS:

FOOD

NASA Scientists are developing 3D-printed food as answer to food shortage!



Bio-Printing:

Organs and living tissues of organisms have been printed through this technology!



3D Printing



Manufacturing:

It has been used to manufacture different parts of machines and robots!



Prototyping:

It has been used to make 3D models by the researchers and business industries

PHASE II
ACQUIRING 3D MODELS



MAKERBOT
THINGIVERSE

Design/Download/Modify

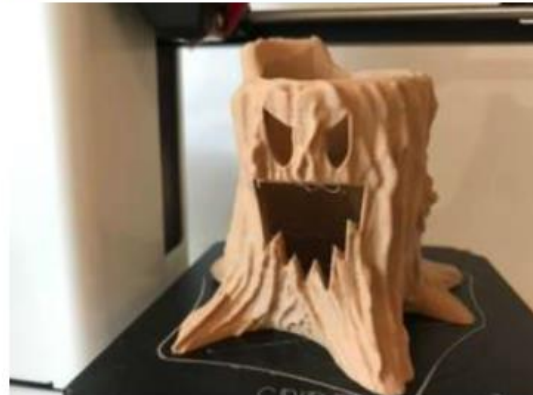


- Thingiverse
- Fusion 360
- Thangs 3D



Thingiverse

- Digital Design Platform - Open Source
- *Millions* of 3D models
- .STL downloadable
- <https://www.thingiverse.com/>





MAKIES COWBOY BOOTS



MAKIES_Short_CowBoy.

15 mb | Updated 11-11-2013 | 6915



Thing Details

1

Thing Files

2

Comments

3

Makes



MAKIES_Short_....STL



Makies Cowboy Boots

Download All



MAKIES_Short_CowBoy_Boots.S...

15 mb | Updated 11-11-2013 | 6915 Downloads

Download

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Makies Cow
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Share Alike

By downloa
by the licen

search

Enter three or more characters

- Seasonal designs
- Sports & Outdoor
- Toys & Games
- World & Scans

File types

- All Types
- 3D Models
- G-code Print Files
- SLA Print Files

G-code filtration

- Prusa MK3/S/S+
- Prusa MINI / MINI+
- Prusa MK3S/S+ & MMU2S
- Prusa MK2.5/S
- Prusa MK2.5S & MMU2S
- More printers

David Warboss



PRUSA 3D FFF

Prusa Mini Base

801 4.6 5 435

Frank Deschner



3D FFF

Designer Lithophane Moon Lamp

730 4.9 7 875

Andrei



3D FFF

Bag Clip (PRINT IN PLACE CAM)

1035 4.9 19 090

Ondřej Střiteský



3D FFF

Prusa Enclosure V2 - MMU2S

713 4.6 35 826

DFV Tech



3D FFF

Charger Cable Organizer

949 4.8 12 035

SethBon



3D FFF

LED Light Bar Prusa i3 MK2/MK3

671 4.9 3 566

Search Button

PRUSA PRINTERS

Prints Events Groups World Forum Blog Eshop



Cherry Labs · Jonathan

This phone/tablet stand is designed to be as universal as possible, print in place, and fold flat while being very...

DOWNLOAD 3.00 MB

Like 100 Print a Make 10 Share 1

created 24. 4. 2019 / published 24. 4. 2019

Details Files Makes & Comments User print files Author Remixes Collections Related prints

Description

This phone/tablet stand is designed to be as universal as possible, print in place, and fold flat

STL/File location

Files 3 Makes & Comments 127 User print files 2 Author Remixes 2 Collections 307

Model files

↓ ALL MODEL FILES (7 MB)

	stand_s.stl	Download button	3 MB uploaded 24. 4. 2019
	stand_m.stl		3 MB uploaded 24. 4. 2019
	stand_l.stl		3 MB uploaded 24. 4. 2019

PHASE III
TINKERCAD FOR CUSTOM
DESIGNS AND MODIFICATIONS



Import

Export



Basic Shapes



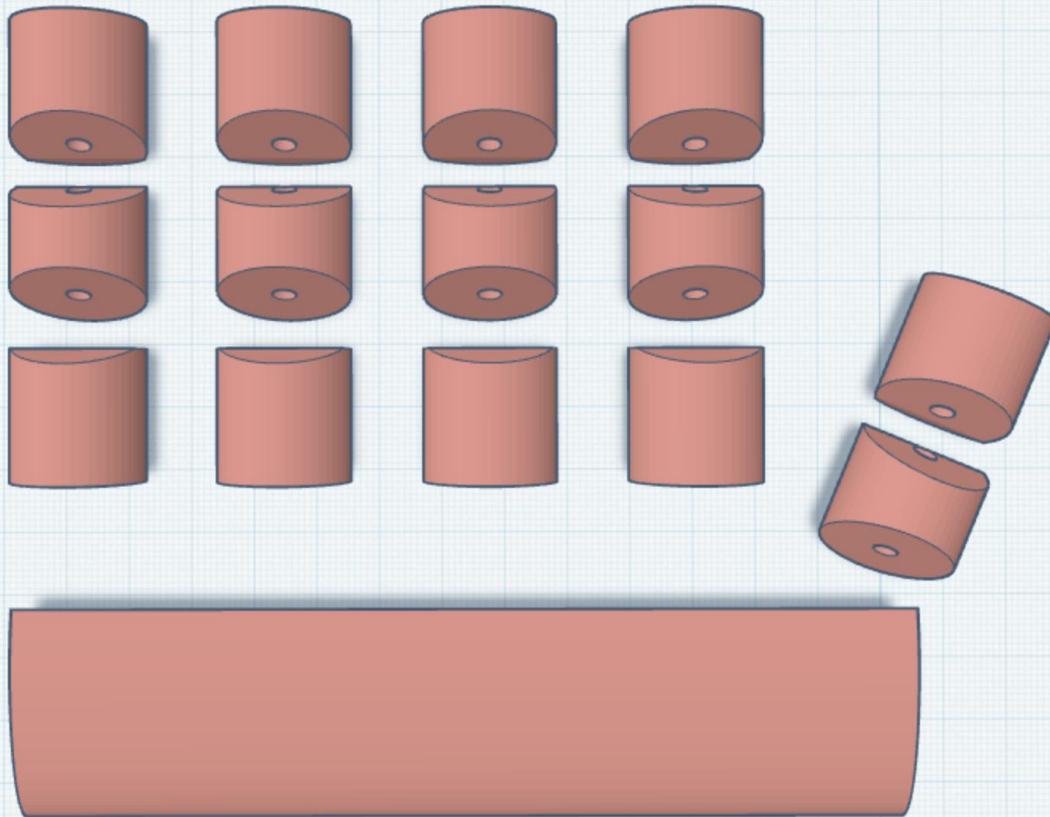
TEXT

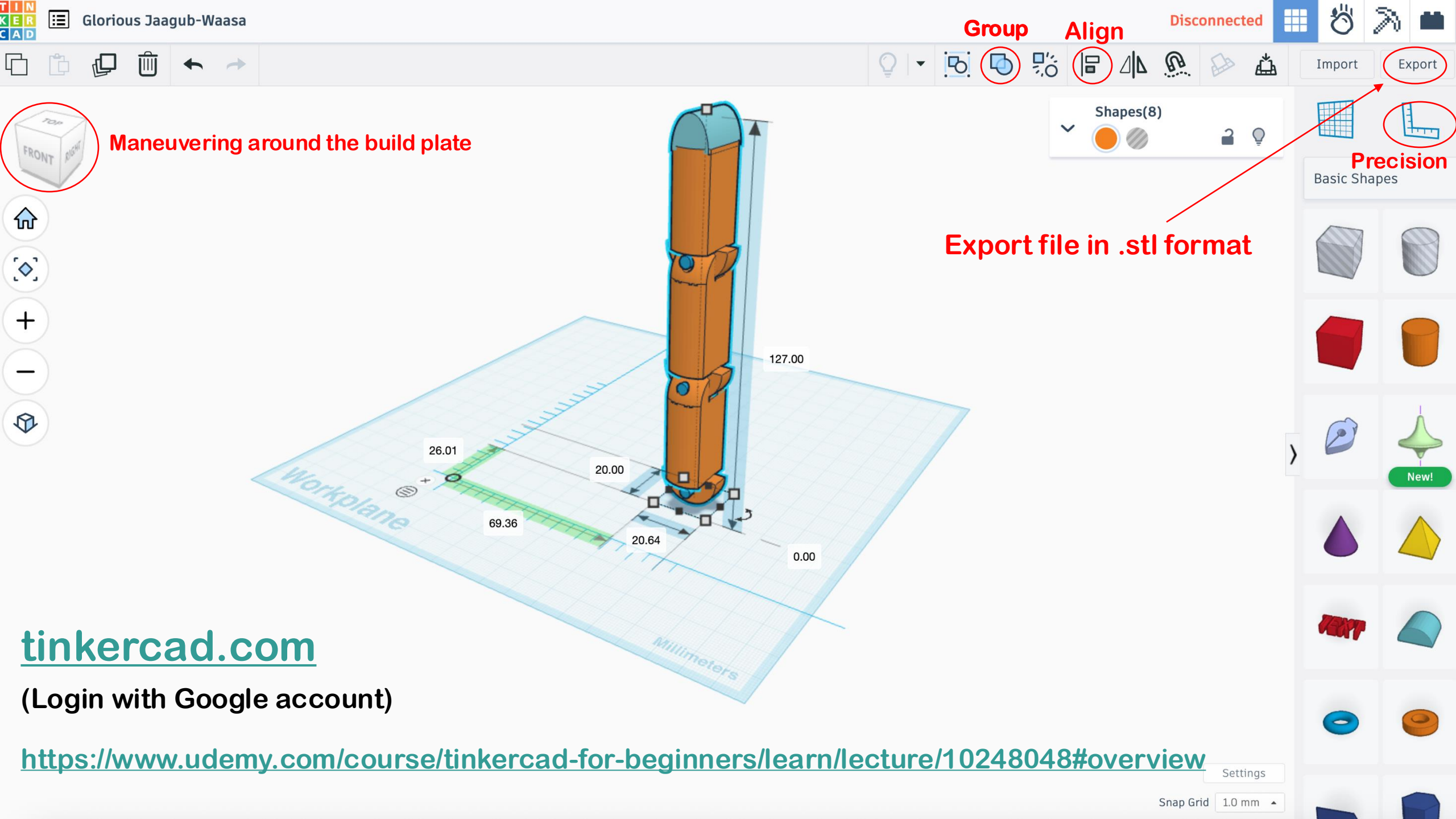


Settings

Snap Grid 1.0 mm

TOP





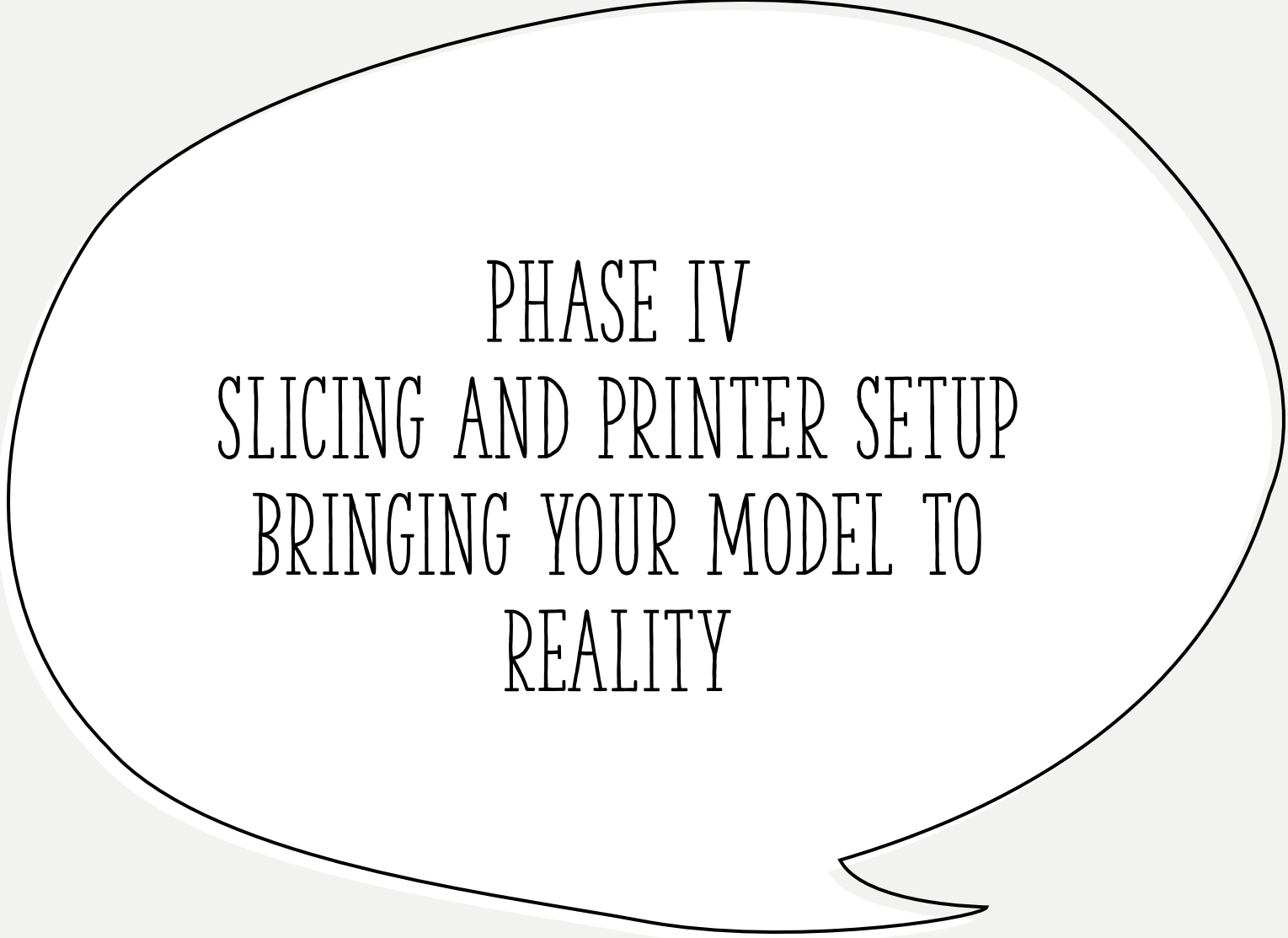
Maneuvering around the build plate

Export file in .stl format

[tinkercad.com](https://www.tinkercad.com)

(Login with Google account)

<https://www.udemy.com/course/tinkercad-for-beginners/learn/lecture/10248048#overview>



PHASE IV
SLICING AND PRINTER SETUP
BRINGING YOUR MODEL TO
REALITY



TIME TO SLICE! (WITH PRUSASLICER)



PrusaSlicer Icon

1

Locate & open *PrusaSlicer* on your computer. (Typically, the software should be found on the desktop of your computer)

2

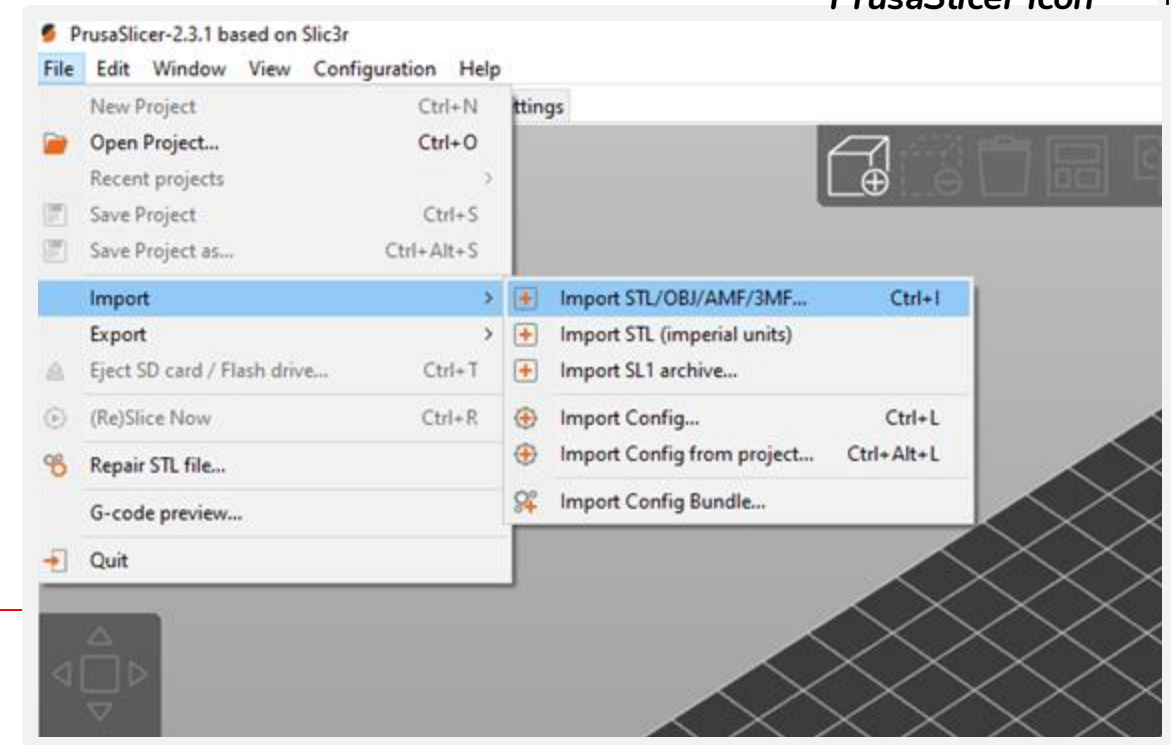
Locate 'File' in the top left corner of your screen

3

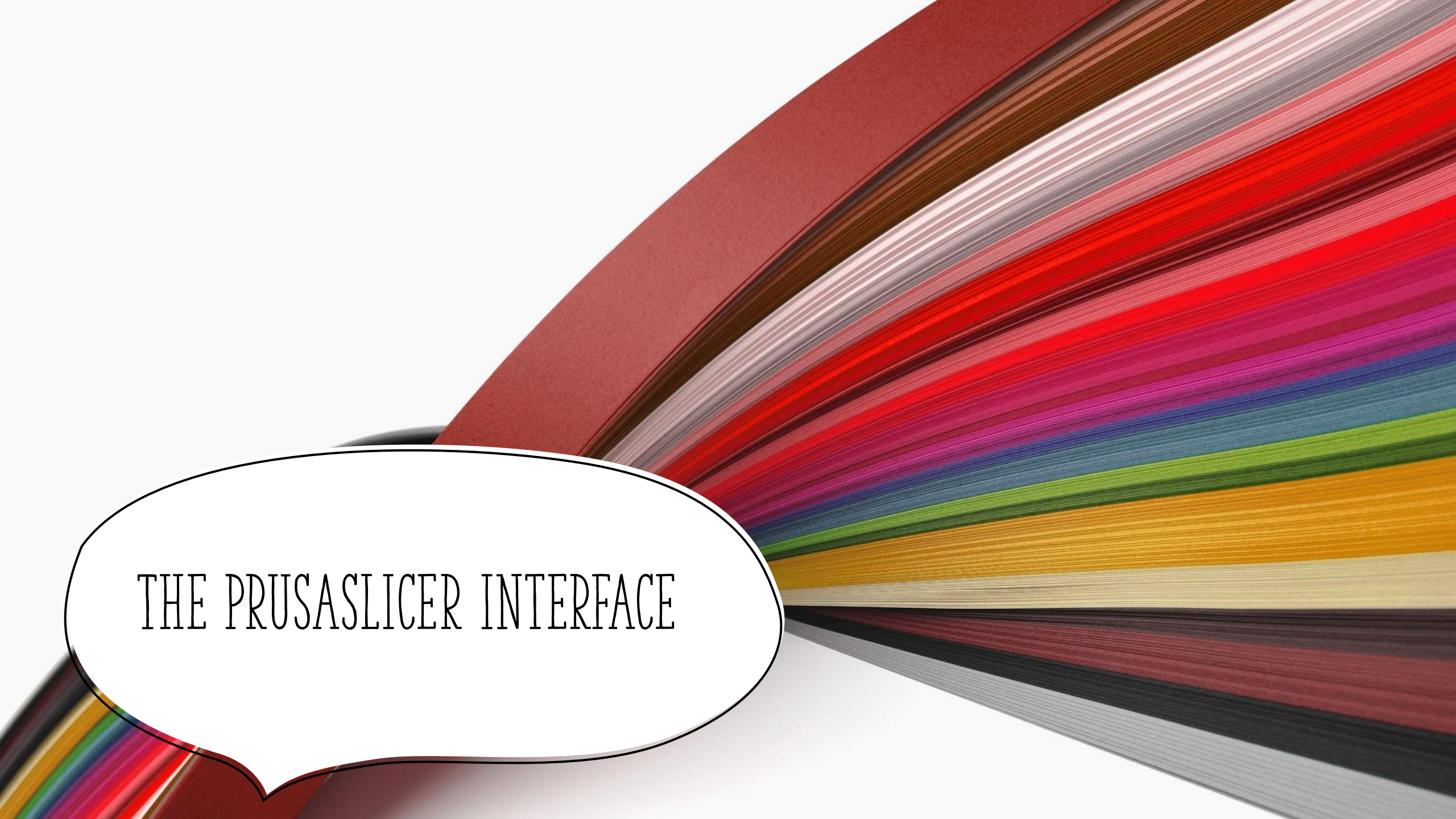
Hover your mouse above 'import' and select 'Import STL/OBJ/AMF/3MF...' This will open File Explorer.

4

Open your desired STL file



Visual example for 'Import' location in PrusaSlicer

A stack of numerous thin, colorful sheets of paper or cardstock is fanned out in a wide, semi-circular arc. The colors transition through a spectrum including reds, oranges, yellows, greens, blues, and purples. In the lower-left foreground, a white, rounded speech bubble with a black outline contains the text 'THE PRUSASLICER INTERFACE' in a black, serif, all-caps font.

THE PRUSASLICER INTERFACE

PrusaSlicer File Edit Window View Configuration Help

Plater Print Settings Filaments **Printers**

Original Prusa i3 MK3S & MK3S+

System presets

- Original Prusa i3 MK3S & MK3S+
- Original Prusa MINI & MINI+
- Original Prusa MK4 Input Shaper 0.4 nozzle
- Original Prusa MK4S

Add/Remove printers

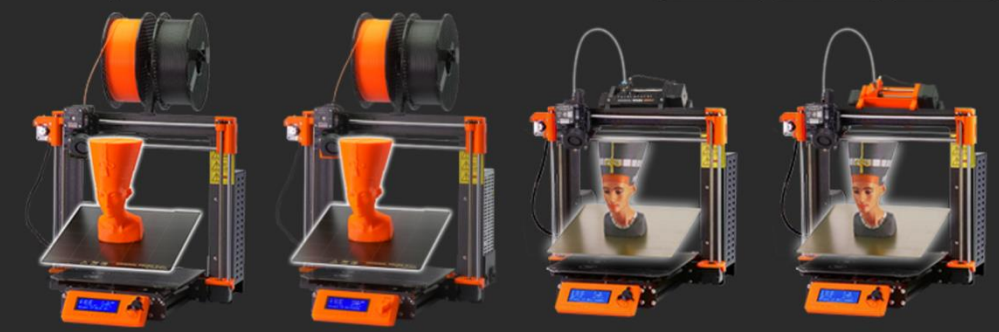
Dependencies

Capabilities

- Extruders:
- Single Extruder Multi Material:

MK3 Family

All standard All None



Original Prusa i3 MK3S & MK3S+
☒ 0.4 mm nozzle
Alternate nozzles:
☐ 0.25 mm nozzle
☐ 0.6 mm nozzle
☐ 0.8 mm nozzle

Original Prusa i3 MK3
☐ 0.4 mm nozzle
Alternate nozzles:
☐ 0.25 mm nozzle
☐ 0.6 mm nozzle
☐ 0.8 mm nozzle

Original Prusa i3 MK3S & MK3S+ MMU3
☐ 0.4 mm nozzle
Alternate nozzles:
☐ 0.25 mm nozzle
☐ 0.6 mm nozzle
☐ 0.8 mm nozzle

Original Prusa i3 MK3S & MK3S+ MMU2S
☐ 0.4 mm nozzle
Alternate nozzles:
☐ 0.25 mm nozzle
☐ 0.6 mm nozzle
☐ 0.8 mm nozzle

Prusa Research FFF Technology Printers

MK4 Family

All standard All None



Original Prusa MK4S
☐ HF0.4 mm nozzle
Alternate nozzles:
☐ HF0.5 mm nozzle
☐ HF0.6 mm nozzle
☐ HF0.8 mm nozzle
☐ 0.25 mm nozzle
☐ 0.3 mm nozzle
☒ 0.4 mm nozzle

Original Prusa MK4S MMU3
☐ 0.4 mm nozzle
Alternate nozzles:
☐ HF0.4 mm nozzle

Original Prusa MK4 Input Shaper
☒ 0.4 mm nozzle
Alternate nozzles:
☐ 0.25 mm nozzle
☐ 0.3 mm nozzle
☐ 0.5 mm nozzle
☐ 0.6 mm nozzle
☐ 0.8 mm nozzle
☐ HF0.4 mm nozzle

Original Prusa MK4 MMU3
☐ 0.4 mm nozzle
Alternate nozzles:
☐ HF0.4 mm nozzle

< Back Next **Finish** Cancel

Plater

Print Settings

Filaments

Printers

Printables

0.20mm SPEED @MK4S 0.4 (modified)



Layers and perimeters

Infill

Skirt and brim

Support material

Speed

Multiple Extruders

Advanced

Output options

Notes

Dependencies

Support material

Generate support material:



Auto generated supports:



Overhang threshold:

40 °

Enforce support for the first:

0 layers

First layer density:

80 %

First layer expansion:

3.5 mm

Raft

Raft layers:

0 layers

Raft contact Z distance:

0.15 mm

Raft expansion:

1.5 mm

Options for support material and raft

Style:

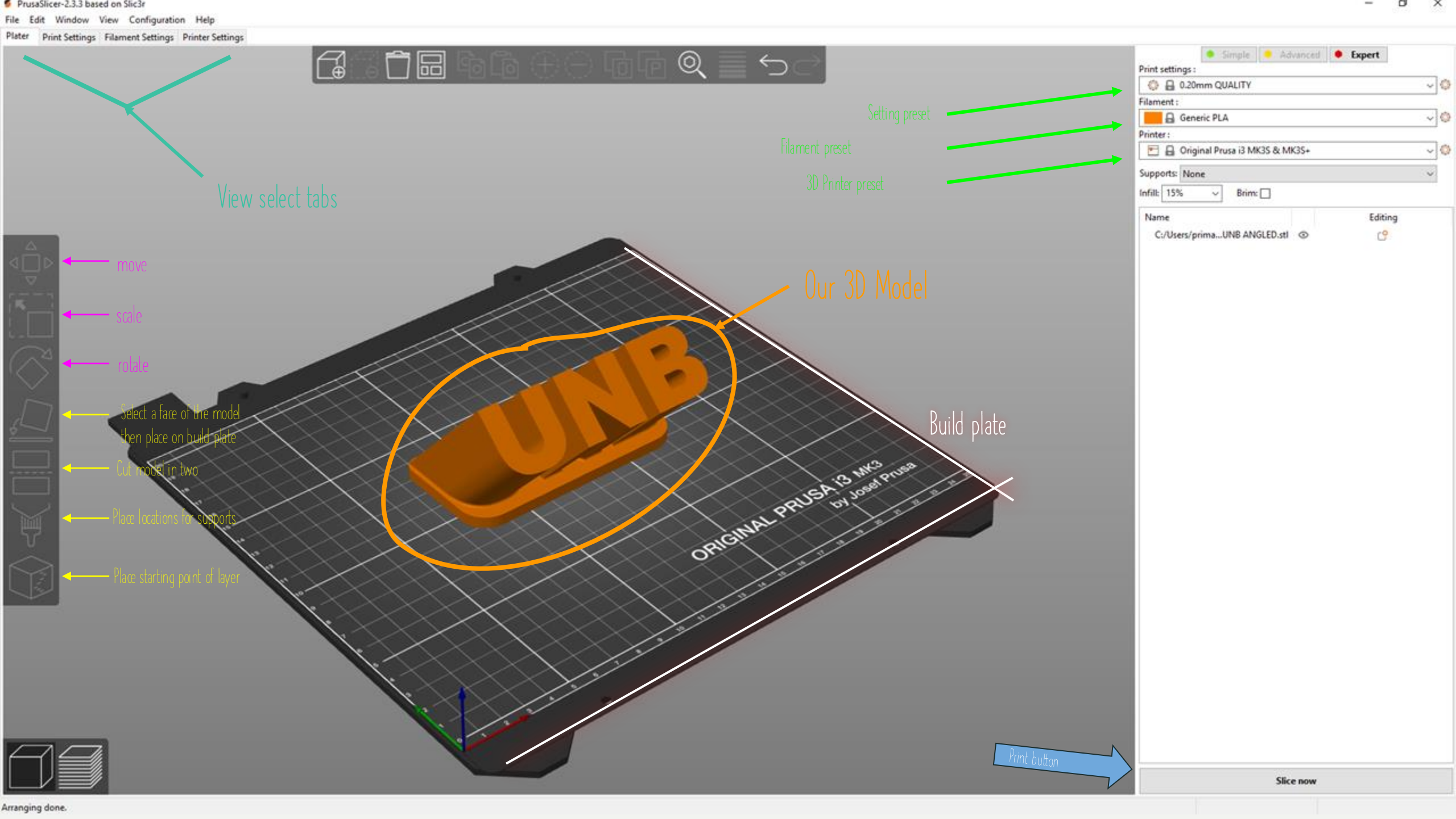
Organic

Top contact Z distance:

Grid mm

Bottom contact Z distance:

Snug mm





WHAT SETTINGS ARE GOOD?

Layer Height

- 0.2 mm is great for 90% of prints
- The lower the setting the longer the print (eg, 0.1 takes ~3X longer to print than 0.3)
- Time can be saved by printing .3 geometrically simple shapes like a box or container

Perimeters

- How many solid layers are on the outside of the print. Changes durability.
- 2 perimeters is good for most things that are for display or light use
- 3+ perimeters are often not needed except for specific mechanical parts like gears and connectors

Infill

- How much filler material is inside the model
- Stay between 8-20% unless your model is going to undergo a lot of mechanical stress

Brim

- Brims are good for very large parts with sharp point (box)
- And very small things that might need more to help hold them down to the build plate

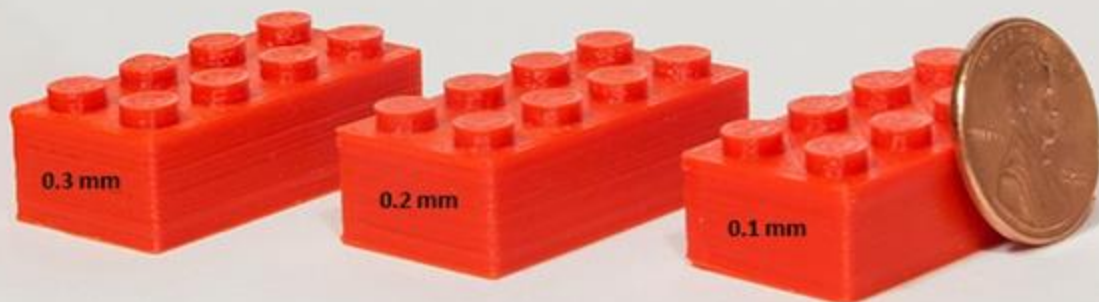
Supports

- Some geometries will require supports- in other words an additional part printed that can be removed afterwards. These are printed for *overhangs*, areas that don't have enough material underneath them to be printed on and require additional support
- Angles under 60 degrees can be printed reliably
- So a "T" would require supports, however an "X" or "O" would not

IMPORTANT 3D PRINTING SETTINGS



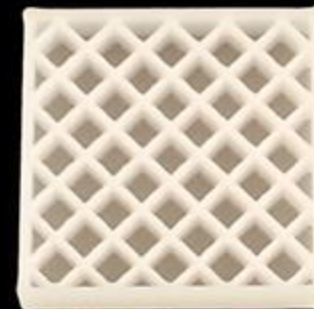
SOME VISUALS



Fill Density



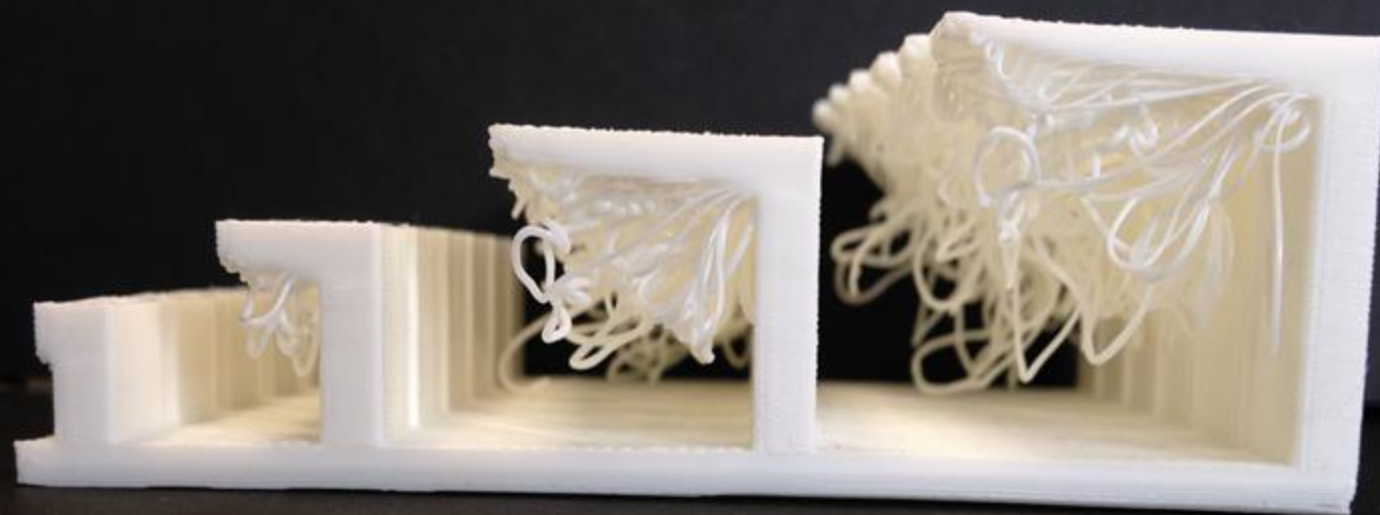
10%



20%



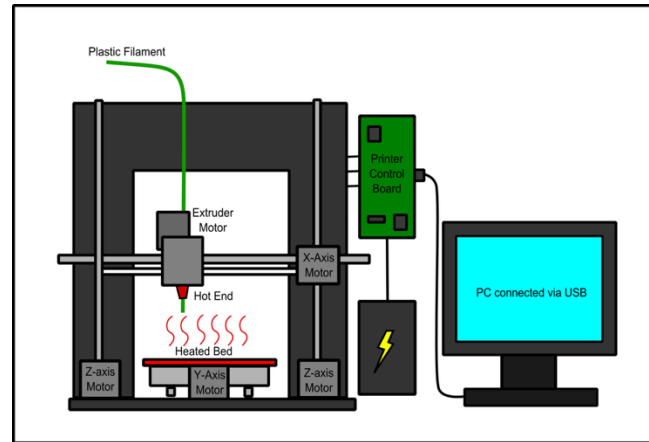
30%



Failed Horizontal Overhangs

TRANSFER MODEL

After you have adjusted your settings and sliced your model you can save the "gcode" file (print file) onto the one of the provided SD cards and bring it to a printer



PHASE IV
PRINTING



RUN THE PRINTER

- Insert SD into the printer
 - Printer will read automatically
 - Scroll to choose file
 - Press button to print
 - Sit back & relax!