

The background features a gradient from light purple at the top to light blue at the bottom. It is decorated with several realistic water droplets of various sizes and orientations. Overlaid on this are several thin, black, irregular geometric lines that create a sense of depth and movement.

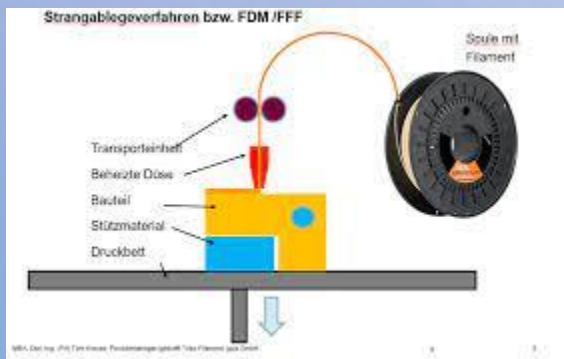
3D PRINTING FOR COSPLAY

DEADLEGATO TWIN CITIES CON 2024

FIND ME AT [DEADLEGATO.COM](https://deadlegato.com)

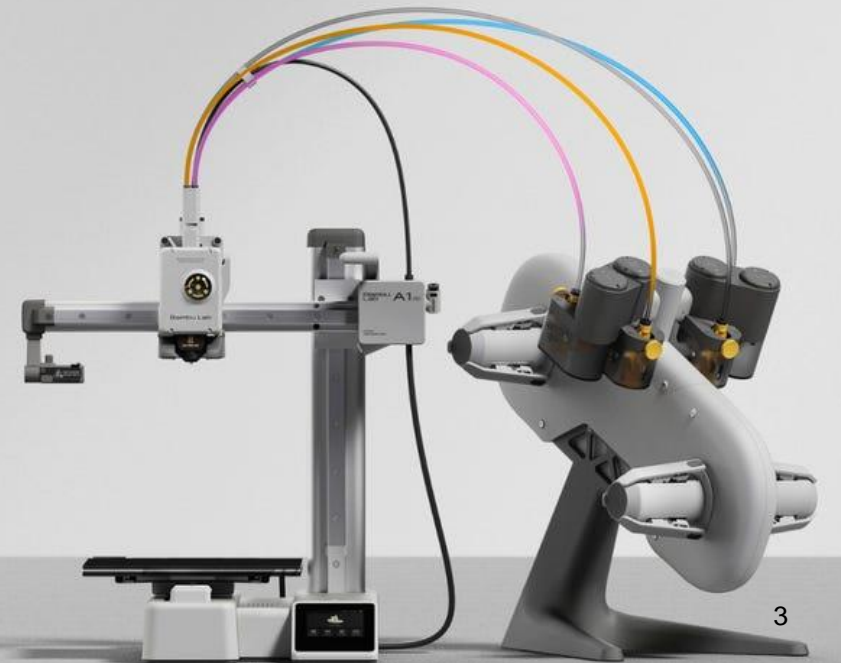
WHAT IS FDM 3D PRINTING?

- Fused deposition modeling (FDM), also known as fused filament fabrication (FFF)
 - What it says, it uses filament to print
 - As opposed to resin printing, which will not be covered in this panel
- Why?
- Because resin 3d printing requires specialized containment and ventilation which I don't have space for



WHAT PRINTER SHOULD I GET?

- That depends on you
- More expensive printers usually require less mechanical knowledge
- Cheaper printers tend to require more mechanical knowledge
 - IE, Bambu printers require very little knowledge to set up but cost more. Creality are cheaper but require a lot of work on your end to get running.
 - I have experience with Bambu, Elegoo, and Prusa models
 - How much space? How big do you want to print?
 - You don't have to print things in single pieces

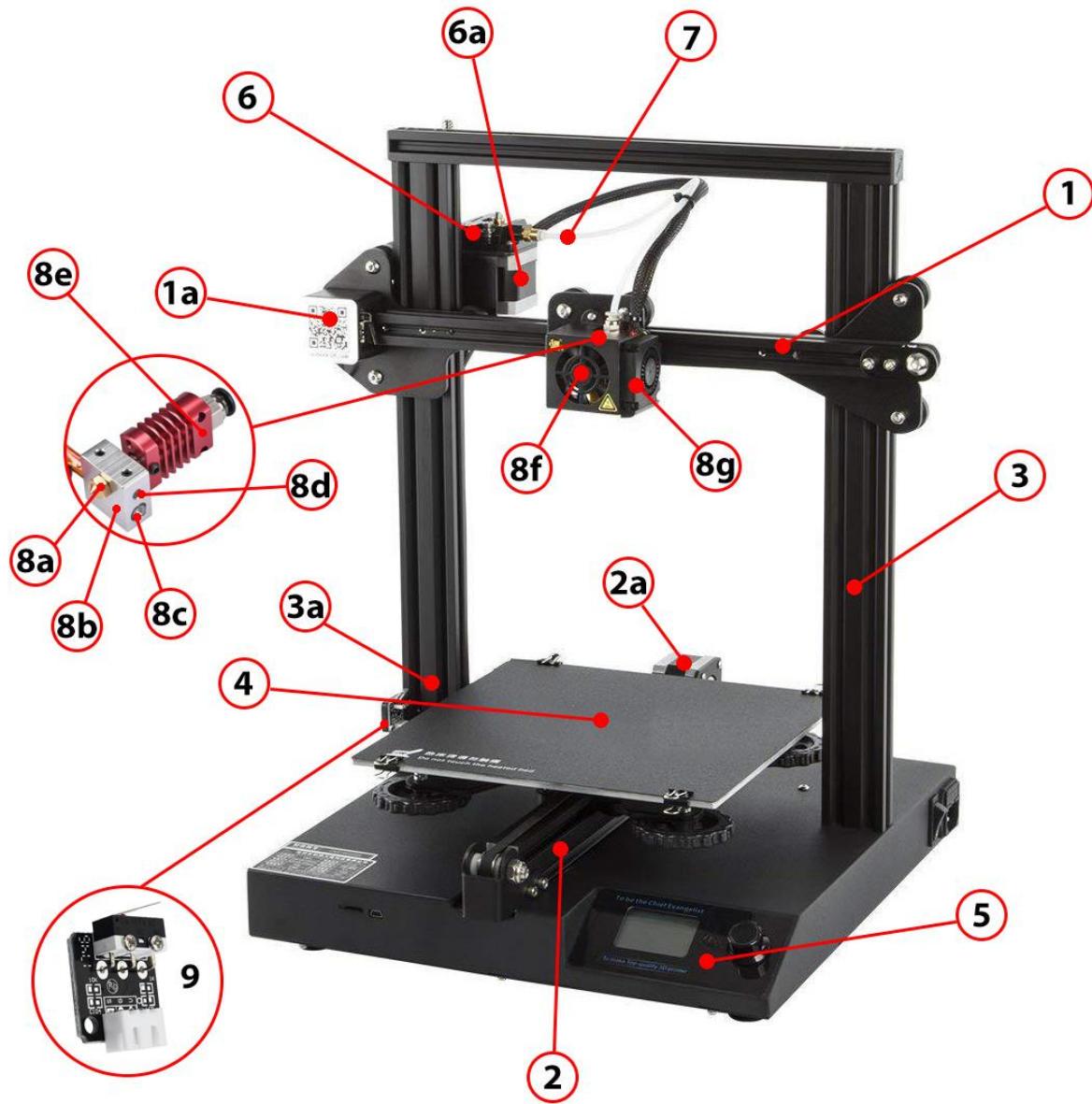


CAN YOU DIAGNOSE MY PRINTER ISSUE?

Unless I am standing in front of your specific machine, it is hard to pinpoint an issue because many problems have the same end result

I can do my best to help!

I will cover ways to troubleshoot your printer in this presentation



ENCLOSURES??



**KOTTO Strong Suction
Hose Fume Smoke
Absorber for Soldering,
Electric Iron Welding, 3d
Printing Extractor
Absorber Remover DIY
Extractor Carbon or HEPA
Filter [Updated, Hose pre-
attached]**

\$ 71.55



WHAT KINDS OF FILAMENTS ARE OUT THERE?

- PLA is the basic filament. It's largely safe, easy to work with, and cheap.
 - PLA+, PLA Silk, Light Weight PLA, ect ect ect are all variants on PLA
 - There are also reinforced filaments (Carbon fiber, glass fiber)
- And weird filaments like marble or wood
 - The weirder filaments including glow in the dark are very abrasive, so you'll have to switch nozzles more often.
- ABS is stronger but can give off fumes when being printed
- PETG is also stronger and gives better clarity for translucent prints, but is harder to work with
- TPU is flexible
- Keep in mind these are still all thermal filaments, so leaving them in places like your hot car can melt your work. Also, not all printers can print all filaments



HOW DO I PRINT?

- You're going to have to start with something to print
- Common file formats are STL and OBJ
- Not all 3d files are meant for printing

WHERE CAN I GET PRINT PATTERNS?

HTTPS://CULTS3D.COM	WWW.SHAPEWAYS.COM	HTTPS://3D-GALLERY.XYZPRINTING.COM/EN-US/PROMOTION	HTTPS://DIGILAB.DREMEL.COM/RESOURCES/LESSON-PLANS	3DCONTENTCENTRAL - HTTPS://WWW.3DCONTENTCENTRAL.COM/	YOBI3D - HTTPS://WWW.YOBI3D.COM/
HTTPS://THINGIVERSE.COM	WWW.YOBI3D.COM		HTTPS://WWW.3DAGOGO.COM/		THREEDSCANS - HTTP://THREEDSCANS.COM/
HTTPS://THANGS.COM	WWW.YOUMAGINE.COM	HTTPS://3DPRINT.NIH.GOV/	HTTPS://WWW.3DWAREHOUSE.SKETCHUP.COM	3DSHOOK - HTTP://WWW.3DSHOOK.COM/	BLANKREPOSITORY - HTTPS://WWW.BLANKREPOSITORY.COM/
HTTPS://SKETCHFAB.COM		HTTPS://3DEXPORT.COM/		3DEXPORT - HTTPS://DE.3DEXPORT.COM/	
HTTPS://PINSHAPE.COM/	WWW.3DCADBROWSER.COM	HTTPS://REPABLES.COM/	HTTPS://WWW.MALIX3DESIGN.COM/?M=1		3DDIGITALDOUBLES - HTTP://3DDIGITALDOUBLES.COM/
HTTP://WWW.3DSHOOK.COM	WWW.123DAPP.COM/GALLERY/CONTENT/ALL	HTTPS://WWW.INSTRUCTABLES.COM/	HTTPS://DTRSTUDIO3D.WIXSITE.COM/WEBSITE	NASA - HTTPS://NASA3D.ARC.NASA.GOV/MODELS/PRINTABLE...	
HTTPS://GRABCAD.COM		HTTPS://LIBRE3D.COM/			PIXELLABS - HTTPS://WWW.THEPIXELLAB.NET/FREEBIES/
HTTPS://WWW.CGTRADER.COM	WWW.LIBRE3D.COM	HTTPS://3DKITBASH.COM/	HTTPS://WWW.ZSCULPTORS.COM	3DCONTENTCENTRAL - HTTPS://WWW.3DCONTENTCENTRAL.COM/	DO3D.COM
HTTP://WWW.TURBOSQUID.COM	WWW.3DSHOOK.COM	HTTP://WWW.RINKAK-SERVICES.COM/EN/	COOKIE CASTER - HTTP://WWW.COOKIECASTER.COM/		3DMAG.ORG
HTTPS://3DEXPORT.COM/	WWW.3DEXPORT.COM/FREE-3D-MODELS	HTTPS://LIBRARY.ZORTRAX.COM/	LITHOPHANE - HTTP://3DP.ROCKS/LITHOPHANE/	PRINT A BRICK (LEGOS) - HTTPS://PRINTABRICK.ORG	PRINTABLES.COM
HTTP://WWW.YEGGI.COM/	WWW.TF3DM.COM	HTTPS://FAB365.NET/	INSTRUCTABLES - HTTP://INSTRUCTABLES.COM/	REPABLES - HTTPS://REPABLES.COM/	MAKERWORLD.COM
HTTPS://WWW.REMIX3D.COM/	WWW.TREATSTOCK.COM/3D-PRINTABLE-MODELS	HTTPS://POLAR3D.COM/	3D WAREHOUSE - HTTPS://3DWAREHOUSE.SKETCHUP.COM/	SKETCHFAB - HTTPS://SKETCHFAB.COM/	PATREON
HTTPS://FAB365.NET/	WWW.OPEN3DMODEL.COM	HTTPS://FREE3D.COM/		TINKERCAD - HTTPS://WWW.TINKERCAD.COM/	
WWW.TINKERCAD.COM/THINGS	WWW.ARCHIVE3D.NET	HTTPS://WWW.THREEDING.COM/MOBILE	SMITHSONIAN - HTTPS://3D.SI.EDU/	EVERMOTION - HTTPS://EVERMOTION.ORG/DOWNLOADS/	THANKS TO D ANTHONY PAUL ON FACEBOOK FOR COMPILING THIS LIST
WWW.CGTRADER.COM	WWW.3DCONTENTCENTRAL.COM	HTTPS://NASA3D.ARC.NASA.GOV/MODELS	SHARECG - HTTP://WWW.SHARECG.COM/	BLENSWAP - HTTPS://WWW.BLENDSWAP.COM/	
WWW.FORGE.ZHENG3.COM	WWW.SHAPETIZER.COM	HTTP://ZHENG3.COM/FORGE/INDEX.PHP?ID=-4	ALL3DP - HTTPS://WWW.ALL3DP.COM/	3DMODELFREE - HTTP://WWW.3DMODELFREE.COM/	
WWW.STLFINDER.COM	WWW.GUMROAD.COM	HTTPS://WWW.REDPAH.COM/			
WWW.TRINPY.COM	HTTPS://WWW.STLFINDER.COM/				
WWW.DIGIBLE.NET					

MAKE YOUR OWN STL FILES

- 3D scanners
- TinkerCAD
- FreeCAD
- Blender
- Fusion360
- Onshape
- Makerworld
- Moar?

I DOWNLOADED AN STL AND PUT IT IN MY PRINTER BUT IT WON'T PRINT WHY

- You have to slice it first!
- Slicing is dividing the print object into the layers it will be printed in
- You need a slicing program to do this with
- The one you pick will depend on you and your printer
- Cura, OrcaSlicer, Bambu Handy, PrusaSlicer

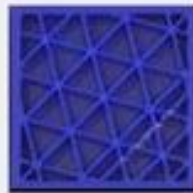
SLICER SETTINGS

- Thickness of the layers (thinner = more detail but more time, may also depend on your nozzle size)
- Walls (outer layers)
- Infill
- Supports
- Bed Adhesion
- Ect Ect

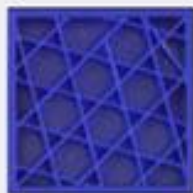
INFILL??



Grid



Triangle



Trihexagon



Cubic



**Cubic
Subdivision**



Cross



Octet



Quarter Cubic



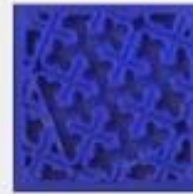
Concentric



**Concentric
3D**

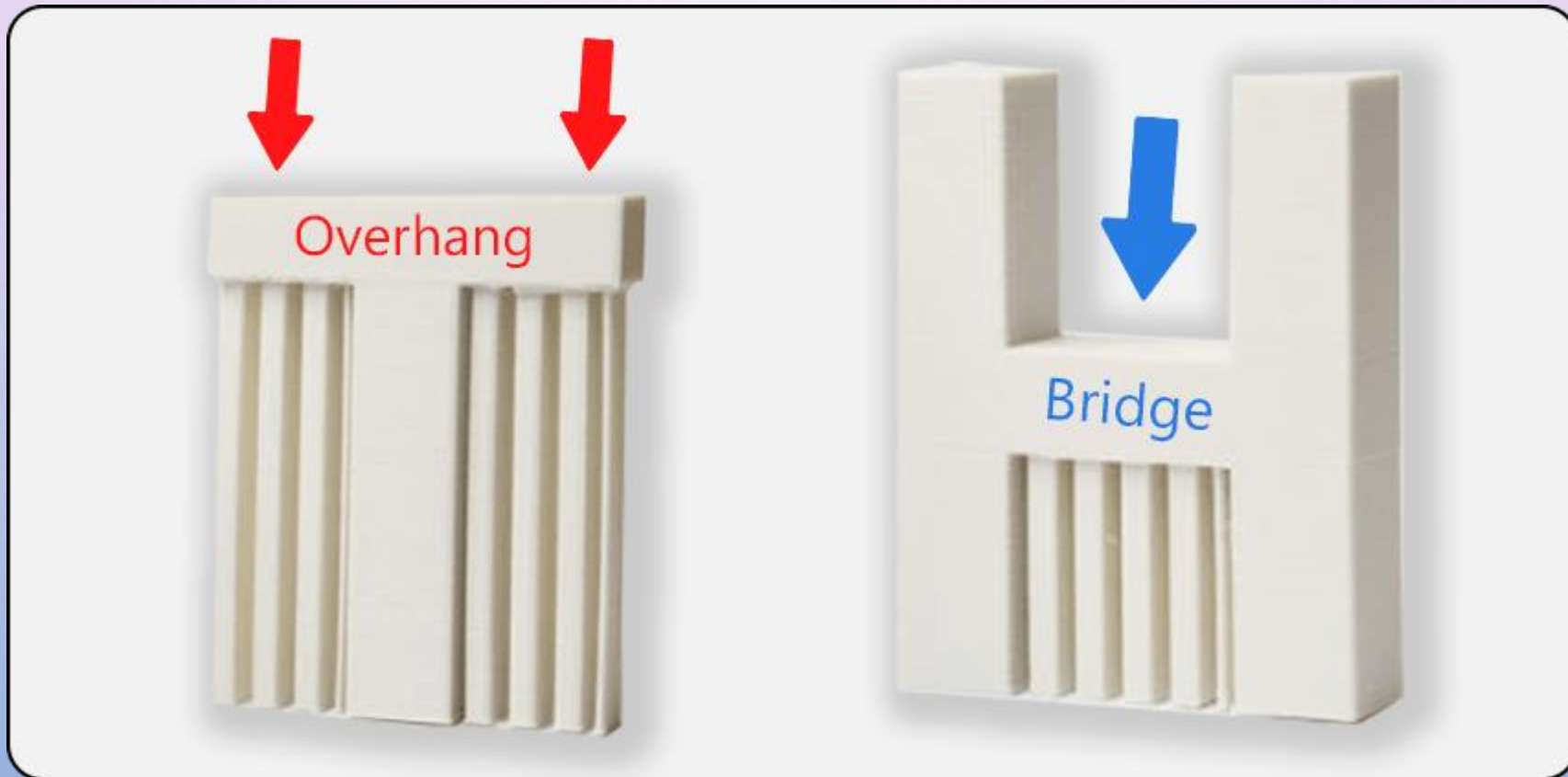


Zig Zag



Cross 3D

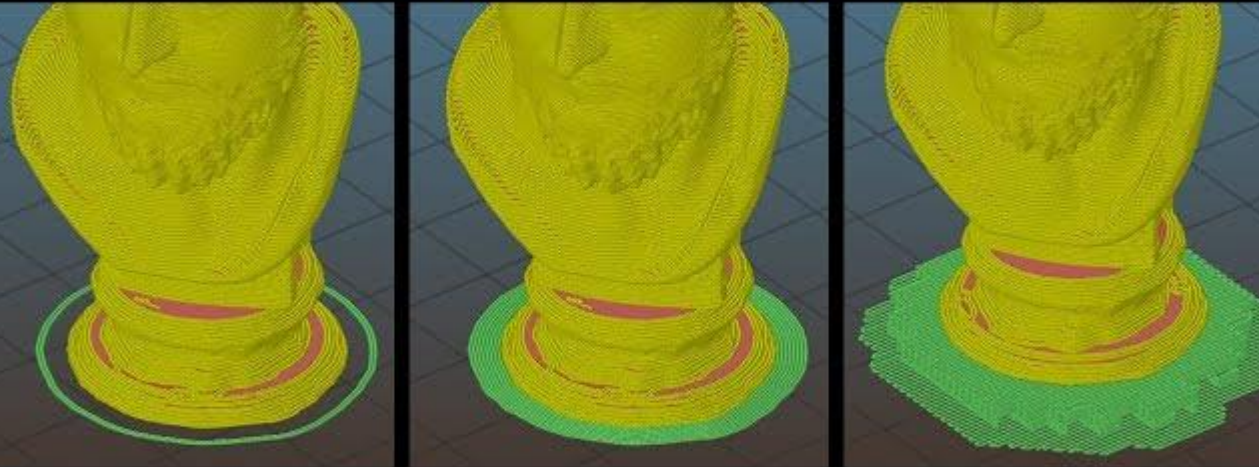
SUPPORTS





BED ADHESION

BETTER ADHESION

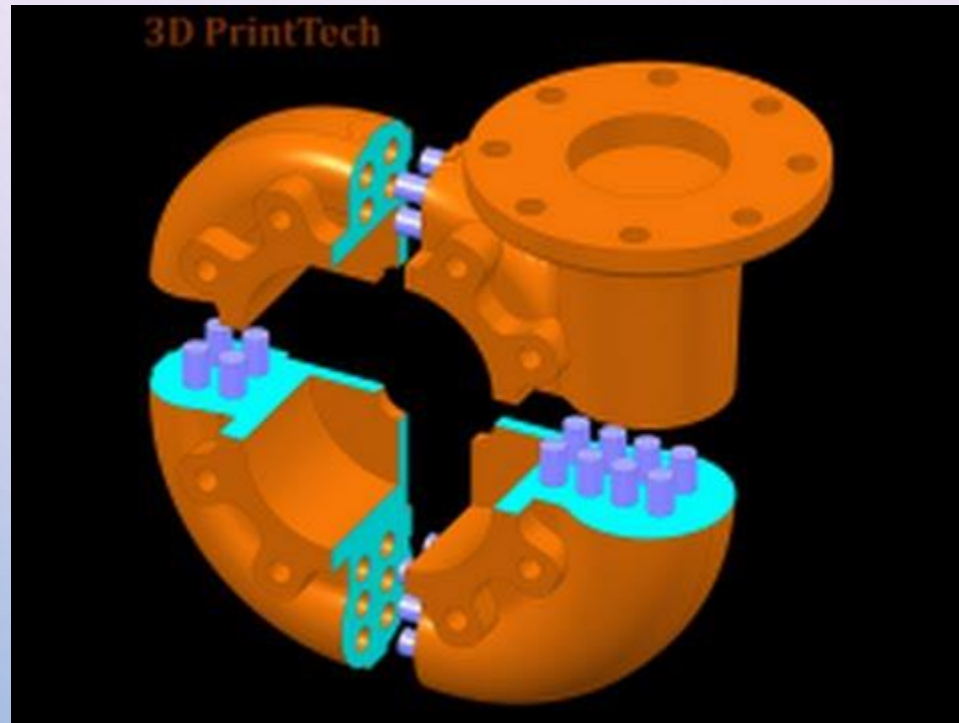


SKIRT

BRIM

RAFT

SPLITTING FILES



GCODE

- Gcode is the actual programming instructions given to the printer to tell it how to print
- Gcode is editable if you know what you're doing

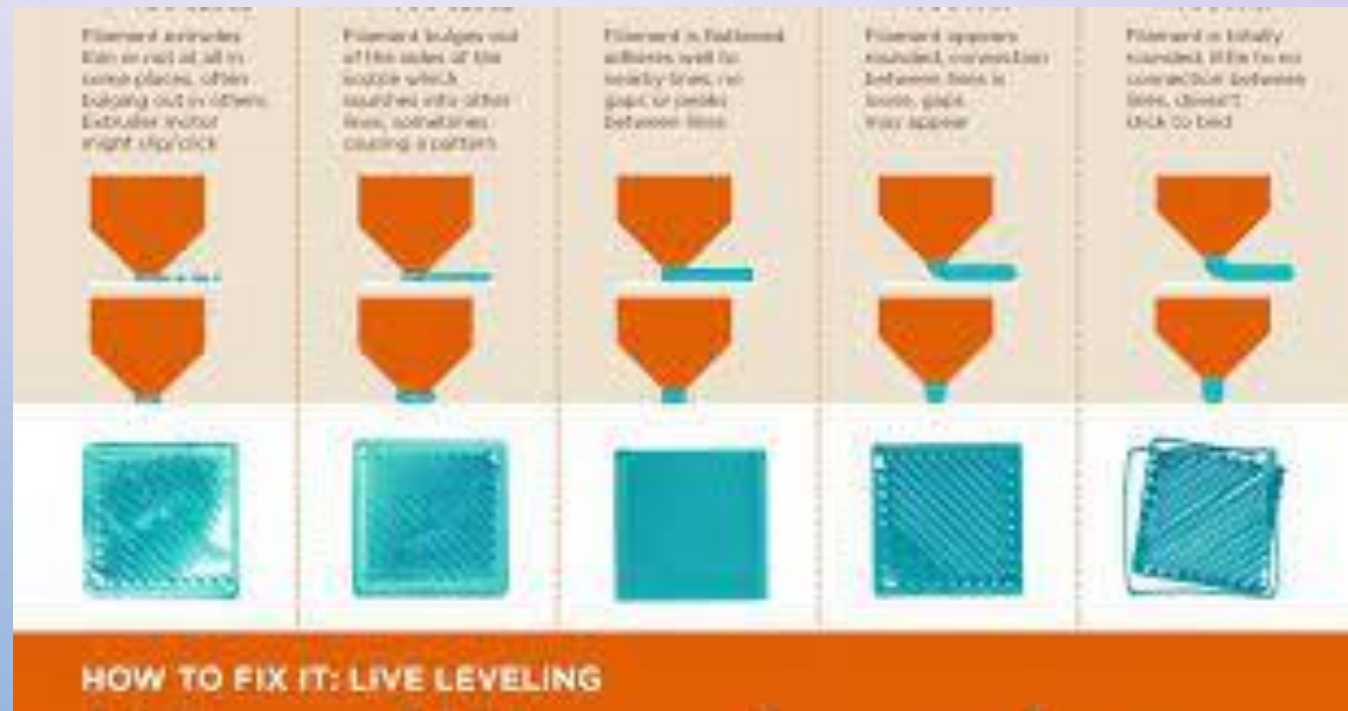
G-code Sample

```
M190 S60           ; wait for bed temp
M109 S215          ; wait for extruder temp
G29               ; mesh bed leveling
G1 X10 Y-3.0 Z0.5 F6000.0
G92 E0.0
G1 X60.0 E9.0 F1000.0 ; intro line
G1 X100.0 E12.5 F1000.0 ; intro line
G92 E0.0
```

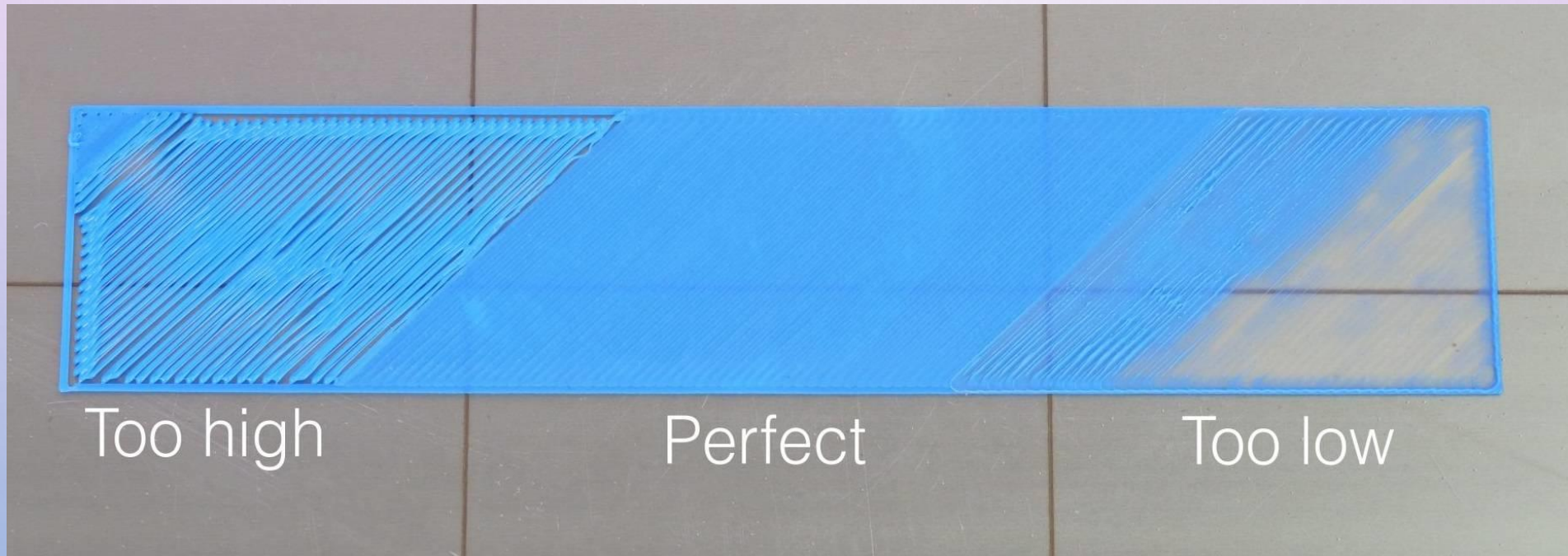


BED LEVELLING

- Has nothing to do with levels
- It means adjusting the distance between the nozzle and the bed to be uniform
- Auto levelling options



INITIAL LAYERS



BED LEVELING

BY BILLIE RUBEN

Bed leveling is, quite literally, the foundation of any successful print, and one of the biggest hurdles newbies must overcome in order to avoid the dreaded plastic spaghetti.

But never fear! I've put together this handy guide to help you! ♥

INCORRECT BED LEVELING CAN CAUSE:

POOR ADHESION
Making first layers hard to lay down

FAILED PRINTS
Resulting in plastic spaghetti

UGLY FIRST LAYERS
That have gaps or weird patterns

WARPING
Ruining the accuracy of your prints



It occurs when the nozzle is not aligned properly to the bed. This is more accurately called 'tramming' (as nothing is being leveled to the ground), but 'leveling' is the common verbiage. As beds are usually leveled at 3 or 4 points, you may see any combination of the below in your first layer.

X MUCH TOO CLOSE

Filament extrudes thin or not at all in some places, often bulging out in others. Extruder motor might slip/click



X A LITTLE TOO CLOSE

Filament bulges out of the sides of the nozzle which squishes into other lines, sometimes causing a pattern



✓ PERFECT

Filament is flattened, adheres well to nearby lines, no gaps or peaks between lines



X A LITTLE TOO FAR

Filament appears rounded, connection between lines is loose, gaps may appear



X MUCH TOO FAR

Filament is totally rounded, little to no connection between lines, doesn't stick to bed



HOW TO FIX IT: LIVE LEVELING

1 ROUGH LEVEL, VISUALLY

Move nozzle to lower left corner of bed, adjust leveling knobs until nozzle & bed touch, then turn it back just a bit, until a line barely appears. Repeat for each knob on your bed



2 SLICE A LEVELING HELPER

In your slicer, resize a rectangular prism so the base is almost as large as your print bed. Give it a nice wide brim, and set the bottom layer pattern to concentric. First layer should look like a square spiral



3 LIVE LEVEL

Print it. As it's laying down the first layer adjust the leveling knobs so that the lines it's extruding look like the perfect example above, then cancel the print



4 MAINTAIN IT

Your bed is now level. To maintain the level, print all future models with a skirt (or brim) and watch it lay the brim down, adjusting leveling as required as it prints the skirt



FURTHER HELP:

If the above instructions aren't working for you, it could be one of these issues:

- Your bed surface may need to be cleaned, or you may need to add some glue to the surface (esp. if cold)
- Your temperature may be wrong (bed usually should be around 60°C and nozzle 200 °C for PLA)
- The axis your nozzle travels on may not be level, seek instructions specific to your machine
- If you have leveled the edges but the middle is too high or low, your bed is warped, seek a replacement
- Your z (up/down) axis end stop may be too high or low, try to move it, or print an adapter
- Your speed may be too high. Seek a slicer settings profile from a trusted source (or use the slicer defaults)

To solve these issues you might need some further help from other printer folk. I help mod the largest 3D printing communities on [Discord \(discord.gg/B4tp8MH\)](https://discord.gg/B4tp8MH) and [reddit \(reddit.com/r/3Dprinting\)](https://reddit.com/r/3Dprinting). We'd be happy to help you there!

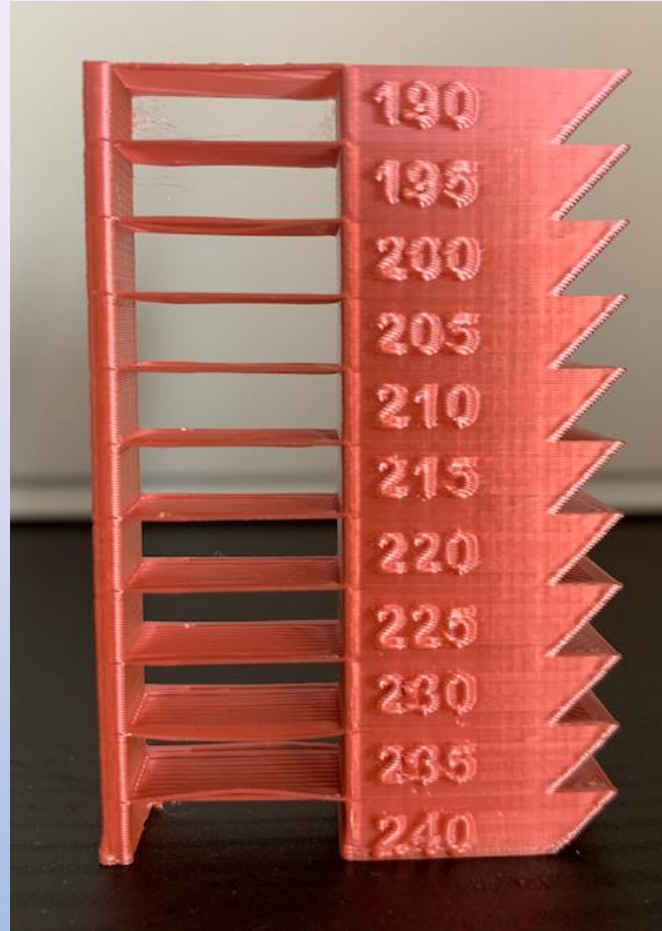


If you'd like more of these guides, I'll be posting them to my Twitter [@BillieRubenMake](https://twitter.com/BillieRubenMake) (in addition to reddit and Discord). Happy Printing! ♥ Billie

BENCHY



CALIBRATION

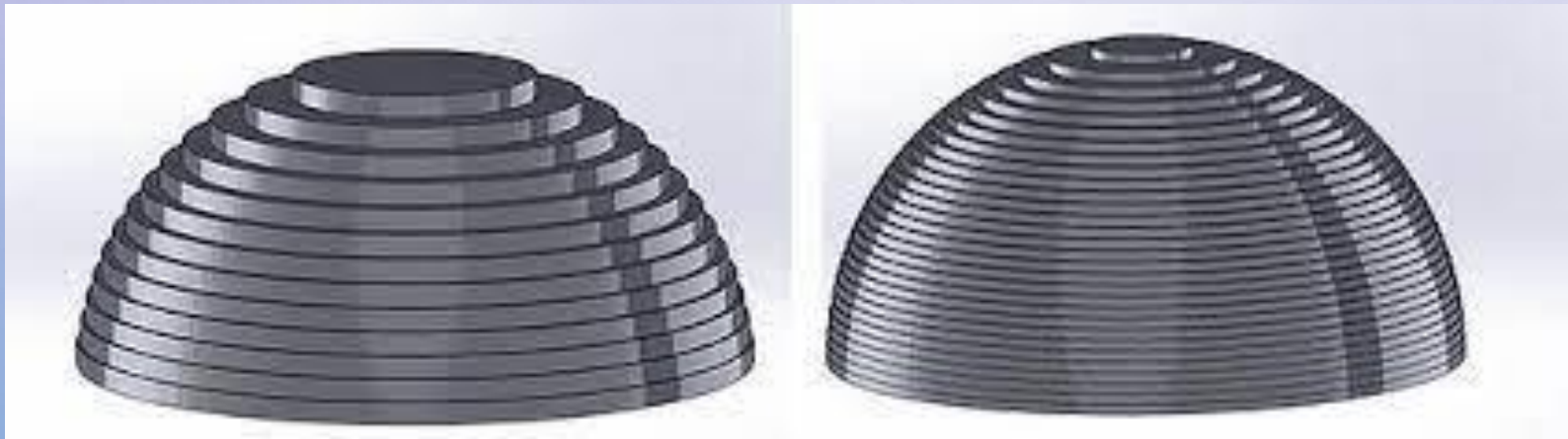


IE how fast the material should flow out of the nozzle

How hot the material should be

SURFACE FINISHING

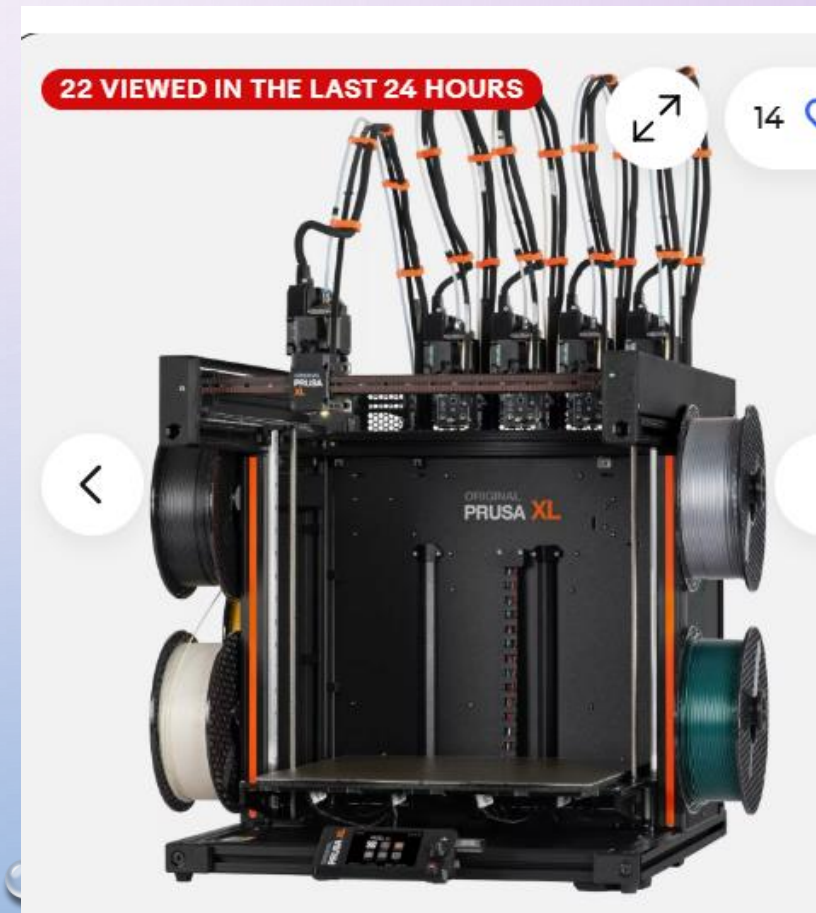
- Any FDM printing will have layer lines. If you want a smooth surface, be prepared for lots and lots of sanding!
- You can also get primers that will help reduce lines – best to prime before doing sanding if you don't want to lose model shape.



AMS (MULTICOLOR PRINTING)



MULTI-COLOR PRINTING WITH MULTIPLE TOOLHEADS



ADHESIVES AND PAINTING

- <https://all3dp.com/2/gluing-3d-printed-best-ways-bond-3d-prints/>
- <https://www.wevolver.com/article/your-guide-to-painting-pla-3d-prints>
- I'm personally a big fan of E6000, but your mileage may vary.

LOCAL 3D PRINTING RESOURCES

Maker's Den Eden Prairie

Microcenter

University of Minnesota Makerspace (U of M Student, Staff, Faculty)

Your local library/makerspace!

