

# Desining & 3D Printing Custom Overland Gear

Expo 2024

# Designing & 3D Printing Custom Overland Gear

*“Have an idea? You can make it!”*





# About Me

## Who is Adam Zolyak?

- Overlanding 10 years with my wife Val and often friends
- Camping, hiking, padding, and exploring 25+ years
- Long time maker - software, 3D printing, teaching, photography, videography, ...
- Home base near Denver, CO but often somewhere in the west



**Tripod Adapter  
for Newest Starlink (Gen 3)**



**Tripod Adapter  
for Older Starlink (Gen 2)**

# Agenda

## What are we learning today?

- How does 3D printing work?
- Workflow
  1. Modeling
  2. Slicing
  3. Printing
  4. Finishing
- Tips along the way: materials, strength, fasteners, etc
- Q&A

# 3D Printing Resource Guide

These slides + my recommendations



<https://journey-labs.ck.page/expo3d>



**What can you make with  
3D printing?**



**This session will help you get started 3D printing; expertise comes with practice**

**How does 3D printing  
work?**

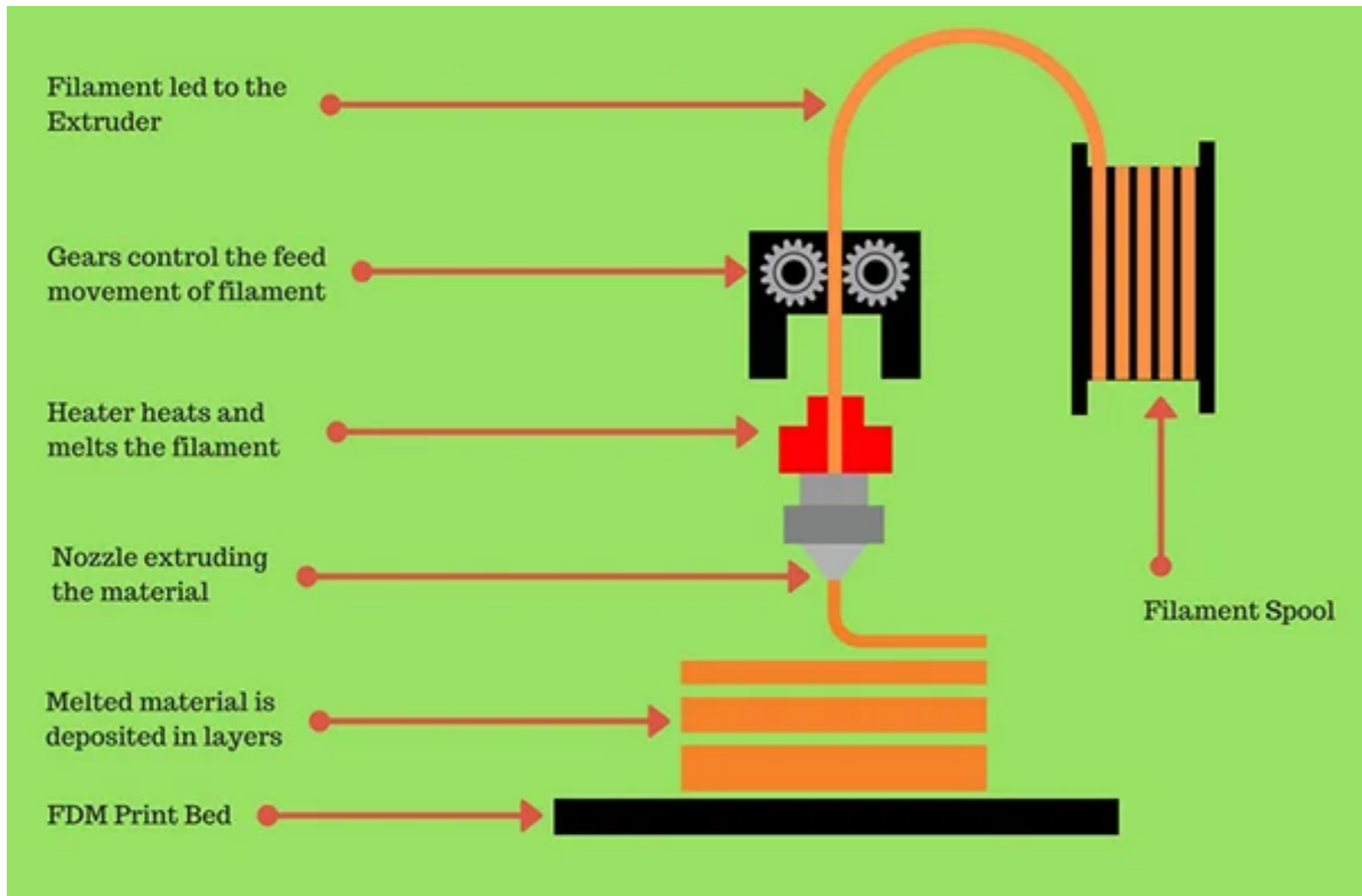
# The Basic of 3D Printing

It's Like A Glue Gun



# The Basic of 3D Printing

## FDM (Fused Deposition Modeling)



<https://twotrees3d.com/fdm-3d-printer-how-do-fdm-3d-printers-work/>

# Bambu A1 Mini

## My Favorite Printer



# 3D Printing Workflow

How to make a thing!

1. Modeling

2. Slicing

3. Printing

4. Finishing



**Step 1**

**Modeling**

**Creating or finding a 3D  
model**

# Creating A 3D Model

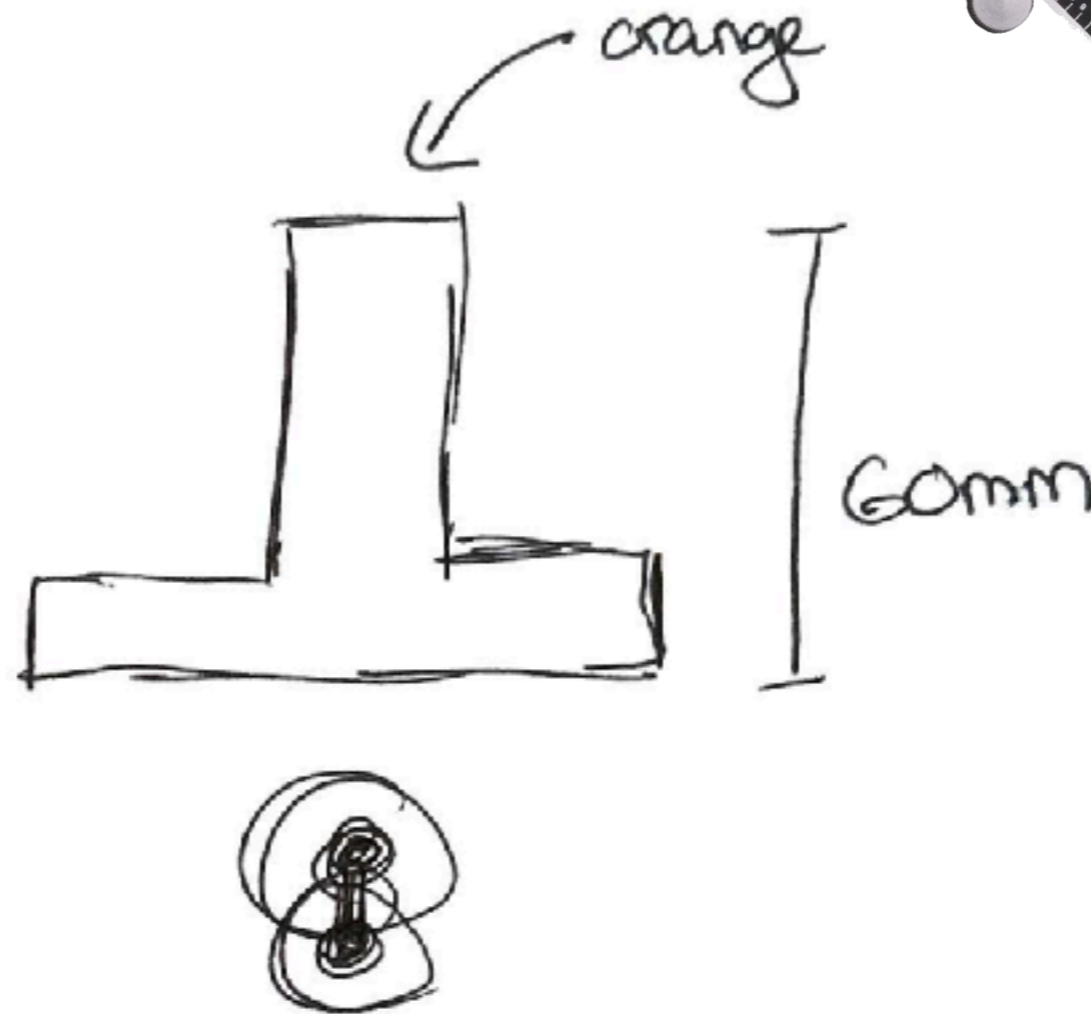
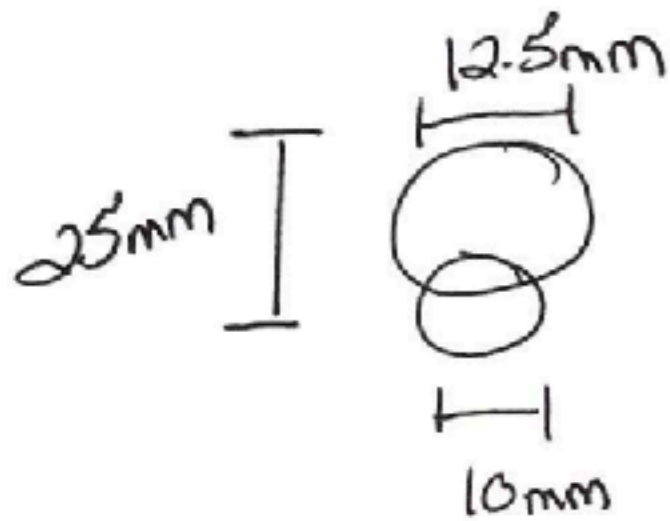
## Solving a problem





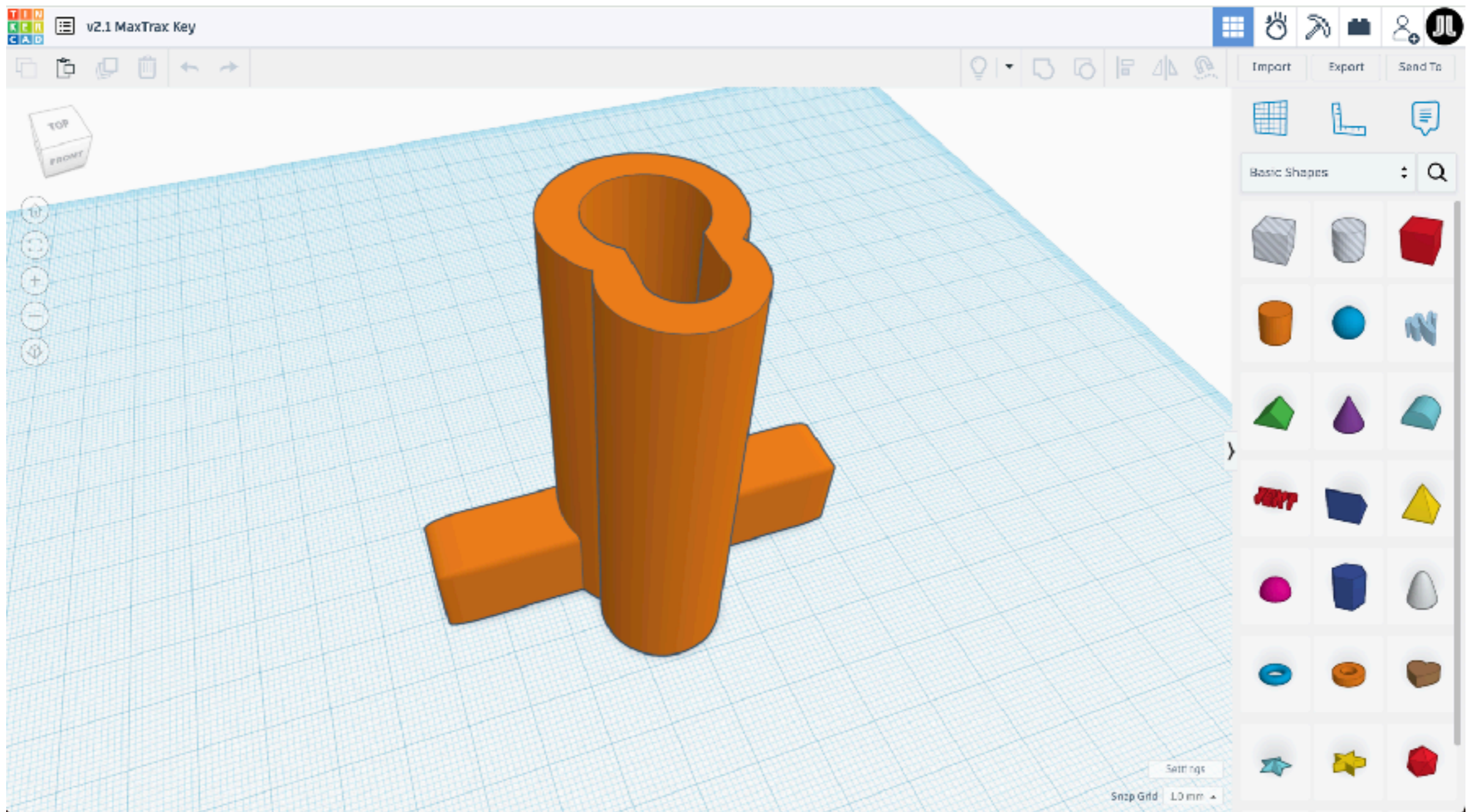
# Creating A 3D Model

## Sketching & Measuring



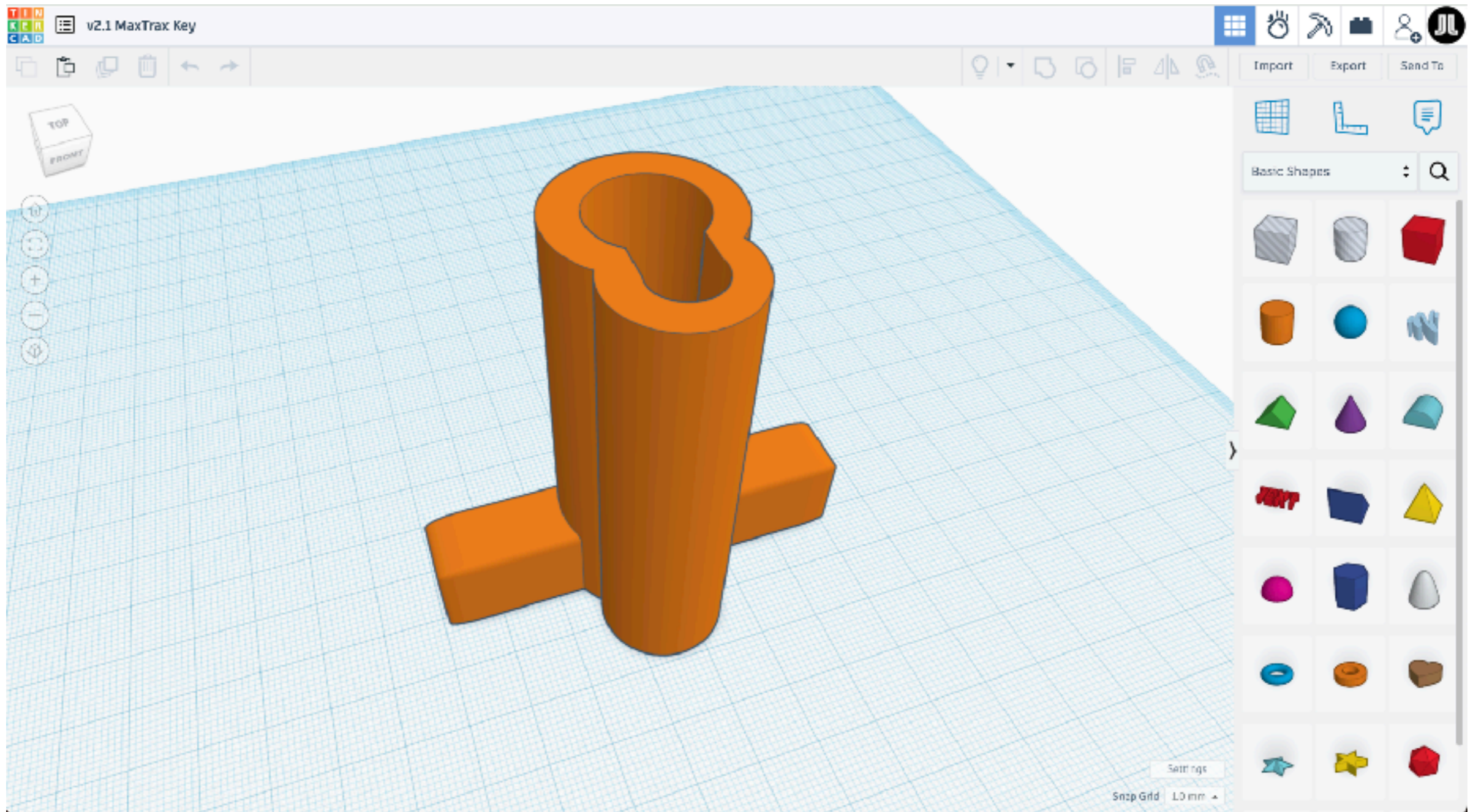
# Creating A 3D Model

What shapes do you see?



# Creating A 3D Model

## Live Demo



# **3D Modeling**

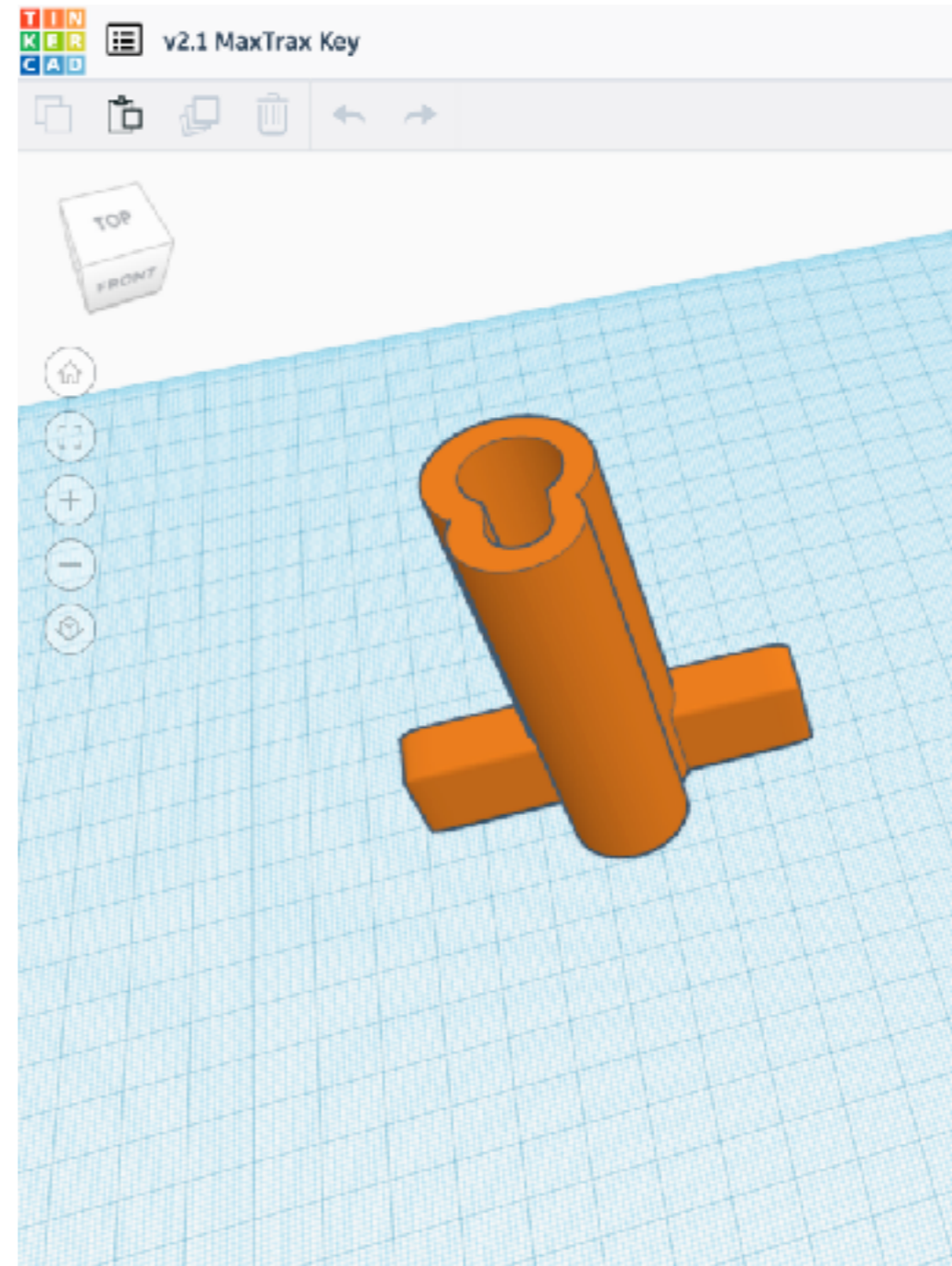


# Creating A 3D Model

## The Basics of 3D Modeling



- Basic Shapes
- Solid or Hole (empty)
- Resizing
- Aligning
- Combining
- Export as STL file



# Finding 3D Models

## Find free or paid models

The screenshot shows the Printables website interface. At the top, there is a navigation bar with the Printables logo and links for 3D Models, Store, Community, Contests, Brands, Events, Groups, Education, Frusa Blog, and Prusa Eshop. A '+ Create' button is on the right. Below the navigation bar, the search results for 'dometic' are displayed. The search bar shows 'Search results: dometic' with a magnifying glass icon and a link to 'How to use advanced search operators'. A dropdown menu is set to 'Best match'. The results are presented in a grid of 8 items, each with a user profile picture, name, and a thumbnail image of the 3D model. The items are: 1. 'Dometic Kochfeld Schraubklammer' by ohrenstoepsel (@ohrenstoepsel), 1 heart, 0 stars, 12 downloads. 2. 'Dometic Fridge Clip' by GatCode (@GatCode\_216007), 20 hearts, 0 stars, 44 downloads. 3. 'Luce Dometic peg' by ChristianR (@ChristianR), 1 heart, 0 stars, 24 downloads. 4. 'Dometic Springrollo E5002' by DrDice (@DrDice\_277381), 1 heart, 0 stars, 18 downloads. 5. 'Dometic Fridge Hinge, - Filed' by DMyers (@DMyers\_22203), 0 hearts, 0 stars, 0 downloads. 6. 'Dometic Refrigerator Airing Device' by Rad Racer (@RadRacer), 0 hearts, 0 stars, 0 downloads. 7. 'Dometic Fridge Lock Card' by ZMax (@ZMax\_49832), 0 hearts, 0 stars, 0 downloads. 8. 'Dometic Window Shade Mod' by Kristen Smith (@KristenSmith), 0 hearts, 0 stars, 0 downloads. On the left side, there are filters for 'All Categories' (3D Printers, Gadgets, Hobby & Makers, Household, Sports & Outdoor, Toys & Games, World & Scans) and 'Show only models...' (featured, with makes, with contest award, Published date: Any time, License: Select).

<https://www.printables.com/>

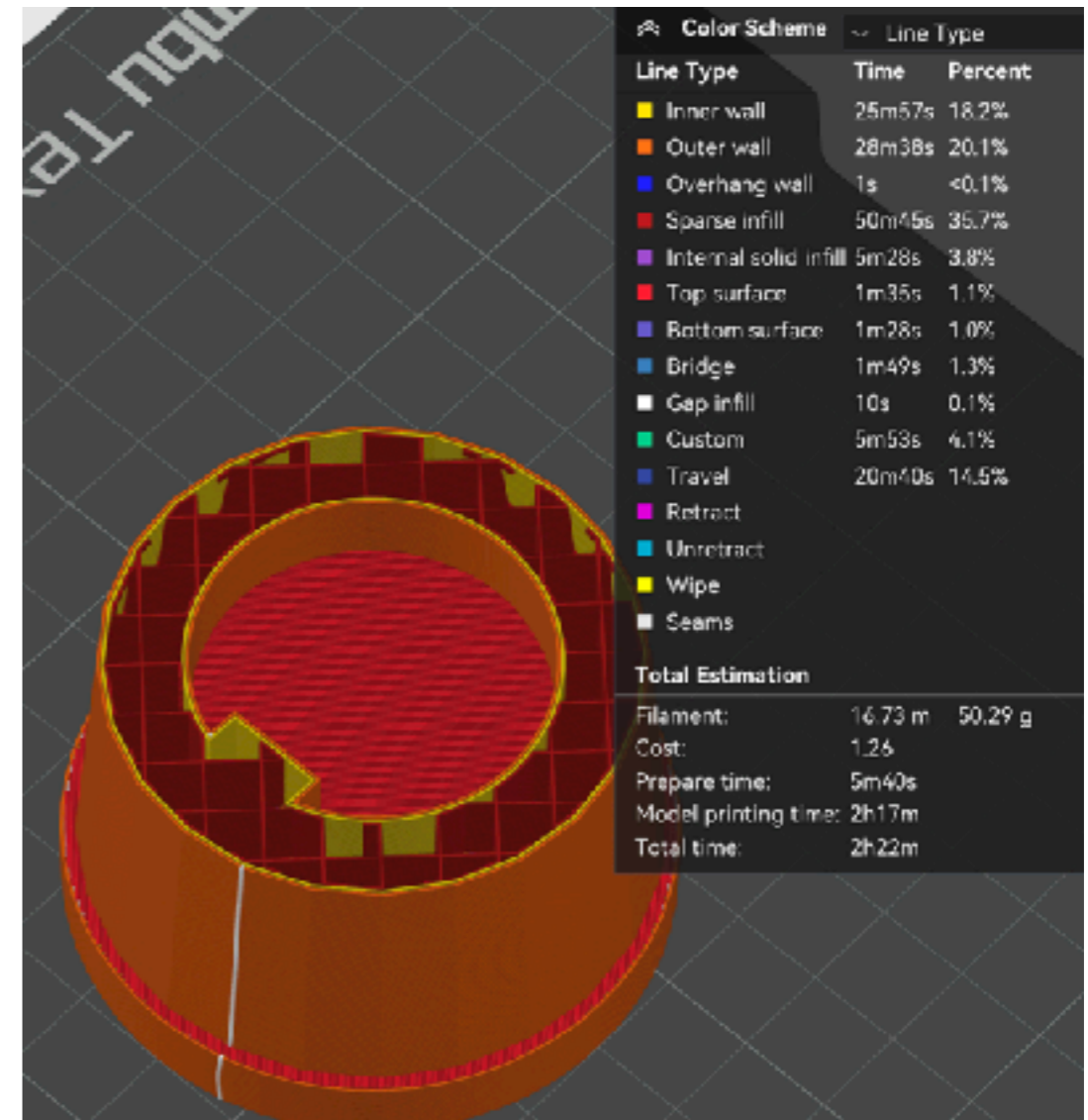
# Step 2

# Slicing

# Slicing A 3D Model

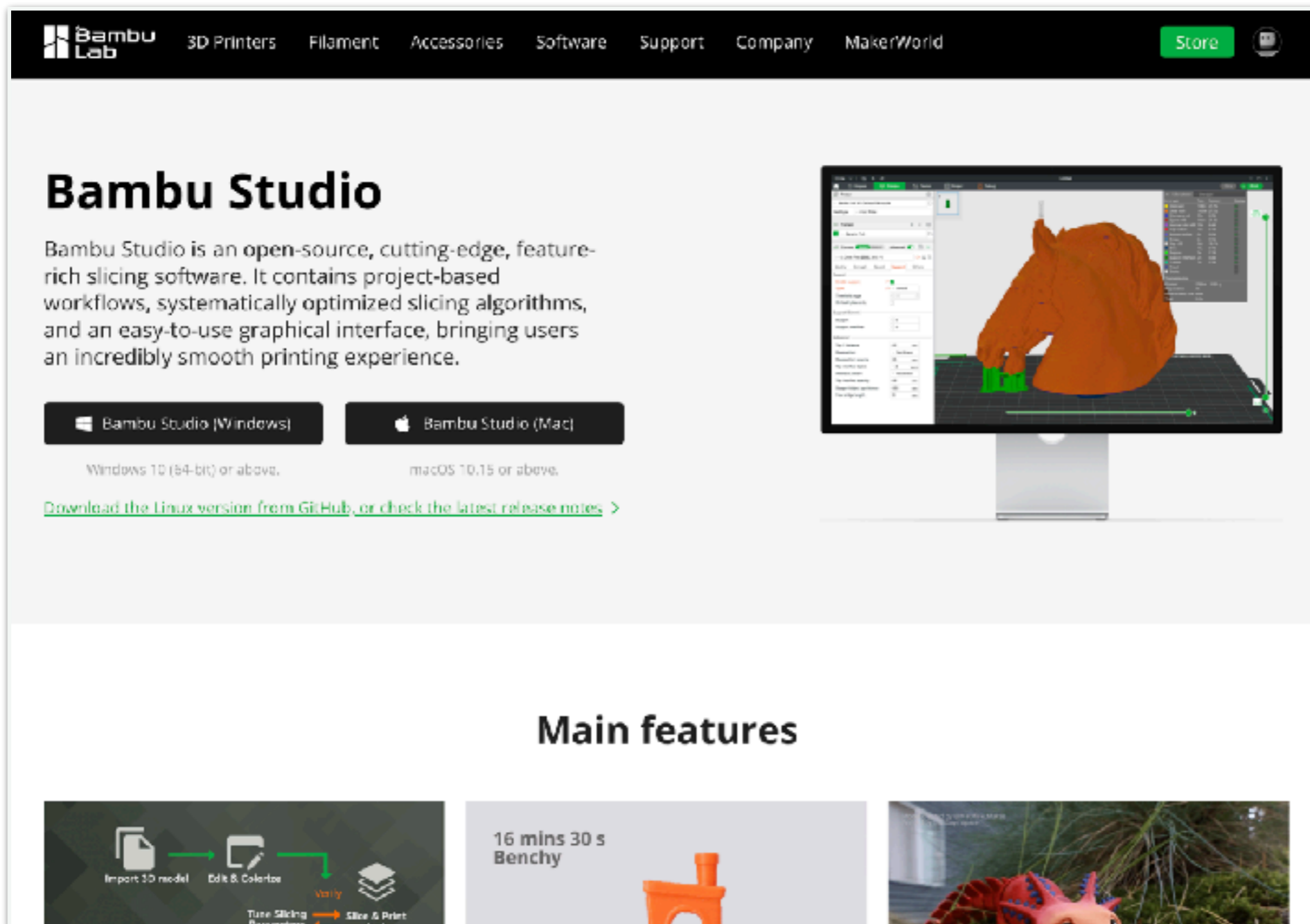
## Preparing to Print

- Slicing software translates a 3D model file (STL) into a print ready file (GCode)
- GCode is a series of 1000s of instructions for the printer - heat to x, move to y, ...
- Slicing factors in the specific settings for the printer, filament, infill, supports, etc



# Slicing A 3D Model

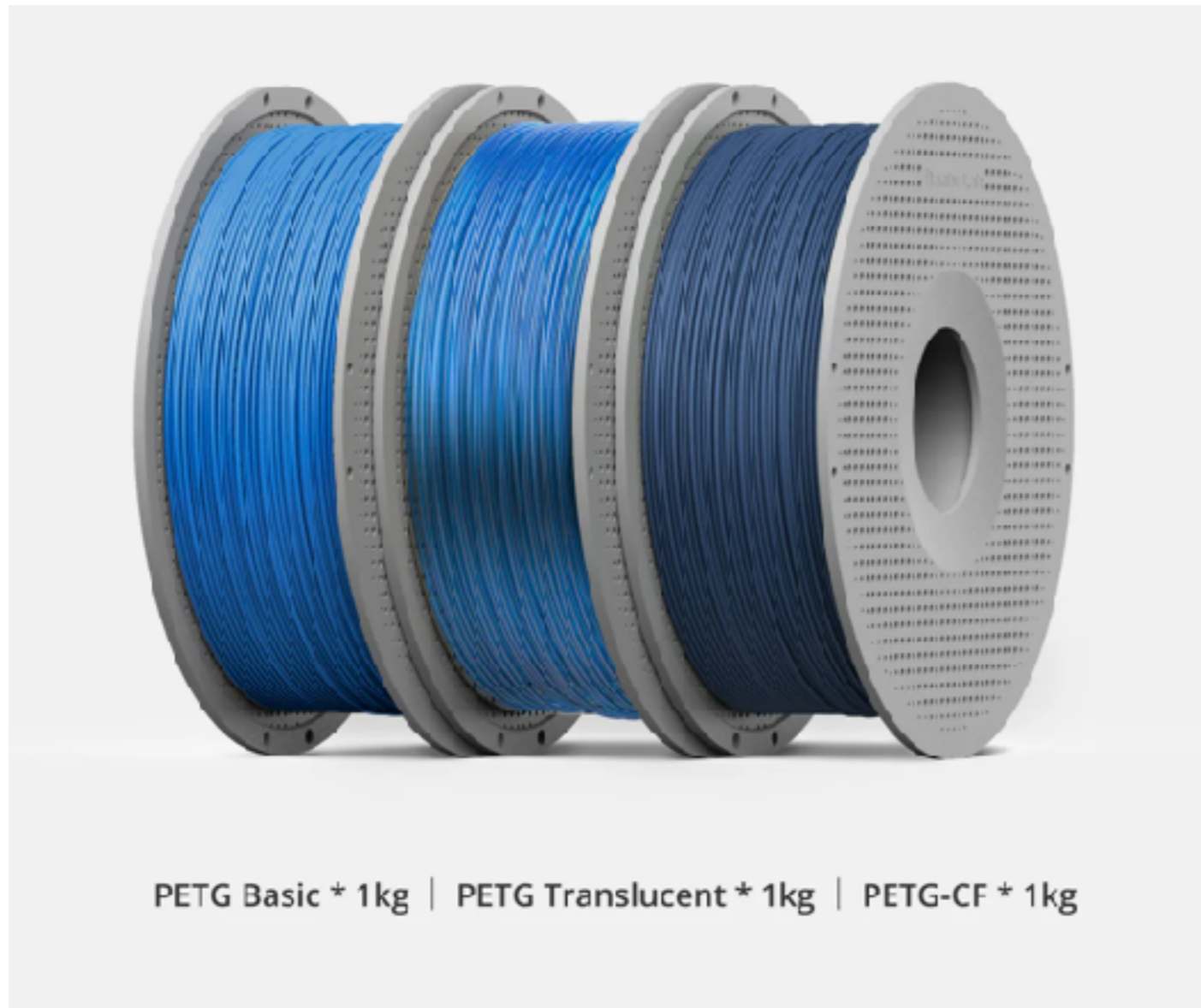
## Slicing software



The screenshot shows the Bambu Studio website. At the top is a navigation bar with links for 3D Printers, Filament, Accessories, Software, Support, Company, and MakerWorld, along with a 'Store' button and a user profile icon. The main heading is 'Bambu Studio', followed by a descriptive paragraph: 'Bambu Studio is an open-source, cutting-edge, feature-rich slicing software. It contains project-based workflows, systematically optimized slicing algorithms, and an easy-to-use graphical interface, bringing users an incredibly smooth printing experience.' Below this are two download buttons: 'Bambu Studio (Windows)' and 'Bambu Studio (Mac)', with their respective system requirements listed underneath. A link for the Linux version is also provided. To the right is a large image of a computer monitor displaying the Bambu Studio interface with a 3D model of a horse head being sliced. Below the main content is a 'Main features' section with three cards: a workflow diagram (Import 3D model -> Edit & Colorize -> Slice & Print), a '16 mins 30 s Benchy' card with a small image of the Benchy model, and a card showing a printed red and blue object.













# Filament

A continuous thread of plastic for printing



# Selecting A Filament

## The right material for the job

	PLA <a href="#">Shop now &gt;</a>	PETG <a href="#">Shop now &gt;</a>	ABS <a href="#">Shop now &gt;</a>
<b>Toughness</b> Impact Strength - XY <span>?</span>	 26.6 kJ/m <sup>2</sup>	 52.7 kJ/m <sup>2</sup>	 39.3 kJ/m <sup>2</sup>
<b>Strength</b> Bending Strength - XY <span>?</span>	 76 MPa	 65 MPa	 62 MPa
<b>Stiffness</b> Bending Modulus - XY <span>?</span>	 2750 MPa	 1670 MPa	 1880 MPa
<b>Layer Adhesion</b> Impact Strength - Z <span>?</span>	 13.8 kJ/m <sup>2</sup>	 13.6 kJ/m <sup>2</sup>	 7.4 kJ/m <sup>2</sup>
<b>Heat Resistance</b> HDT, 0.45 MPa <span>?</span>	57 °C	69 °C	87 °C
<b>Saturated Water Absorption Rate</b> 25 °C, 55% RH <span>?</span>	0.43%	0.32%	0.65%

<https://bambulab.com/en/filament-guide>

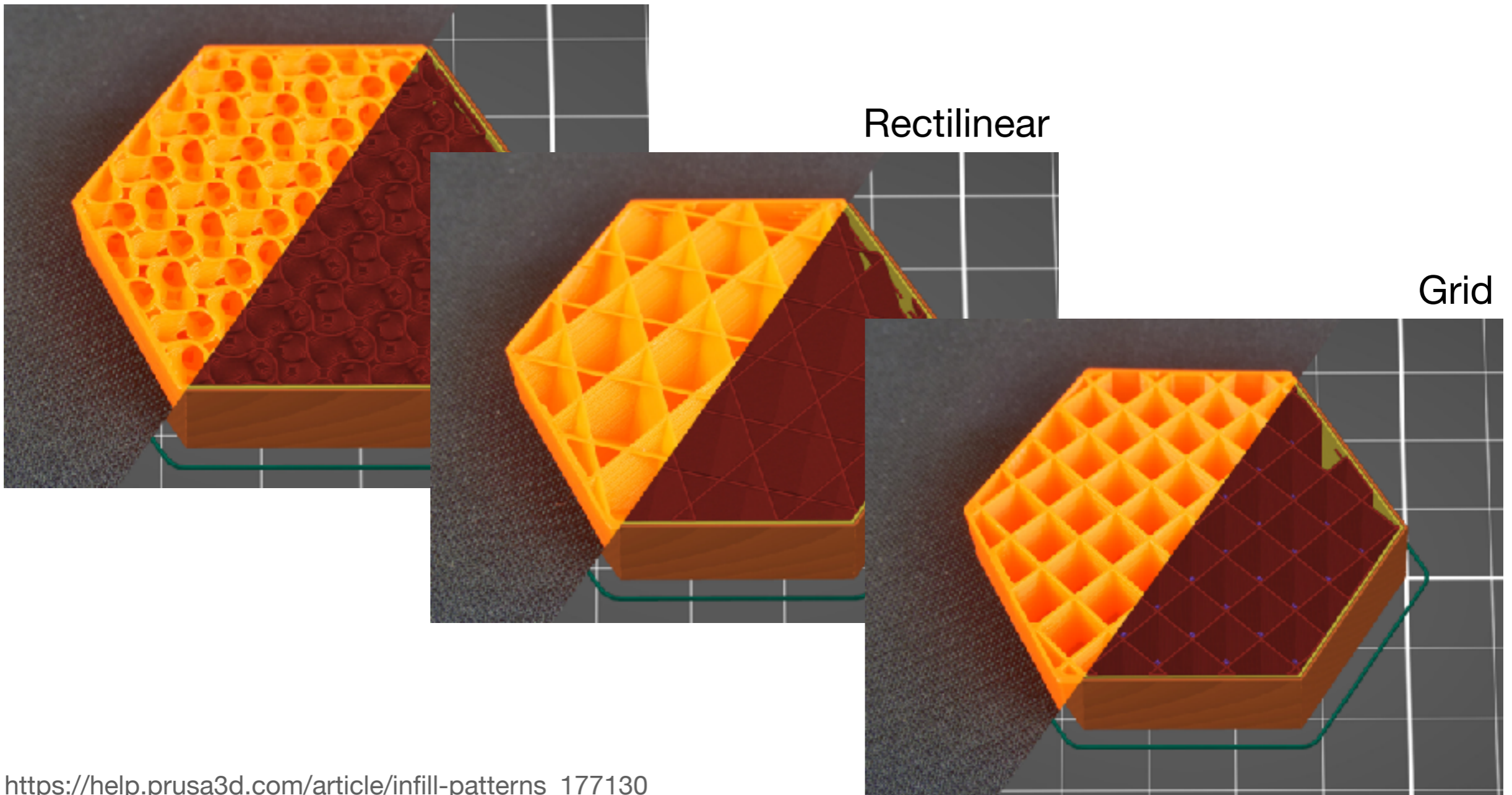
# Selecting An Infill

The right pattern and density for the job

Gyroid

Rectilinear

Grid



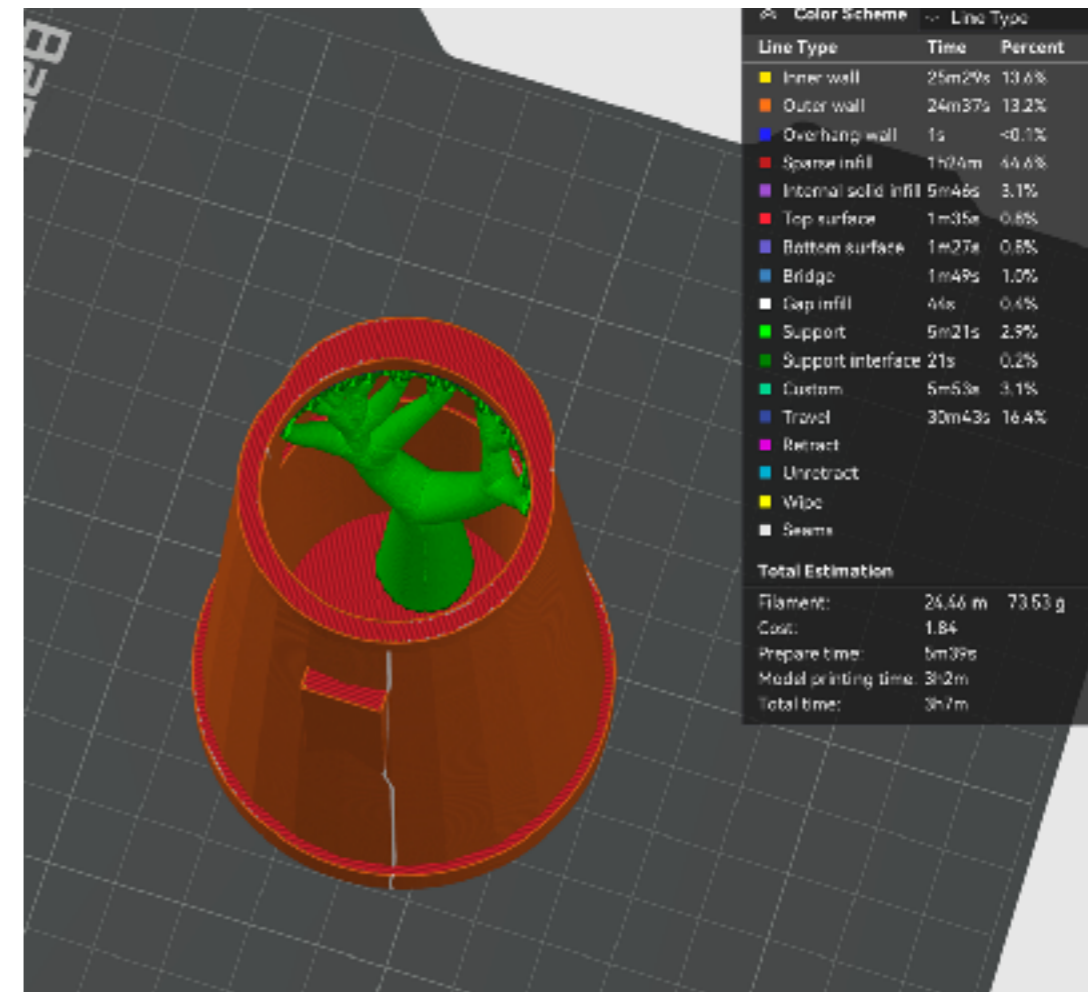
[https://help.prusa3d.com/article/infill-patterns\\_177130](https://help.prusa3d.com/article/infill-patterns_177130)



# Supports

## To support or not to support?

- Supports are temporary structure to support overhangs  $> \sim 45$  degrees
- Supports are removed after printing
- I like to try printing without supports at first if I think it might be ok without them - less time, material, complexity



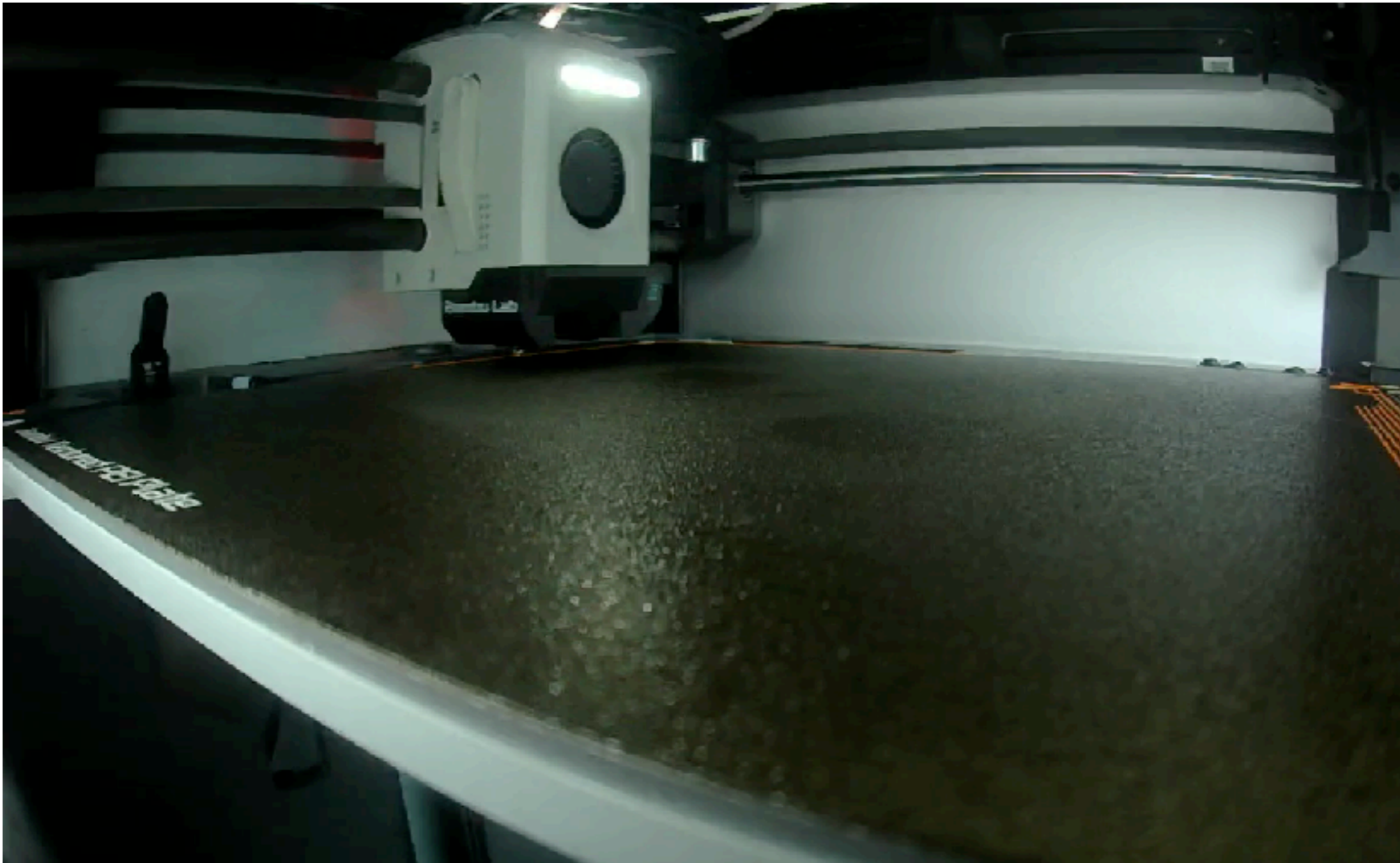
# 3D Slicing

**Step 3**

**Printing**

# Timelapse

Because 3D printing can take a long time...



# Printer Considerations

## What to look for in a 3D printer

- Print size
- Print speed
- Heated chamber
- Auto calibration
- Support - documentation, community



# Refining

## Iterate, iterate, iterate

- Often takes 2-3 times to get things dialed in, refining the design between prints
- Printing sub-sections can be helpful to tune fit while reducing time and waste

# Problems

## The internet is your friend

- Sometimes things just don't work - supports, fastener sizing (ex screw holes), etc
- Adjust settings and try again
- Search for the problem - someone has probably already had it and solved it - YouTube, forums, etc



**Step 4**

**Finishing**



# Finishing Fasteners

## Connecting parts

- Screw holes
- Nuts, bolts, ...
- Threaded heat inserts
- 3M VHB or Dual Lock tape
- Glue



# Finishing Tools

Helpful to remove supports or improve finish

- Needle nose pliers
- Tweezers
- Heat Gun
- Deburring Tool



# 3D Printing Workflow

How to make a thing!

1. Modeling

2. Slicing

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# 3D Printing Resource Guide

A free guide with my recommendations

Get a copy of these slides and links to my recommendations:

- Free 3D modeling and slicing tools tools
- Free 3D model sources
- Printer and filament recommendations
- My favorite finishing tools



<https://journey-labs.ck.page/expo3d>

**Questions?**