# 3D
# Printing

Get ready to enjoy this session!!

# What is 3D Printing?

**3D printing**, also known as additive manufacturing, is a modern manufacturing process that creates three-dimensional objects from a digital file using a 3D printer.

# Why **3D printing** matters



Empowers creativity

Enables customization

Speeds up development

# Why **3D printing** matters
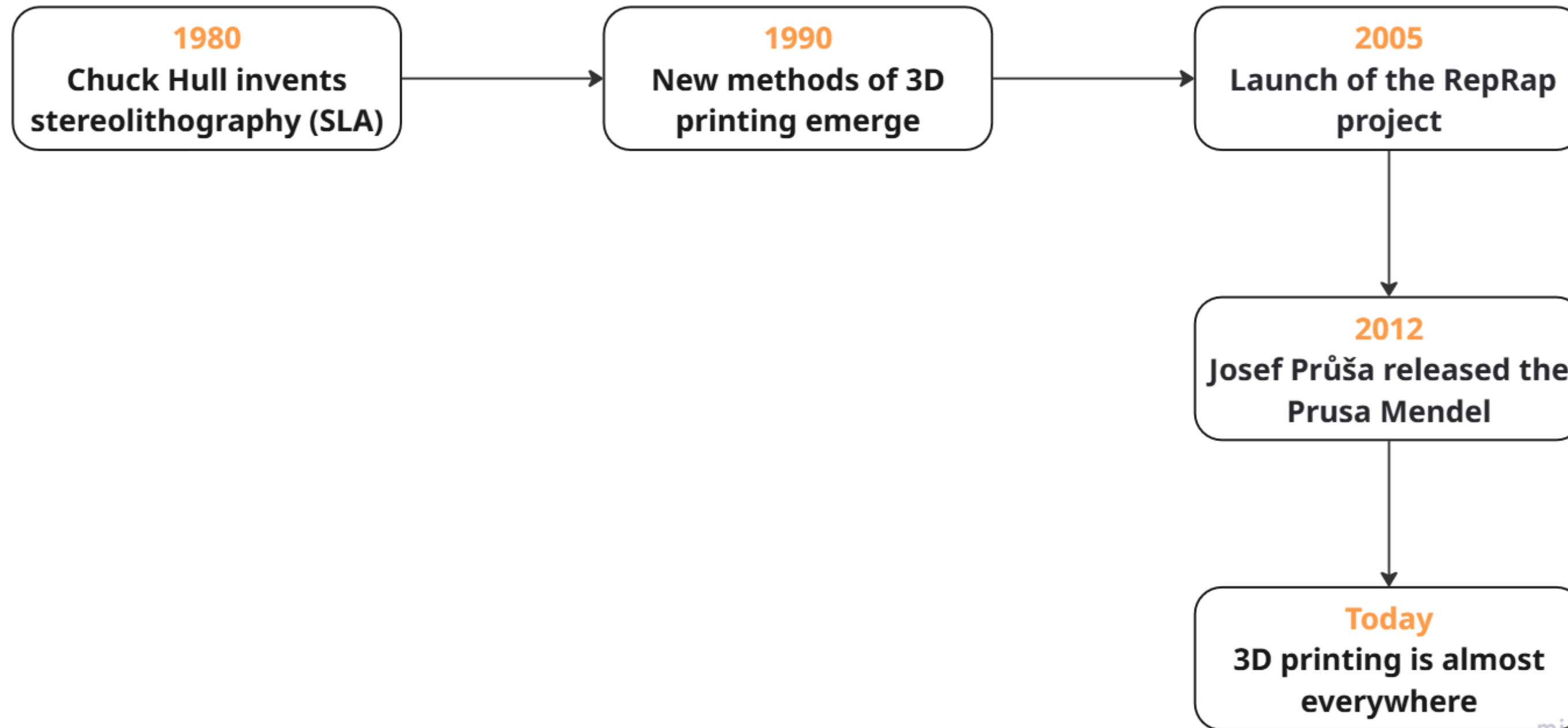


**Reduces waste and costs**



**Transforms industries**



**Supports sustainability**

# A Brief History of 3D Printing

**1980**
Chuck Hull invents stereolithography (SLA)

→

**1990**
New methods of 3D printing emerge

→

**2005**
Launch of the RepRap project

↓

**2012**
Josef Průša released the Prusa Mendel
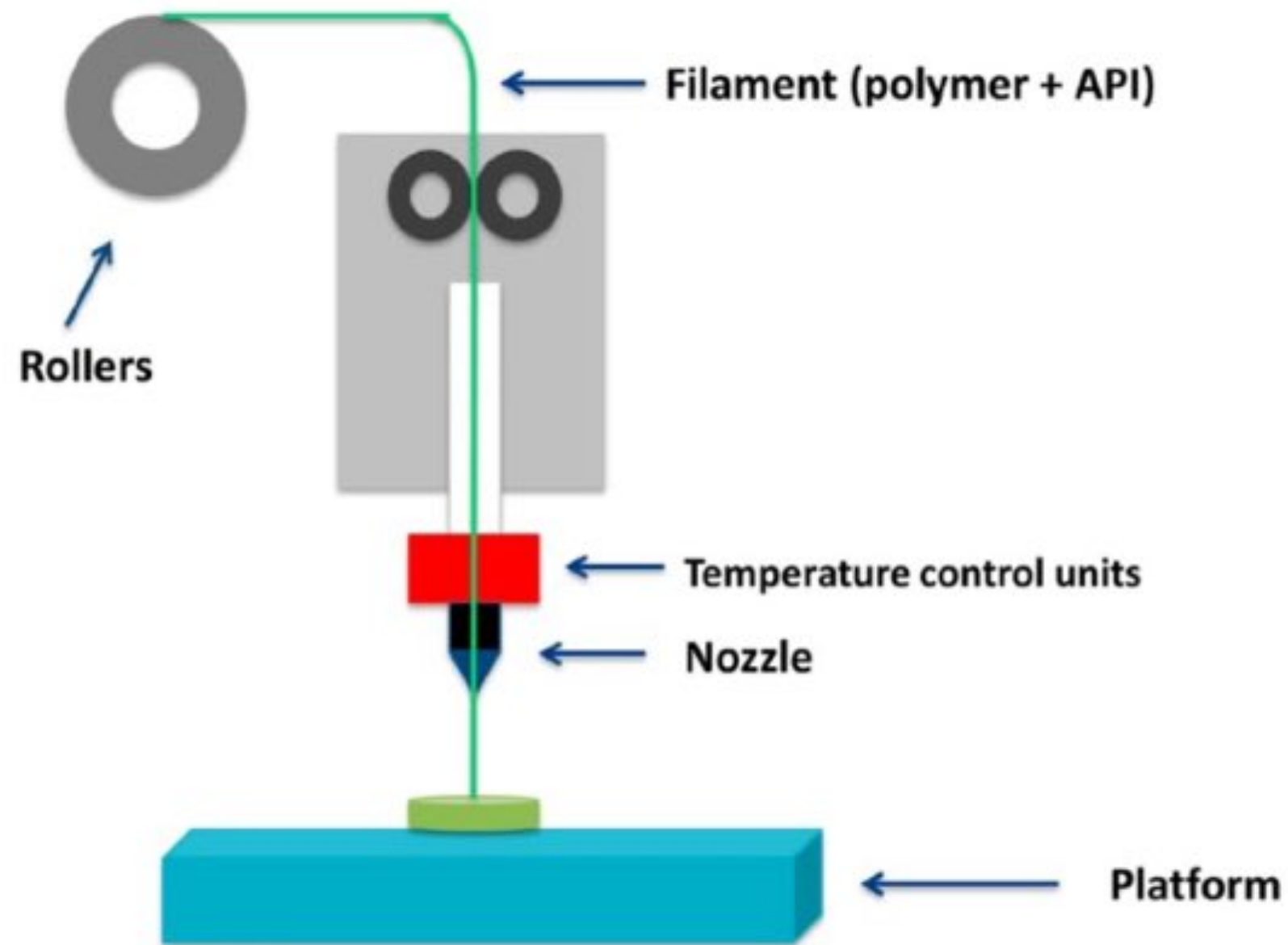
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**Today**
3D printing is almost everywhere

# Fun Fact !!

- The **first 3D printed object** ever was a small black plastic eyewash cup, created by Chuck Hull in 1983 to prove his new idea worked.

Filament (polymer + API)

Rollers

Temperature control units

Nozzle

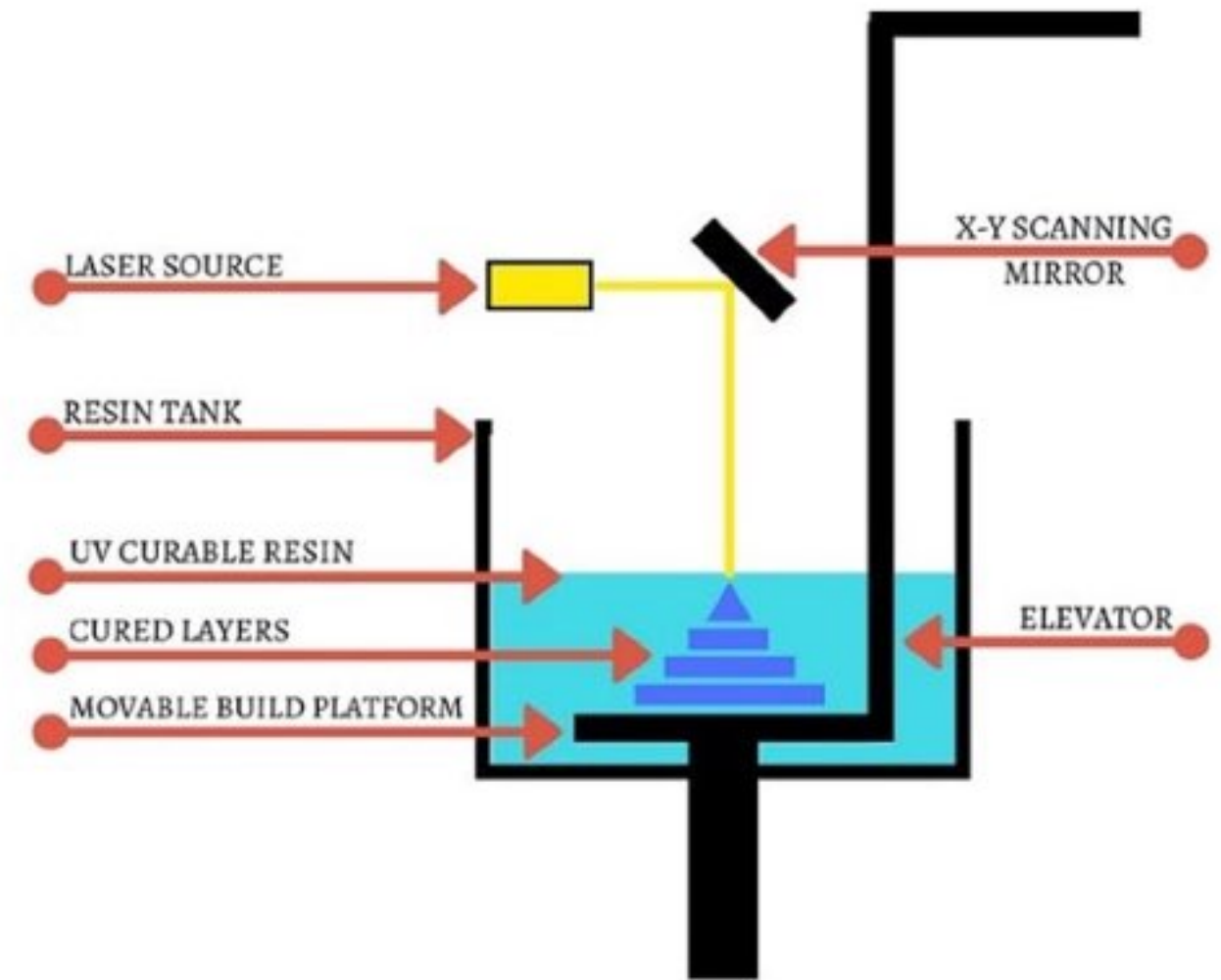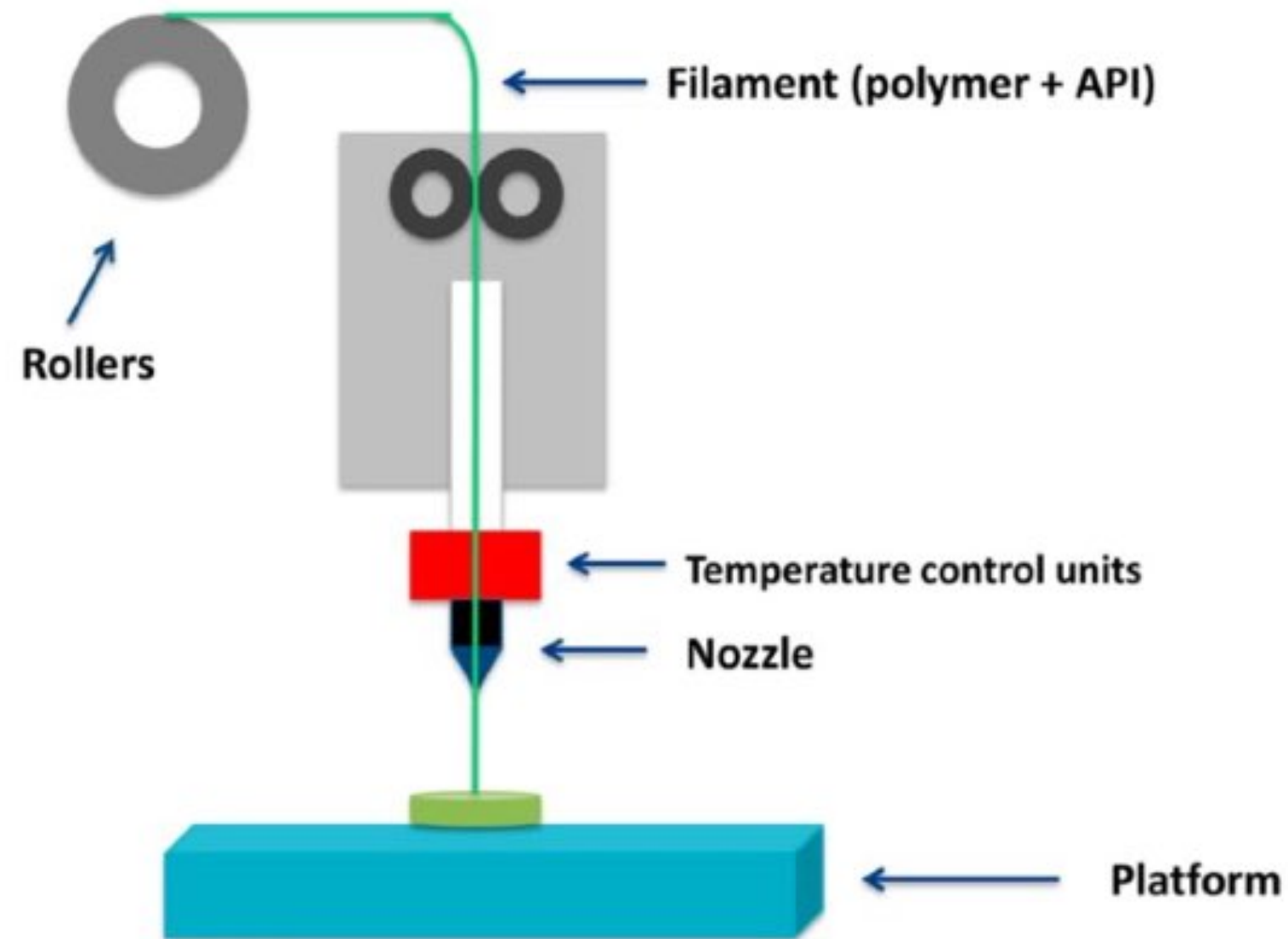Platform

# Methods of 3D Printing

Most 3D printing methods fall into a few main types, each with its own materials, process, and best uses.

Let's hear some guesses 🙂

# What is the Difference?



Filament (polymer + API)

Rollers

Temperature control units

Nozzle

Platform



LASER SOURCE

X-Y SCANNING MIRROR

RESIN TANK

UV CURABLE RESIN

CURED LAYERS

ELEVATOR

MOVABLE BUILD PLATFORM

# Fused Deposition Modeling (FDM)

**How it works**:
- A plastic filament (like PLA or ABS) is melted and extruded through a heated nozzle, building the object layer by layer.
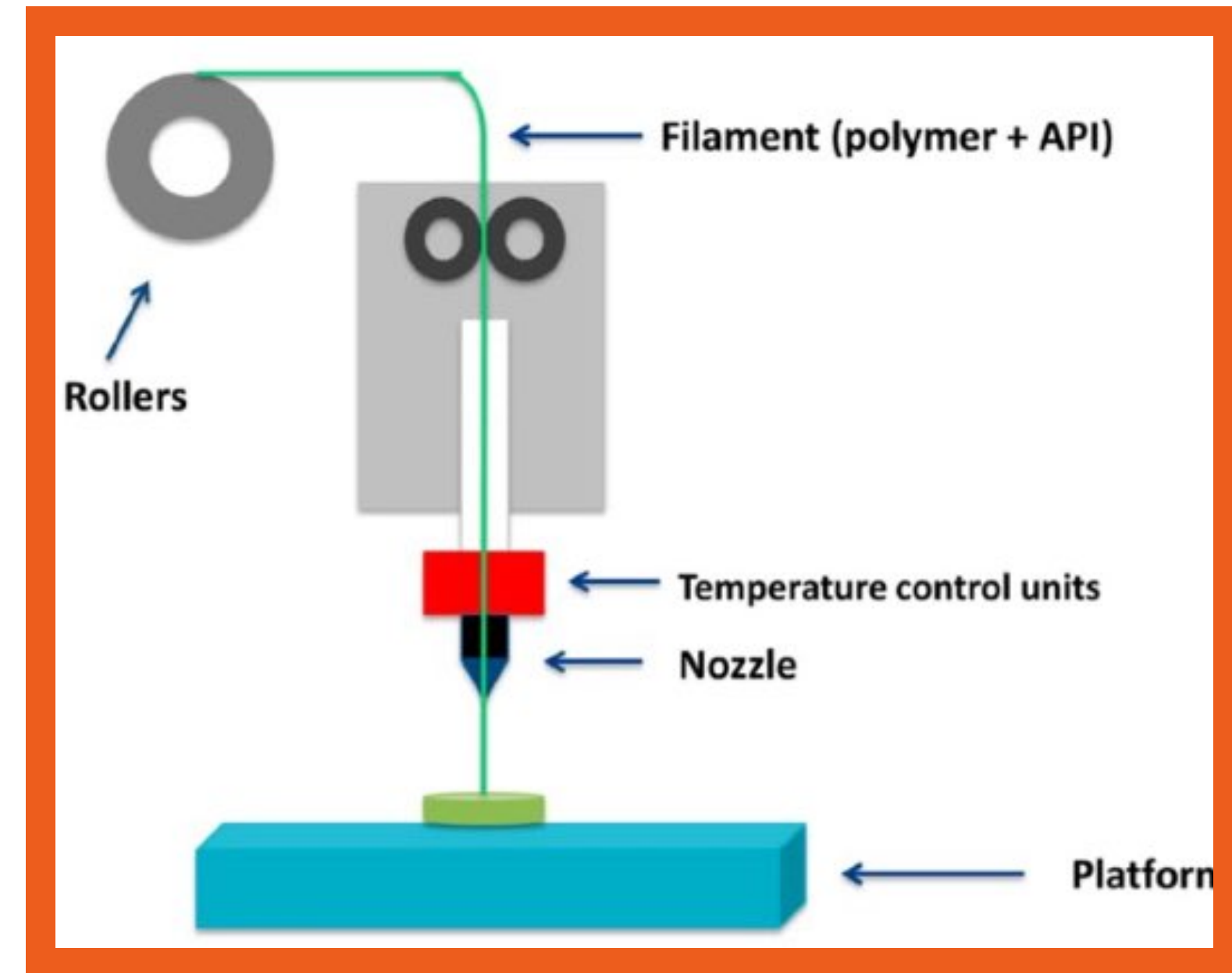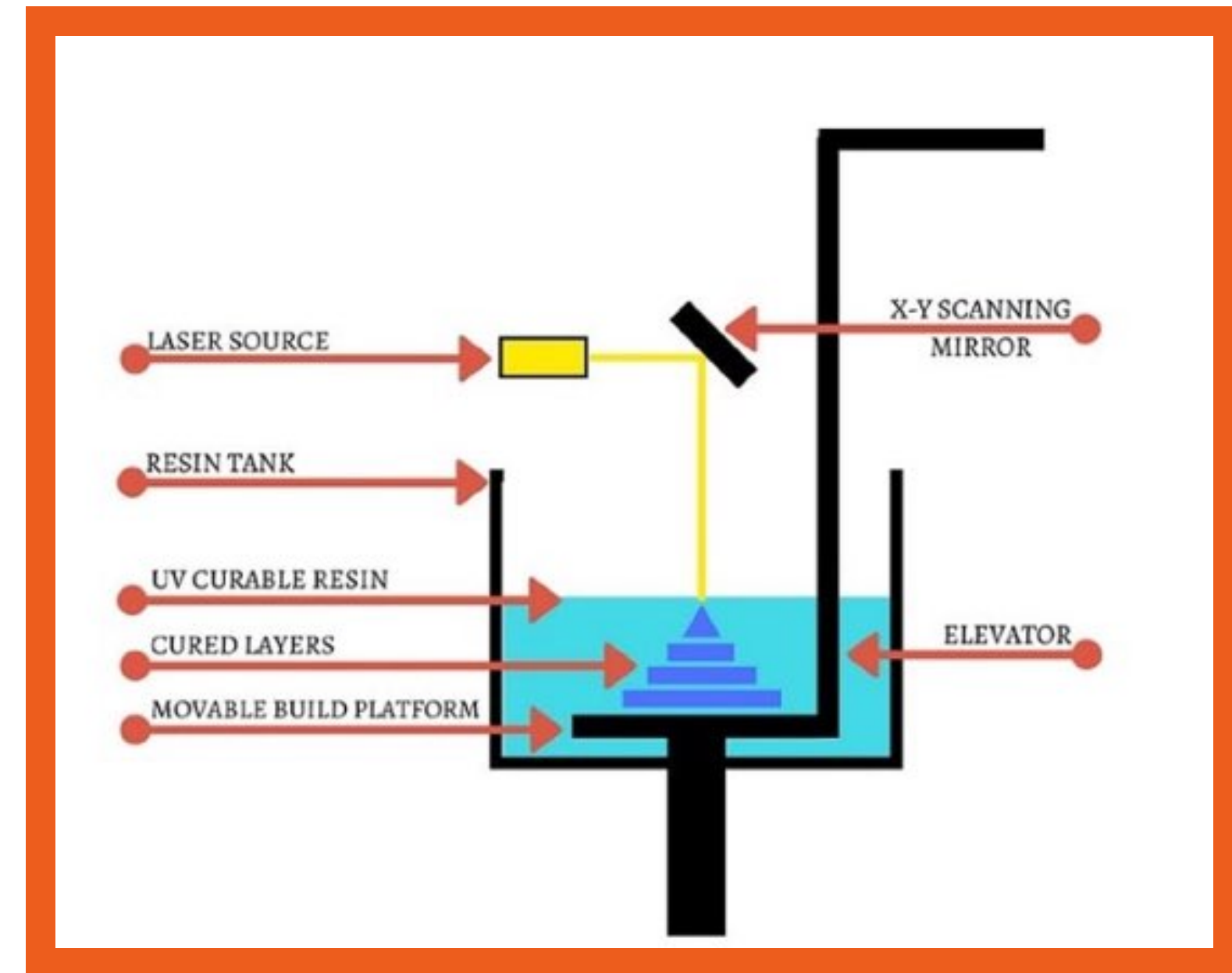


Fused Deposition Modelling

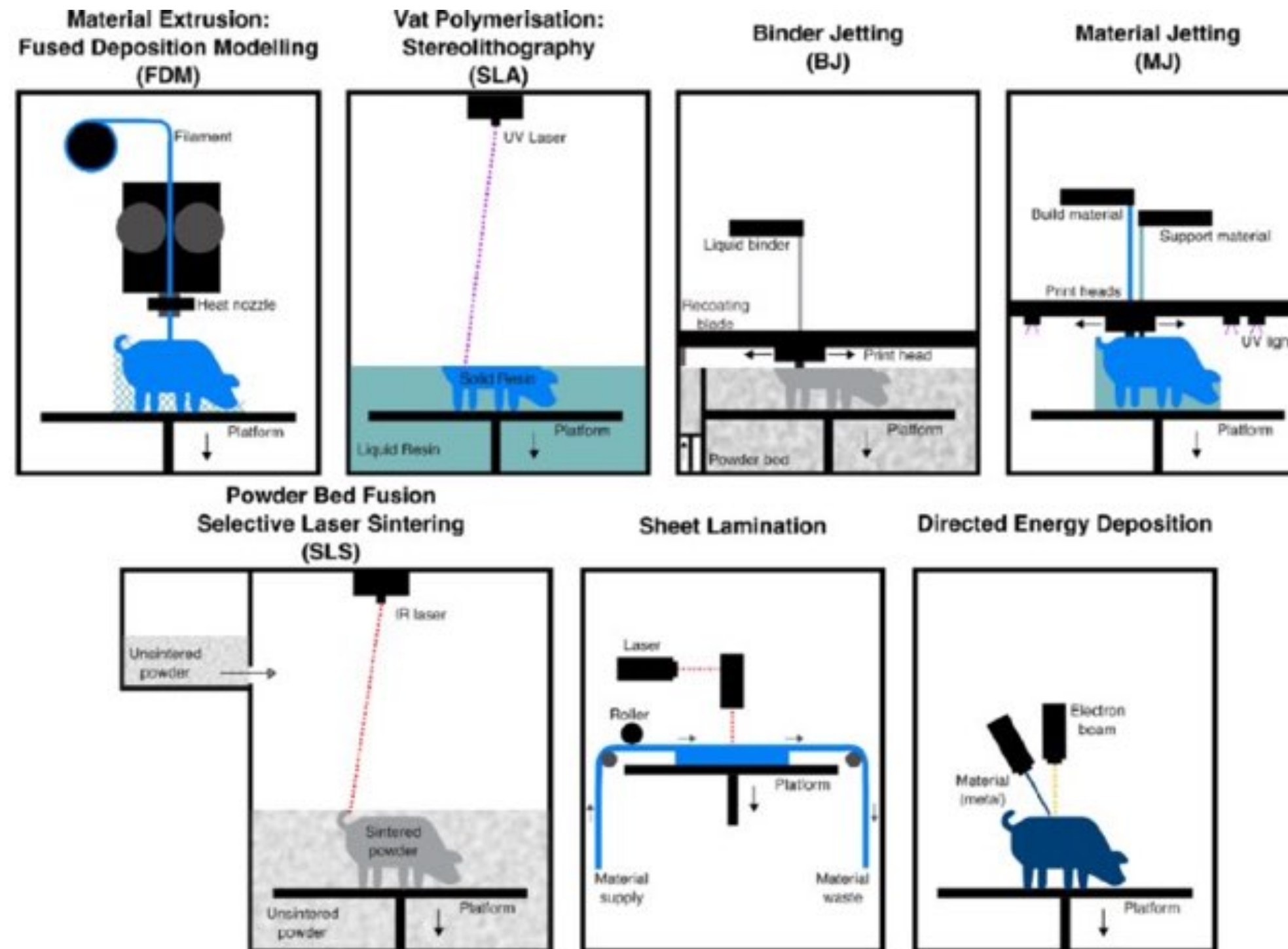# Stereolithography (SLA)

**How it works:**

- A container of liquid photosensitive resin holds the printing material.
- A laser beam traces and hardens the resin layer by layer, turning the liquid into solid plastic wherever the laser touches.
- Process repeats until the whole 3D object is formed.



LASER SOURCE

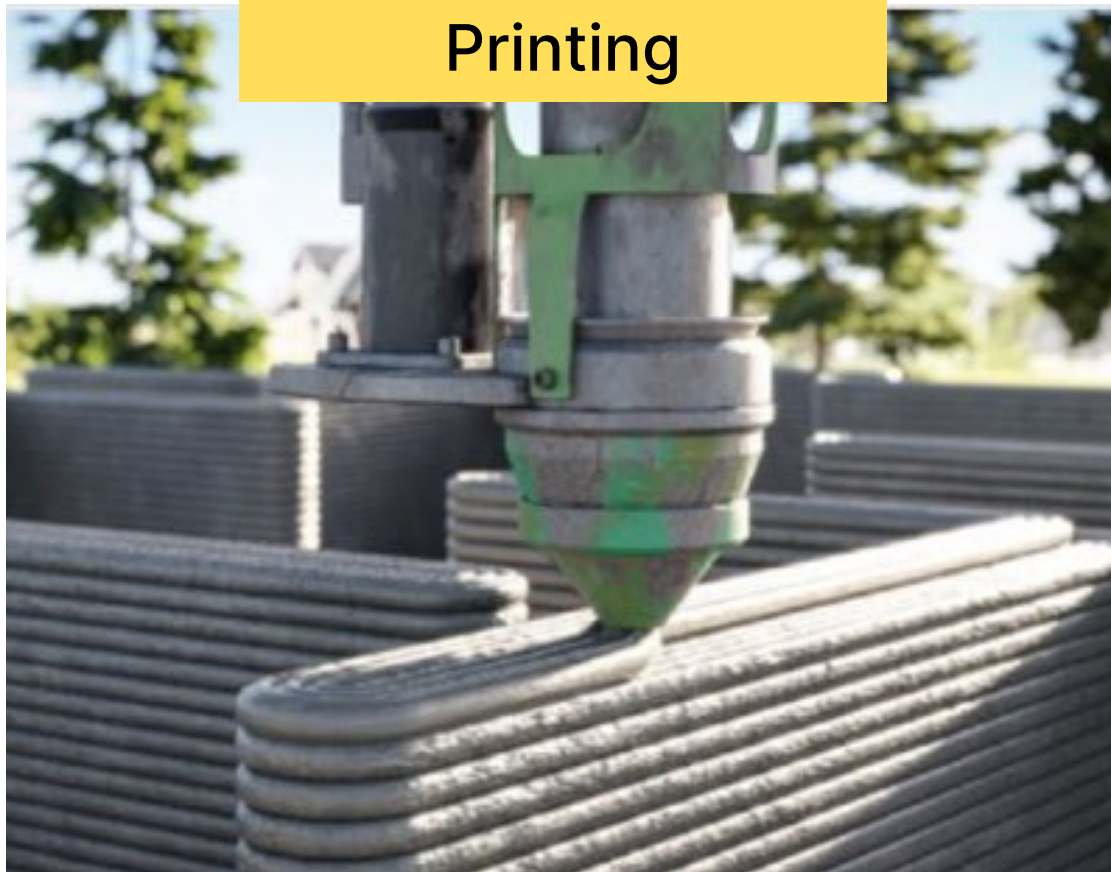X-Y SCANNING MIRROR

RESIN TANK

UV CURABLE RESIN

CURED LAYERS

ELEVATOR

MOVABLE BUILD PLATFORM

Stereolithography

# Illustration of different 3D Printing Methods

# **Emerging** Methods

**Concrete 3D Printing**

**Bioprinting**

**Food Printing**

# 3D Printers

For you to 3D print, you'll obviously require a 3D printer. There are many types of 3D printers, each with its own unique specifications.
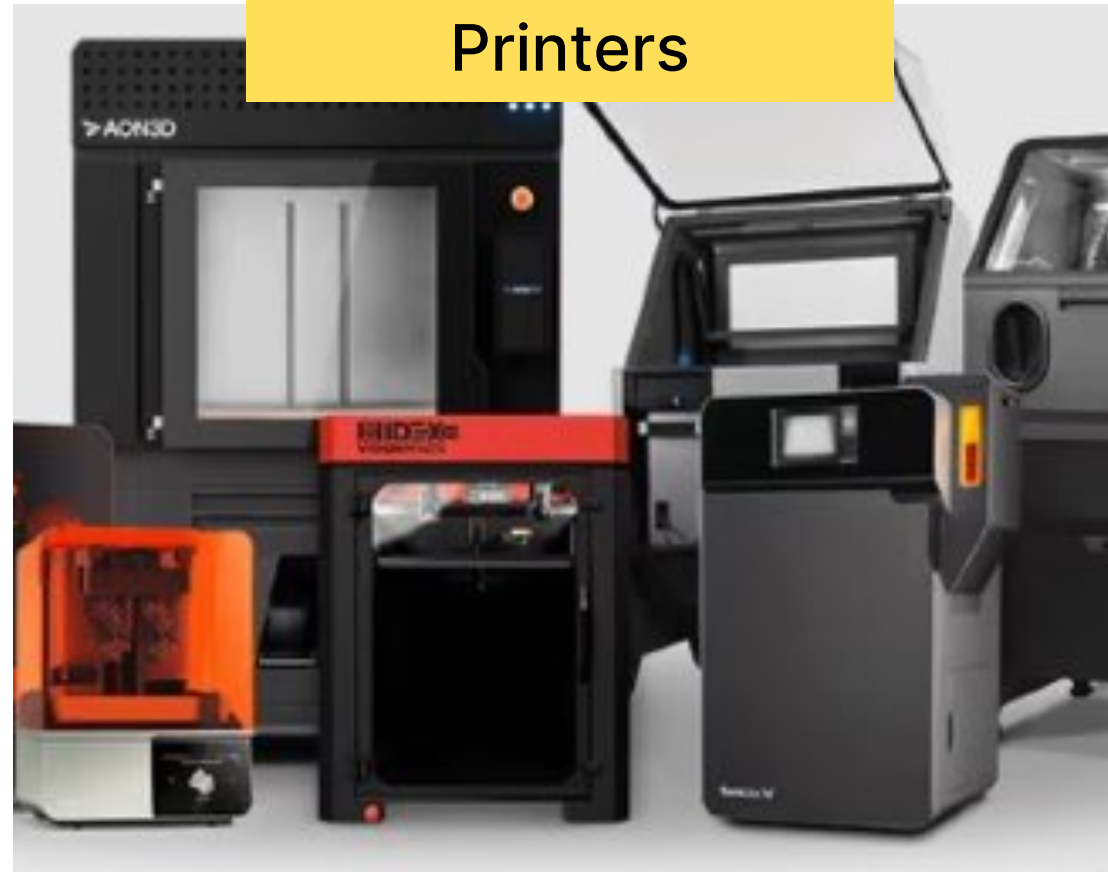
Have you worked with one before?🙂

# Type of **3D Printers**

**Desktop 3D Printers**

**Industrial 3D Printers**

**Bioprinters**

# Type of 3D Printers

Food Printer

Bioprinters

# The Original Prusa i3 MK3S Printer



Diagram labels:

- FILAMENT
- FILAMENT HOLDER
- THREADED ROD
- PRINTER FRAME
- Z-AXIS
- USB PORT
- EINSY RAMBO MOTHERBOARD
- EXTRUDER STEPPER
- X STEPPER
- X-AXIS
- AC POWER CORD
- HEATBED
- Z1 STEPPER
- Z2 STEPPER
- Y-AXIS
- SD CARD SLOT
- LCD KNOB
- LCD PANEL
- RESET BUTTON

# Points to consider when using the 3D Printer

## 1. Slicing & Print Settings

- **Infill density**: Higher infill for strength; lower saves material and time.
- **Supports**: Add supports for overhangs if needed, and check placement.
- **Bed adhesion tools**: Use brim, raft, or skirt depending on print shape.

# Points to consider when using the **3D Printer**

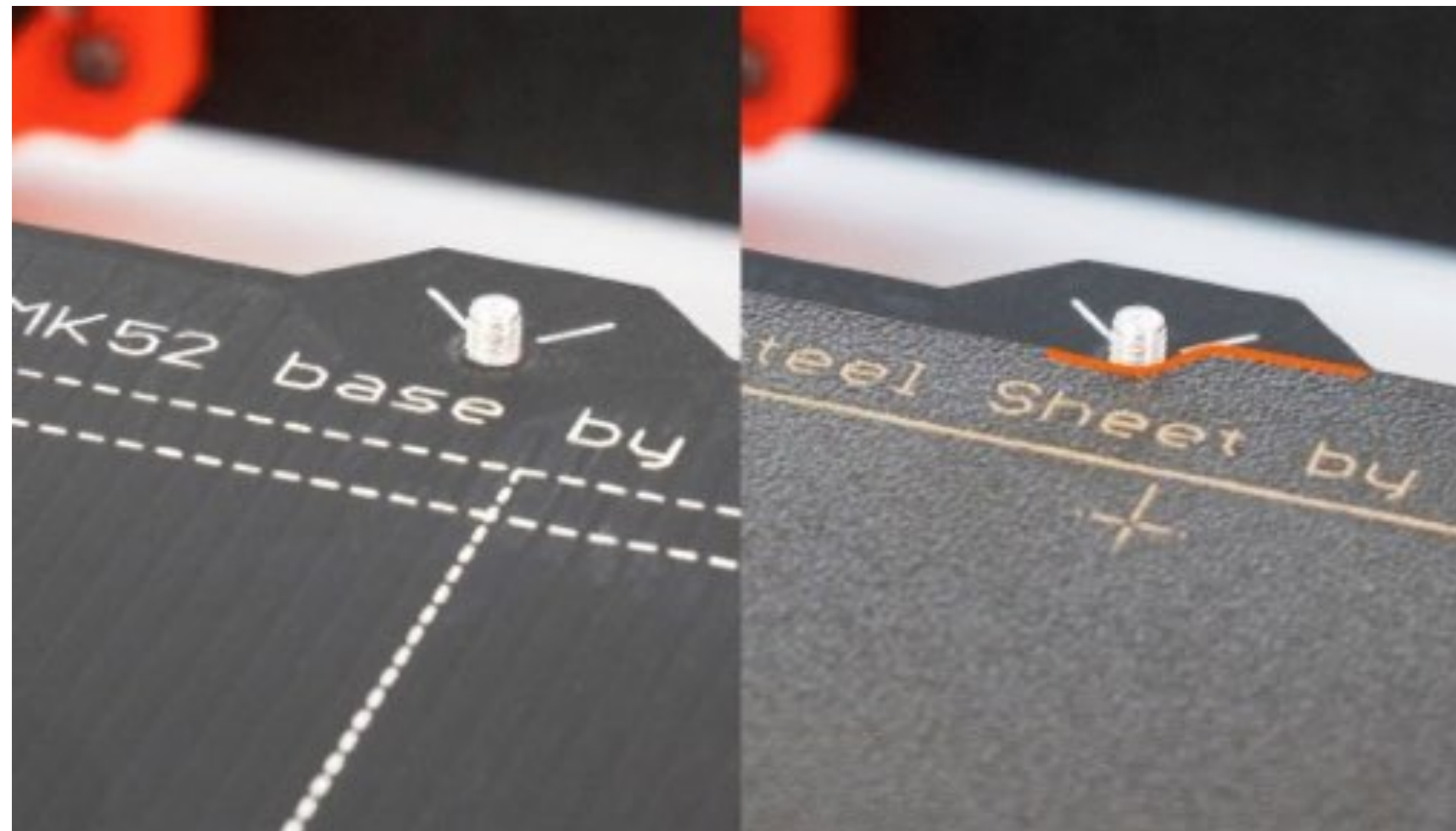# Points to consider when using the 3D Printer

## 2. Preparation & Setup

- **Clean the build surface/ sheet**: Remove dust, oils, or leftover filament bits by using Isopropyl alcohol on a paper towel or a warm soapy cloth.
- **Apply an adhesive to the sheet**: This helps to hold the first layer of the object to be 3D printed in place.
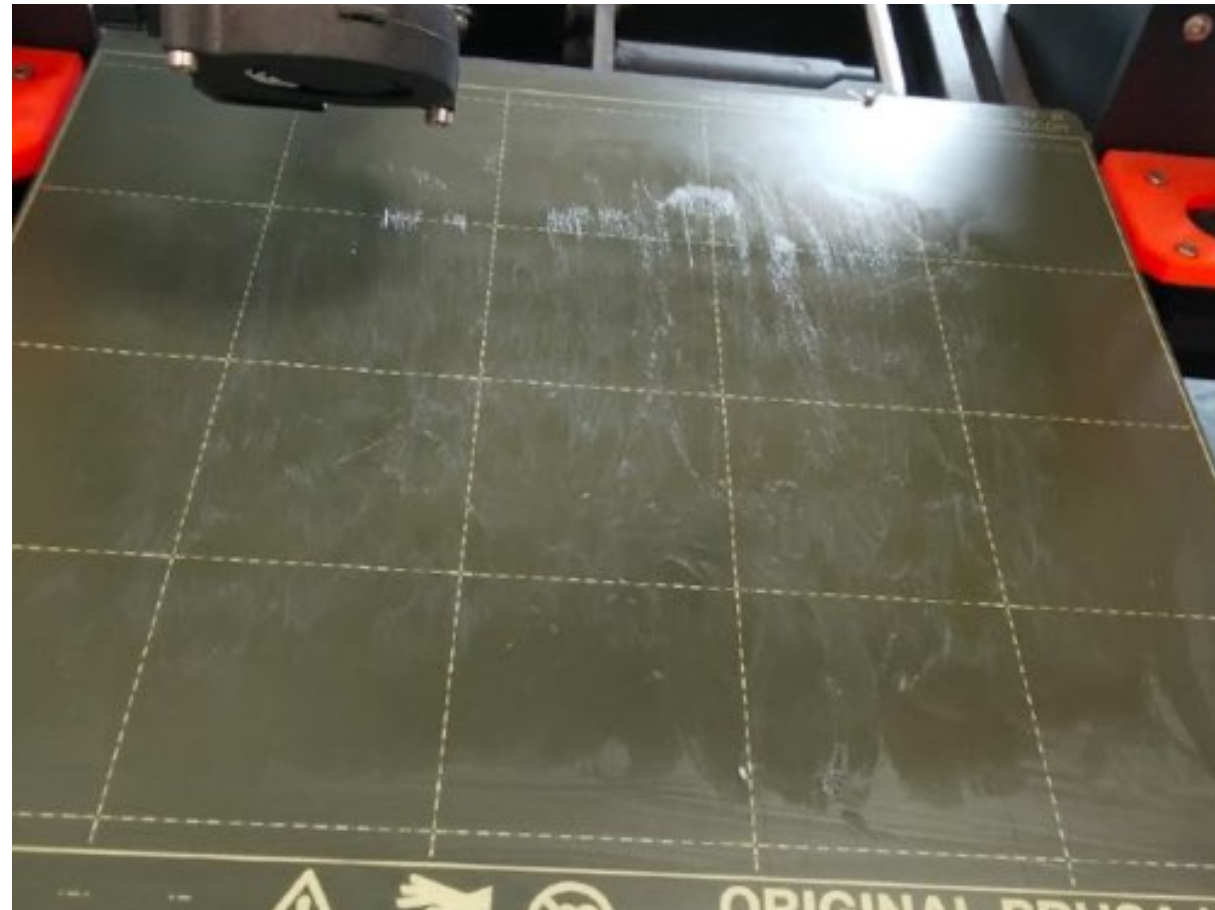
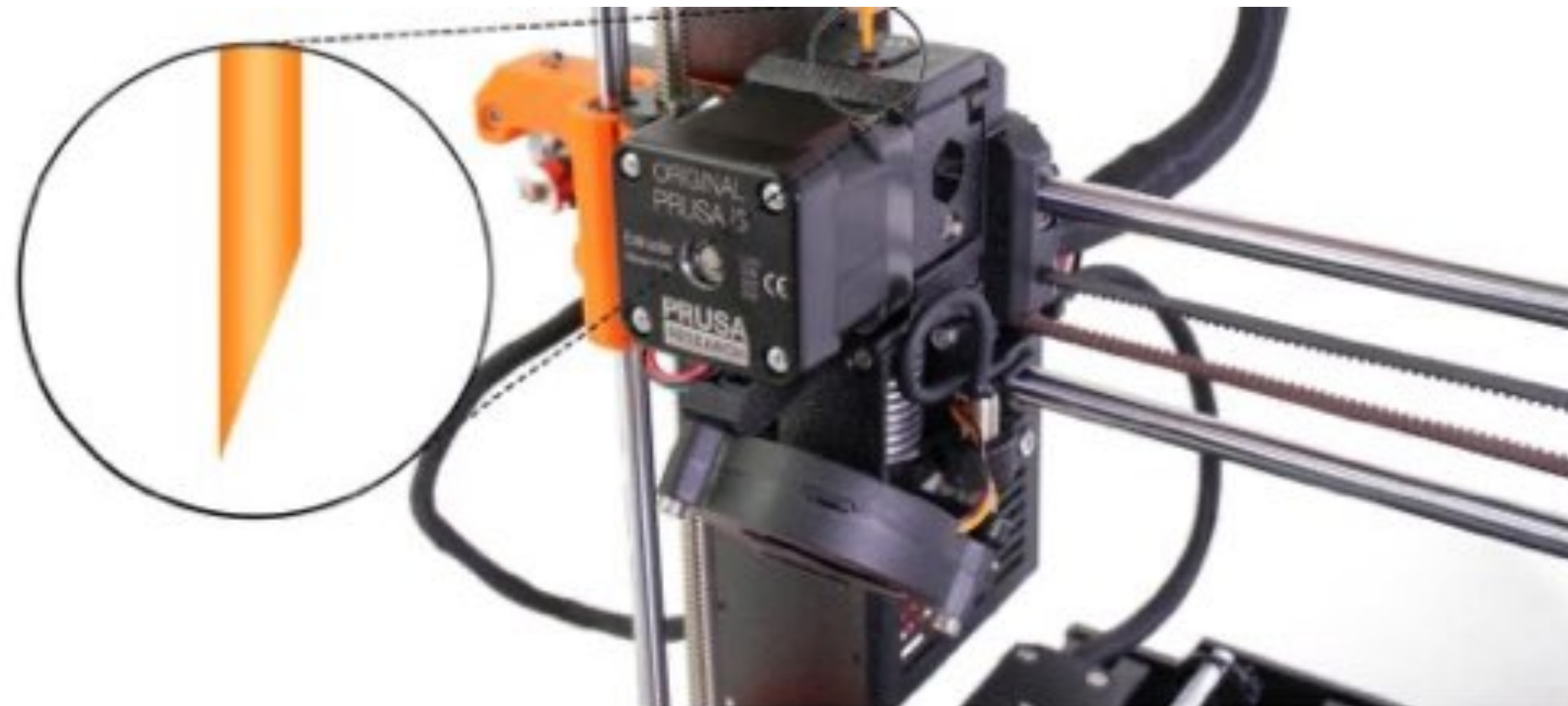# Points to consider when using the ==3D Printer==

- **Check the bed level**: Ensure the build plate is properly leveled for good first layer adhesion.
- **Check if the sheet is in place**: ensure the sheet is properly seated on the magnetic heatbed.

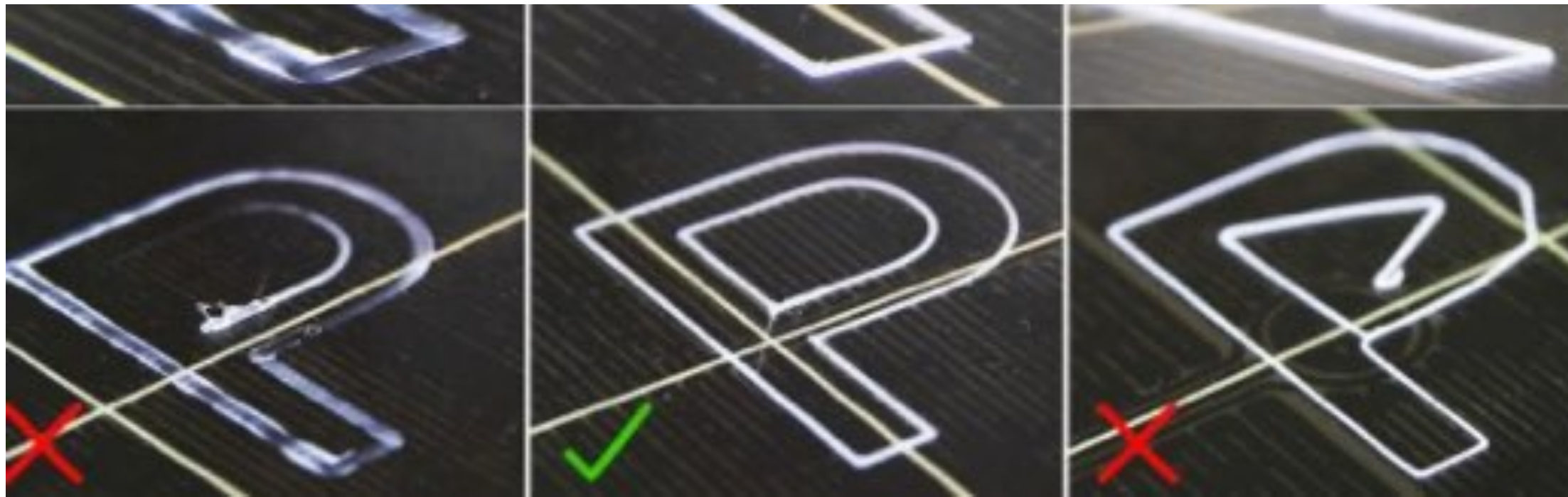# Points to consider when using the **3D Printer**

- **Choose the right filament**: Match filament type (PLA, ABS, PETG, etc.) to your print needs.
- When loading new filament, **cut it in an angle** to ensure easier insertion into the extruder and to reduce chances of clogging.
- **Check spool condition**: Make sure filament isn't tangled or brittle.

# Points to consider when using the

## 3D Printer

**3. During Printing**
- **Monitor the first layer**: a bad first layer usually ruins the print.



- **Watch temperature**: Keep an eye on nozzle and bed temps to avoid clogs or warping.
- **Keep the area clear**: Avoid bumping the printer or letting anything hit moving parts. Bumps lead to the X, Y or Z crashing.

# Points to consider when using the 3D Printer

## 4. After Printing

- **Remove print carefully**: Let the bed cool before removing the print. If you encounter any resistance, use a spatula or flexible bed to avoid damage.
- **Store filament properly**: In dry, sealed containers to avoid moisture.

# Points to consider when using the
## 3D Printer

**5. Maintenance & Safety**
- **Regular cleaning**: Remove filament residue and dust from fans and rails.
- **Check moving parts**: Tighten belts, check for loose screws, and clean rods.
- **Proper ventilation**: Especially when printing with ABS or resins.
- **Handle hot parts carefully**: Nozzle and bed stay hot even after printing.

**6. Software & Updates**
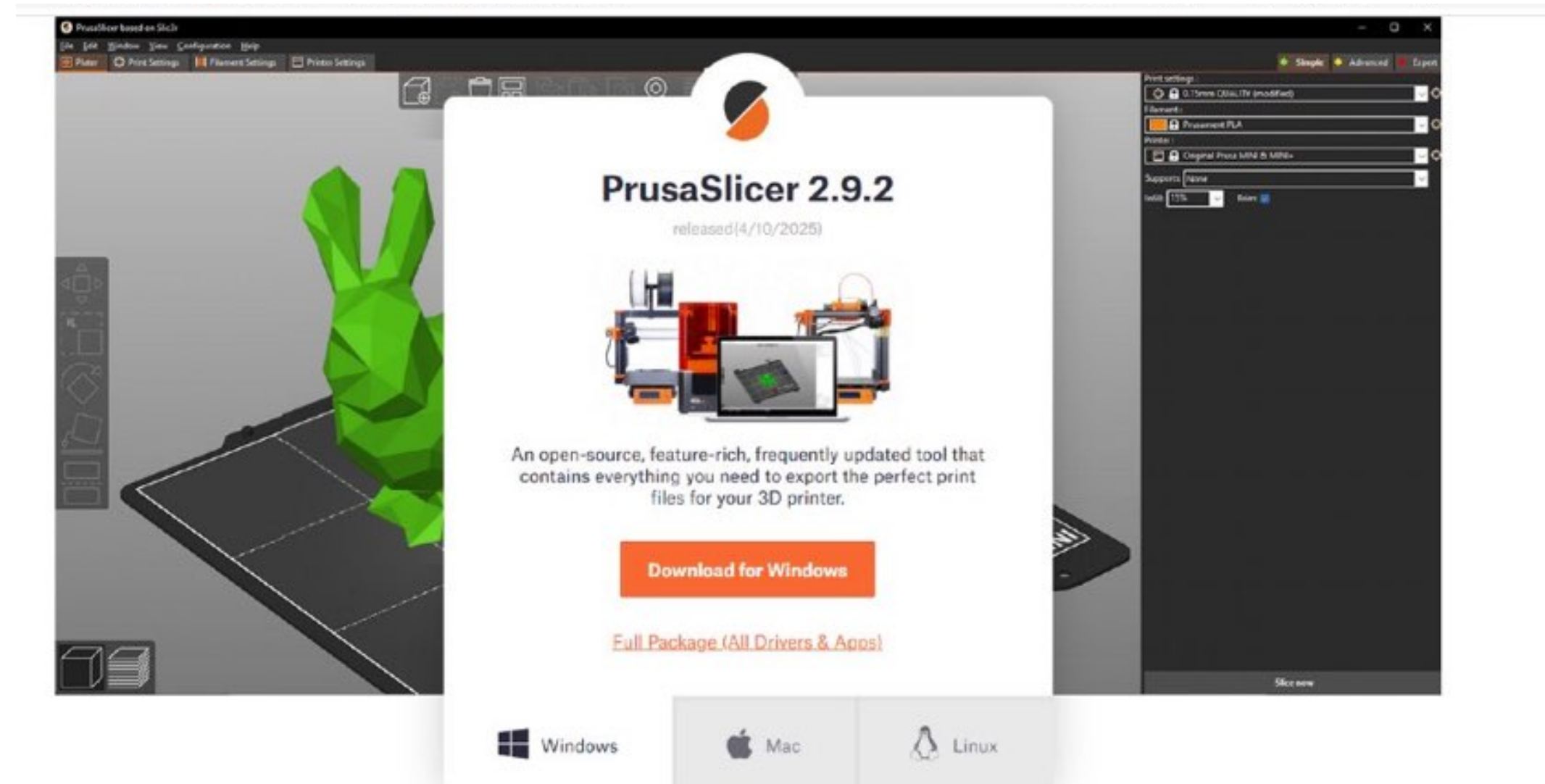- Update firmware: Keeps your printer safer and fixes bugs.

# 3D Printing Practical Guide Using
# PrusaSlicer and Prusa Printer

## Step 1: Download PrusaSlicer

- Go to the official PrusaSlicer page: <u>PrusaSlicer │Original Prusa 3D printers directly from Josef Prusa</u>
- Choose the version compatible with your OS (Windows, macOS, Linux)

- Download the installer and run it.

## Step 2: Install PrusaSlicer
- Follow the on-screen setup instructions.

## Step 3: Initial Configuration
- After installing and launching PrusaSlicer for the first time, you'll go through a Configuration Wizard. Follow these exact steps to ensure you're correctly set up for the **Original Prusa i3 MK3S/MK3S+ printer with a 0.4 mm nozzle.**
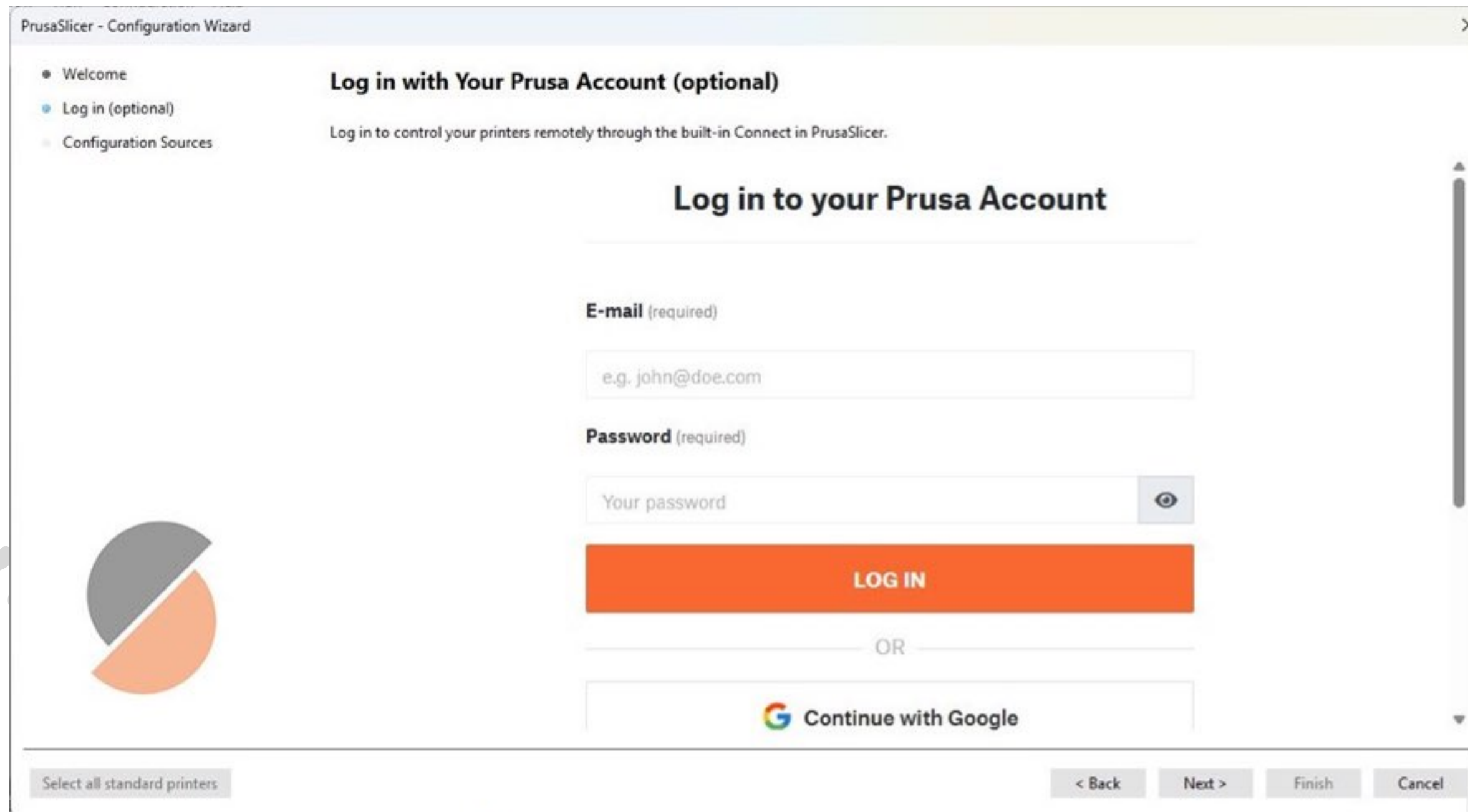
## i) Start the Configuration Wizard
- When you first open PrusaSlicer, the Configuration Wizard will launch automatically.
- If not, you can start it manually:
- Click Configuration > Configuration Wizard from the top menu.

PrusaSlicer - Configuration Wizard

● Welcome
○ Log in (optional)
○ Configuration Sources

## Welcome to the PrusaSlicer Configuration Wizard

Hello, welcome to PrusaSlicer! This Configuration Wizard helps you with the initial
configuration; just a few settings and you will be ready to print.

Select all standard printers          < Back     Next >     Finish     Cancel

## ii) Optional – Create or Skip Account

- You'll be prompted to sign in or create a Prusa Account.
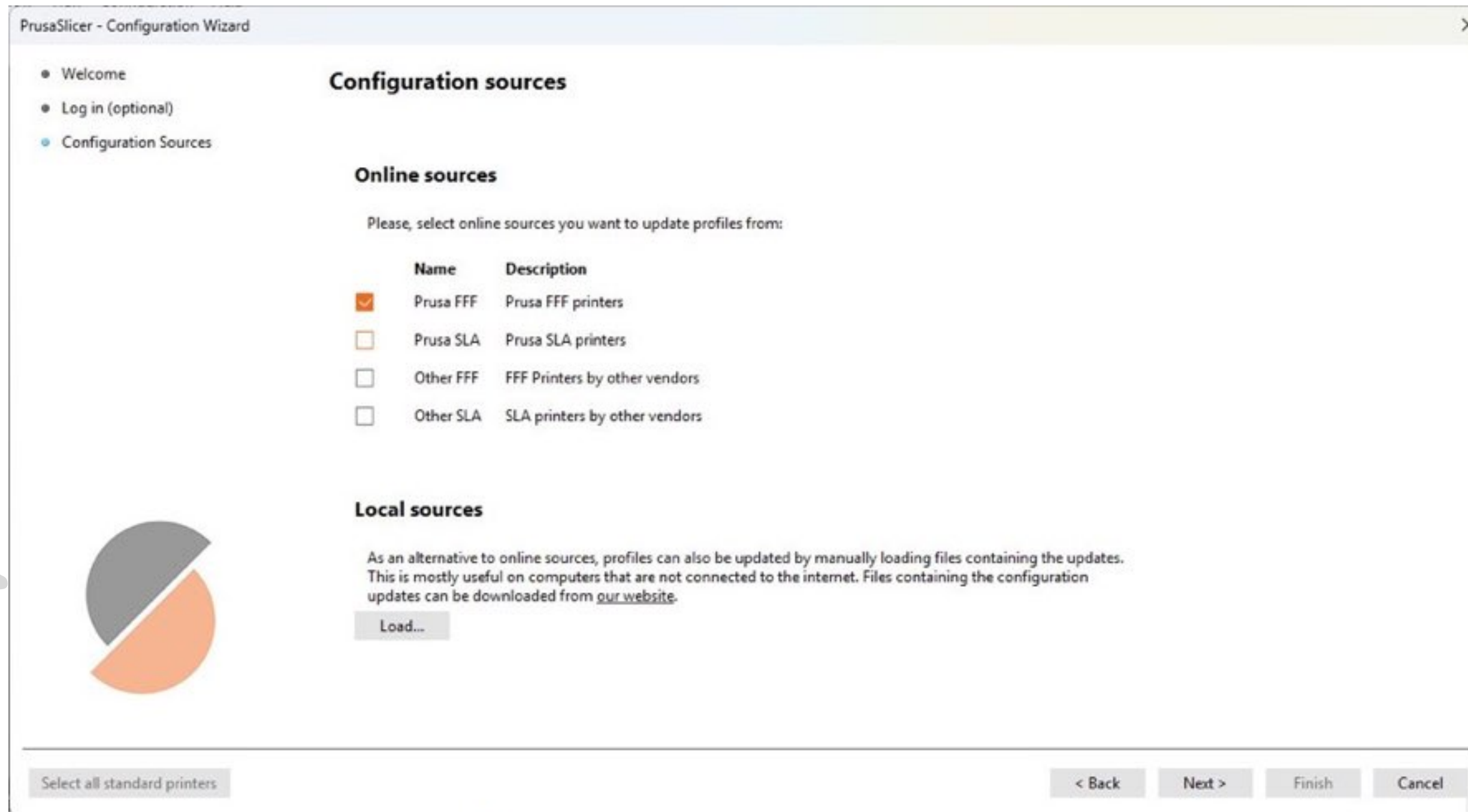- You can choose to skip this step.
- Click Next to proceed.

## iii) Select Printer Sources

A list of printer profiles and sources will be shown.

1. Deselect everything except:

**Prusa FFF printers** (keep this one checked)

2.Click **Next** and wait for PrusaSlicer to fetch the available printer configurations.
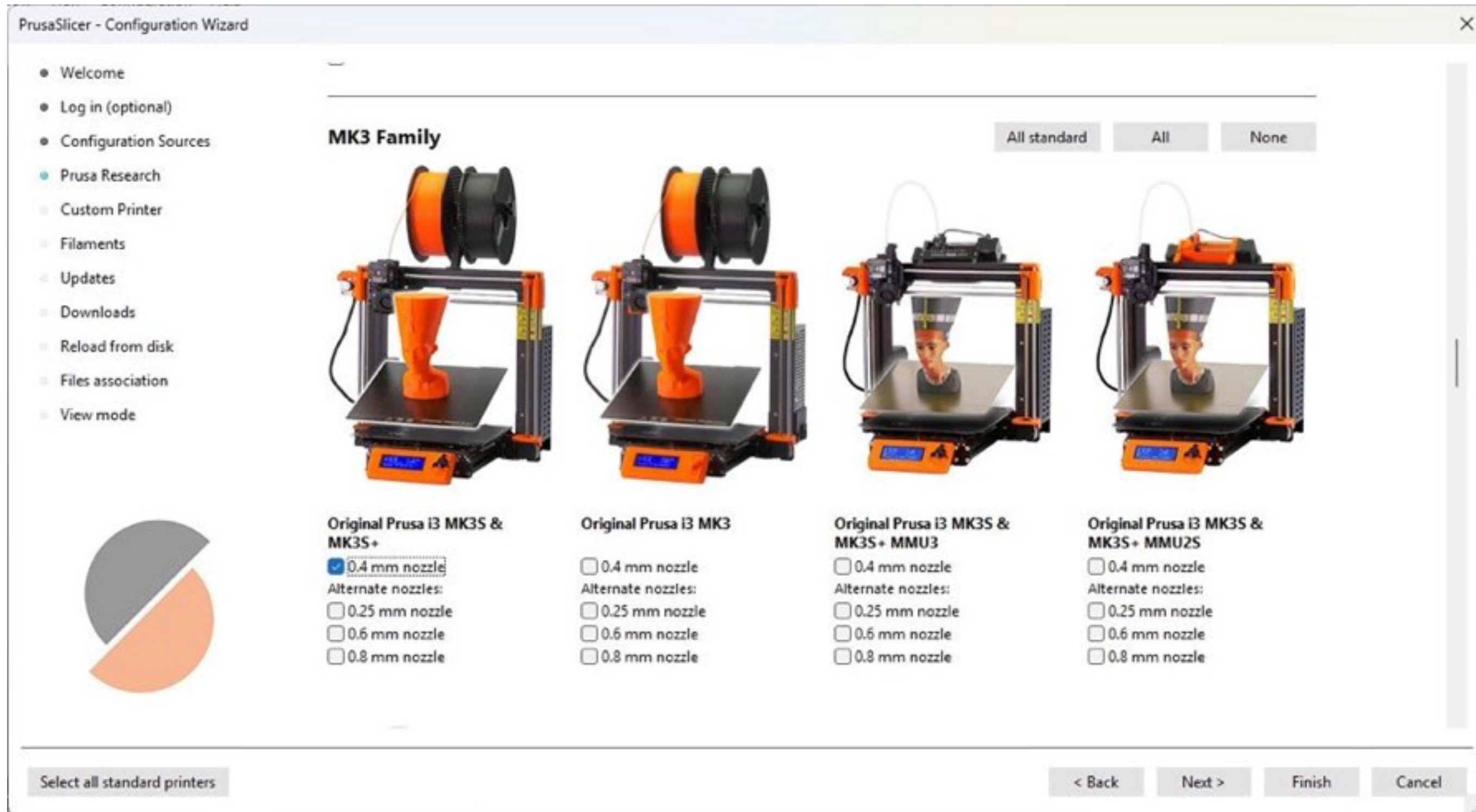
## iv) Select Your Printer

- From the list, scroll down to MK3 Family and select:

**Original Prusa i3 MK3S & MK3S+**
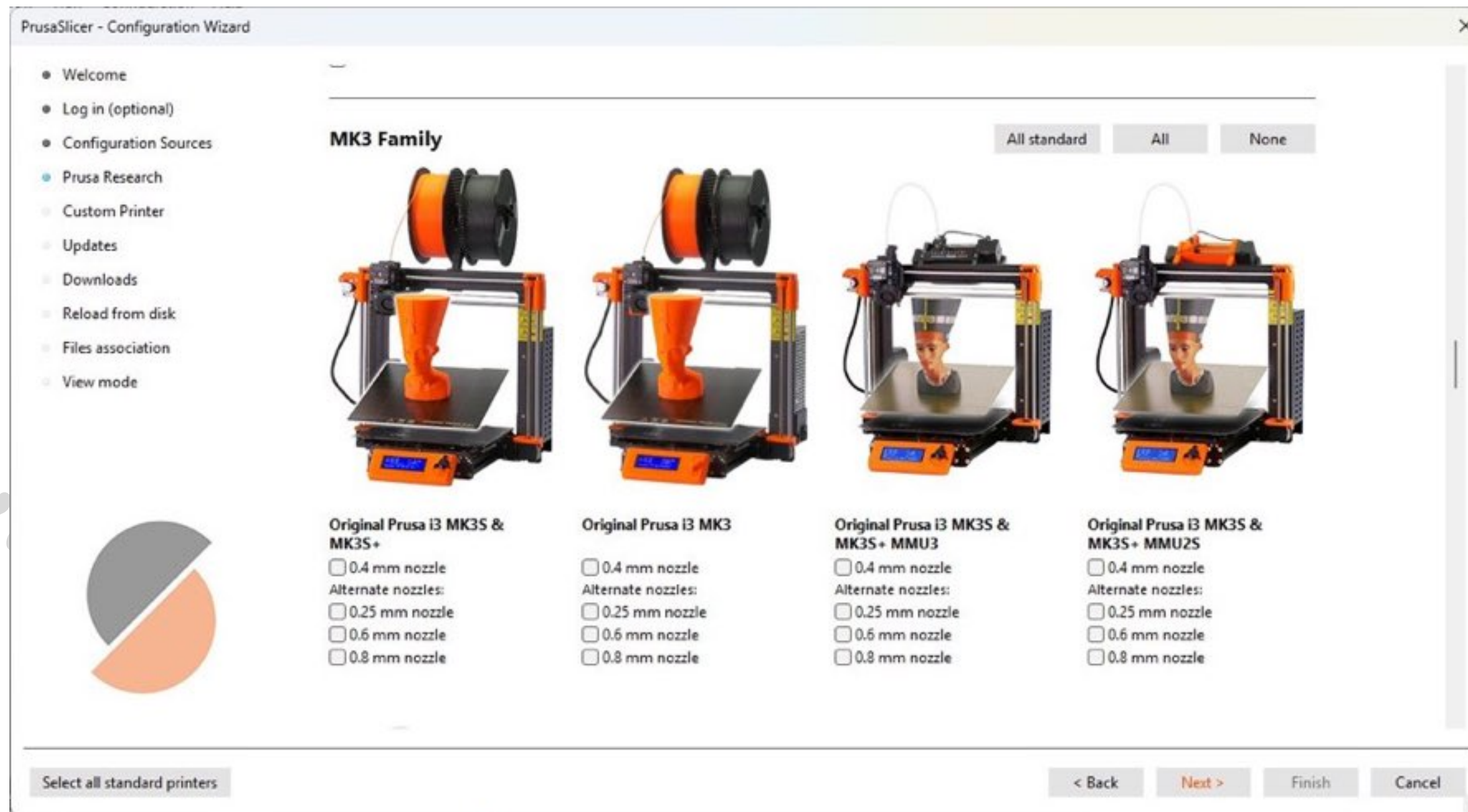
# v) Choose Nozzle Size

- Choose:
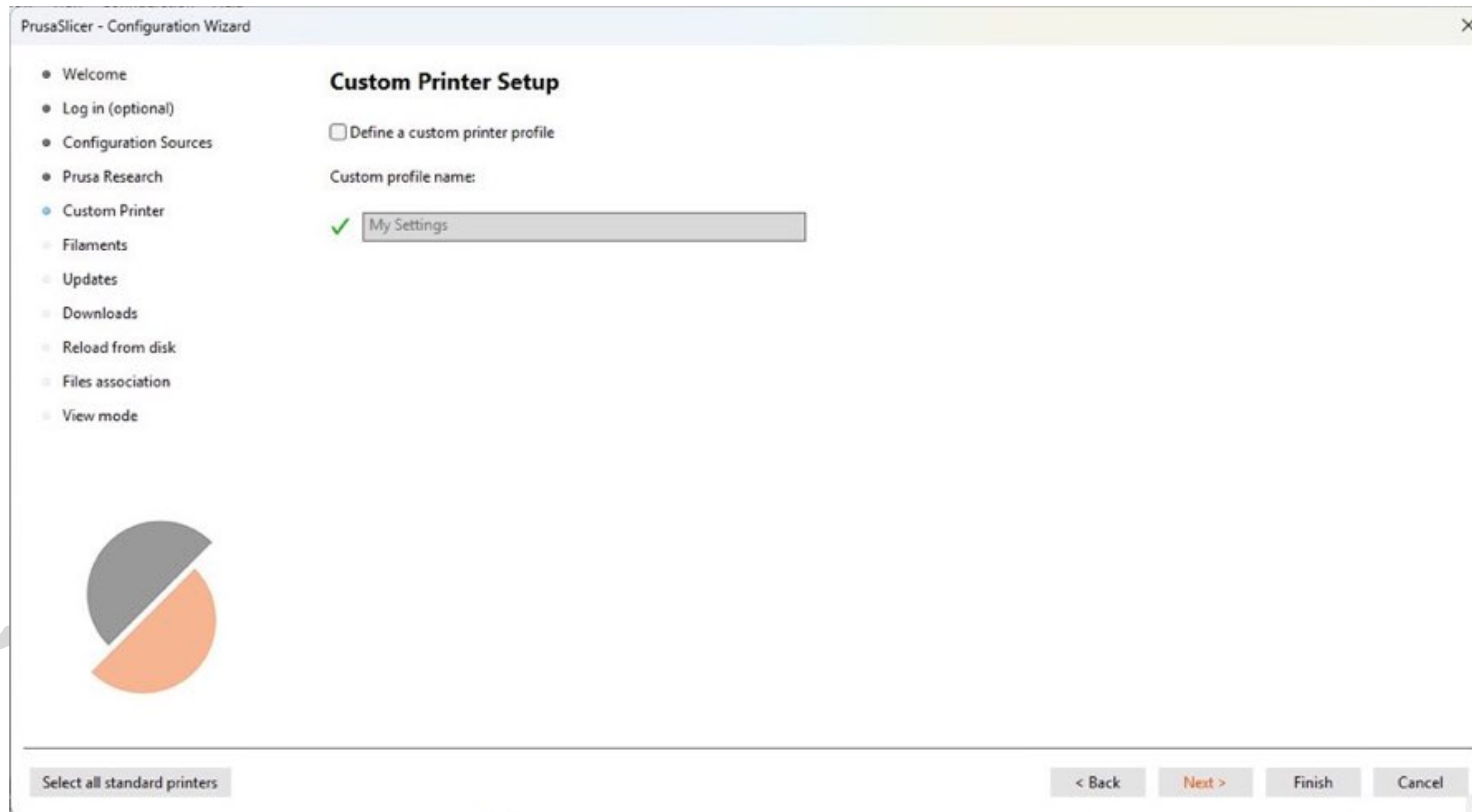
**0.4 mm nozzle** (the most commonly used and standard size for most prints)

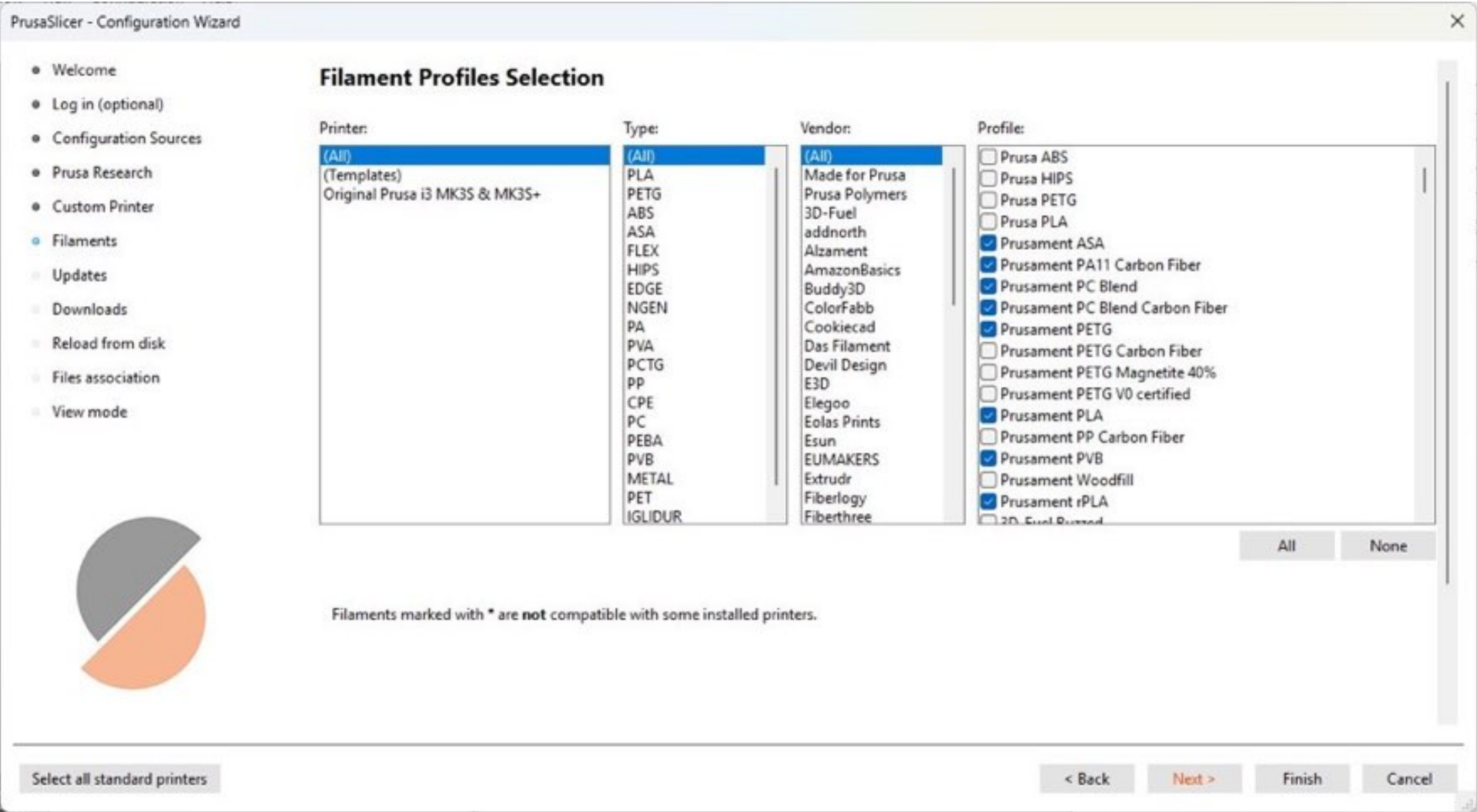- Click **Next.**
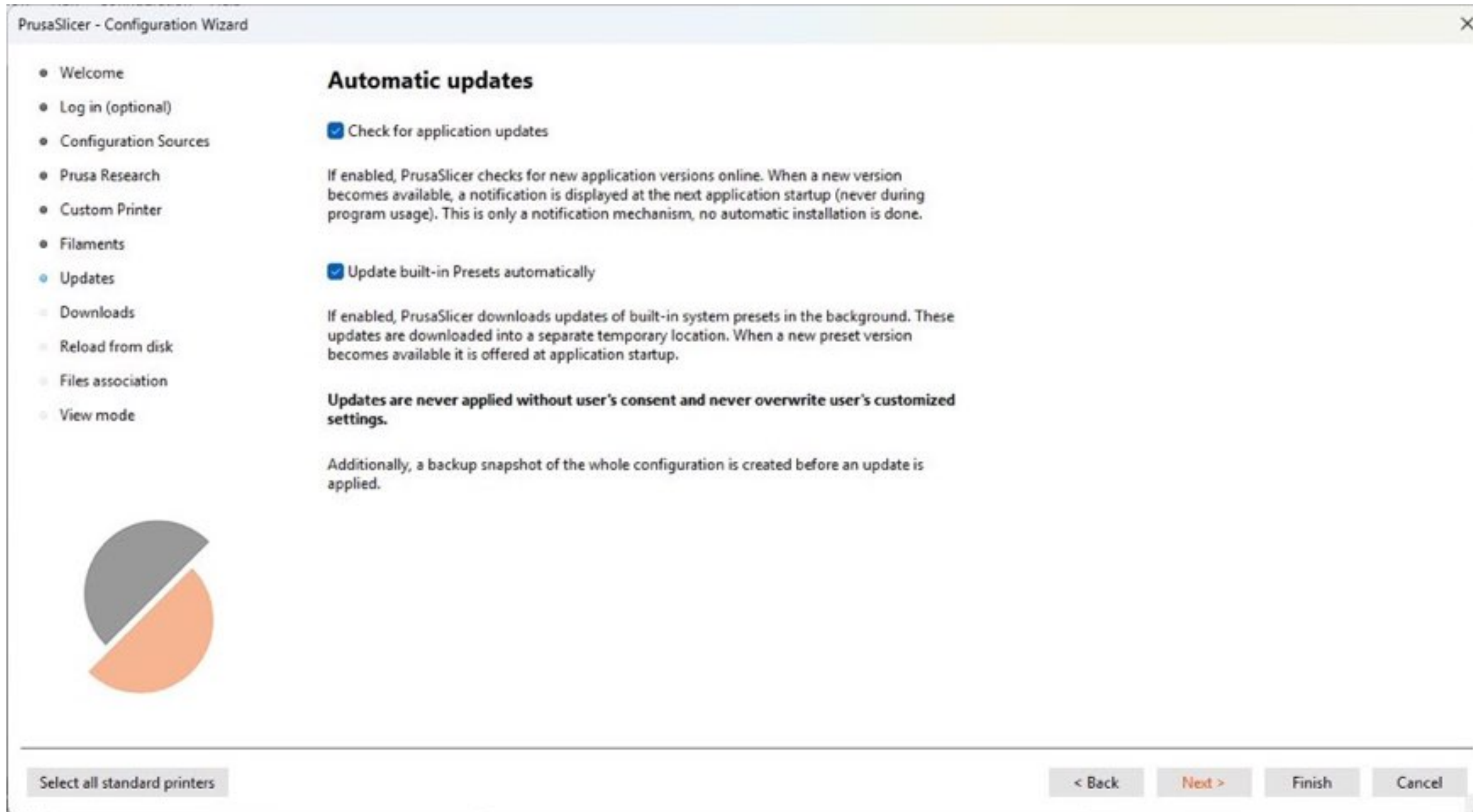
## vi) Custom Printer Setup



- Click **Next**

## viii) Filament Profiles Selection.
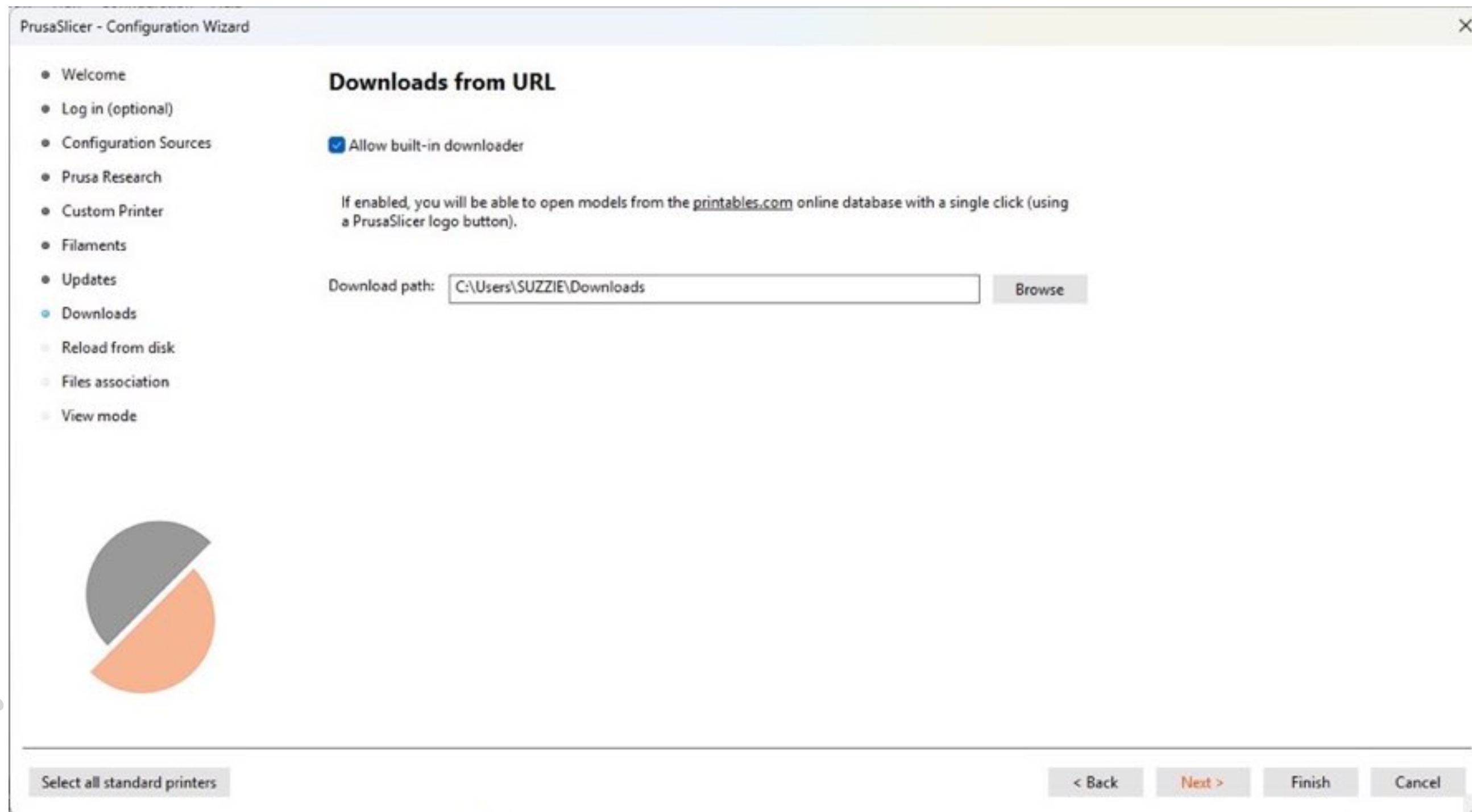
- Leave it as it is and click Next.

# ix) Automatic Updates Selection

- Check the boxes and click on Next.
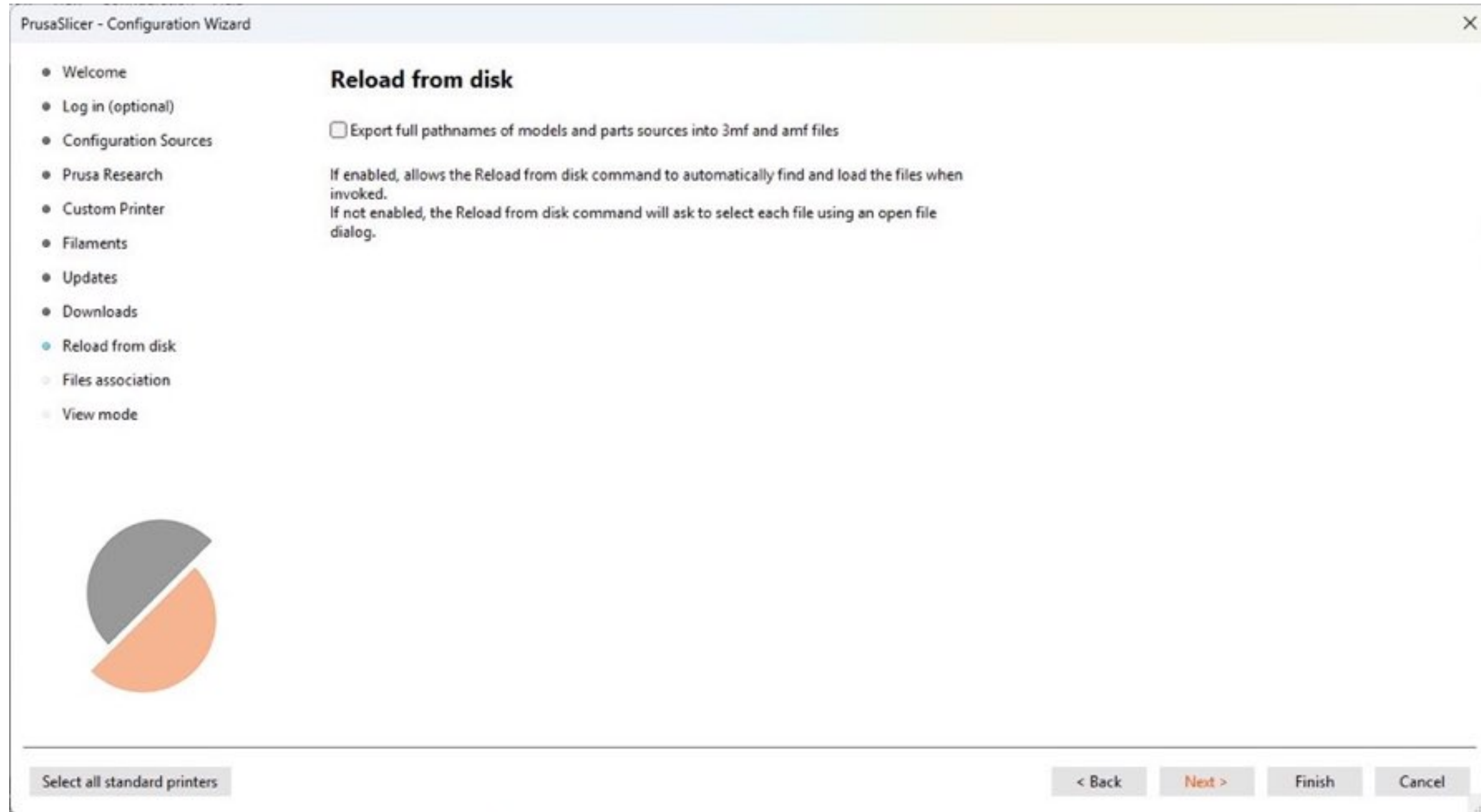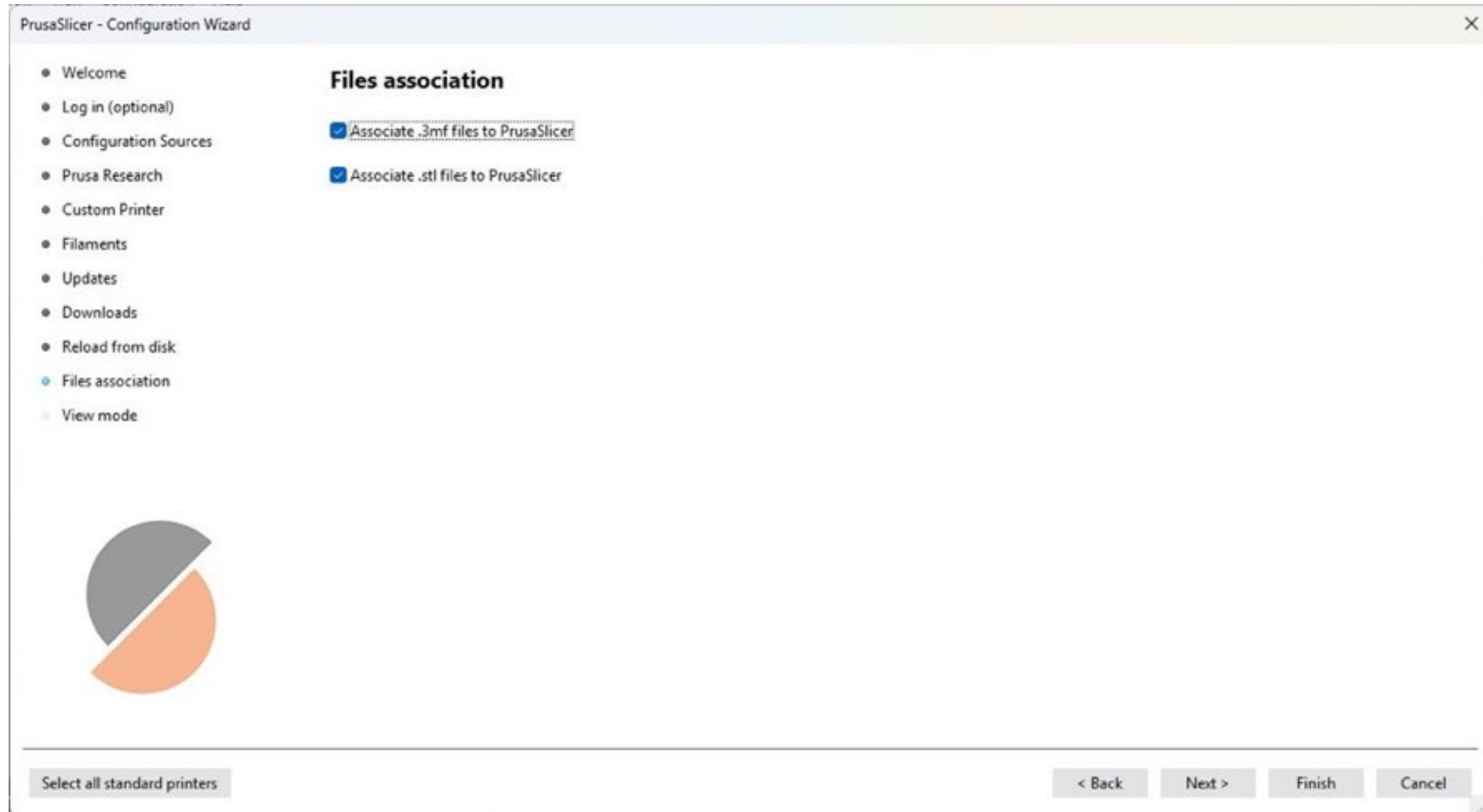
- Click **Next**

- Click **Next**

# x) Files Association

- Check the boxes and click on Next.

# xi) View Mode

- Select your preferred mode according to your level of experience.
- Click On Finish.



PrusaSlicer - Configuration Wizard

- Welcome
- Log in (optional)
- Configuration Sources
- Prusa Research
- Custom Printer
- Filaments
- Updates
- Downloads
- Reload from disk
- Files association
- View mode

**View mode**

PrusaSlicer's user interfaces comes in three variants:
Simple, Advanced, and Expert.
The Simple mode shows only the most frequently used settings relevant for regular 3D printing. The other two offer progressively more sophisticated fine-tuning, they are suitable for advanced and expert users, respectively.

○ Simple mode

○ Advanced mode

○ Expert mode

The size of the object can be specified in inches

☐ Use inches

Select all standard printers

< Back     Finish     Cancel

## 2. Importing an STL File and Preparing It for Slicing in PrusaSlicer.

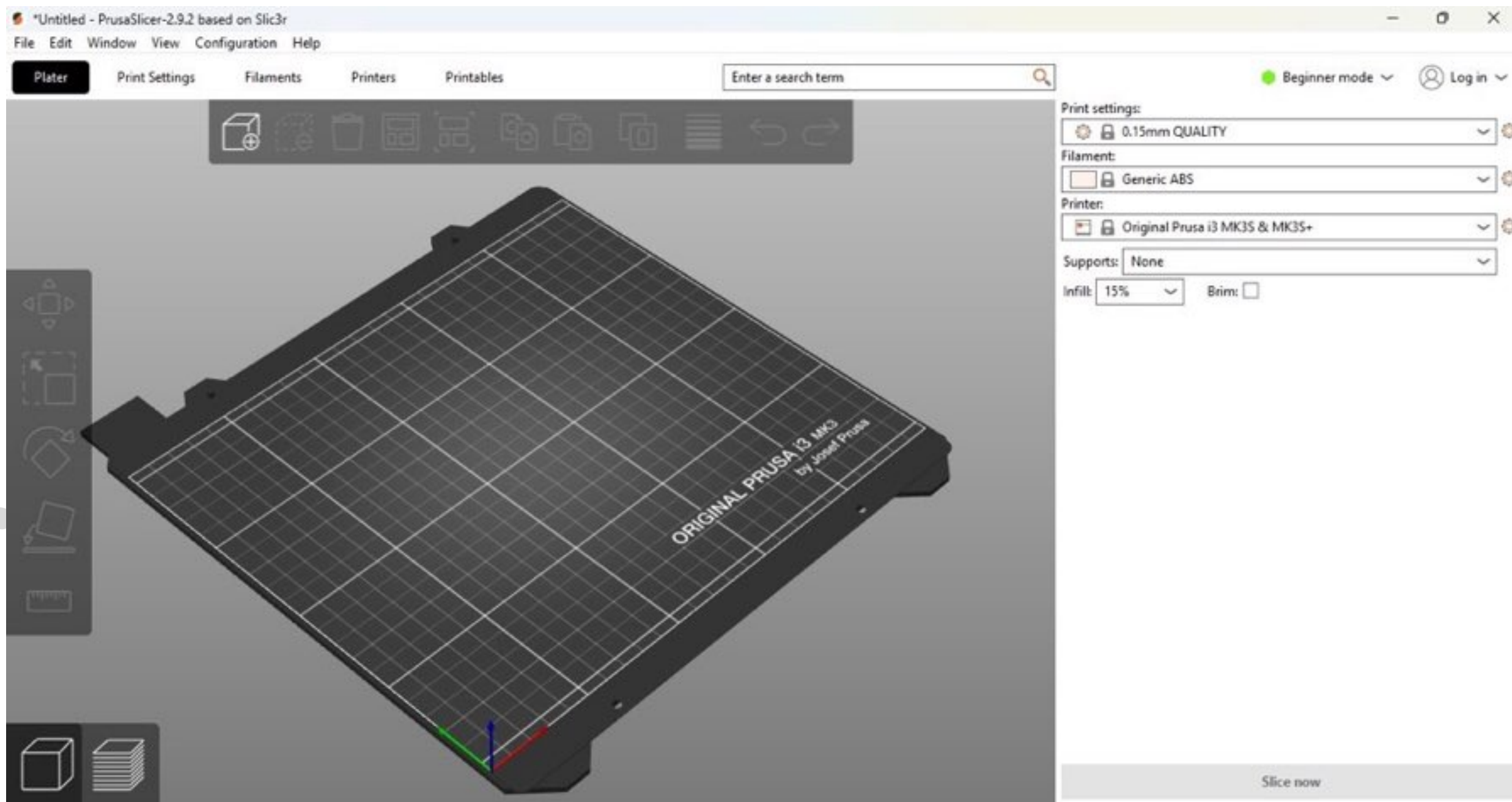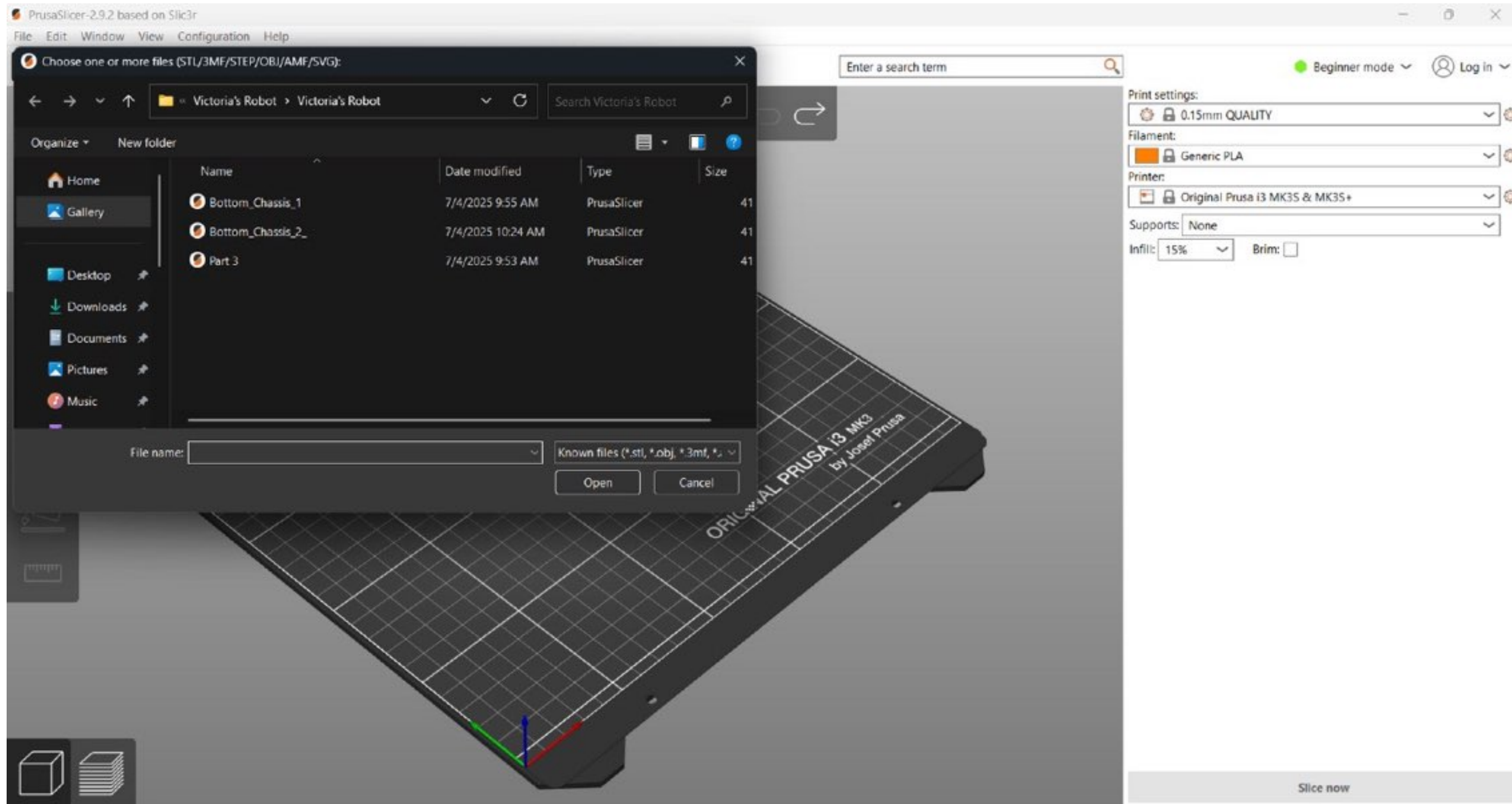Once setup is completed, the main PrusaSlicer workspace opens. You can begin importing your 3D design for slicing.

### Step 1: Click the "Add" Button

- On the top-left toolbar, click the Add button (represented by a cube icon with a plus sign).
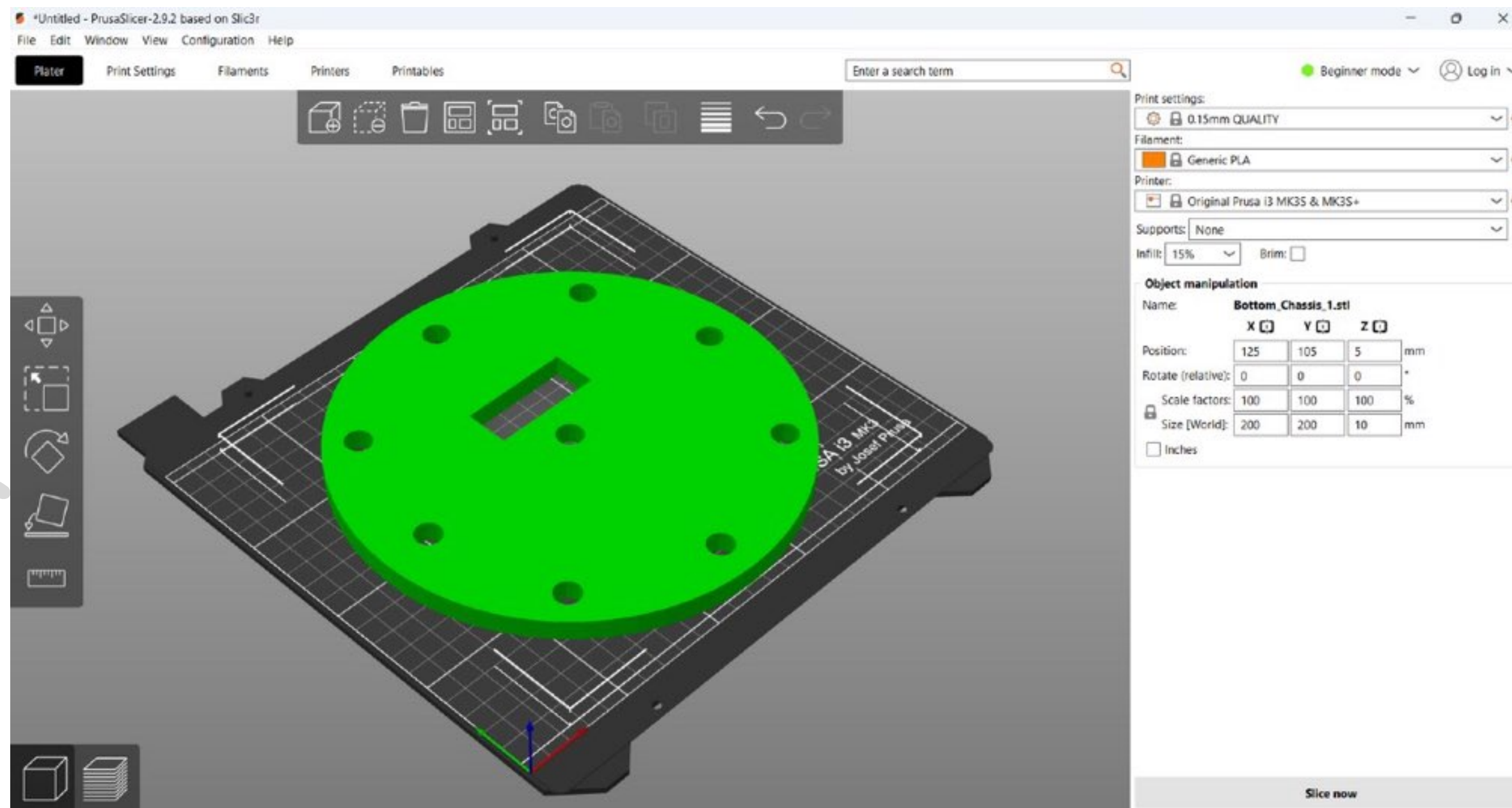
- A file browser window will open.

## Step 2: Locate and Select Your STL File

- In the file browser:
  - Navigate to the folder where you saved your 3D model.
  - Select the file with the .stl extension (e.g., Bottom_Chassis_1.stl).
  - Click Open.

The STL file will now appear on the virtual print bed in the PrusaSlicer workspace.

**Step 3: Adjust Model Position (Optional)**

Once the model is imported:

- Move Tool: Click and drag to reposition the object on the bed.
- Rotate Tool: Use the rotation handles if your model needs re-orientation.
- Scale Tool: Resize your model if needed (use the right-side panel or shortcut S).

**Step 4: Review Print Settings**

Check or modify the key parameters:

- **Print Settings**: e.g., 0.15mm QUALITY.
- **Filament**: Make sure Generic PLA is selected (or the material you're using)
- **Printer**: Should already show Original Prusa i3 MK3S+
- **Infill**: Choose your desired percentage of infill depending on strength needed.

- Click the "Slice Now" button
- Review the estimated time, filament usage, and preview the layers
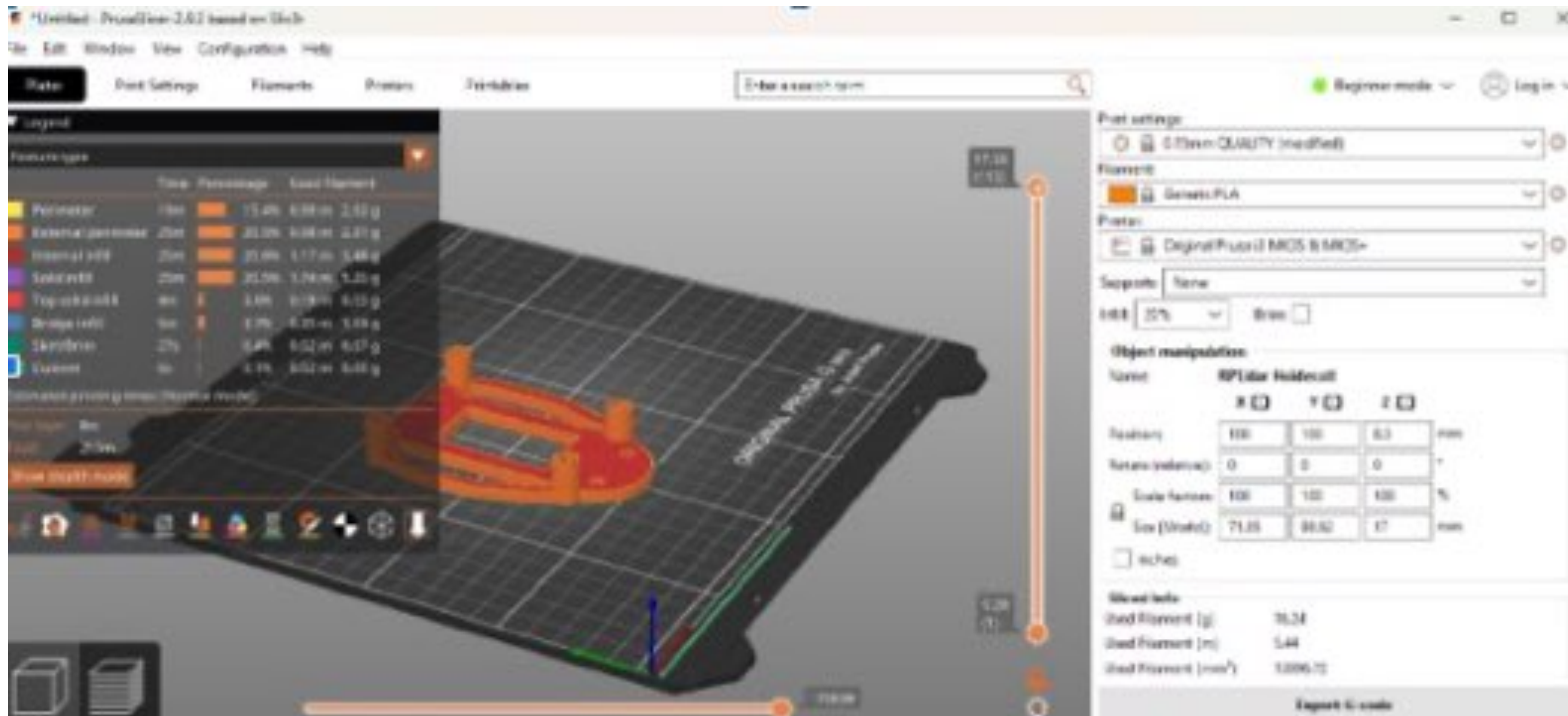
# 3.Exporting the G-code
- Click Export G-code
- Name your file clearly (e.g., Bottom_Chassis_1.gcode)
- Save it to a location you can access easily.
- Remove the SD Card from Prusa printer's SD card slot and insert it into your laptop.
- Move the .gcode file to your SD card.

## 4. Loading G-code into the 3D Printer

- Safely remove the SD card from your computer
- Insert it into the Prusa printer's SD card slot

## 5. Preparing the Print Bed

- Use isopropyl alcohol and a lint-free cloth to wipe the bed surface
- Ensure it's free of dust or oil

## 6. Starting the Print

### Step 1: Select File

- On the Prusa printer menu:
  - Go to Print from SD
  - Select your G-code file (e.g., Bottom_Chassis_1.gcode)

### Step 2: Start Printing

- Confirm selection.
- The printer will:
  - Calibrate for positioning.
  - Heat the nozzle and bed
  - Begin printing automatically

- **And just like that, you're done! Here's what I printed using this exact setup — the Bottom Chassis for our robot**
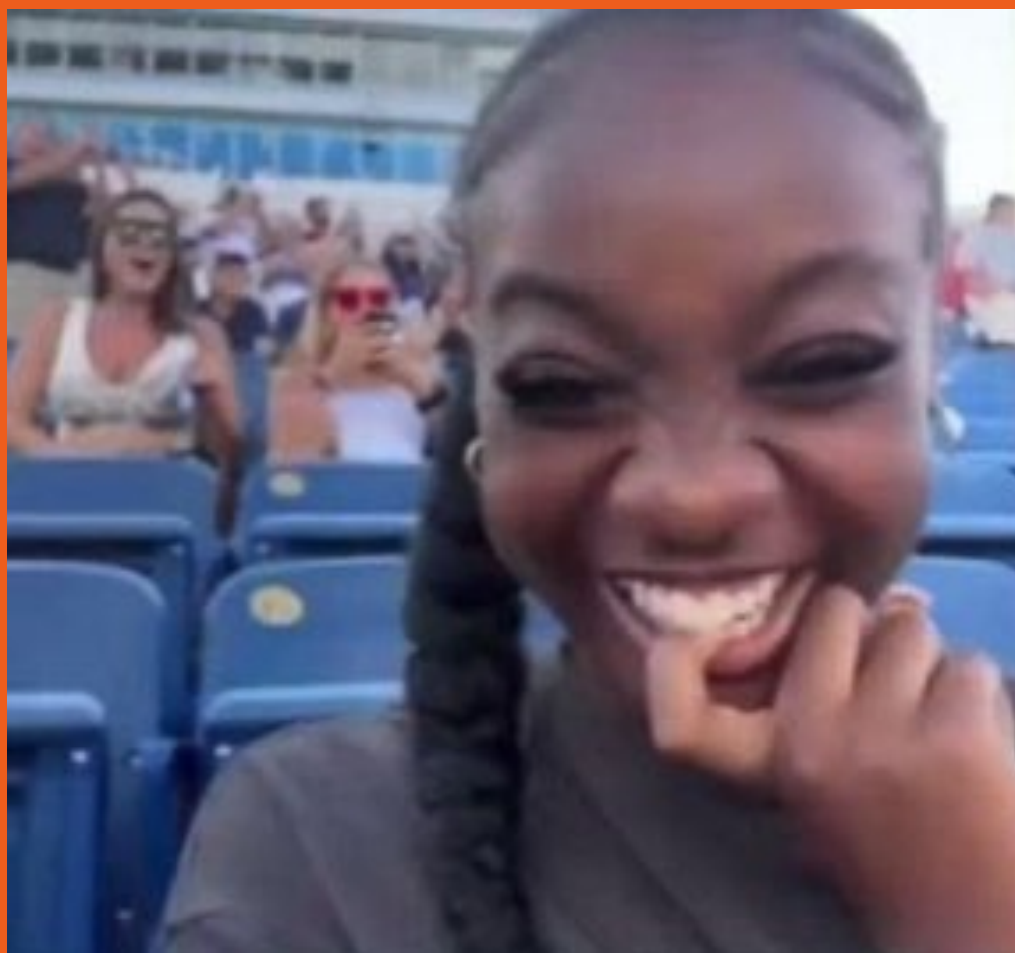
# References

[3D Printing Blog](#)

[3D Printers Blog](#)

[Guide to 3D Print using the PrusaSlicer with the Prusa MK3S](#)

**Thank You!**

Created by Maryanne Farida

maryannefarida@gmail.com