OT 699 – WEEK 8

SOOK-LEI LIEW, PHD, OTR/L, SLIEW@USC.EDU

HARDWARE: 3D PRINTING

OBJECTIVES

By the end of this session, students will be able to:

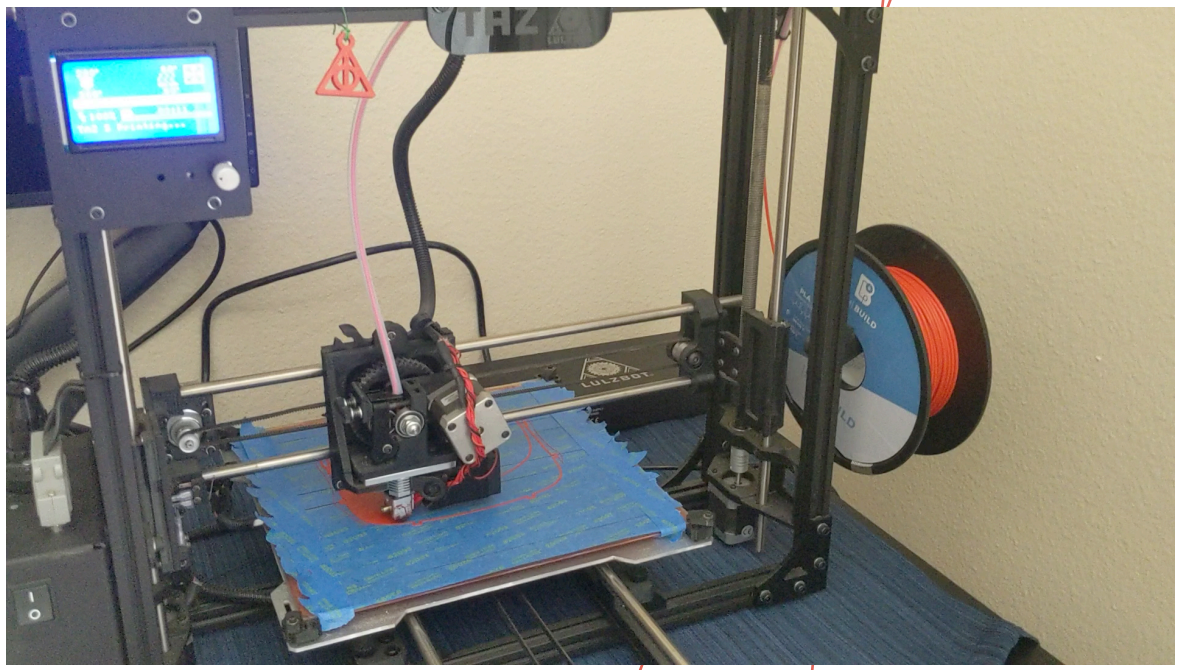
- Describe the role of 3D printing in creating prototypes
- Understand the basic requirements for the 3D printing process
- List three ways that 3D printing can be used in clinical settings

SESSION FORMAT

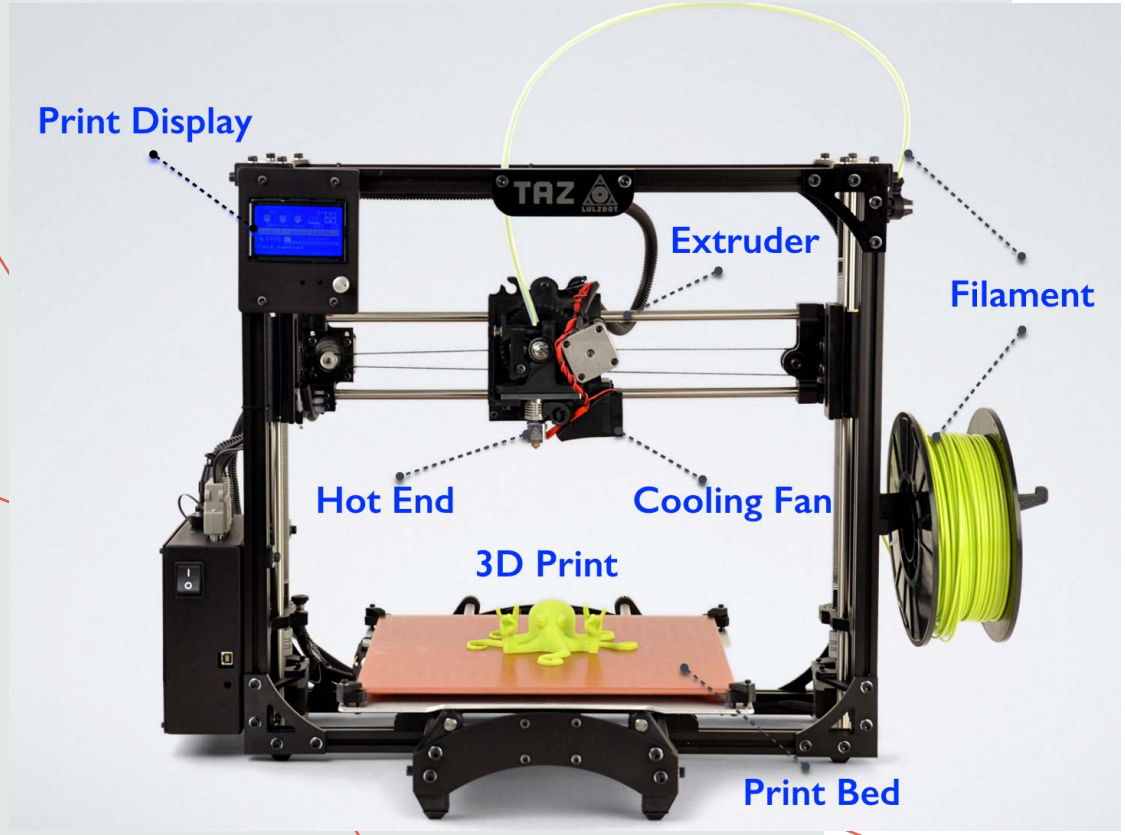
- Brief overview of 3D printing
- Guest lecture showing ins and outs of 3D printing, by USC NPNL's Mr. Octavio Marin-Pardo (USC Biomedical Engineering PhD student)
- Synchronous time: Guest lecture and Q&A with Rancho's Emerging Tech Lab Director Andy Lin, MS, ATP (https://www.ranchoemergingtechlab.org/)

3D PRINTING – WHAT IS IT GOOD FOR?

- Rapid prototyping of physical objects
- Often easier to shape than other rigid materials (e.g., wood, steel, etc.)
- Can be customized to precise dimensions and specifications
- A fast, cheap way to make samples of your idea

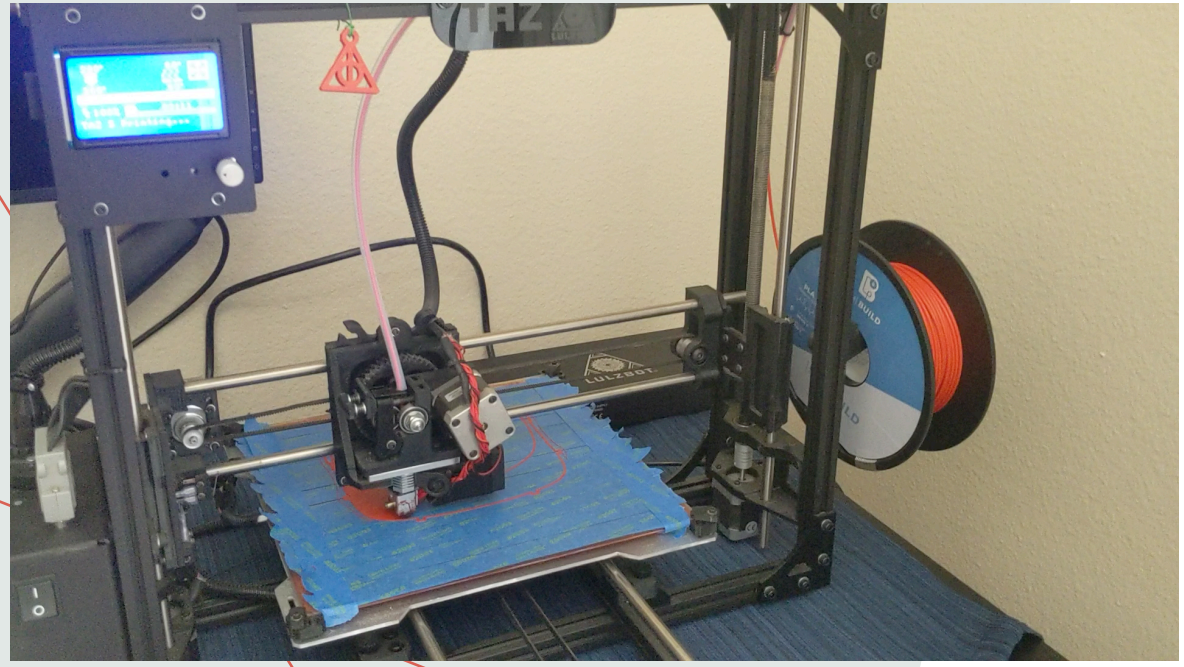


3D PRINTING – BASICS

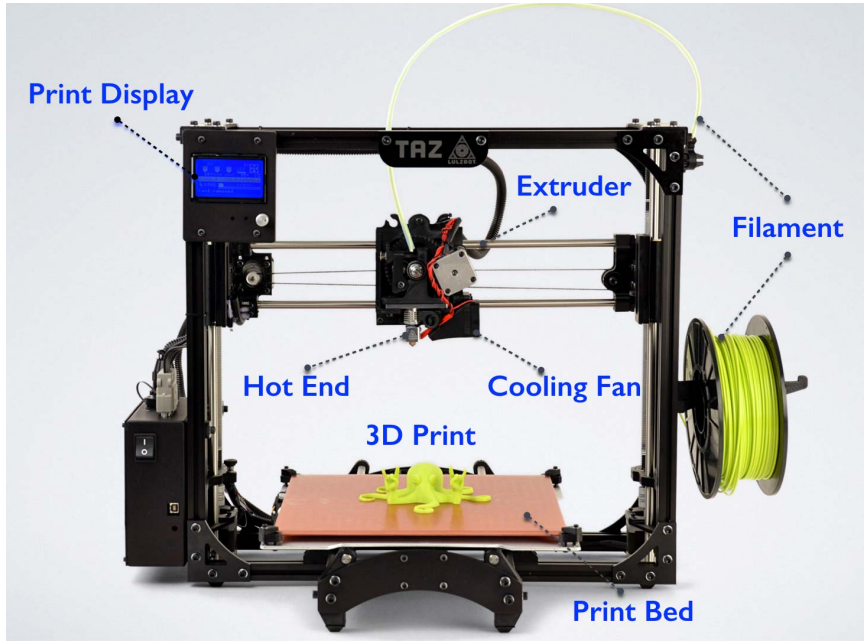


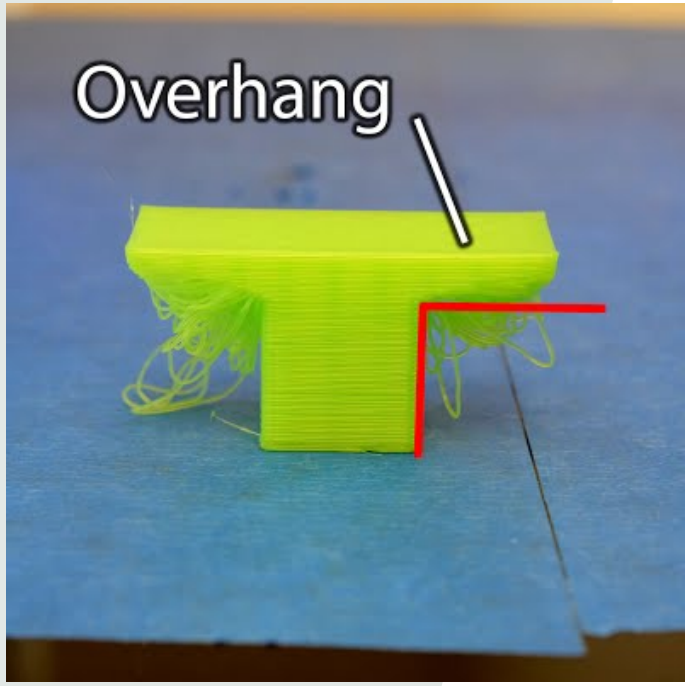
- Requires:
  - 3D design/model of what you want to print (created using software for 3D modeling like Blender, OpenSCAD (CAD=computer aided design), Maya)
  - 3D print software to slice and connect to host (e.g., Cura – may come with printer)
  - A way to connect the design/software to the printer (SD card, HDMI to computer)
  - A filament (choices depend on how rigid/flexible you want the print to be, if you intend to dissolve parts of the structure, colors, etc.)
  - The 3D printer itself, with all it's component (extruder, cooling fan, print bed, print display, power supply…)

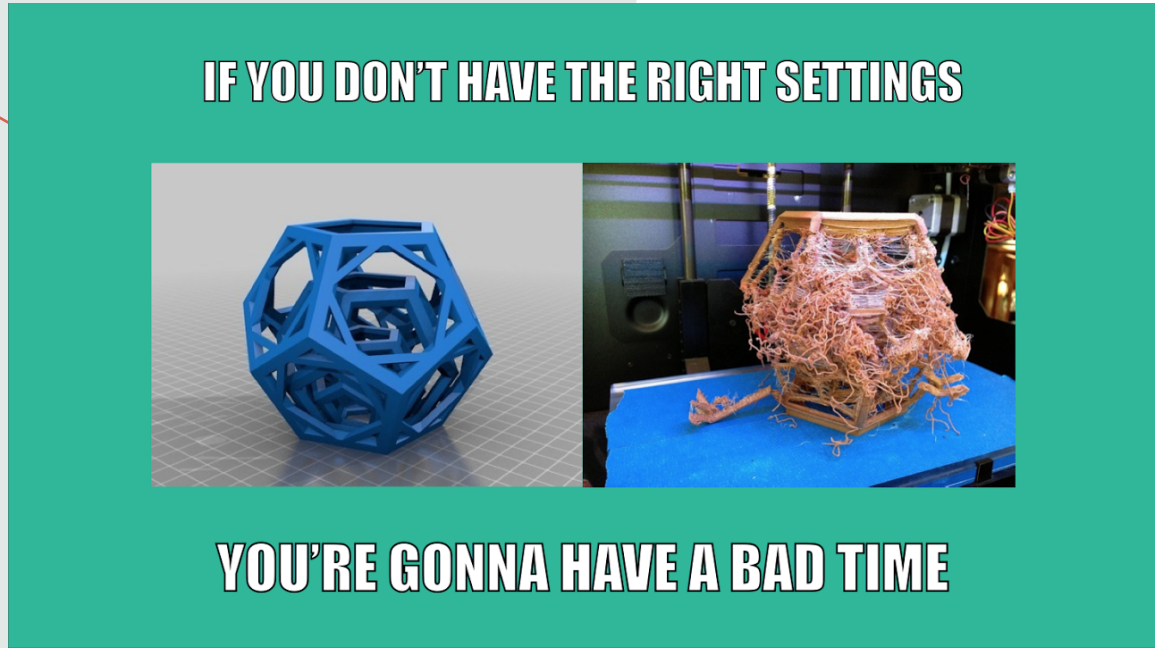
3D PRINTING – BASICS



- Given a design, the printer will “print” or extrude thin layers of filament that build upon one another
- Think of it like a printer, but it prints layers on top of layers (hence 3D)
- You can specify the amount of filament, temperature of extrusion and the print bed, and thickness of layers to create the design







3D PRINTING LIMITATIONS

- Because you are always building up on layers, the model to be printed should be contiguous (e.g., always touching) or have supports that can be removed after.
- The settings (temperature, bed properties, filament) matter a lot!
- Thin layers, or detailed non-contiguous designs, can be tricky
- Object size must be smaller than print area (or glued together)

3D PRINTING LIMITATIONS

- Troubleshooting to get the right print bed temperature and conditions, extruder temperature, filament type, and design specifications can take a long time
- Lots of online forums to troubleshoot and try different things (calibrate printer, painters tape and/or glue stick on the print bed for better adhesion)
- Lots of trial and error and patience!

WHAT ARE SOME THINGS YOU MIGHT WANT TO 3D PRINT & WHY?

- Think about this (and the feasibility of your idea) as we go into the next section where Mr. Marin-Pardo will show you the ins and outs of 3D printing

- Also consider this when participating in our live session where we will have a great lecture and Q&A with Rancho's Emerging Tech Lab Director Andy Lin