A Practical Guide to 3D Printing
Topics

- What is 3D printing?
- Use cases
- Methods and Materials
- The 3D Printer
- 3D Models
- Software
- Computer-Aided Design
- Printing Walkthrough
- Activities: 3D Scanning, AR models
3D Printing

• It's all in the name
• Material is gradually added to form 3D structures
An **additive** manufacturing process
A subtractive manufacturing process
Automated Mill (cutting away material)
3D Printer (adding material)
3D Printing Benefits

• Simple (relatively)
• Fast (comparably)
• Inexpensive (to a point)
• Time and material efficient
What is it good for?

- Fashion design
- Medical industries
- Vehicle production
- Precision manufacturing
- Construction
- Art
- Food preparation
- Rapid prototyping
- EVERYTHING
Large-Scale 3D Printing
For research...
Methods

• Fused Deposition Modeling (FDM)
• Stereolithography (SLA)
• Digital Light Processing (DLP)
• Selective Laser Sintering (SLS)
Fused Deposition Modeling (FDM)

- Filament based
  - ABS plastic
  - PLA plastic
  - Nylon
Fused Deposition Modeling (FDM)
Stereolithography (SLA)

- Liquid based
- Photopolymer resin
Stereolithography (SLA)
Digital Light Processing (DLP)

- Liquid based
- Photopolymer resin
Digital Light Processing (DLP)
Selective Laser Sintering (SLS)

- Powder based
  - Most thermoplastics
  - Primarily nylon
Selective Laser Sintering (SLS)
An FDM 3D Printer

- Print bed
- Filament reel
- Extruder
- Motors + actuation
- Power supply
- Control board
3D Models

• Many file types, but "STL" files are the norm
• Download
• Create your own!
  • Computer-Aided Design (CAD)
  • 3D Scanning
Download

Hobbyist
- Thingiverse
- TinkerCAD
- YouMagine
- MyMiniFactory

Semi-Pro
- GrabCAD
- TurboSquid
Printer Software

• A **slicer** is software to get you from 3D model -> 3D print

• Each printer will have recommended slicer

• Many open-source options
Computer-Aided Design

Browser-Based
- TinkerCAD
- SketchUp

Download
- Blender
- FreeCAD
3D Printing Time

1. Read/watch a how-to guide for your printer!
2. Determine appropriate settings for your printer (usually default)
3. Level the print bed
4. Pre-heat the extruding nozzle and print bed
5. Load filament into extruder
6. “Slice” the 3D file
7. Export to printer/print part
Slicer Walkthrough
No Printer? No Problem

• Use the **MERGE Cube**
• Physical handle in the real world that allows for AR projection of models from a mobile device
MERGE Cube

• We get a sense of depth from motion, not just stereo vision.
• Motion parallax grants realism to virtual models
• Buy or make your own
Try:

- Make a MERGE Cube account at https://www.miniverse.io/cube
- Download *Object Viewer for MERGE Cube* app
- Download a 3D model (.STL file) from
  - Thingiverse.com
  - Tinkercad.com/search
- Upload your 3D file to your MERGE account
  Menu -> My Objects -> Add New