



Smart 3D Printing Surveillance: Detecting Failures with Computer Vision and Machine Learning

Christine Li

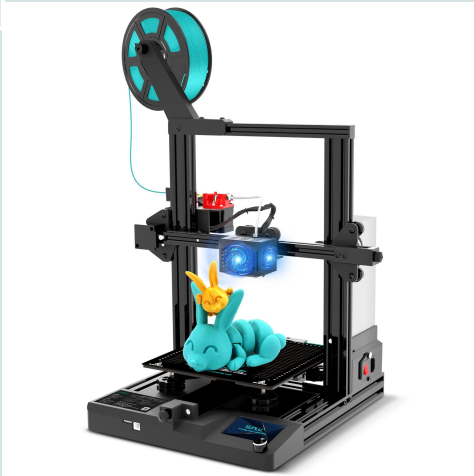
The image features a light blue background with a white grid pattern in the top-left and bottom-right corners. In the top-left corner, there is a pink sphere with a gold band around its equator and a grey cylinder. In the bottom-right corner, there is a green ring and another grey cylinder. The text "What is 3D printing?" is centered in the middle of the image.

What is 3D printing?

Types of Printers

FDM

Filament-based



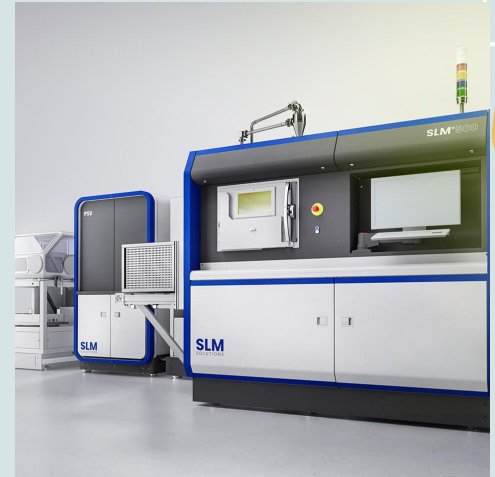
SLA

Resin liquid hardened by
UV light



SLM

Powder-based



Parts of a 3D Printer



01

**Motion
controllers**

Moves on the XYZ axis

02

Print bed

Heated vs. non-heated
platform

03

Extruder

Unloads the filament

04

Frame

Structure for stability

05

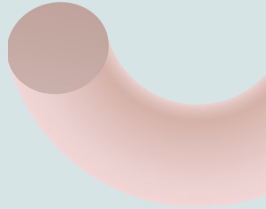
Connectivity

Power for the printer

06

Filament

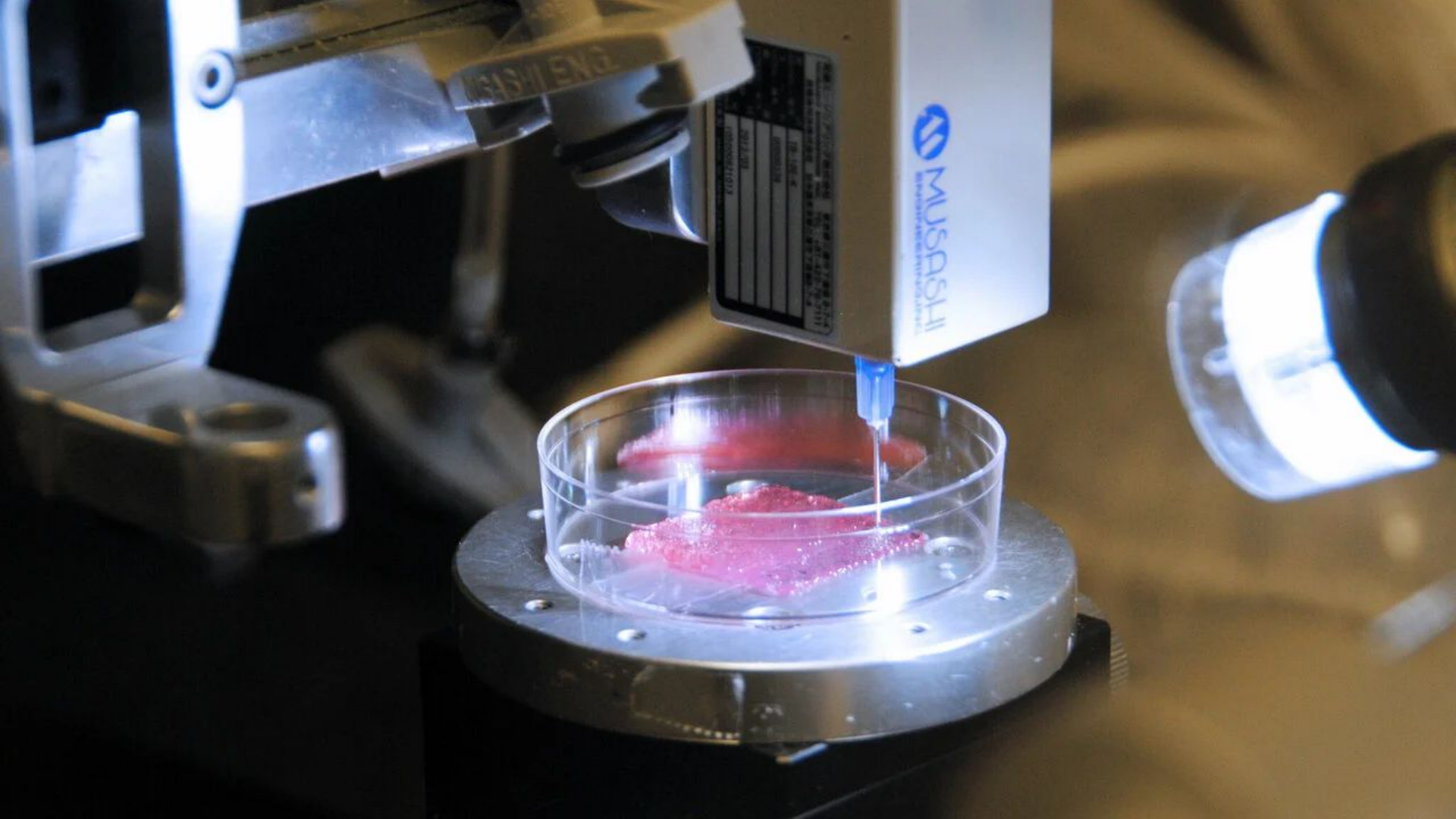
Material used to print





**Why should
you care?**





MUSASHI

MODEL	MP-100
TYPE	DISPENSER
REVISION	1.0
DATE	2000.01.01
MANUFACTURED BY	MUSASHI ELECTRIC CO., LTD.
ADDRESS	1-1-1, HONJO, NAGATSUTA, TOKYO 113, JAPAN
TEL	03-5727-1111
FAX	03-5727-1112
E-MAIL	SALES@MUSASHI-ELECTRIC.COM
WWW	WWW.MUSASHI-ELECTRIC.COM

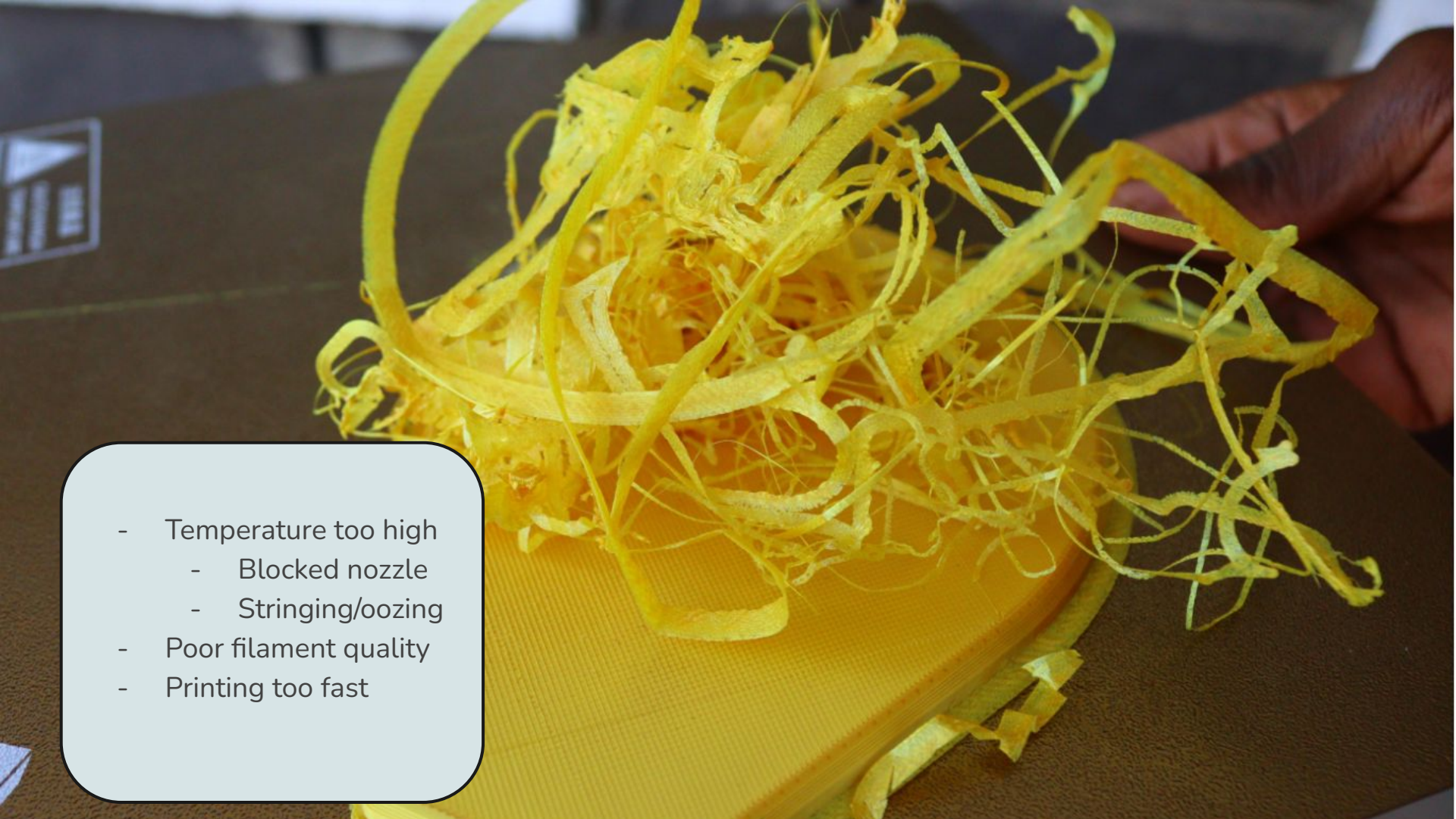
MUSASHI
THE QUALITY OF YOUR EXPERIMENT





A pink sphere with a gold band is positioned at the top center, partially overlapping a white grid. The grid is a 10x10 square pattern. To the right of the grid, the text "It can fail." is written in a dark teal, serif font. On the far right edge, a grey cylindrical object is partially visible.

It can fail.



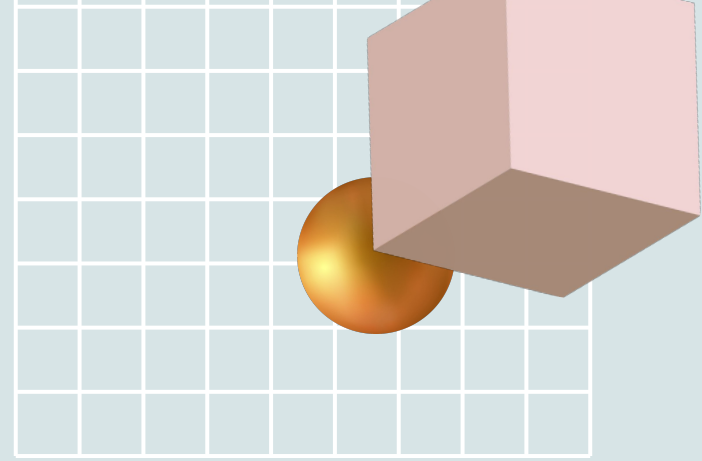
- Temperature too high
 - Blocked nozzle
 - Stringing/oozing
- Poor filament quality
- Printing too fast

Previous Works



Automated Process
Monitoring in 3D Printing
Using Supervised Machine
Learning (Delli et al.)

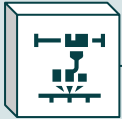
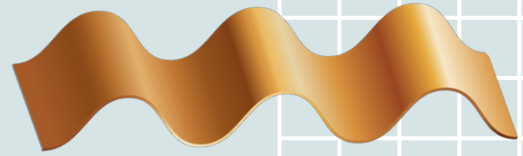
Detects the quality of 3D printed parts
(more specific)



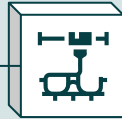
"A study of failure
detection and prediction
for FDM 3D printers" (J.
Cao et al.)

- Proposes real-time monitoring

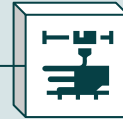
My Solution



Create an AI
model

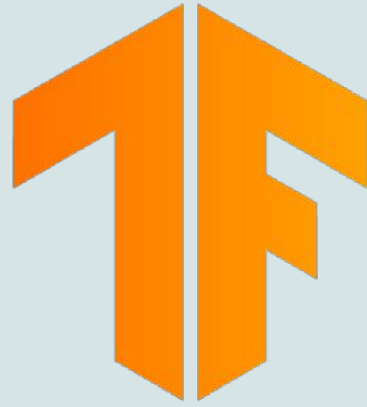


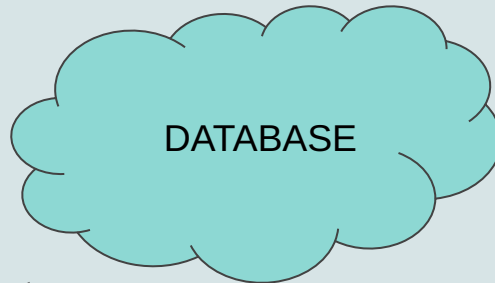
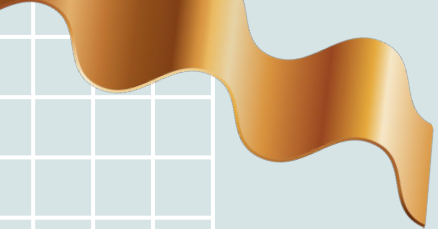
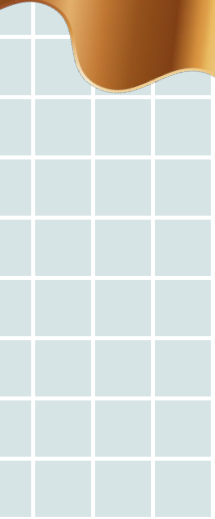
Design an app



Test for results

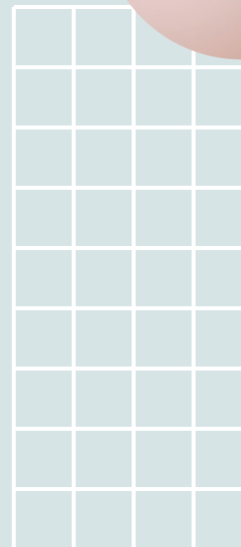
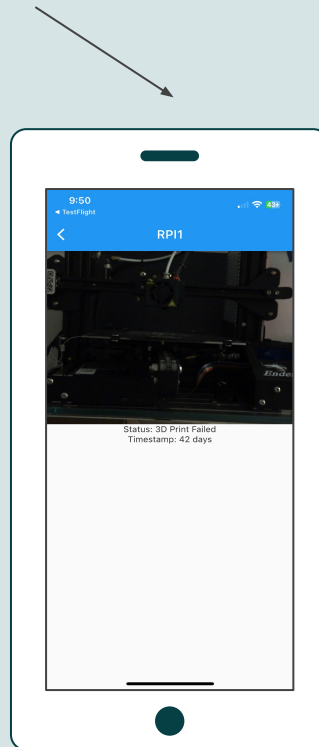
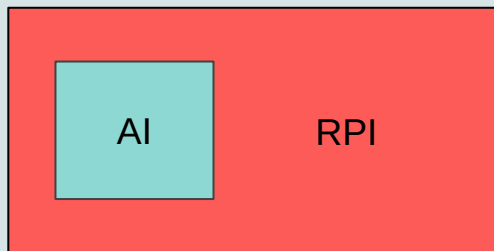




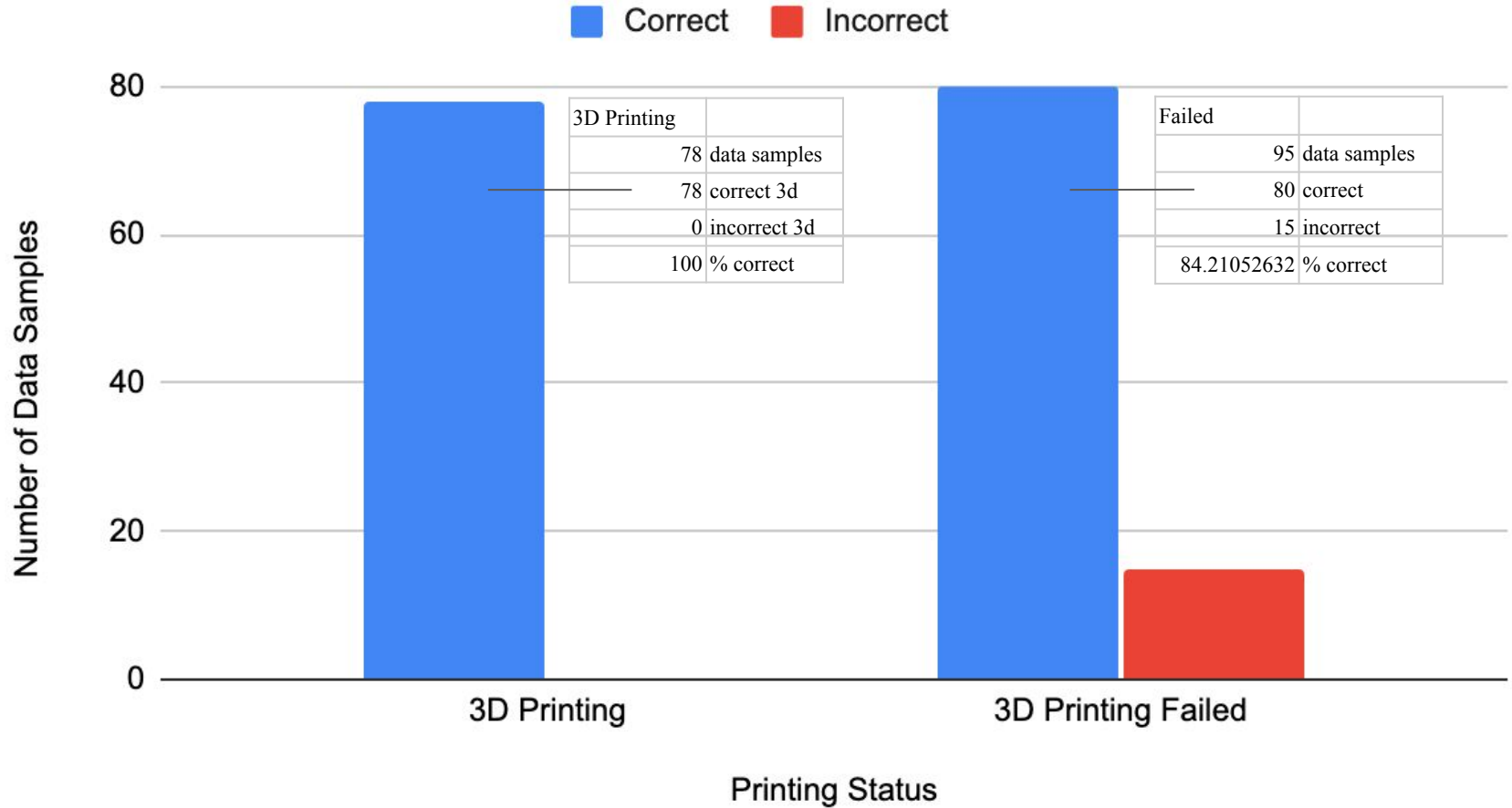


1. Photo
2. Status
3. Timestamp

CAMERA

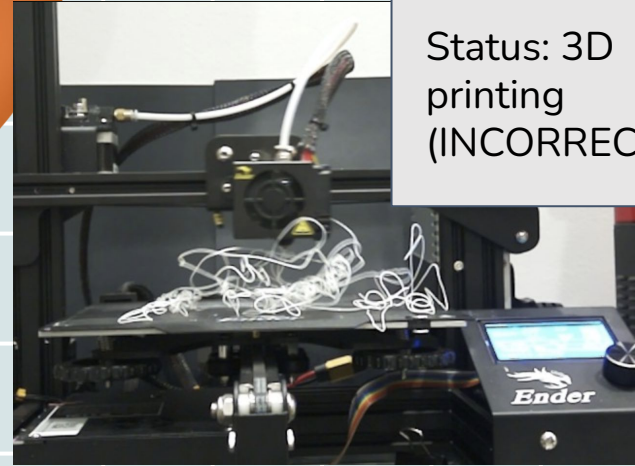


3D Printing Samples

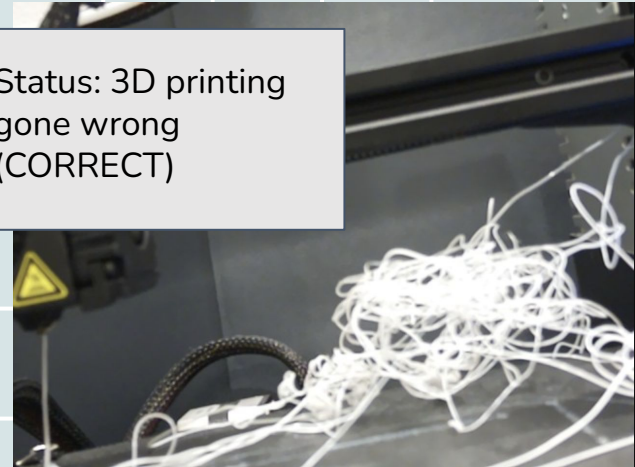


91.3%
correct

3D printing: 78-0; 3D printing
failed: 80-15-18



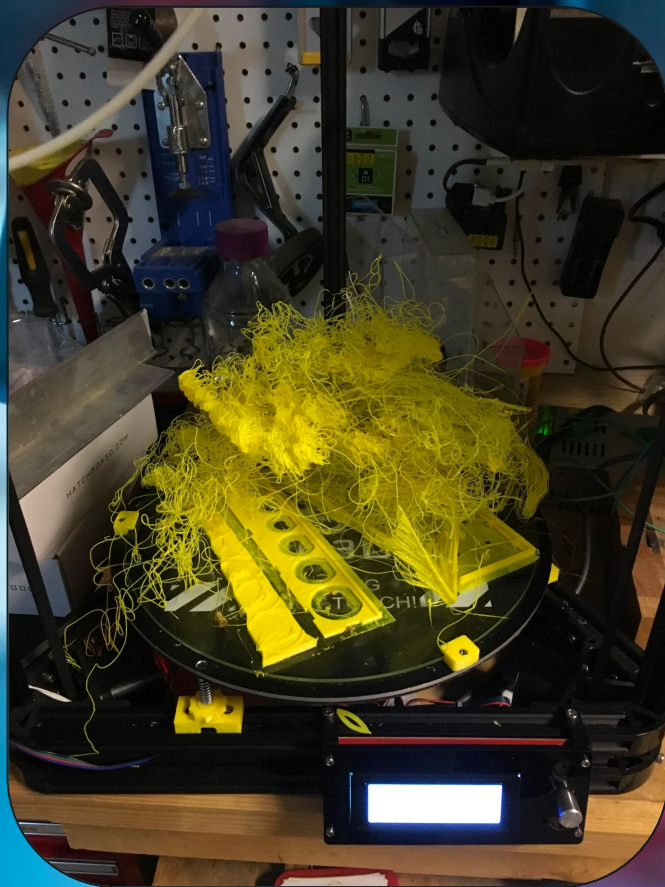
Status: 3D
printing
(INCORRECT)



Status: 3D printing
gone wrong
(CORRECT)



Challenges



Future Work

- Explore innovative applications (e.g. crane games)
- More experiments
 - Training my model with more pictures
 - Running more trials with different types of backgrounds, colors, printers
 - Types of failures (e.g. power outage)
- Improving aesthetic of the app



Thank you!