AI Project Proposal 3D printing defect (spaghetti) detection

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Contents

1 Introduction

- **Focus:** Detecting 'spaghetti' defects in FFF (Fused Filament Fabrication) 3D printing using AI image recognition.
- **Relevance:** Reducing material waste and improving safety in personal 3D printing.

2 Domain Understanding

- **Problem:** 'Spaghetti' - Figure 1 defects due to print malfunctions or improper adjustments. The 'Spaghetti' error in 3D printing happens when the filament is extruded in a disorganized manner, resembling a pile of spaghetti, usually due to the print not adhering to the build plate or the printer losing its coordinates.

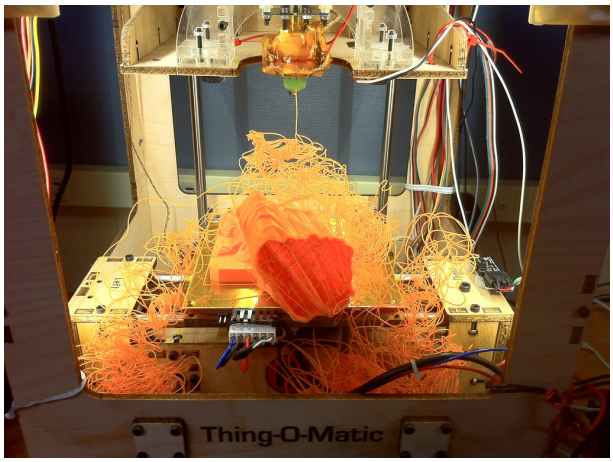

Figure 1: Extruded filament that resembles spaghetti

- **Research:** Focused on understanding the 3D printing process and defect characteristics.

3 Data Sourcing

- **Data Type:** Images (.jpeg, .png) of 3D prints, both defective and non-defective.
- **Collection:** Homemade pictures and open-source online repositories.

4 Analytic Approach

- **Objective:** Identify 'spaghetti' defects in 3D printed models.
- **Target Variable:** 'Defect Status' (0 for absent, 1 for present).

5 Data Preparation

- **Process:** Standardize image size/format, normalize pixel values, annotate, and label.

6 Modeling

- **Approach:** Use YOLO variants for defect detection.
- **Metrics:** IoU, AP, mAP, Precision, Recall, F1 Score.

7 Conclusion

- **Impact:** Enhancing quality control in 3D printing, reducing waste and risks.