

2025 12 17

Reassembling Vision

Classifying and Reusing Model-Making Materials as a **Playful Collaboration**

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SCI 6492: QUANTITATIVE AESTHETICS: INTRODUCTION TO
MACHINE LEARNING AND PERCEPTUAL MACHINES FOR DESIGN

Context

Problem

Disassembly Isn't Engaging or Meaningful (Yet)

- At GSD and other design schools, physical models are still essential—but after reviews, most materials are quickly disassembled and discarded. Foam, chipboard, wood, and plastics are rarely sorted correctly, and existing disassembly guidelines feel instructional rather than engaging.

Opportunity

Turn Disassembly Into a Participatory, Playful Experience

- Advances in computer vision make it possible to automatically detect and classify materials from images.
- This can quantify material usage and identify recyclable vs. non-recyclable streams.
- Integrating such tools supports sustainable design workflows and material traceability in education.

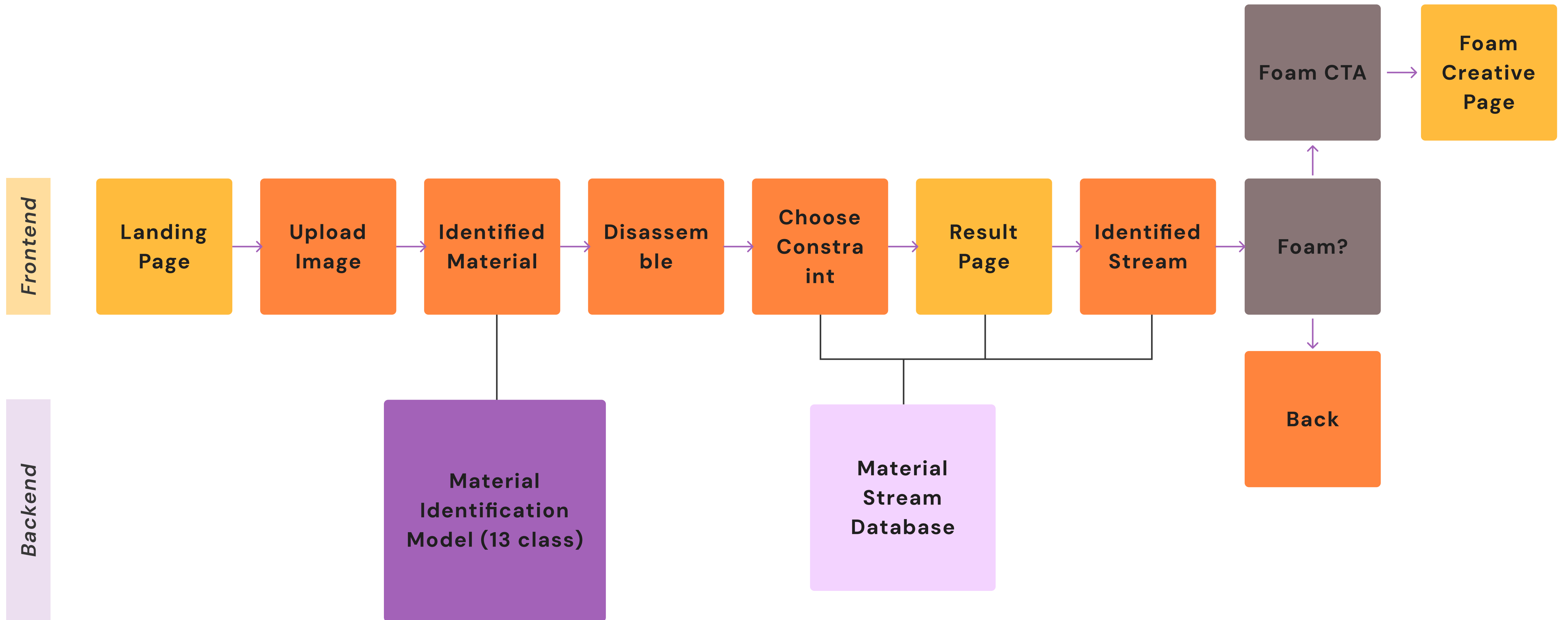
Goal

Build an Interactive System Inspired by GSD's Disassembly Guidelines That Makes Reuse

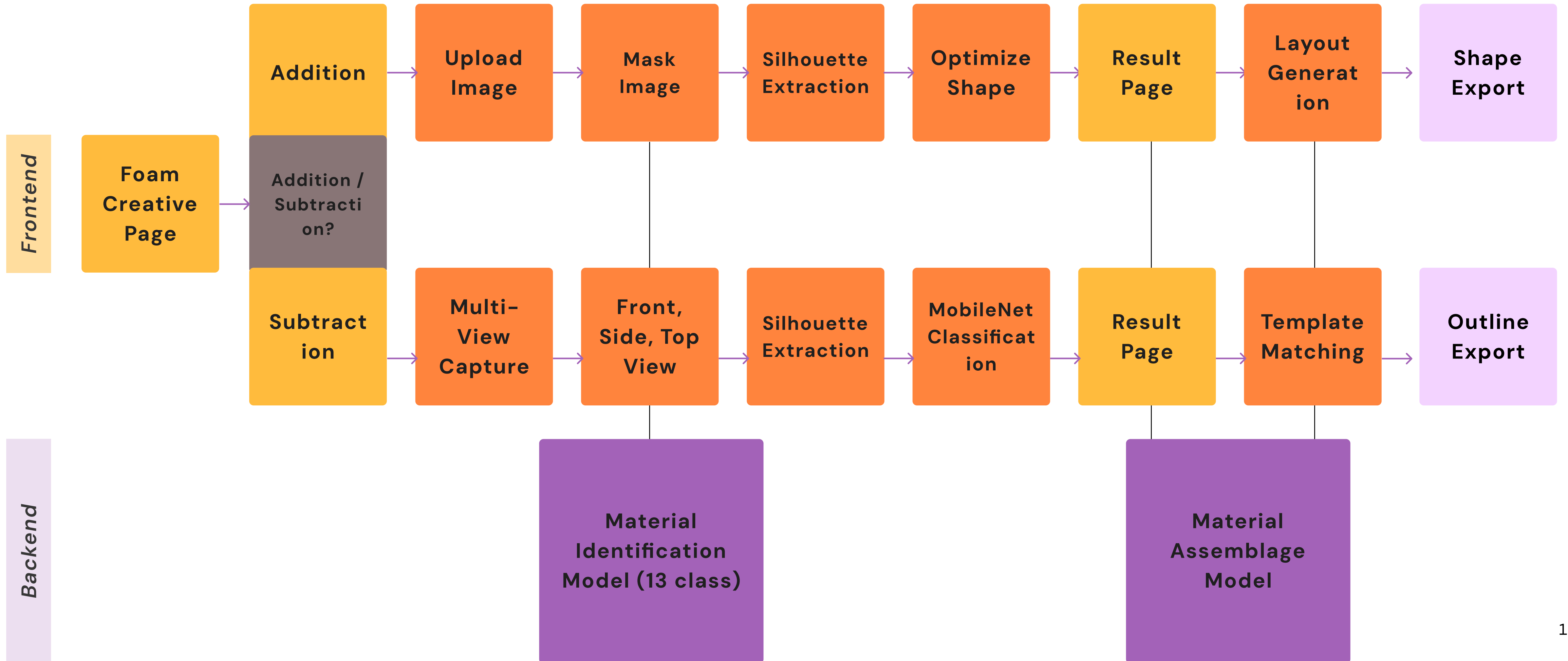
Fun

- Develop a web-based interface using image classification to:
 - Detect and segment materials in model photos.
 - Identify their type and recycling stream.
 - Provide visual feedback on recyclable vs. non-recyclable composition.
- Integration with AR or scale calibration can allow accurate material quantification.

User Flow - 1. detective

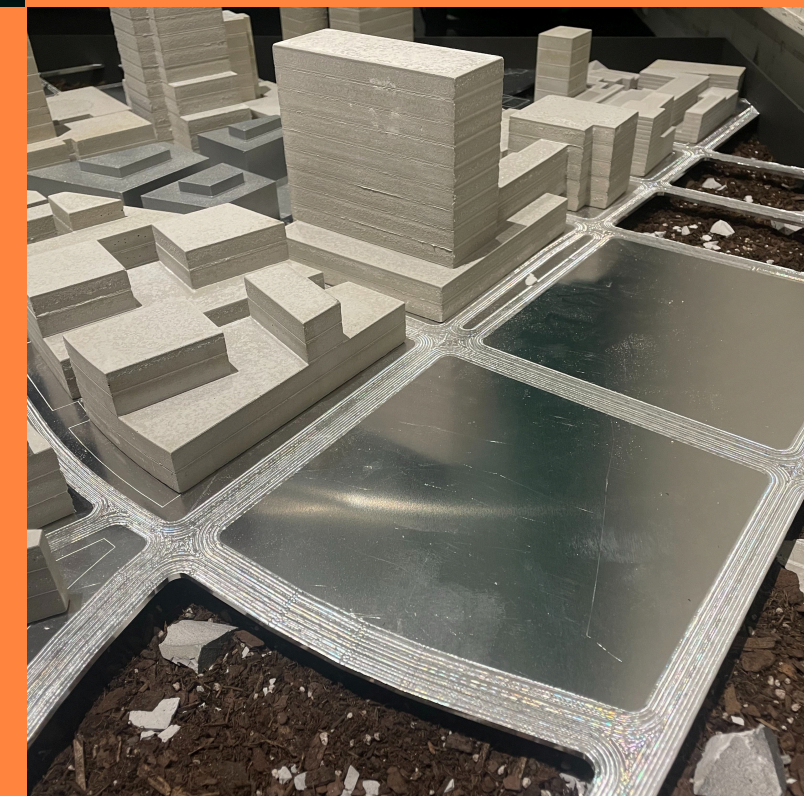
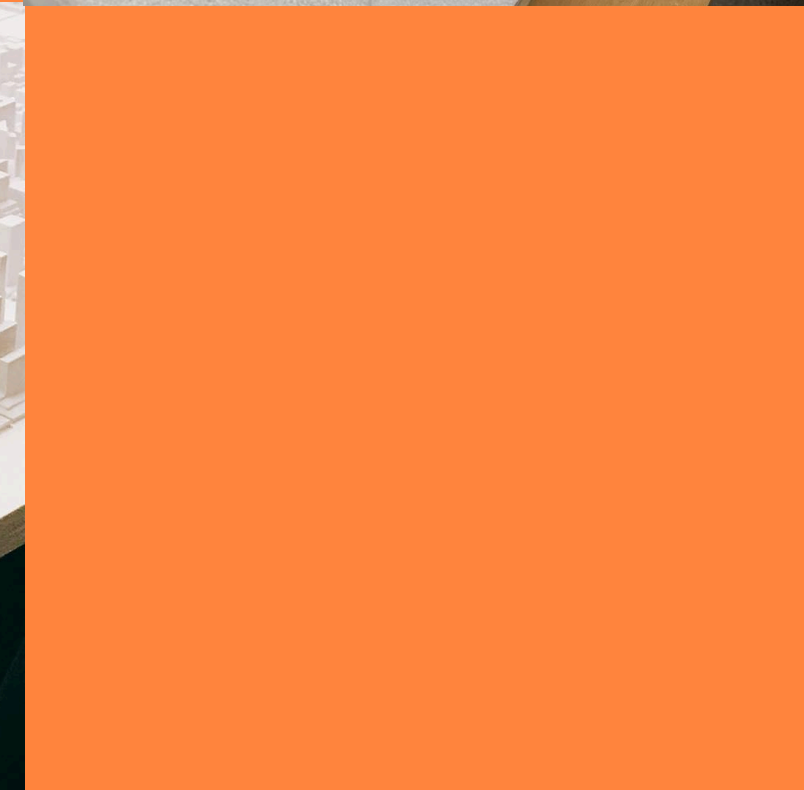


User Flow - 2. creative

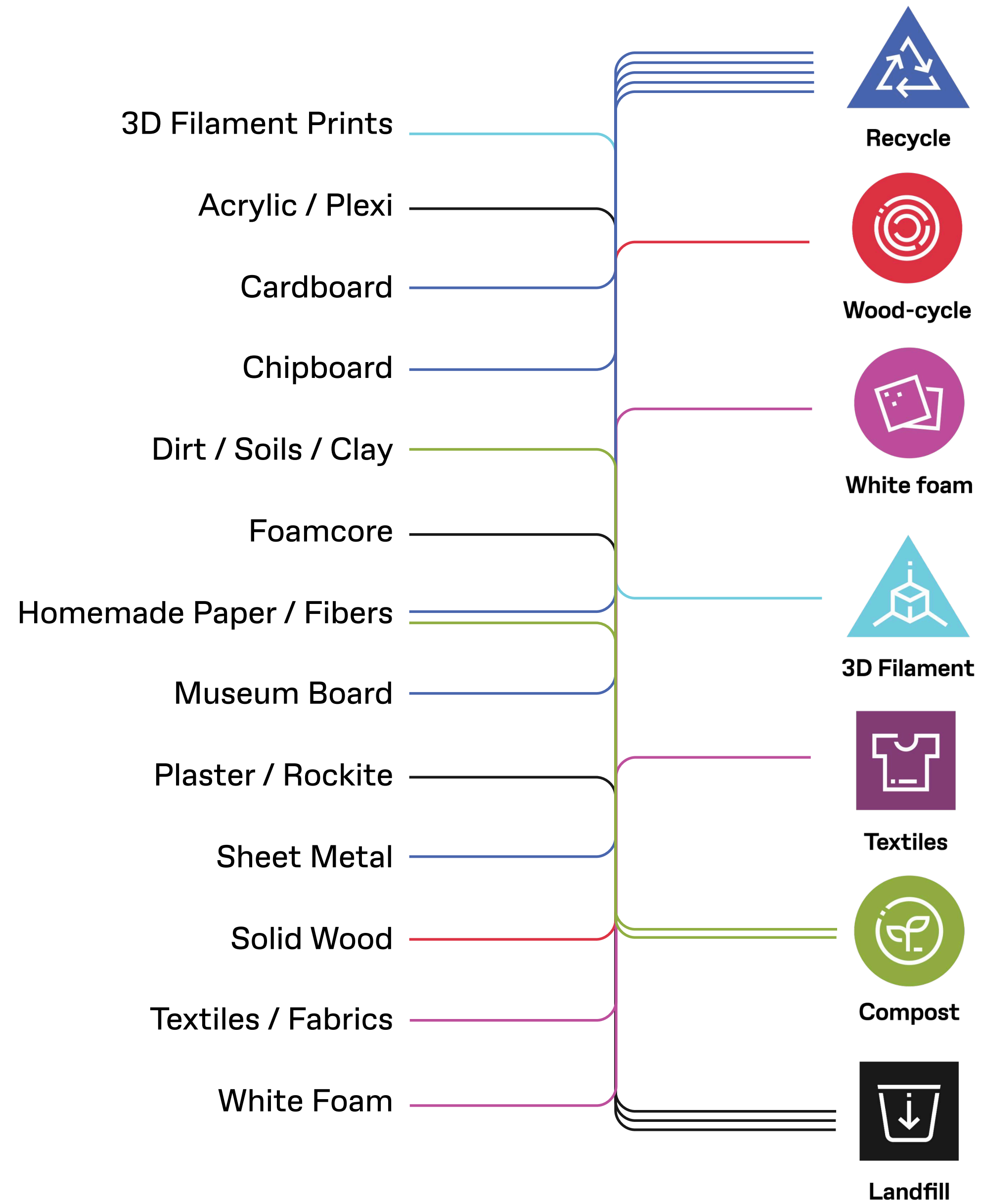


1. detective

Model Examples



Classifier List

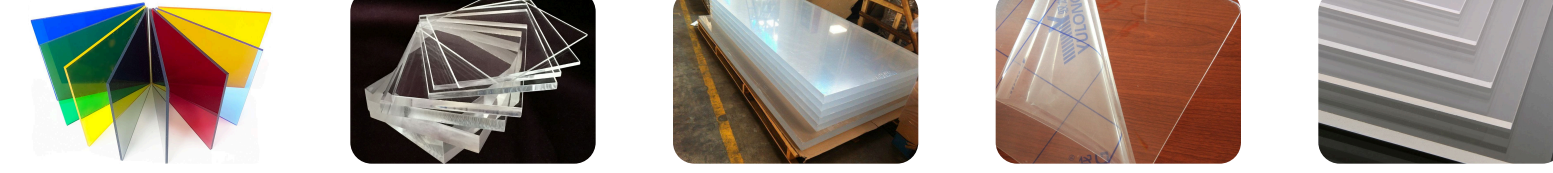


Classifier List

3D Filament Prints



Acrylic / Plexi



Cardboard



Chipboard



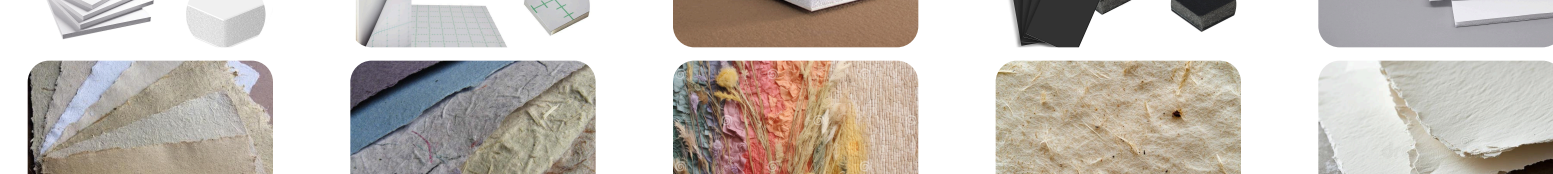
Dirt / Soils / Clay



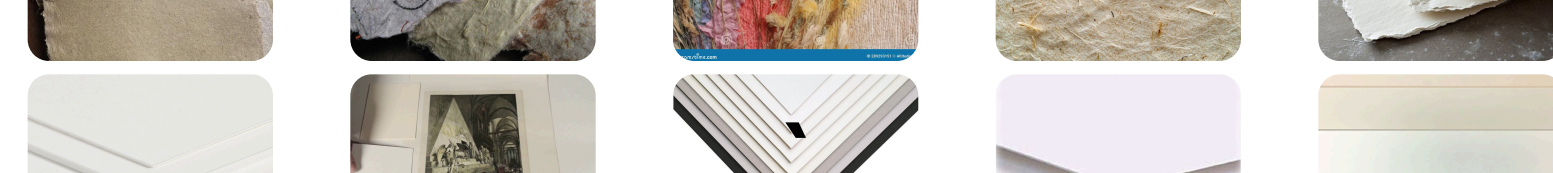
Foamcore



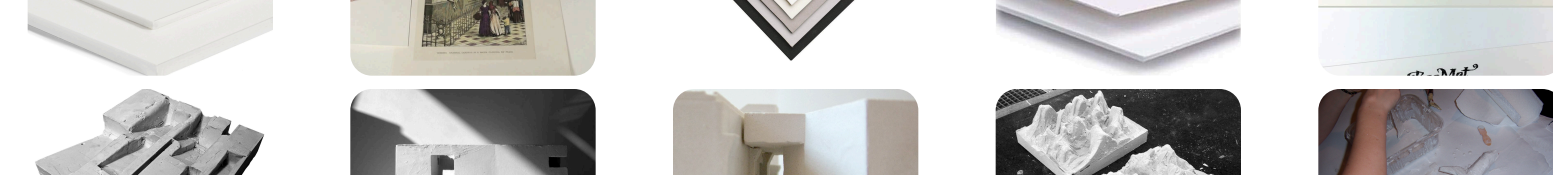
Homemade Paper / Fibers



Museum Board



Plaster / Rockite



Sheet Metal



Solid Wood



Textiles / Fabrics



White Foam



Model Test

Results

non-training materials



Acrylic_Plexi
(30.22%)



Plaster_Rockite (99.40%)



Sheet_Metal
(52.32%)



Sheet_Metal
(95.75%)



Plaster_Rockite (76.03%)

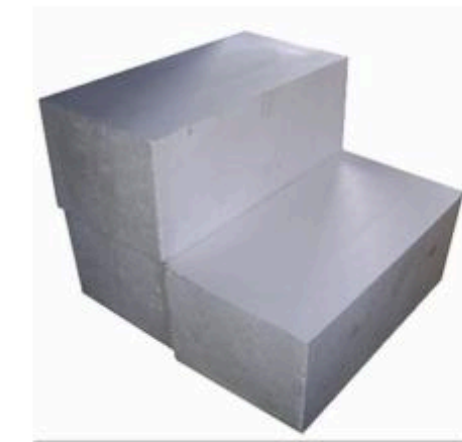


Solid_Wood
(59.52%)

training material

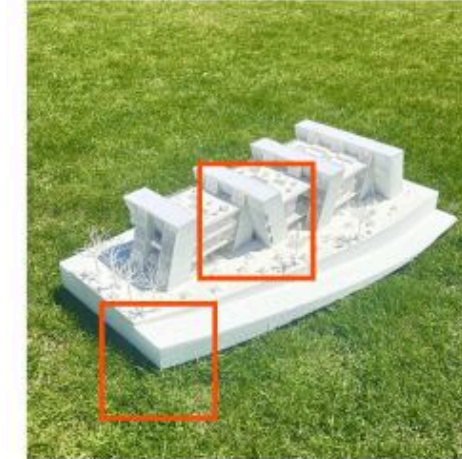


Dirt_Soils_Clay (96.30%)



White_Foam (77.28%)

Check: blur texture



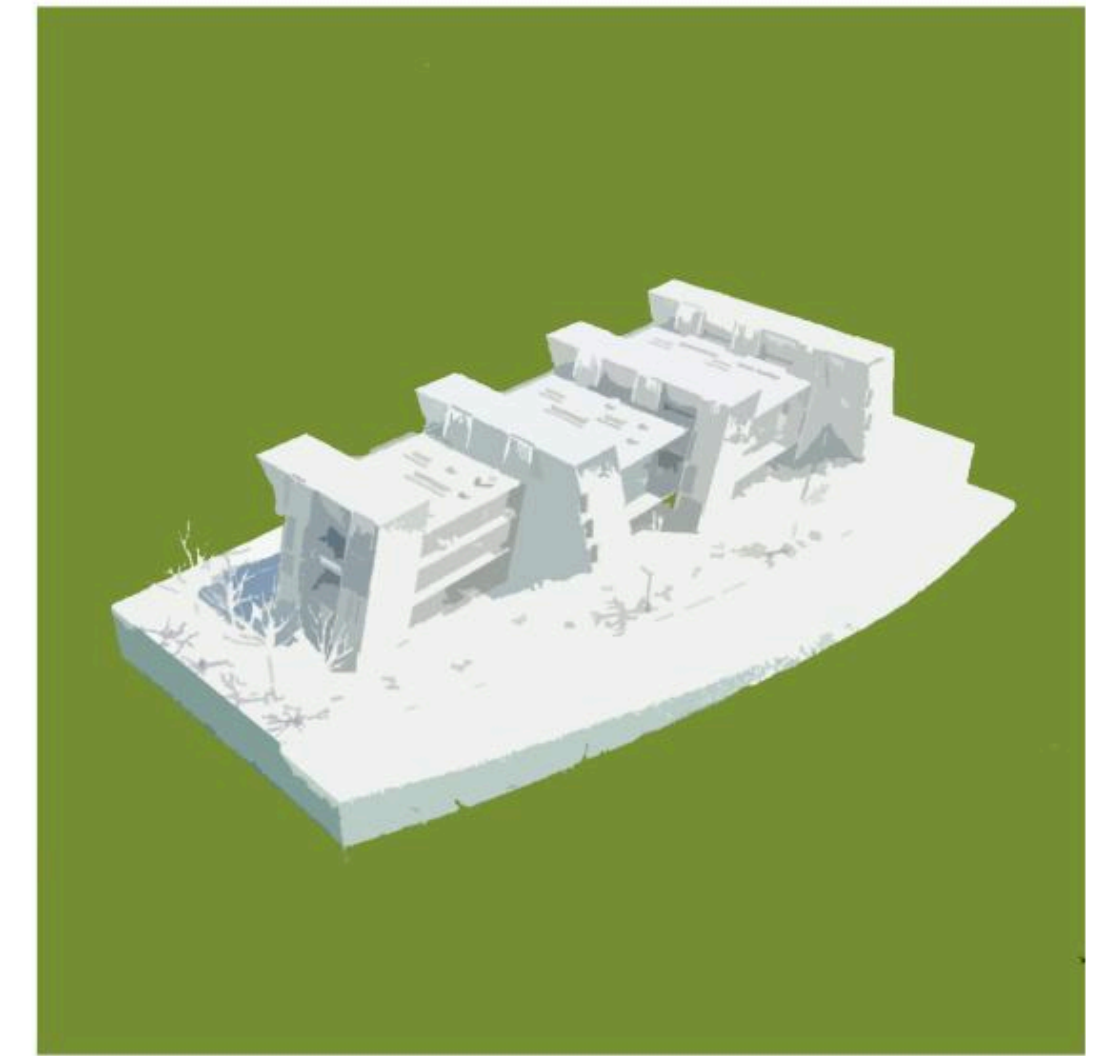
Plaster_Rockite
(99.77%)



Sheet_Metal (93.47%)



White_Foam
(95.84%)



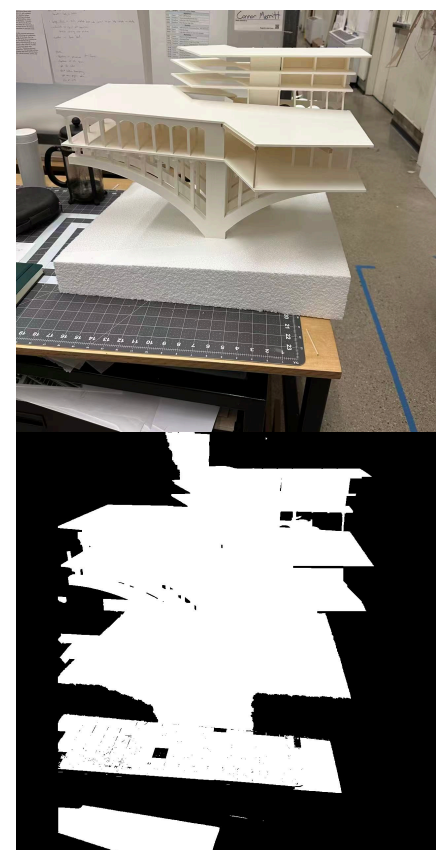
3D_Filament_Prints (83.72%)

Model Test

center
region =
80%

iteration
= 1

mask1



Identify from color boundry

window
size =
112

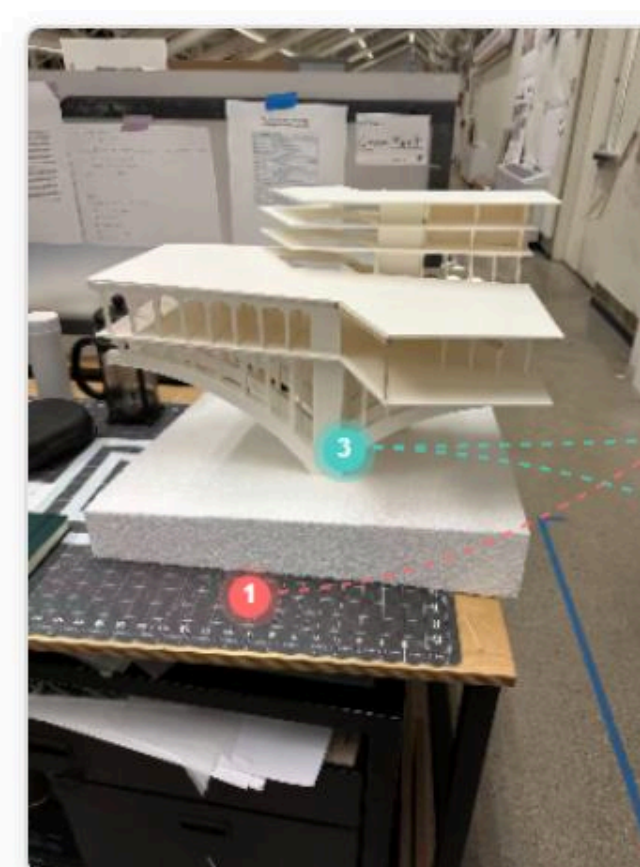
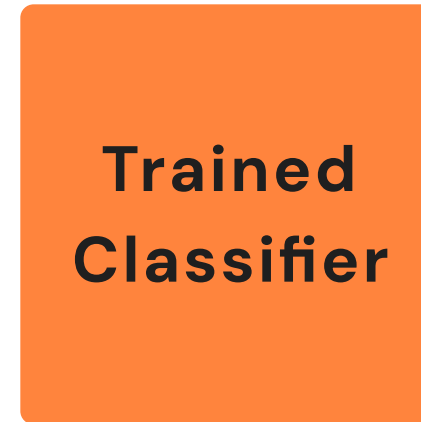
mask2



Identify from texture
set $k > class$ for redundancy
class = 13

window
size =
224




identify



Identify from trained syntax

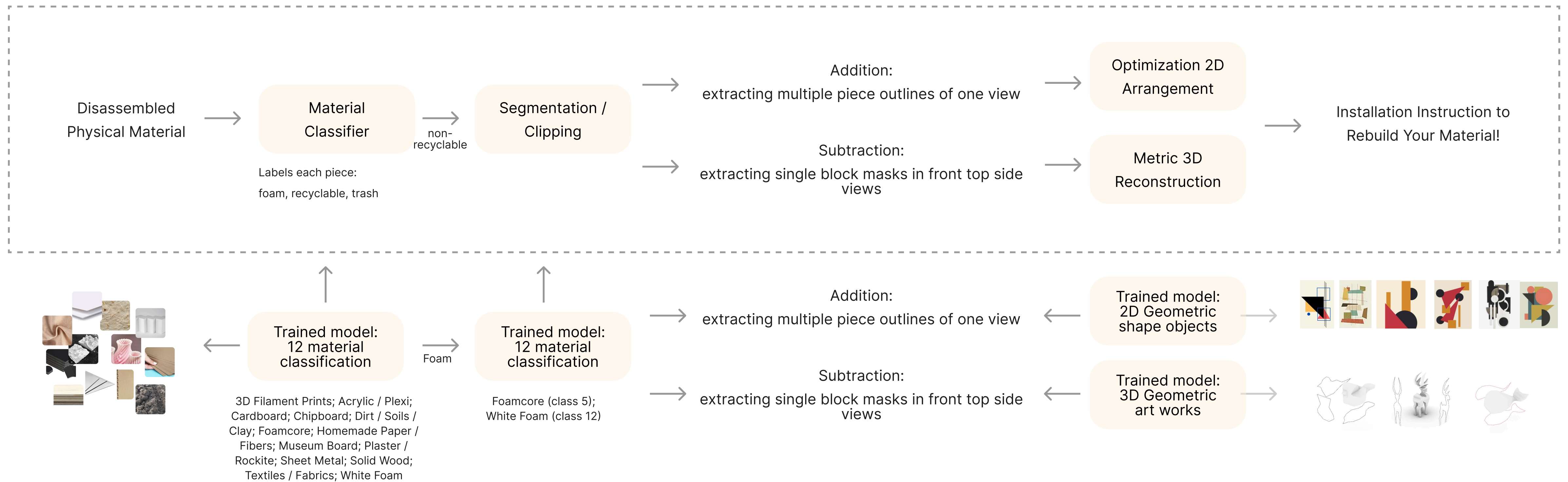
Detected Materials

3 items

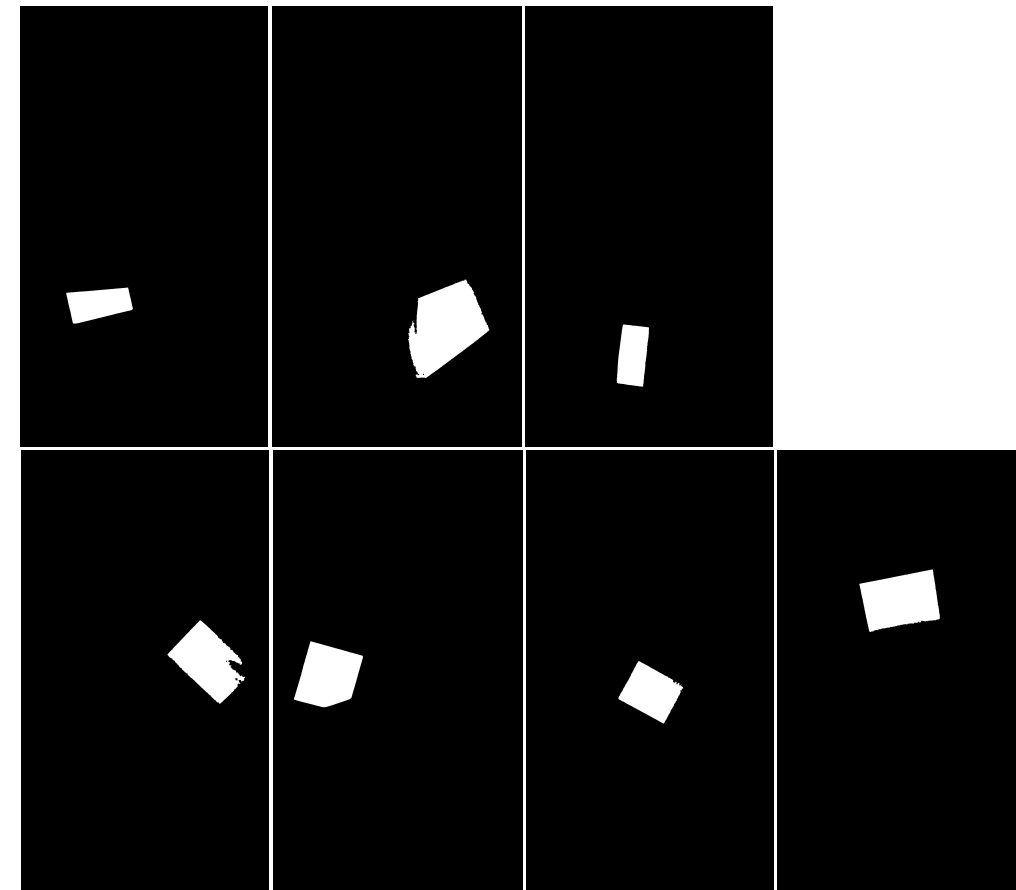
1		Foamcore ⚠ Foam material	Foamcore	×
2		Acrylic Plexi	Acrylic Plexi	×
3		MuseumBoard	MuseumBoard	×

1. creative

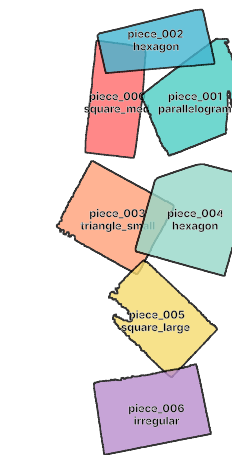
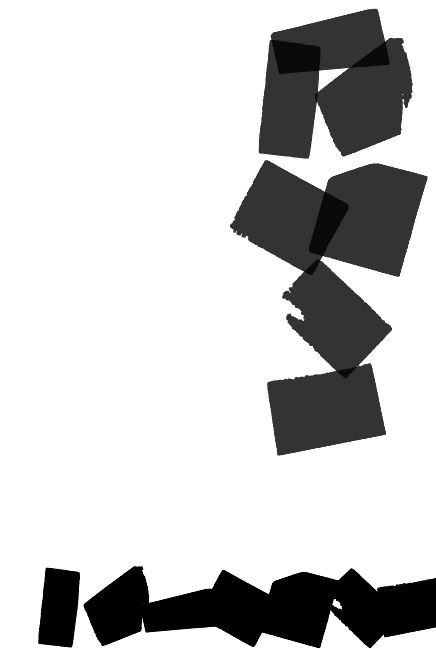
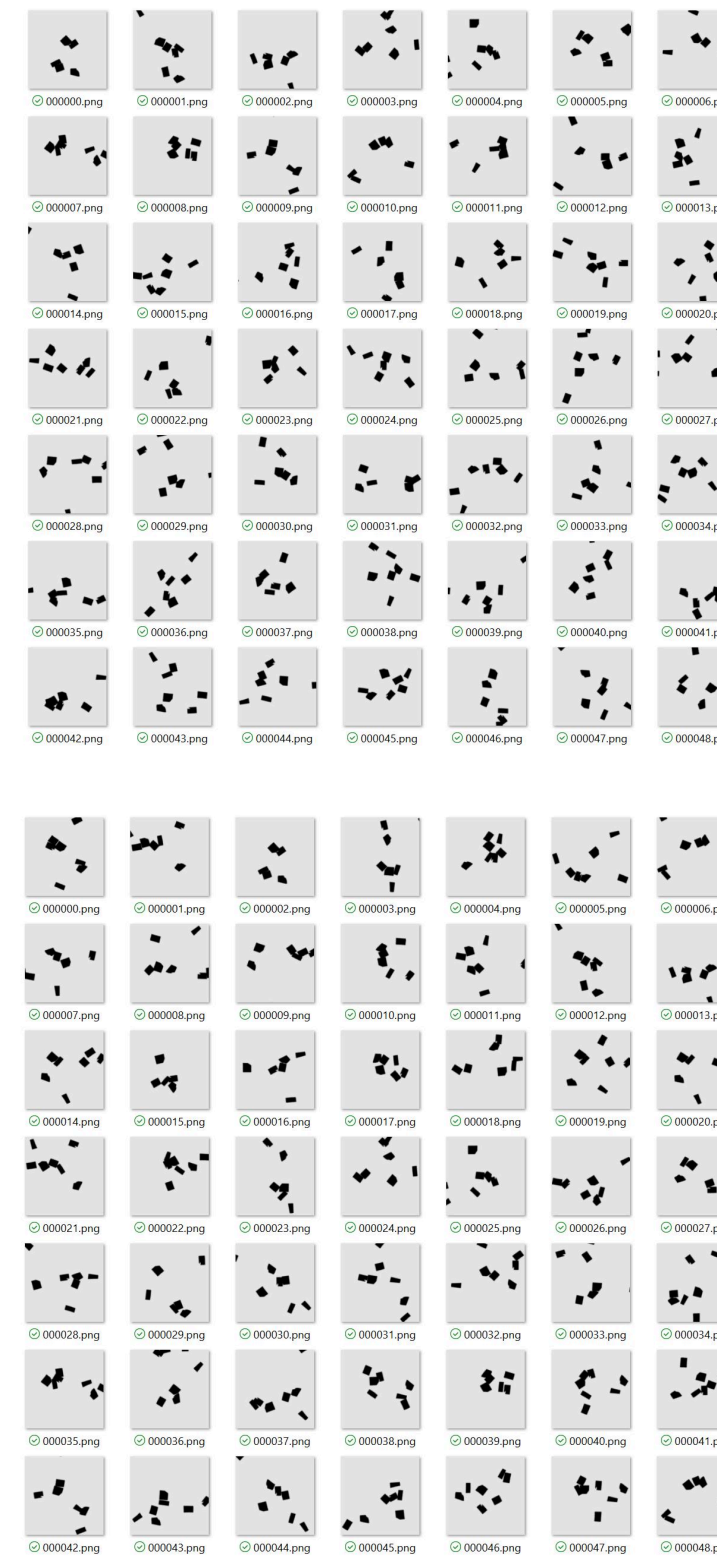
System Overview



Addition



TextPromptOptimizer

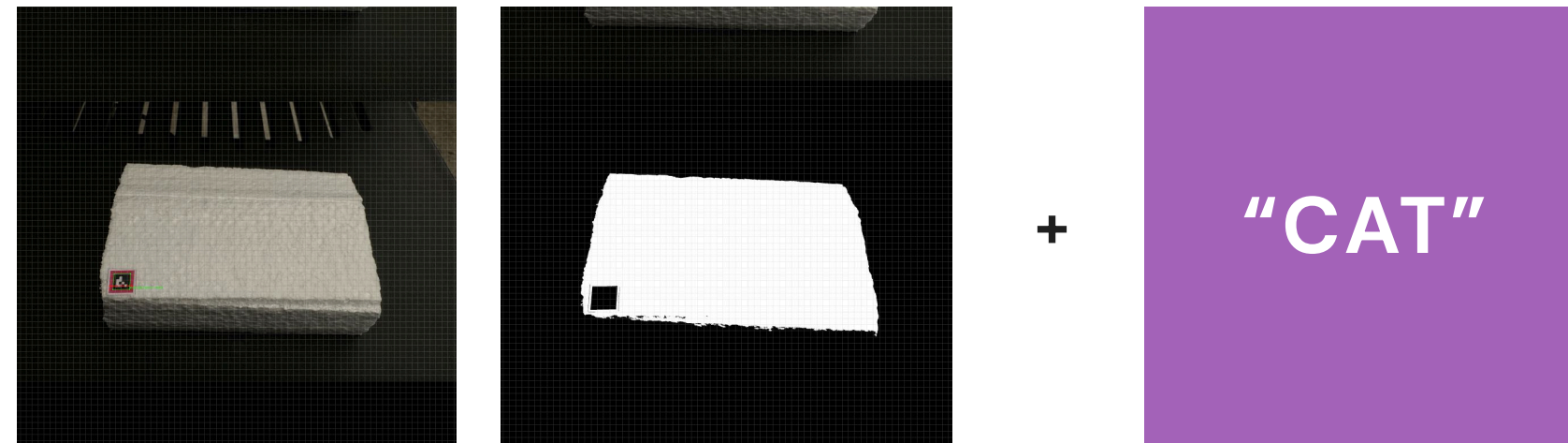


“building”

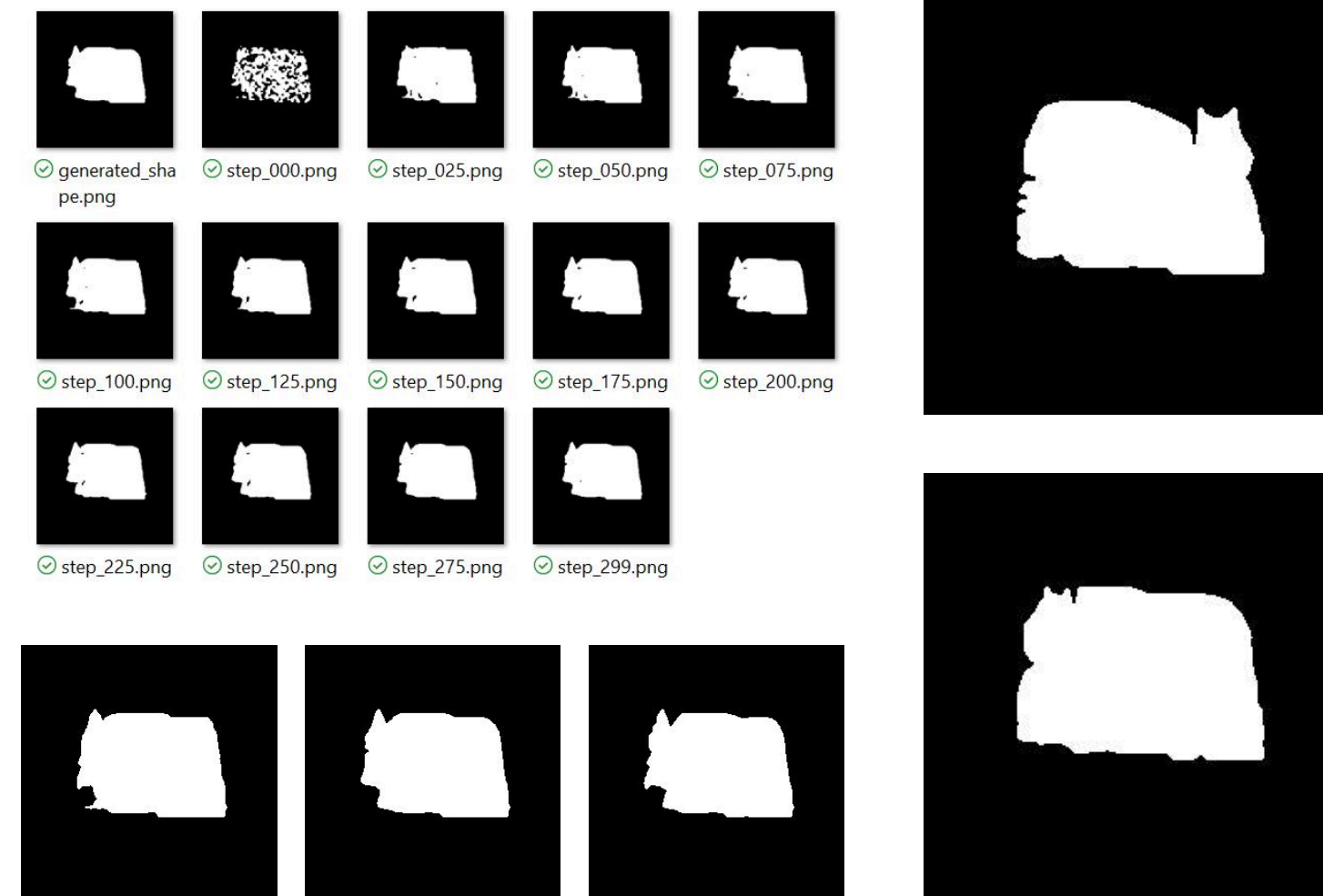


“row house”

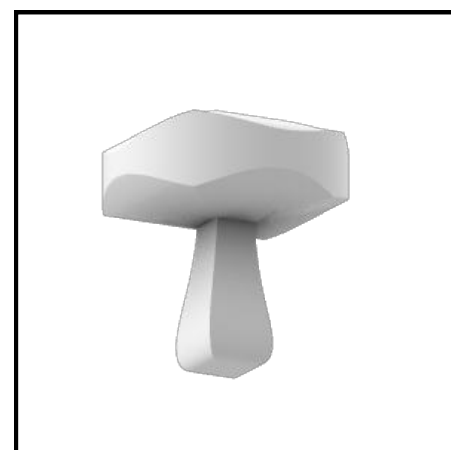
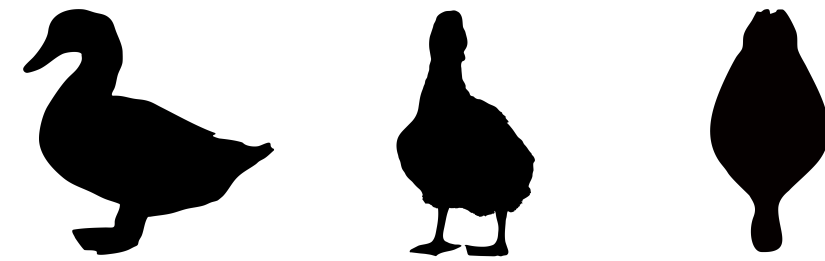
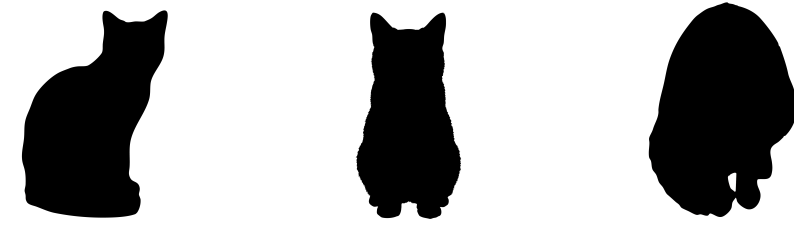
Subtraction



Clip + Shape Generator



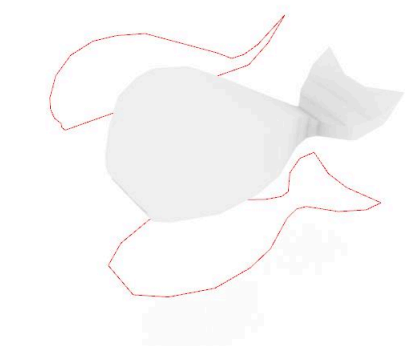
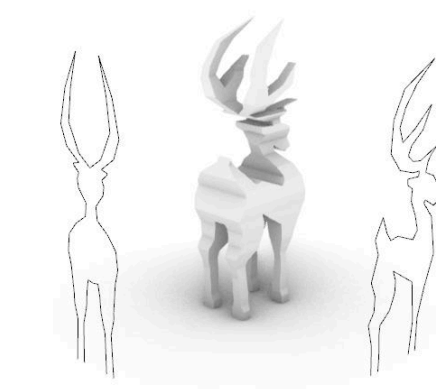
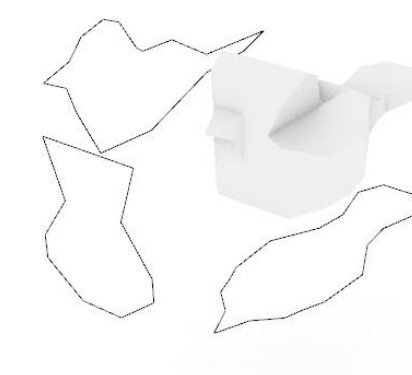
Subtraction



MobileNet CNN

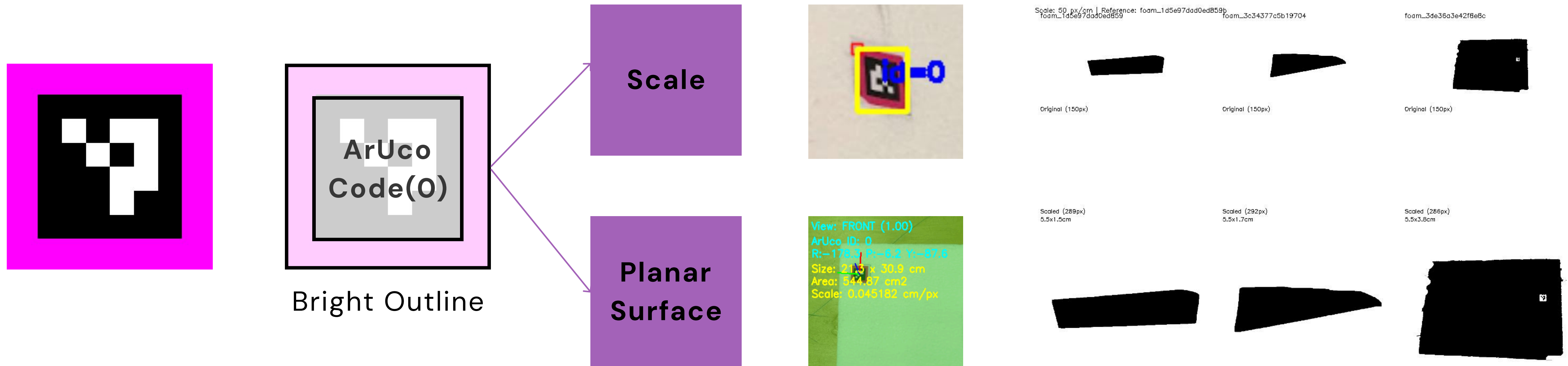
Read
and
choose

Recreation



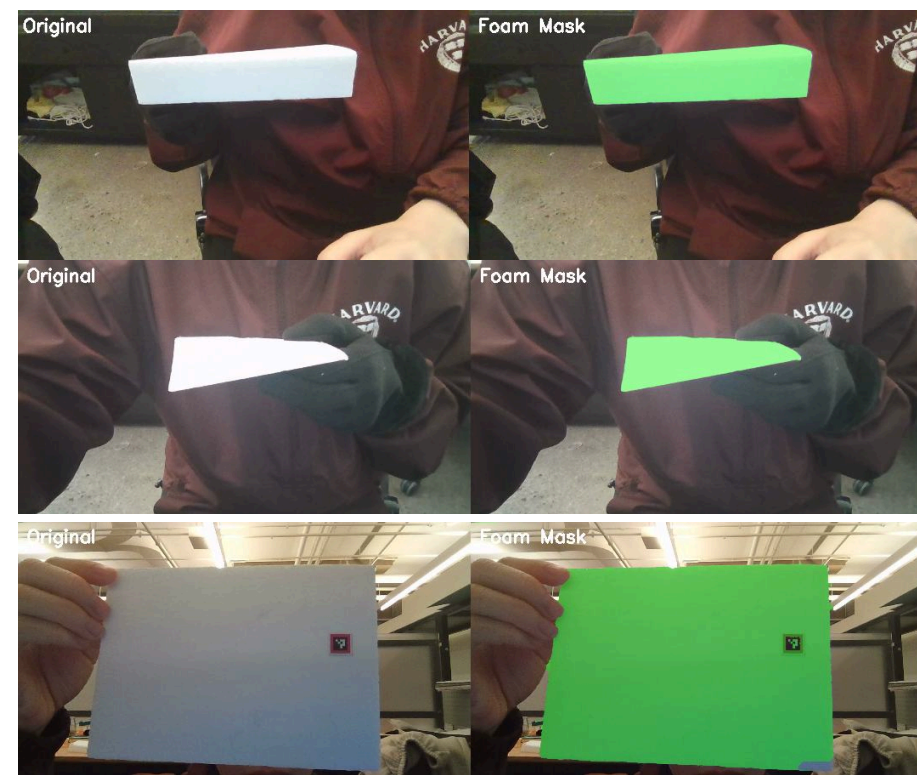
Trained Selection: Subtraction

Step1 Identify a face



Trained Selection: Subtraction

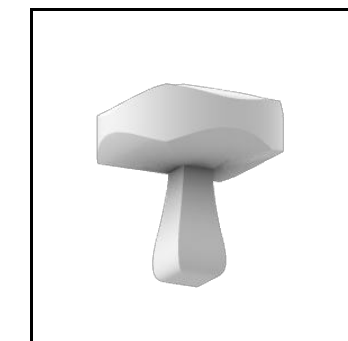
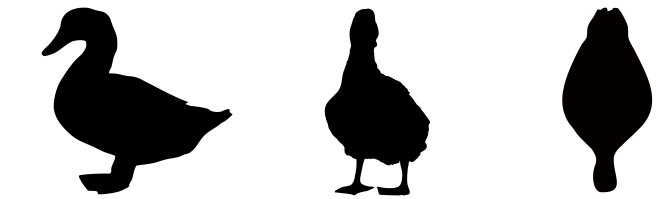
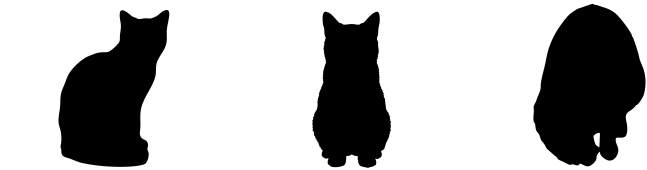
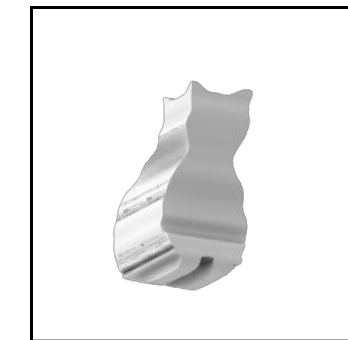
Step2 match a template



Your foam will become: A Mushroom
Template: mushroom_v1



AI CONFIDENCE: 100%



Trained Selection: Subtraction

Step3 resize template

Your foam will become: A Mushroom

Template: mushroom_v1



AI CONFIDENCE: 100%



FOAM_1D5E97DAD0ED859B (S)

Template: mushroom
Foam: 5.8 x 5.8 cm
Scale: 0.95x, Rot: 0.0 deg

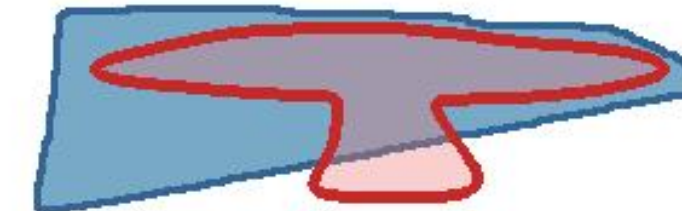


Foam silhouette Template outline



FOAM_3C34377C5B197043 (SI)

Template: mushroom
Foam: 5.8 x 5.8 cm
Scale: 0.95x, Rot: 0.0 deg

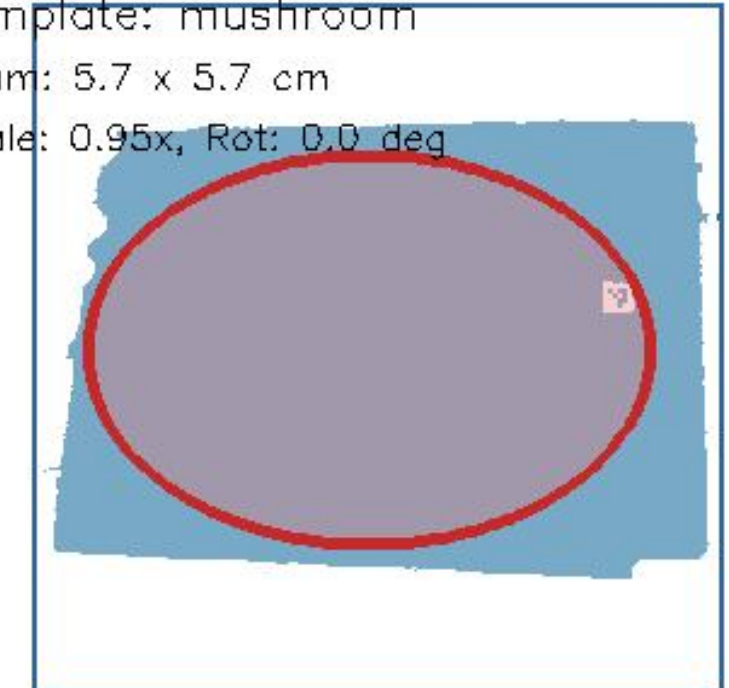


Foam silhouette Template outline



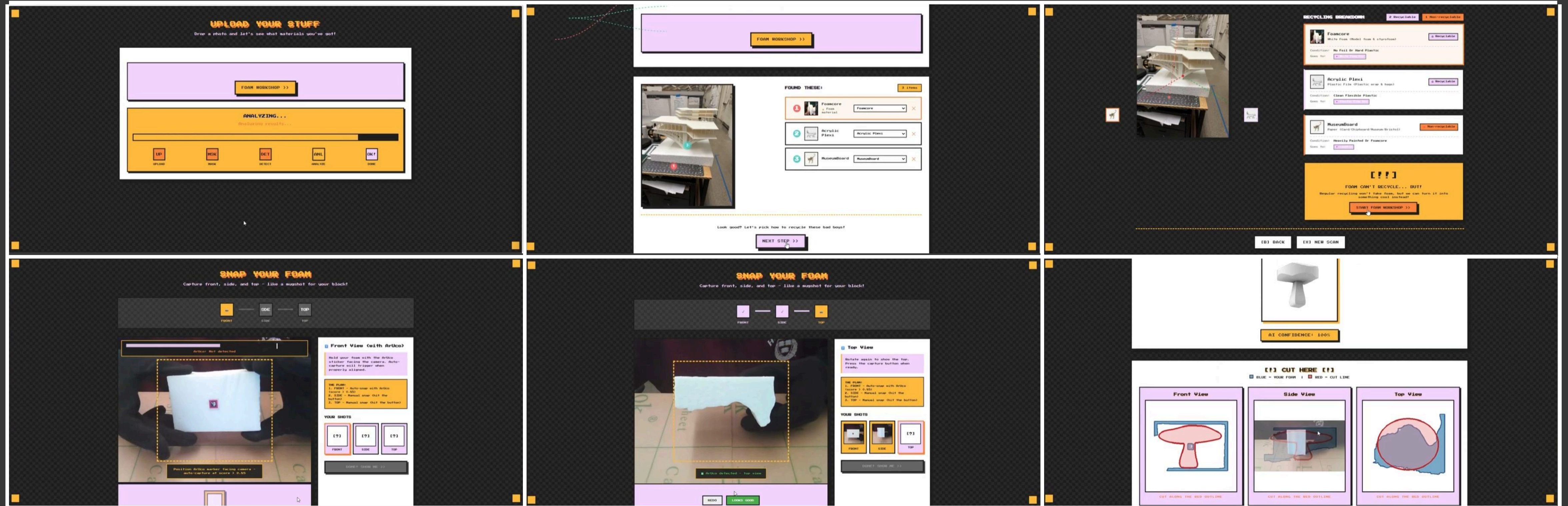
FOAM_3DE36A3E42F8E8CC (T)

Template: mushroom
Foam: 5.7 x 5.7 cm
Scale: 0.95x, Rot: 0.0 deg



Foam silhouette Template outline

Product Formation



<https://youtu.be/Ofub38bJTX8>