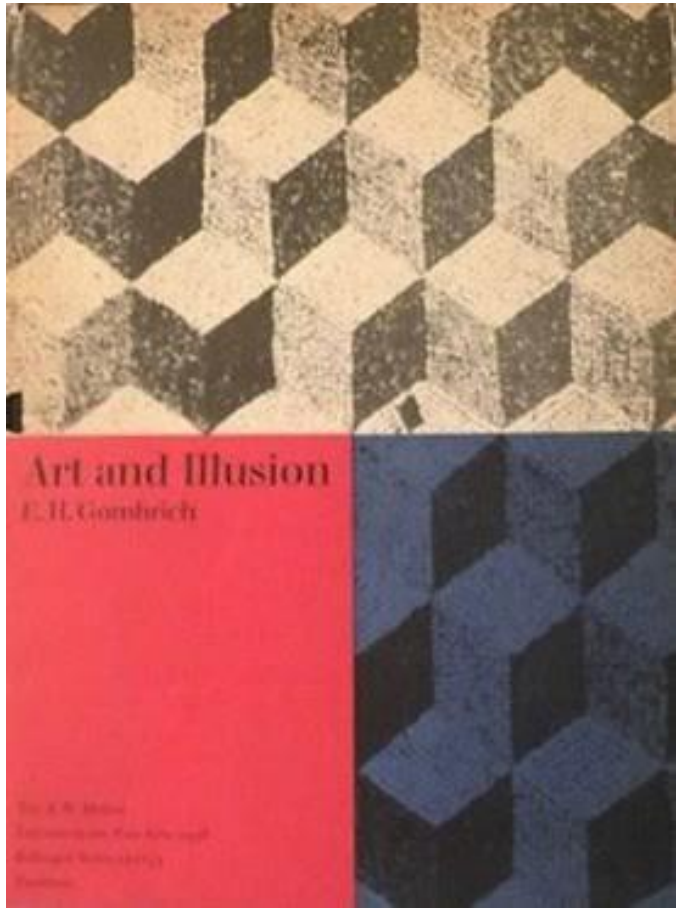
Progressive Photorealistic Simplification

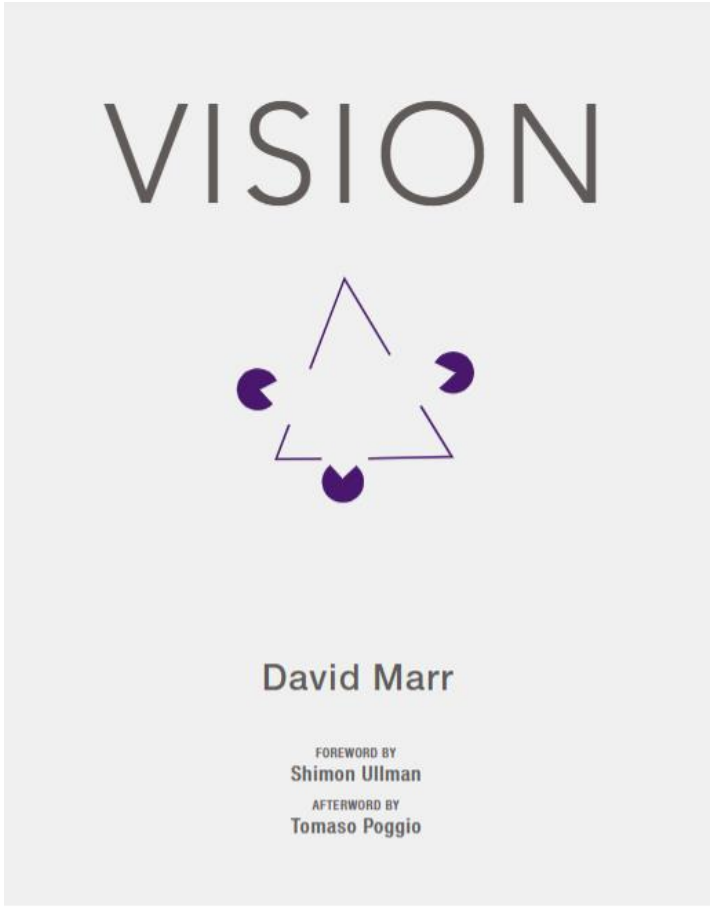
Adi Rosenthal[1, 2] · Dana Berman[1] · Yedid Hoshen[1, 3] · Ariel Shamir[1, 2]

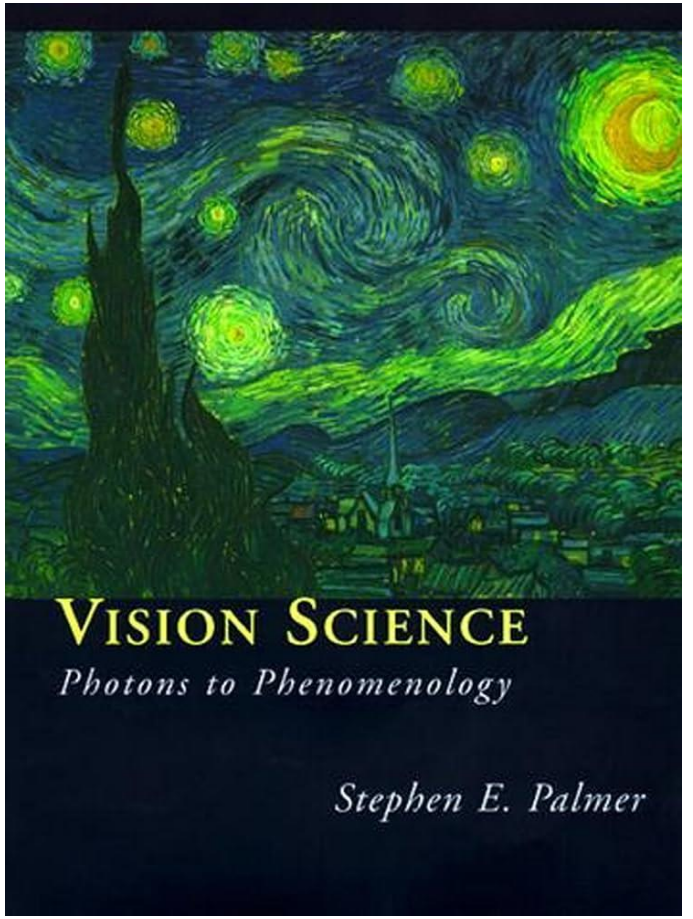
1 Reichman University 2 canvas lab. 3 האוניברסיטה העברית בירושלים THE HEBREW UNIVERSITY OF JERUSALEM

SAGIVTECH IMVC 2026

Abstraction & Perception







Abstraction & Perception

Perceptual organization

We do not see passively, we group and prioritize visual elements

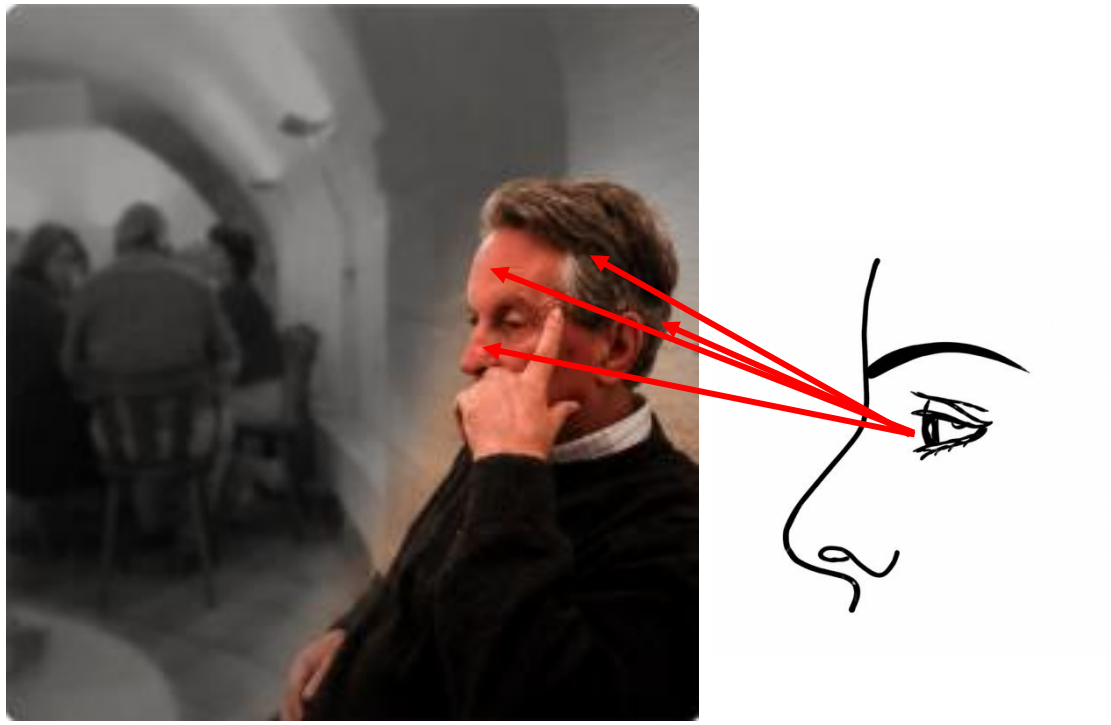
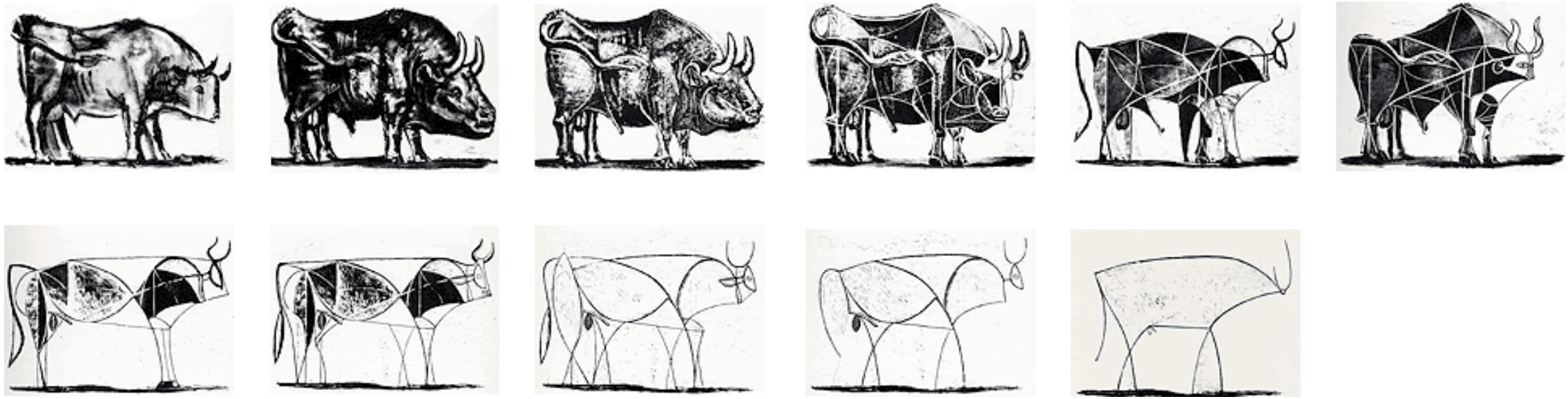


Image from “Stylization and abstraction of photographs”

Abstraction & Perception

Visual abstraction

We reduce visual detail while preserving the underlying structure



Non-Photorealistic Rendering

Photograph

Sketch abstraction (Vinker et al. 2023)

Non-Photorealistic Rendering

Stylistic simplification (Farbman et al . 2008)

THE PROBLEM

The Modality Shift

Photorealistic

Non- Photorealistic

Traditional NPR fundamentally alters the visual modality.

OUR FRAMING

Simplification in the Photorealistic Domain

Elements disappear; photorealism remains.

Progressive & Subtractive

STEP 1

STEP 3

STEP 4

STEP 7

STEP 9

STEP 11

INPUT → MINIMAL SCENE

Where To Stop?

Input

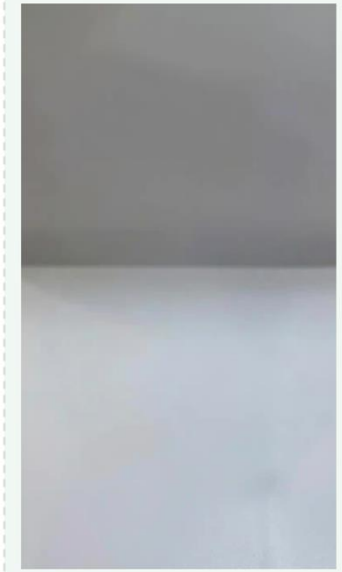
?

Decluttering

?

Change the Main Subject

?



?

Fully Abstract

THE PROBLEM

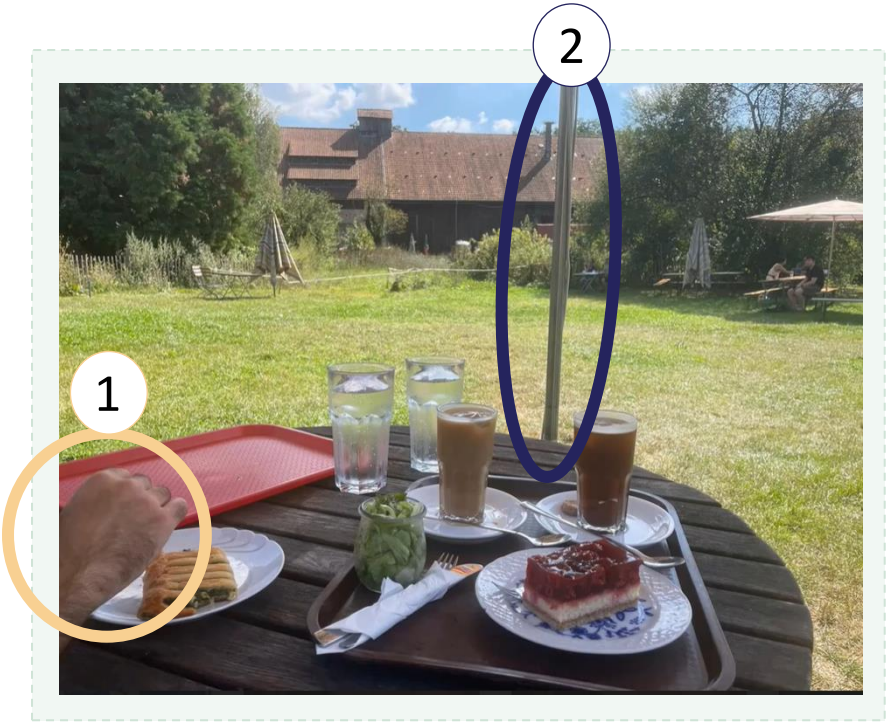
What to remove? When?

THE PROBLEM

Problem Formulation

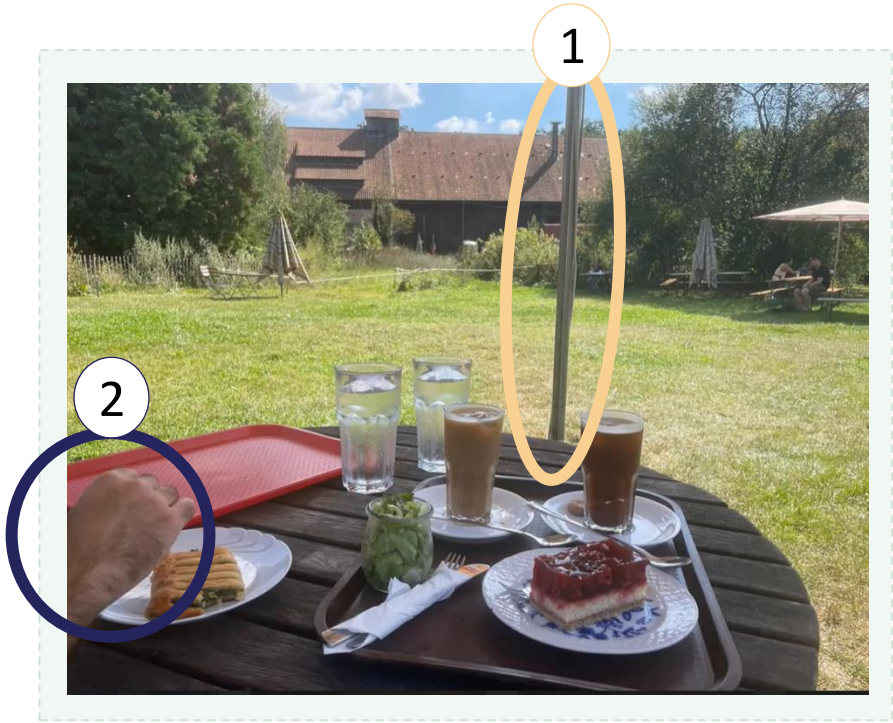
THE PROBLEM

Subjectivity of Ordering



Which to remove first?

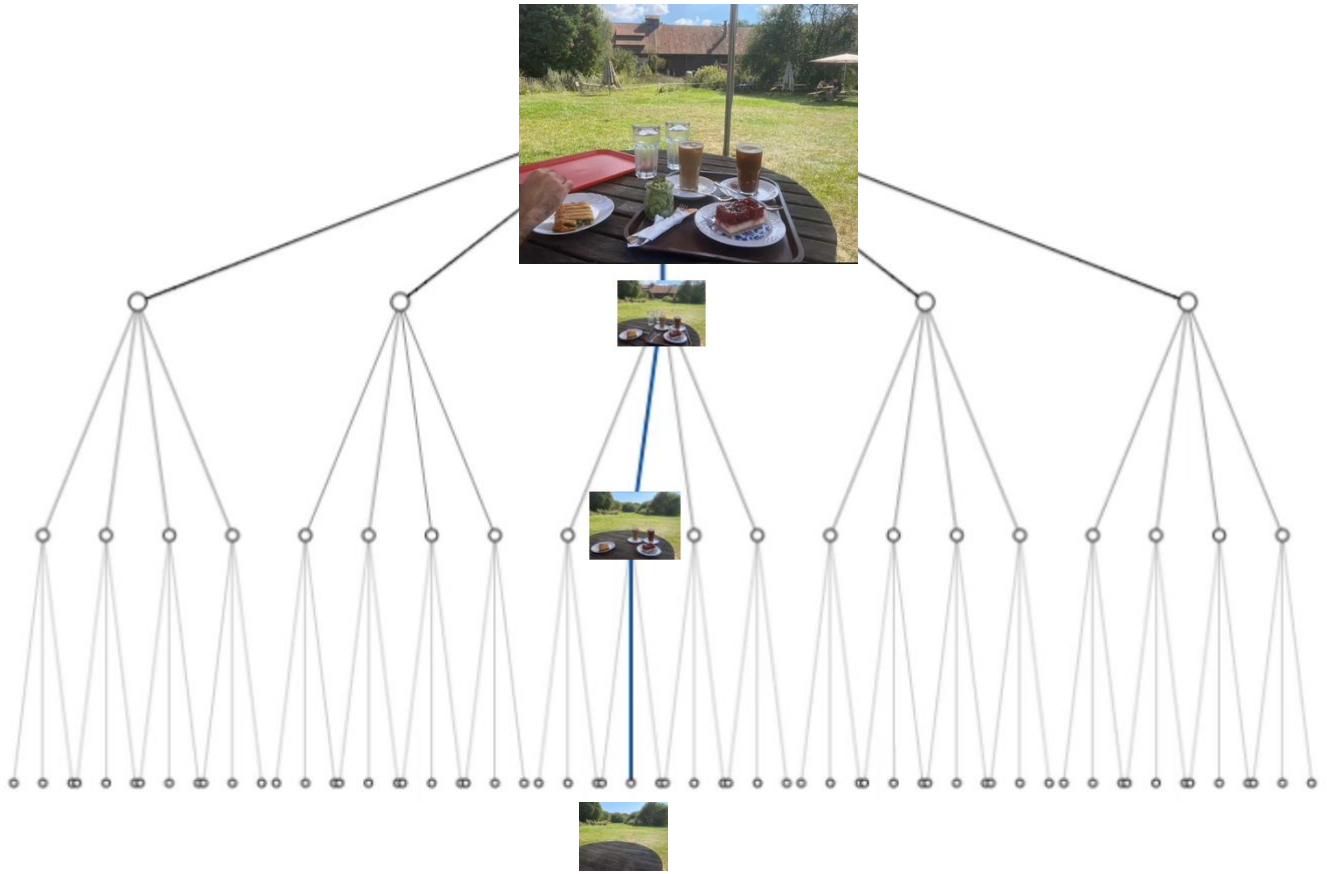
?



No ground truth for importance of elements

THE PROBLEM

Path of Removals



Search space: ***n!*** possible permutations

The 4-Level Taxonomy

Distractor

Secondary

Primary

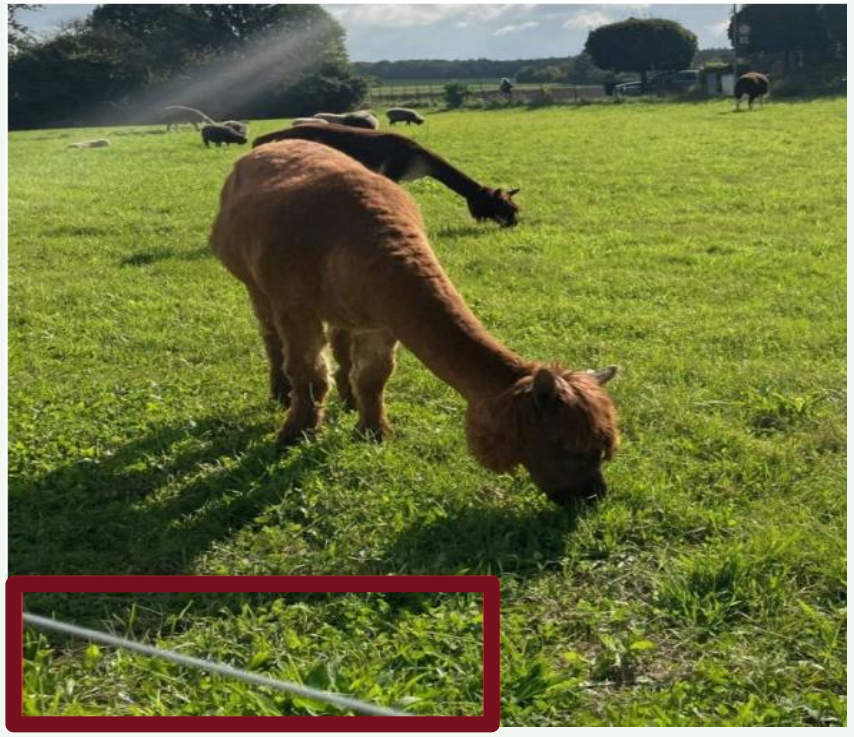
Background

A simple, interpretable taxonomy

TAXONOMY

1 Distracting Elements

Trash, cables, clutter



TAXONOMY

2 Secondary Elements

Lamp, plant, contextual objects

TAXONOMY

3 Primary-Subject Elements

Person, main furniture, focal object

TAXONOMY

4 Background Elements

Walls, empty room, environment

TAXONOMY VALIDATION

Elements Annotation


Distractor

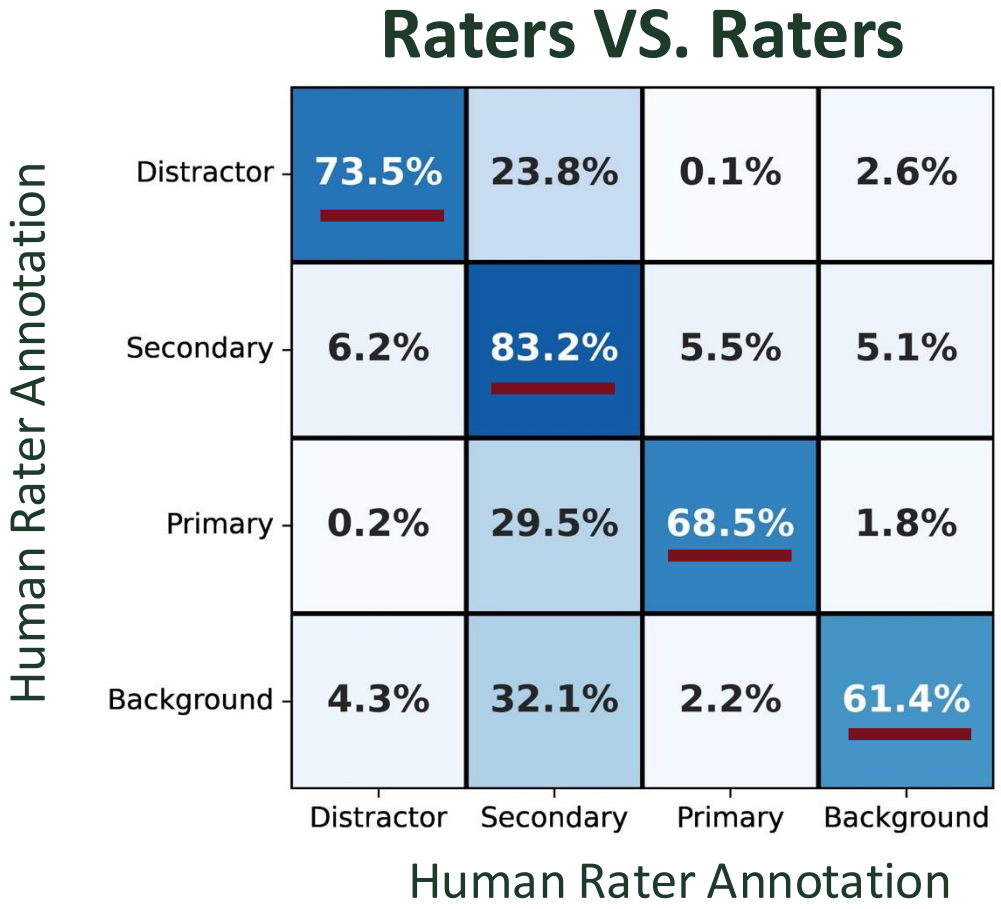

Secondary


Primary


Background

TAXONOMY VALIDATION

Elements Annotation - Strong Inter-Rater Agreement



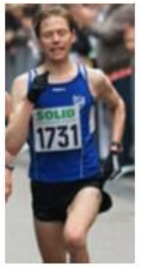
* Row-Normalized

TAXONOMY VALIDATION

Removal Order

Distractor < **Secondary** < **Primary** < **Background**

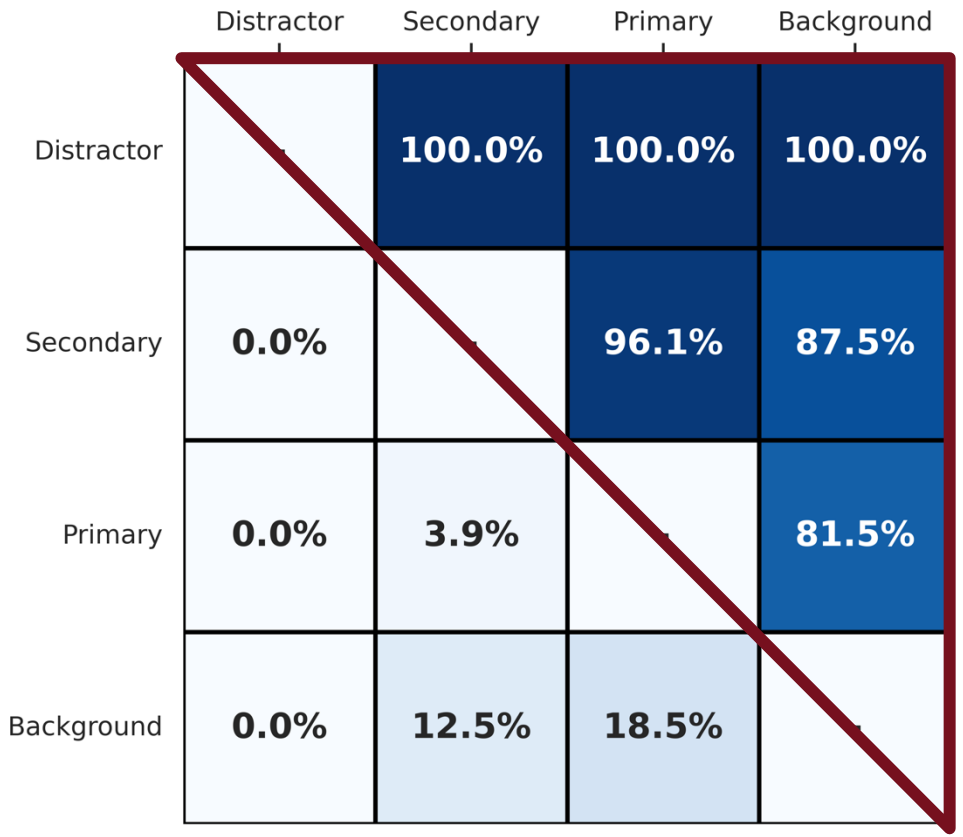




TAXONOMY VALIDATION

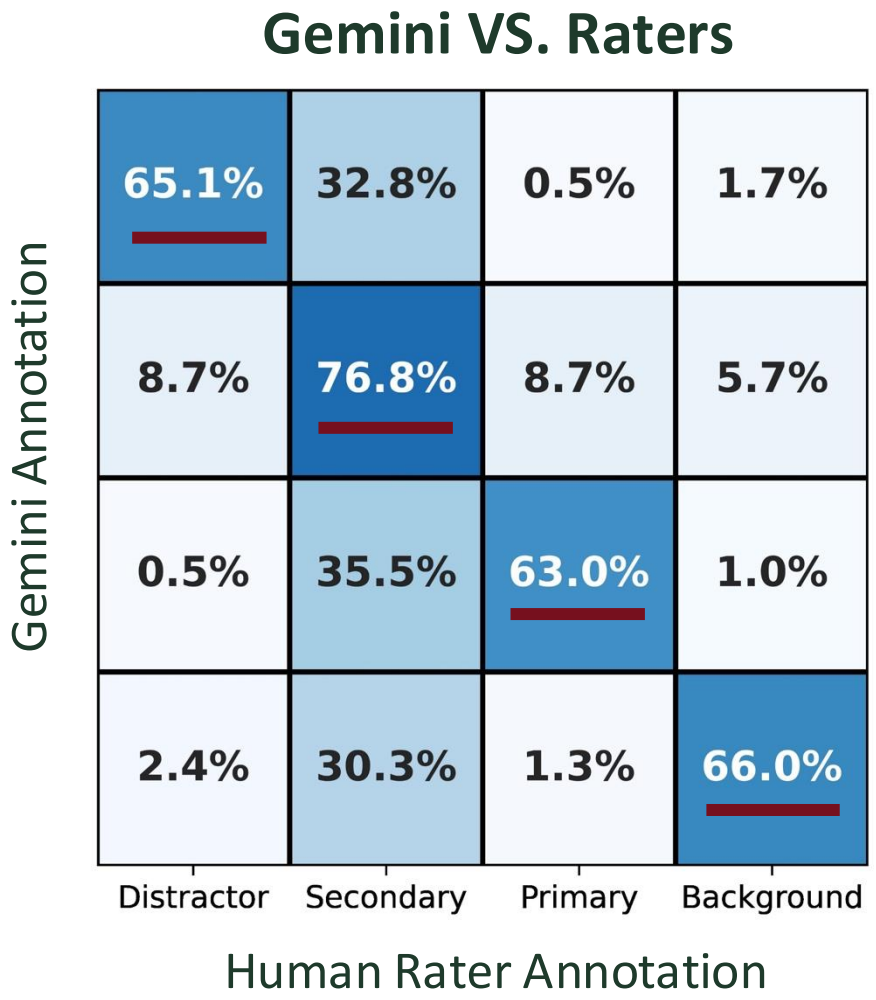
Removal Order - Strong Inter-rater Agreement



Which element would you remove first?

TAXONOMY VALIDATION

Strong Gemini-Rater Agreement



* Row-Normalized

METHOD

Search-Based Trajectory

METHOD

Select

Evaluate and rank the least important element

Active category: Secondary

1. “Paved road…”
2. ”Large tree…”
3. “Metal fence …”
4. ”Stone bollard …”
⋮

VLM
(Gemini)

“Metal fence …”

METHOD

Remove

1 Select → 2 Remove → 3 Verify

An image editing model removes the chosen element

Inputs

Chosen Object <*X*>

+

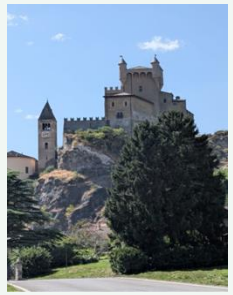
→ **Image-Editing Model** 🍌

"Remove Object <X> from Image <Y>"

→ **Model's result**

→ **Find mask**

-



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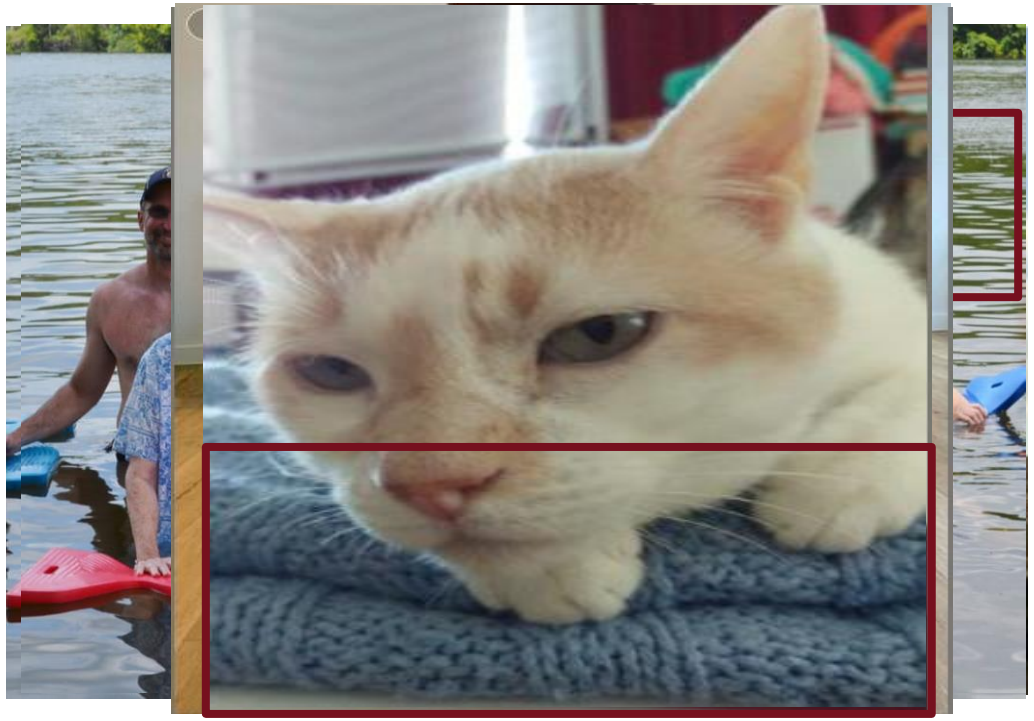
→ **Blending**

METHOD

Verify

We trained a classifier to evaluate each removal



APPROVED ✓

METHOD

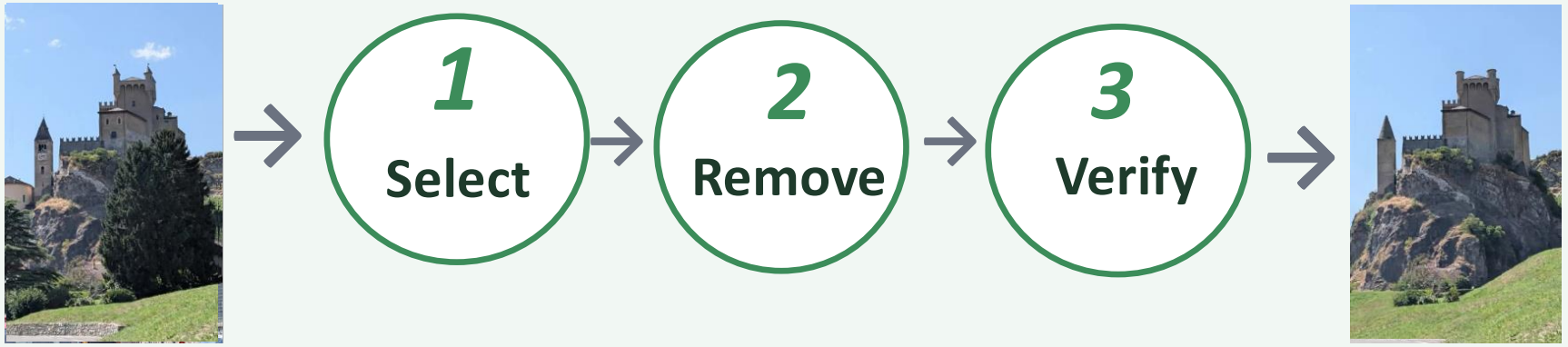
Repeat

Primary
Active category: ~~Secondary~~

1. ~~“Paved road…”~~
2. ~~”Large tree…”~~
3. ~~”Stone bollard …”~~

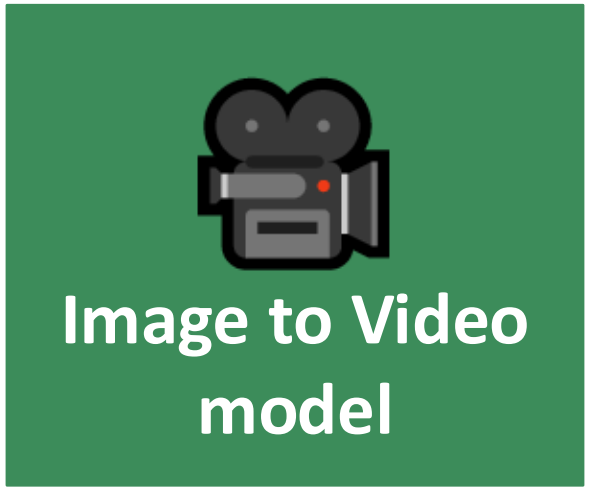
METHOD

High Quality, High Compute



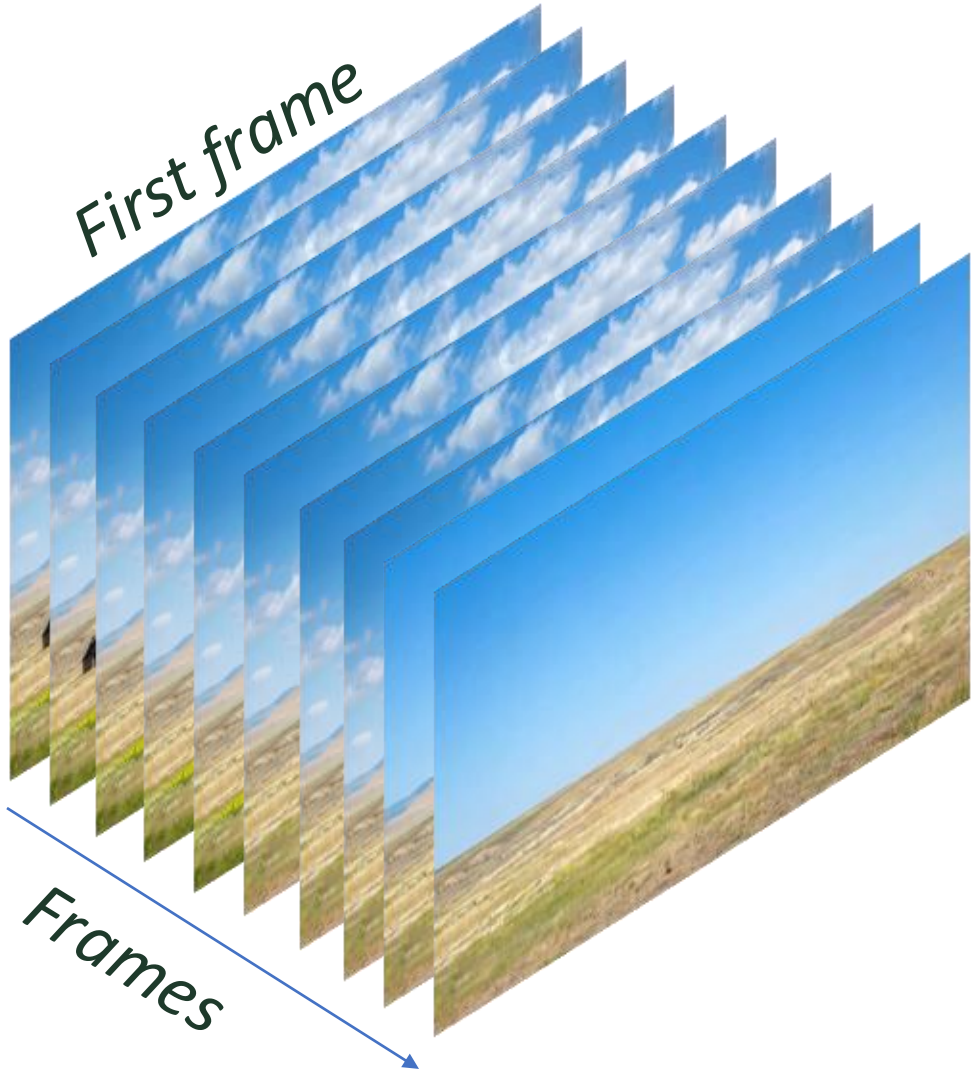
Distillation via Video Model

Distill



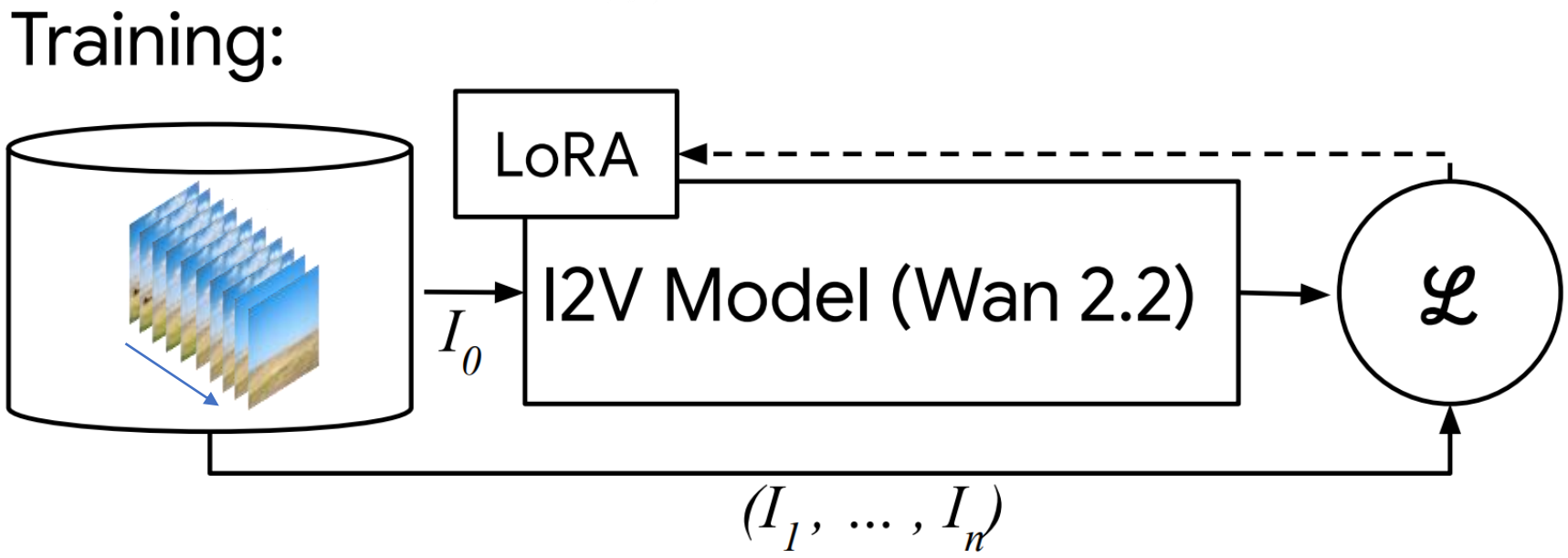
METHOD

Subtractive "Stop-Motion"



METHOD

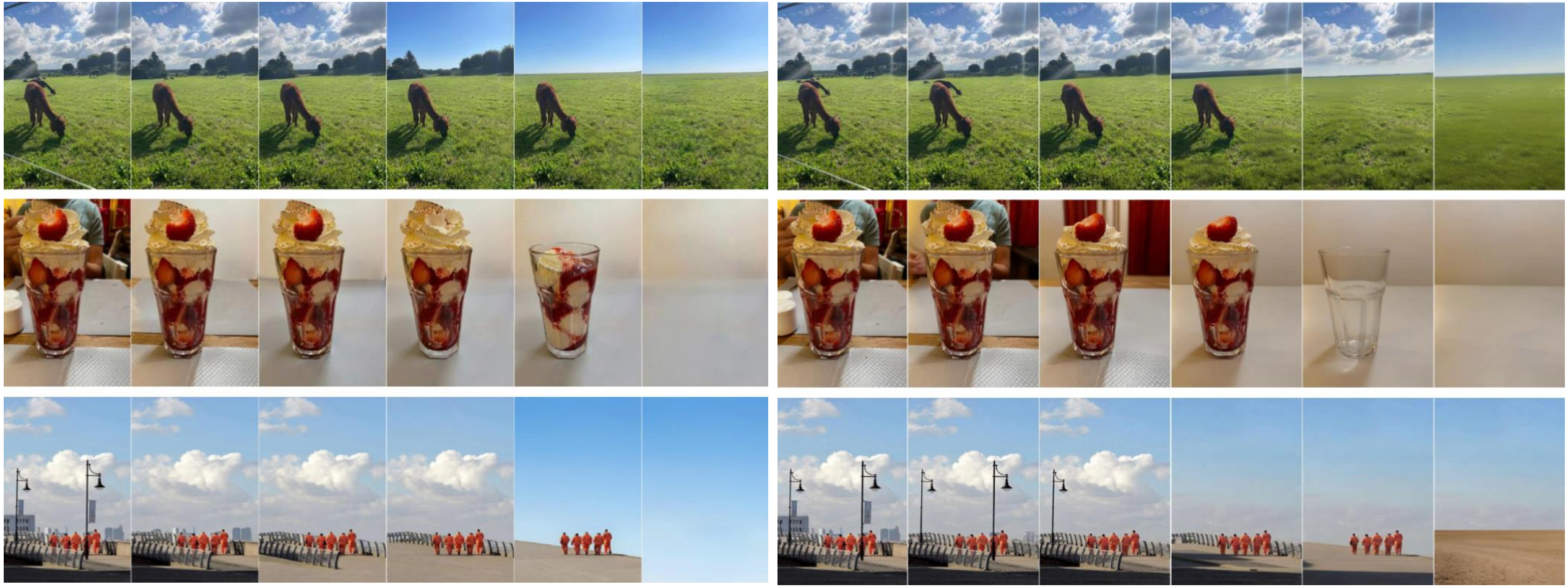
Subtractive "Stop-Motion"



Fine-tuned latent diffusion Image-to-Video model using LoRA

EVALUATION

Search-Based vs. Distilled



EVALUATION

Search-Based vs. Distilled

Method	Order Accuracy ↑
Distilled	0.716 ±0.021
Search-based	**0.728** ±0.019

RESULTS

Search-Based

RESULTS

Search-Based

RESULTS

Search-Based

RESULTS

Distilled

RESULTS

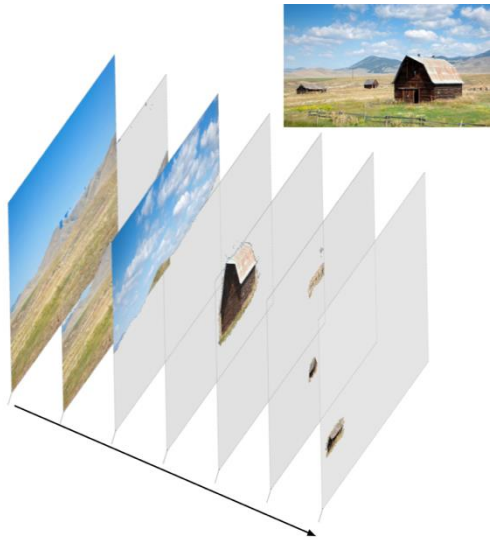
Distilled

RESULTS

Applications

Interactive Simplification

De-cluttering



Layering

RESULTS

Interactive Simplification

Interactive exploration via a continuous abstraction slider

RESULTS

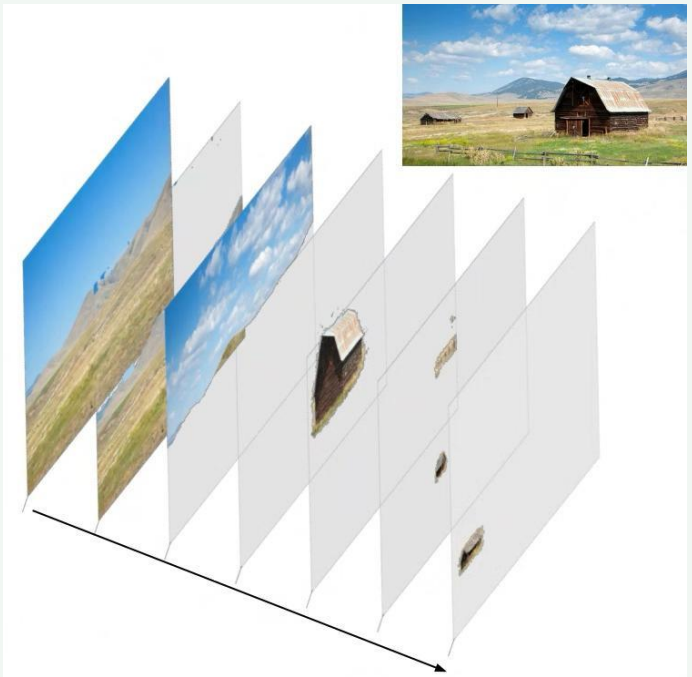
Semantic Image De-cluttering

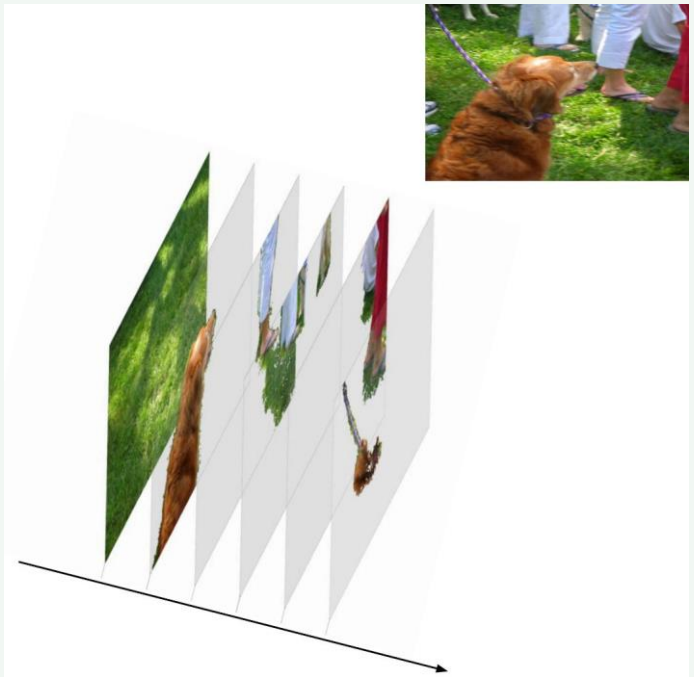
BEFORE

AFTER

RESULTS

Image Layering





Realism & Abstraction
on a Continuous Spectrum

Thank You

Scan for our website

Adi Rosenthal, Dana Berman, Yedid Hoshen, Ariel Shamir

Reichman University

canvas lab.

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