One-shot Recognition Of Any Material Anywhere

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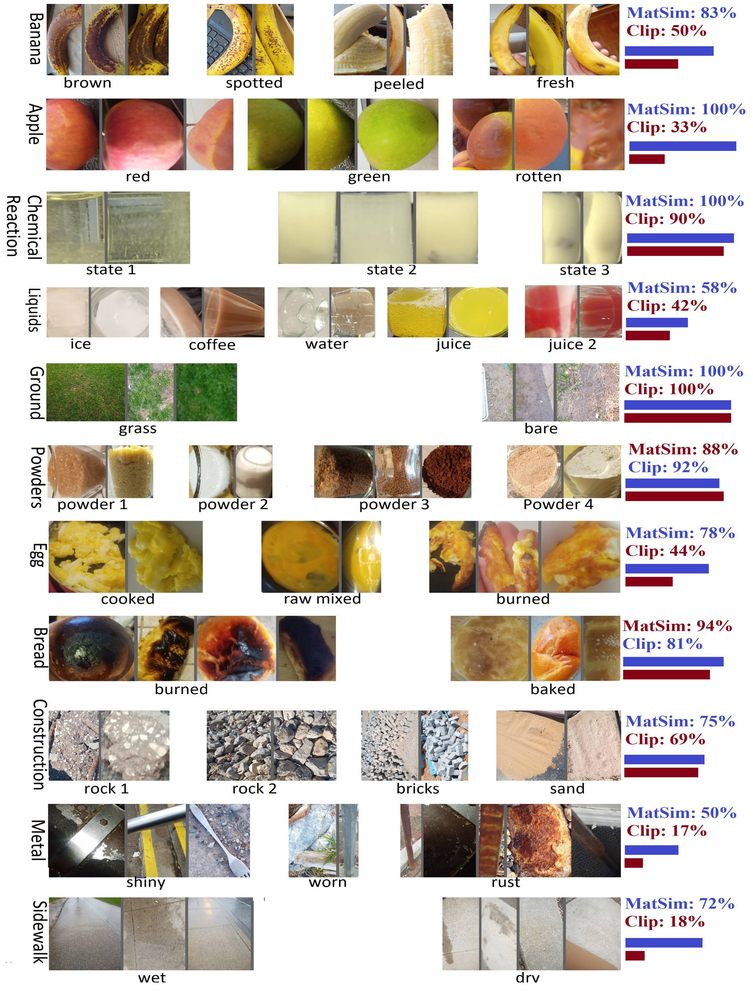
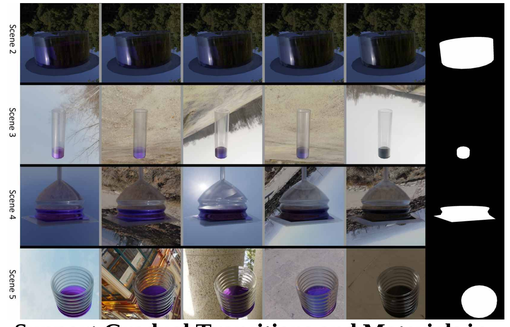
Visual recognition of materials is essential for understanding the world.



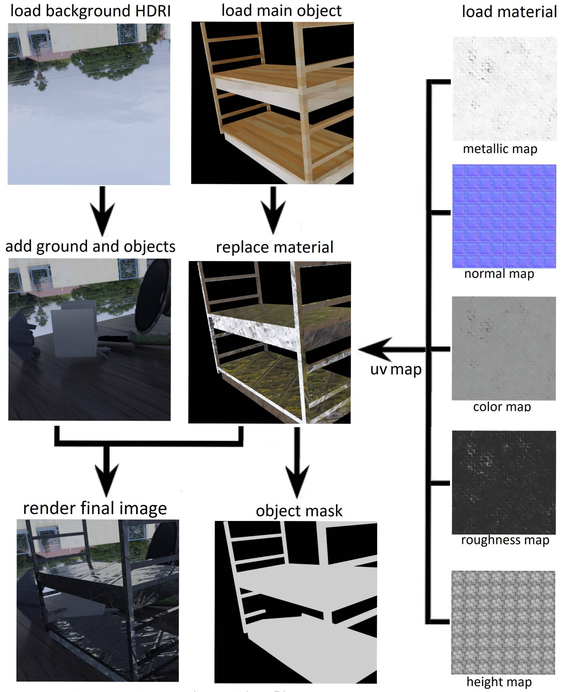
Diverse Real-World Image Benchmark

MatSim: The first Dataset for one-shot recognition of materials focusing on identifying any material state under any conditions from a single example.



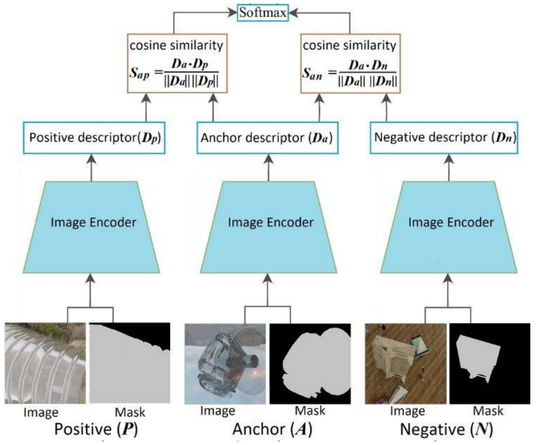
Support Gradual Transitions and Materials in Transparent Containers

Synthetic Training Data:



Scene Creation Pipeline

Contrastive Learning:



Experiment Results:

Method	Set1 Subclass	Set1 All	Set2
Random	0.30	0.006	0.07
MatSim	0.71	0.56	0.73
MatSim+C	0.77	0.56	0.85
MatSim+M	**0.78**	0.56	**0.91**
MatSim+C+M	0.72	**0.61**	0.85
Open CLIP H14	0.55	0.44	0.47
Open CLIP H14+C	0.67	0.52	0.77
Open CLIP H14+M	0.59	0.40	0.53
Open CLIP H14+C+M	0.66	0.52	0.67
CLIP B32	0.51	0.32	0.44
CLIP B32+C	0.56	0.38	0.49
CLIP B32+M	0.56	0.28	0.37
CLIP B32+C+M	0.56	0.35	0.56

+C: uses clipping, +M: uses Masking

Models trained on our MatSim Dataset Signifcantly outperformed larger CLIP based Models trained on real-world datasets.