Dataset of Annotated Images of Sundry Objects －Benchmark for Performance Degradation Caused by Domain Shifts

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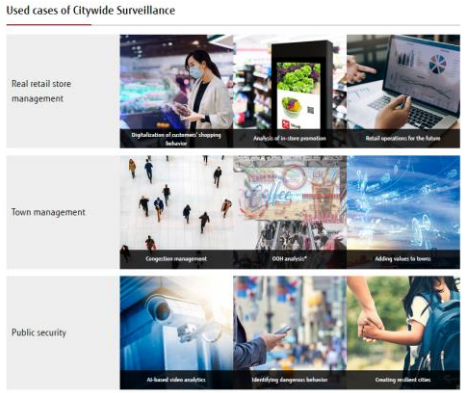
Background
We need dataset with domain shift

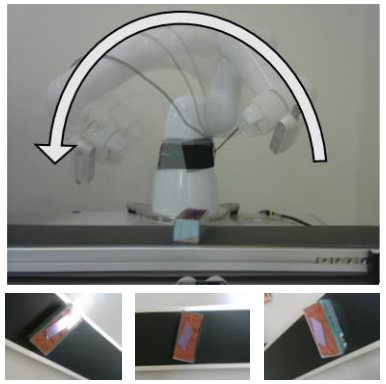
- For real-world image recognition tasks, performance degradation is often observed when we shift from the development environment to the production environment
- Domain adaptation technologies can be adopted.
- The various limitations associated with real data hinder the technology development.



Examples of real-world applications in our group *

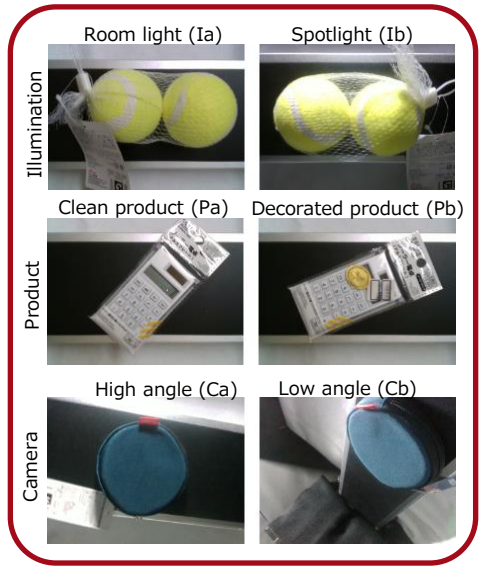
Overview
DAISO-100 : A novel dataset

- Semi-automatically collected 16M images on 100 classes
- Annotated conditions designed based on real applications
- Intentionally paired confusing classes for task difficulty control and deeper analysis



Automated image collection

100 classes sundries

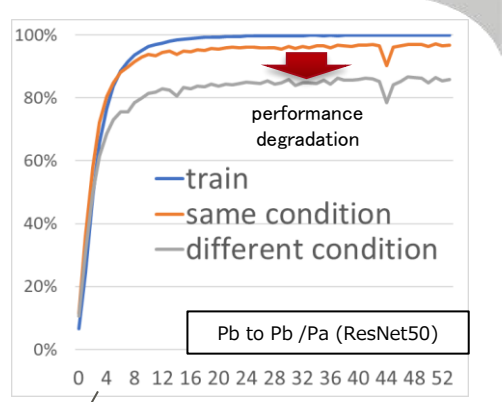


Different conditions with annotations

Confusing products

Benchmark
Consistent with real-world phenomena

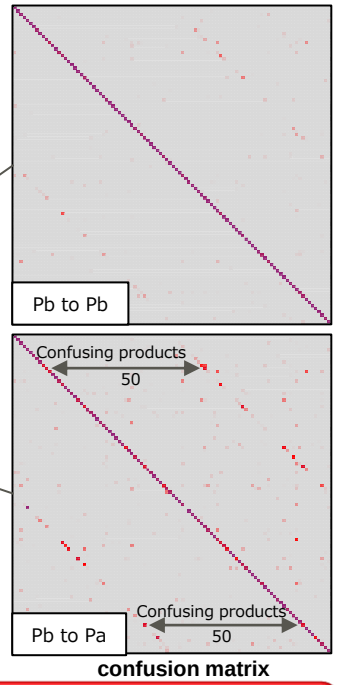
- Performance degradation was observed with 3 type of domain shifts and 5 network architectures.
- The value of performance degradation depended on the type and the direction of the shift.
- Confusing products extent the performance degradation for some domain shifts.



training curve (ACC)

	conditions	MLP	VGG16	ResNet50	DenseNet121	SENet50
Illumination	Ia to Ia	61.0±1.2	89.0±1.3	96.7±0.6	97.9±0.4	97.8±0.3
	Ia to Ib	15.2±0.7	47.3±7.3	35.3±4.0	46.3±6.1	55.8±5.1
	degradation	45.8±1.3	41.7±7.4	61.4±3.9	51.6±6.0	42.0±5.0
	Ib to Ib	55.9±0.5	87.8±0.6	96.9±0.4	98.1±0.5	97.1±1.7
	Ib to Ia	10.8±0.7	48.0±4.3	42.7±3.0	42.7±3.1	52.6±2.6
	degradation	45.1±0.8	39.8±4.6	54.2±2.7	55.4±2.8	44.5±2.9
Product	Pa to Pa	56.2±1.0	88.1±0.9	95.6±0.3	95.6±3.0	96.2±0.5
	Pa to Pb	42.1±0.8	68.3±2.1	84.1±1.0	84.9±3.7	78.2±1.7
	degradation	14.1±0.7	19.8±1.9	11.5±1.0	10.7±1.2	18.1±1.5
	Pb to Pb	52.0±1.4	89.2±0.9	96.7±0.6	96.3±6.4	96.9±4.1
	Pb to Pa	44.2±1.5	74.6±1.7	86.2±2.5	84.7±8.0	83.8±5.9
	degradation	7.8±1.0	14.6±1.5	10.6±3.0	11.6±1.7	13.2±2.0
Camera	Ca to Ca	55.1±1.9	86.7±0.8	94.5±0.3	95.8±0.6	96.3±0.6
	Ca to Cb	24.0±1.1	58.6±2.2	81.9±1.3	81.8±3.5	86.0±1.8
	degradation	31.1±1.4	28.2±2.1	12.6±1.4	14.0±3.2	10.3±1.4
	Cb to Cb	53.6±1.3	86.7±1.1	95.4±0.4	97.1±0.3	96.0±0.8
	Cb to Ca	30.5±1.1	77.0±3.2	94.0±0.4	96.3±0.3	94.9±1.1
	degradation	23.1±1.1	9.7±2.2	1.4±0.3	0.8±0.3	1.1±0.4

Test ACC (%) degradation



confusion matrix

Plan
Release DAISO-100 with some other datasets on http://dataset.labs.fujitsu.com/

* source: https://www.fujitsu.com/global/solutions/business-technology/tc/sol/greenages-cs/

Example images

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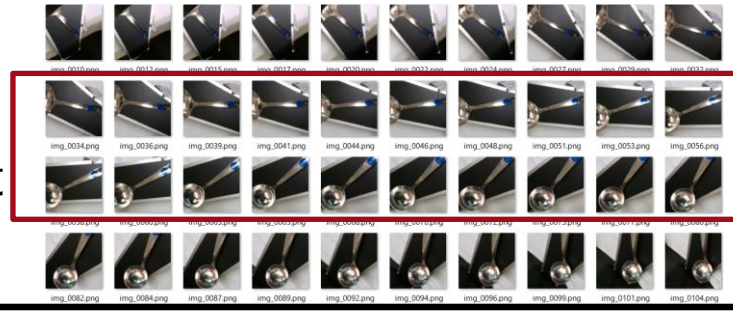
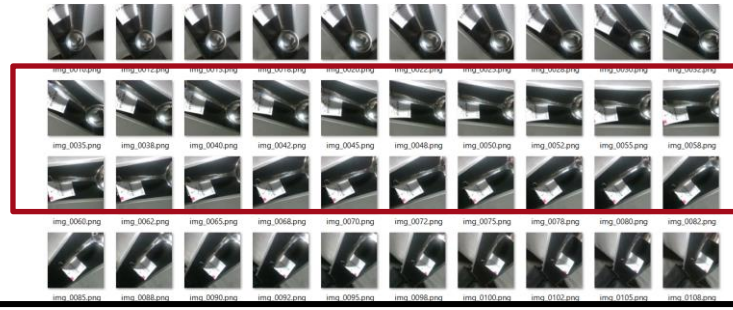
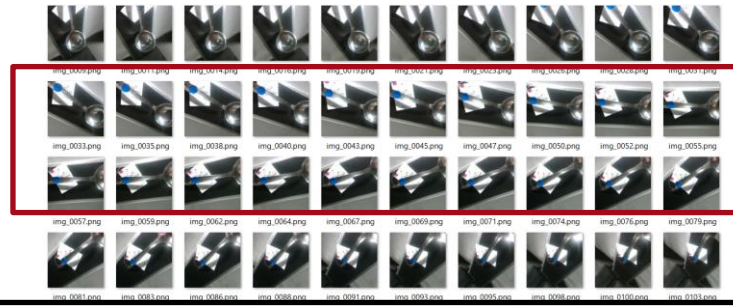
	Class 40		Class 90
room light clean product		high camera angle	
room light decorated product		high camera angle	
spotlight clean product		high camera angle	
spotlight decorated product		high camera angle