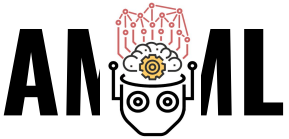
Politecnico
di Torino



Project:
Activation Shaping for Domain Adaptation

A.A. 2023/2024

Leonardo Iurada

Setting and Motivations

The Domain Shift Problem

“Art Painting”
Visual Domain

“Photo”
Visual Domain

The Domain Shift Problem

"Art Painting"
Visual Domain

$$\mathcal{X}_s \neq \mathcal{X}_t$$

"Photo"
Visual Domain

The Domain Shift Problem

"Art Painting"
Visual Domain

$$\mathcal{X}_s \neq \mathcal{X}_t$$

$$\mathcal{Y}_s = \mathcal{Y}_t$$

"Photo"
Visual Domain

The Domain Shift Problem

In Unsupervised Domain Adaptation (UDA)

"Art Painting"
Visual Domain

$$\mathcal{X}_s \neq \mathcal{X}_t$$

$$\mathcal{Y}_s = \mathcal{Y}_t$$

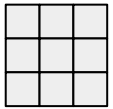
"Photo"
Visual Domain

Source Domain (s)
- **Training Set (Labeled)**

Target Domain (t)
- **Training Set (Unlabeled)**
- **Test Set**

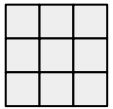
Main Research Questions

Full
Activation Map

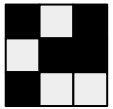


Main Research Questions

Full Activation Map



Sparse Activation Map

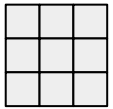


Same Accuracy!

[1] A. Djurisic et al., “Extremely Simple Activation Shaping for Out-of-Distribution Detection”, in ICLR 2023

Main Research Questions

Full Activation Map



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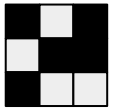

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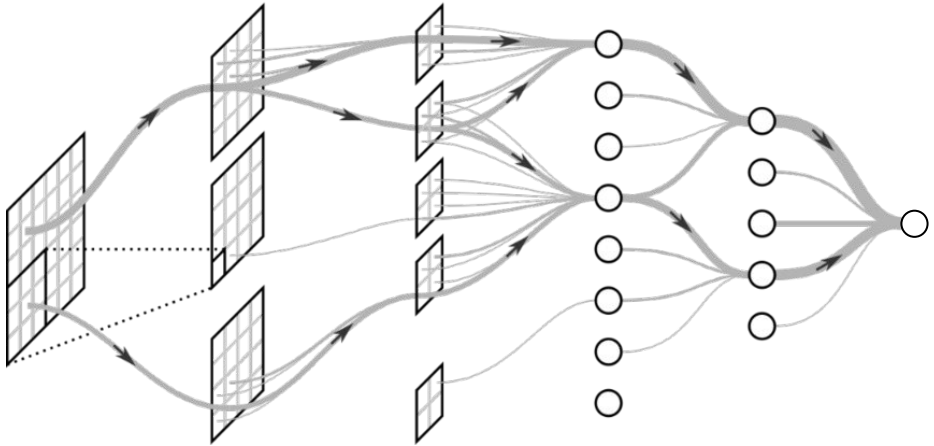
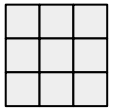


1. Do <u>Content-specific</u> and <u>Style-specific</u> Paths exist within a network?

[1] A. Djurisic et al., “Extremely Simple Activation Shaping for Out-of-Distribution Detection”, in ICLR 2023

Main Research Questions

Full Activation Map



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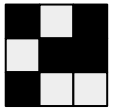

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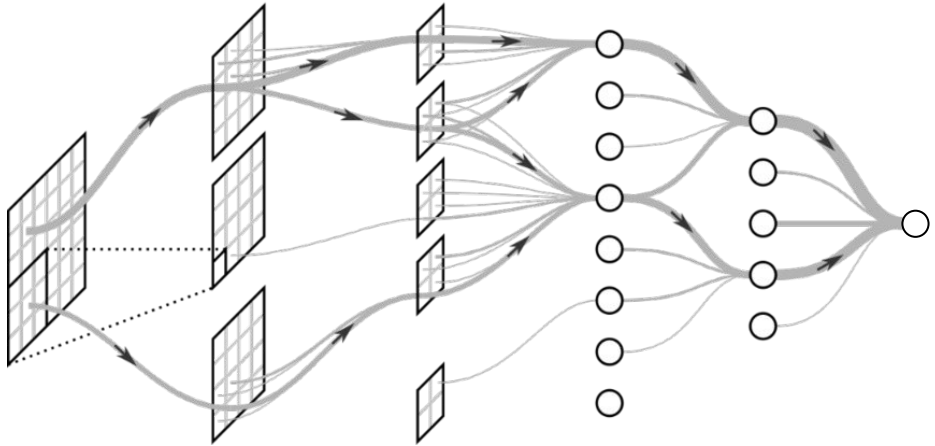
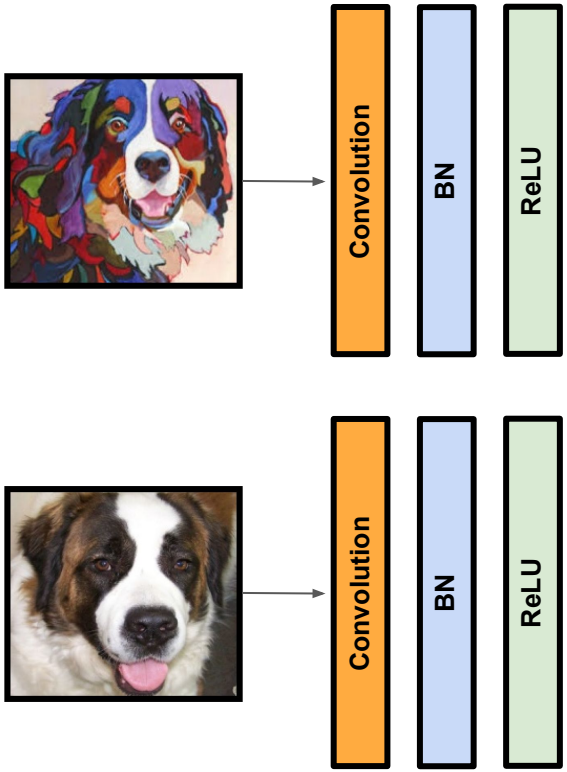


1. Do <u>Content-specific</u> and <u>Style-specific</u> Paths exist within a network?

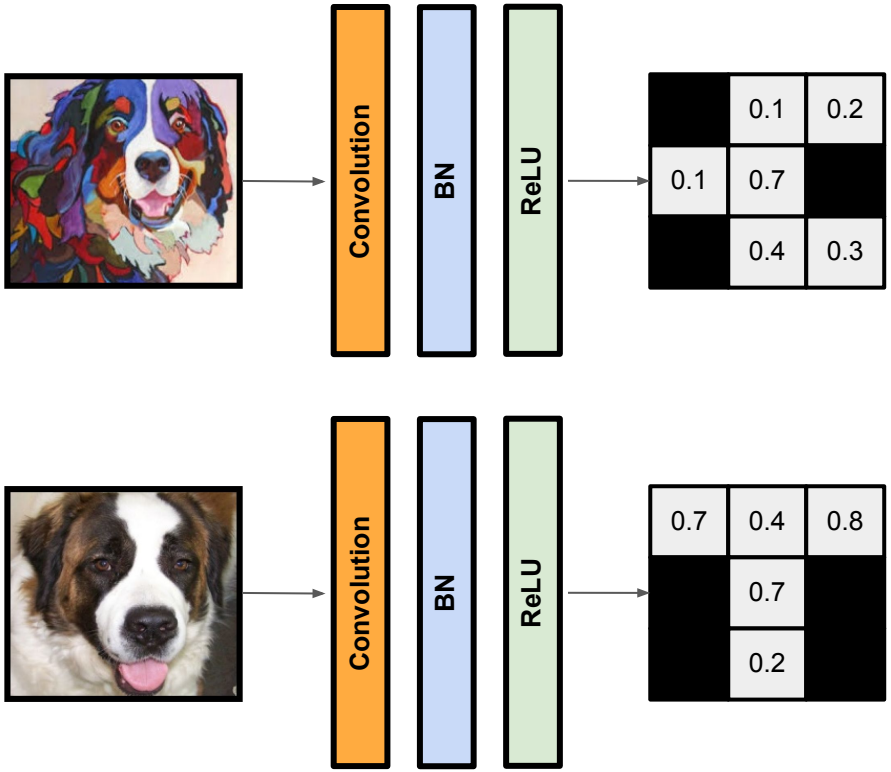
2. Can we discard Style-specific Paths to improve Generalization?

[1] A. Djurisic et al., “Extremely Simple Activation Shaping for Out-of-Distribution Detection”, in ICLR 2023

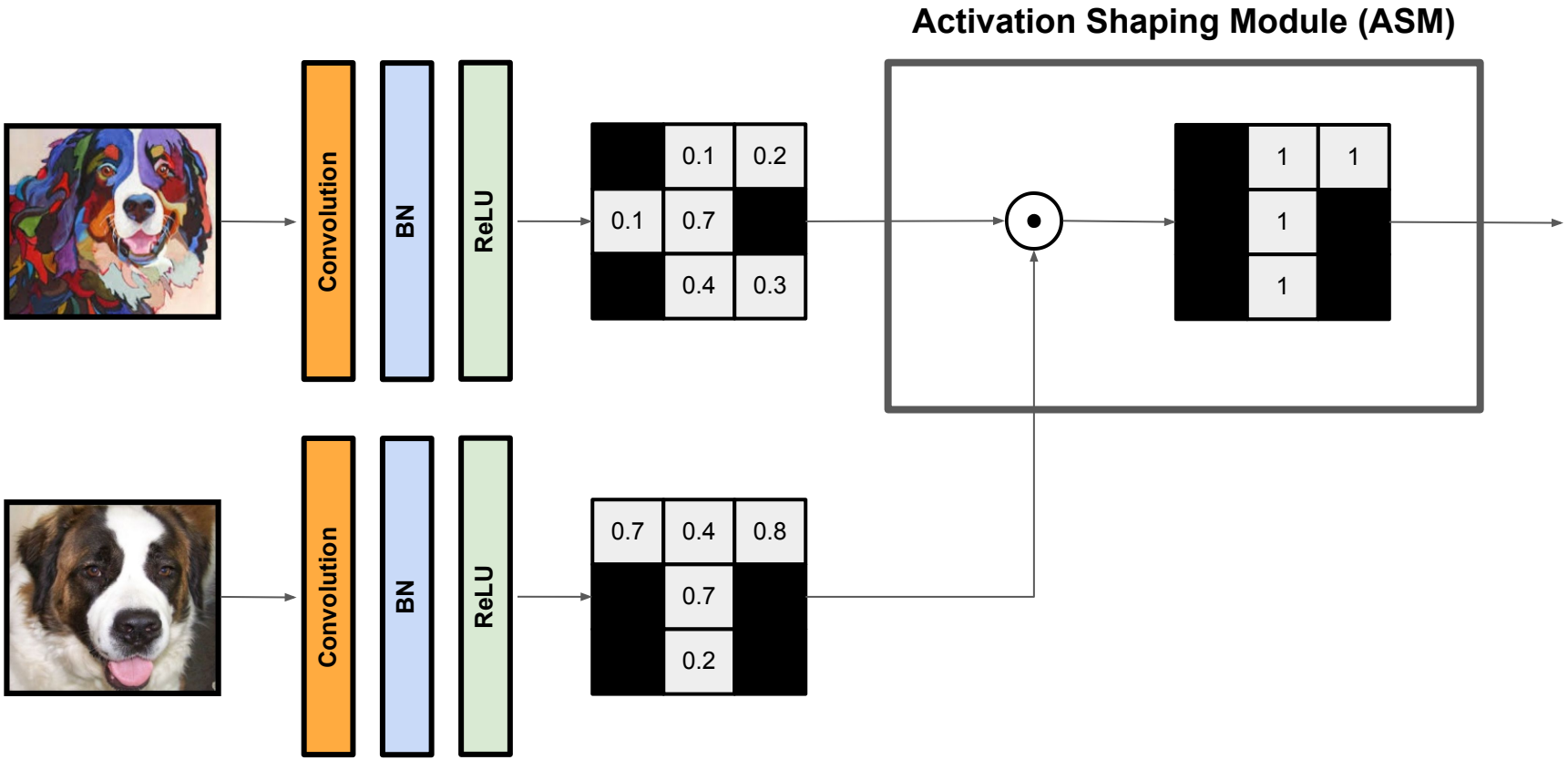
Activation Shaping



Activation Shaping



Activation Shaping



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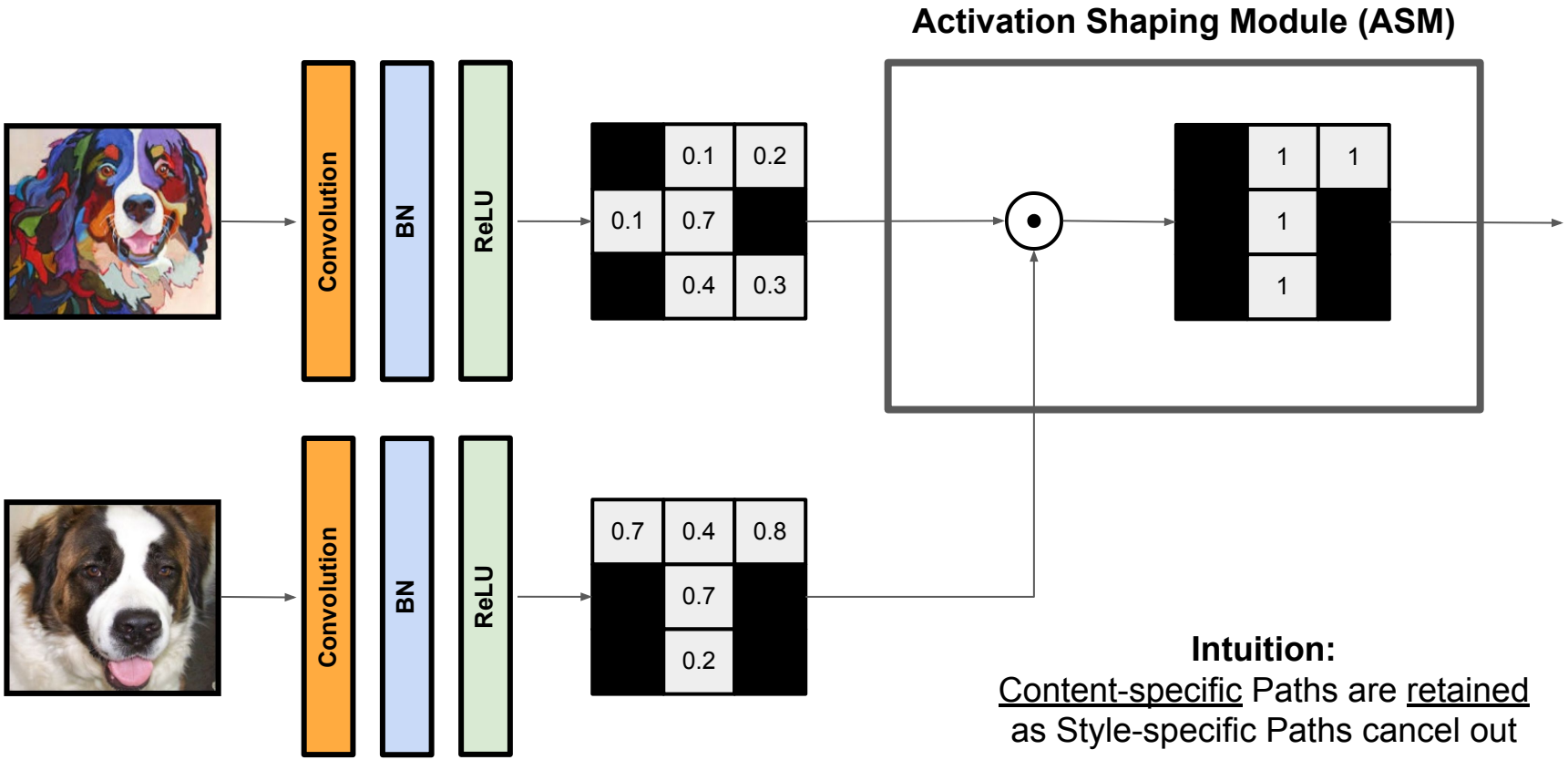
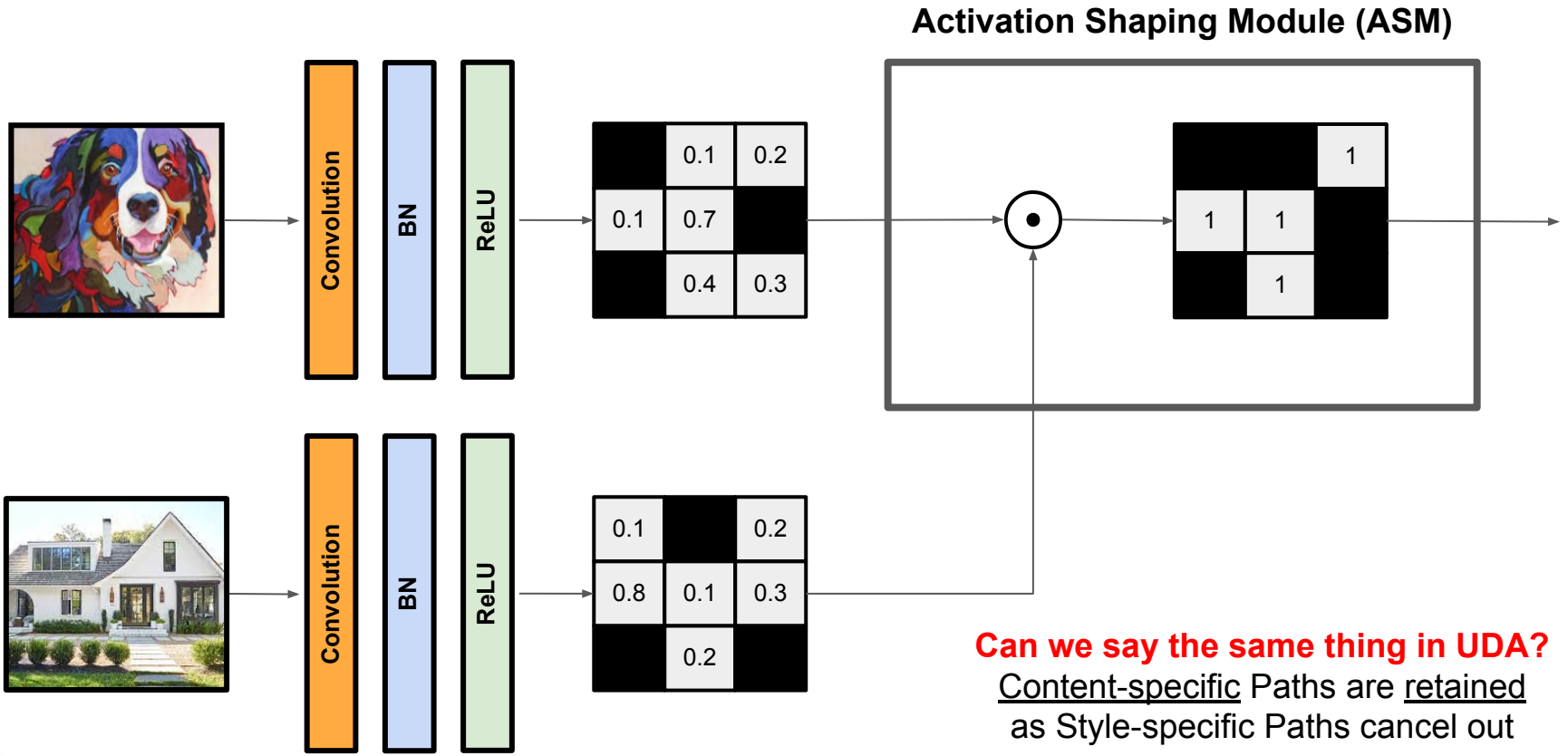


Activation Shaping for UDA

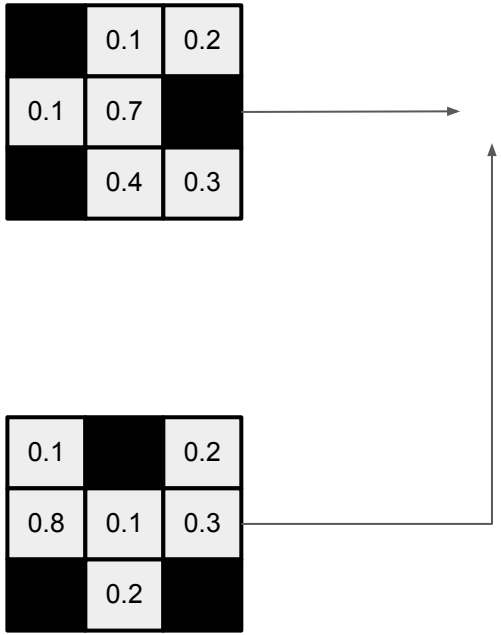


Can we say the same thing in UDA?

Content-specific Paths are retained as Style-specific Paths cancel out

Project Tasks & Structure

1. ASM - Implementation



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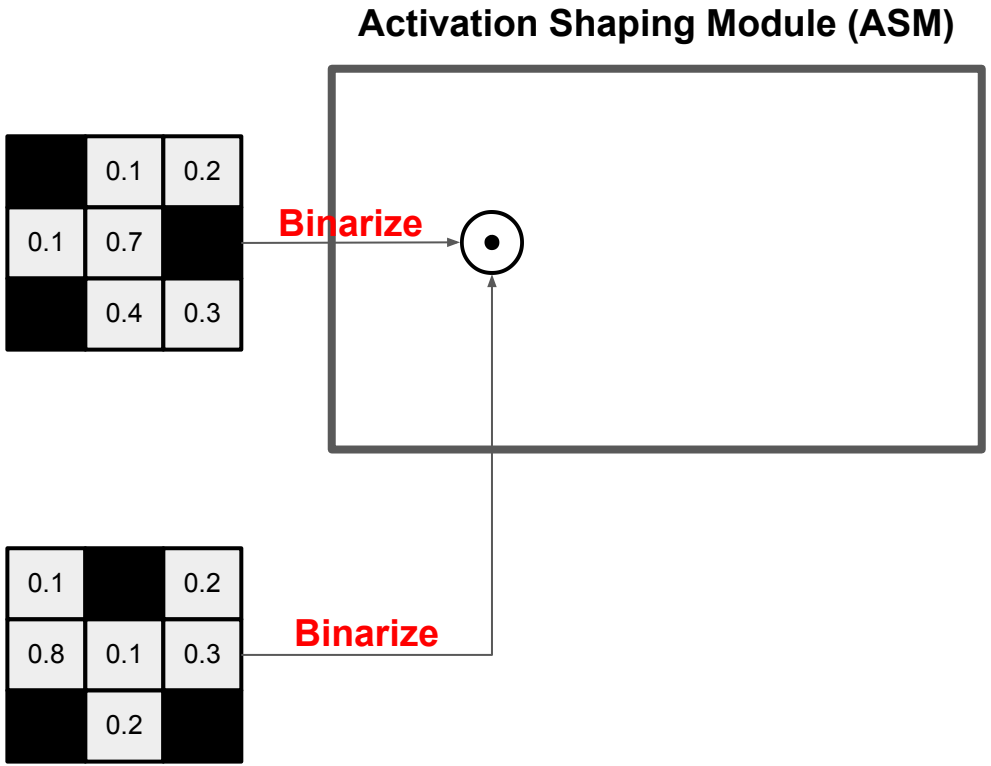
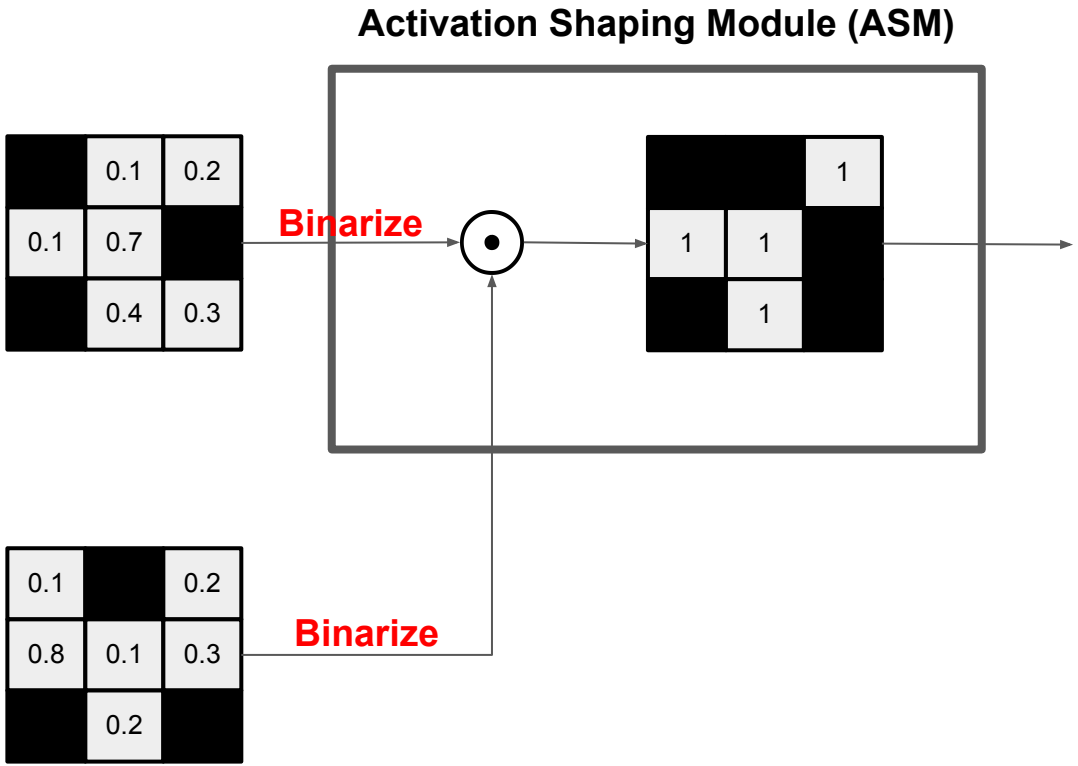
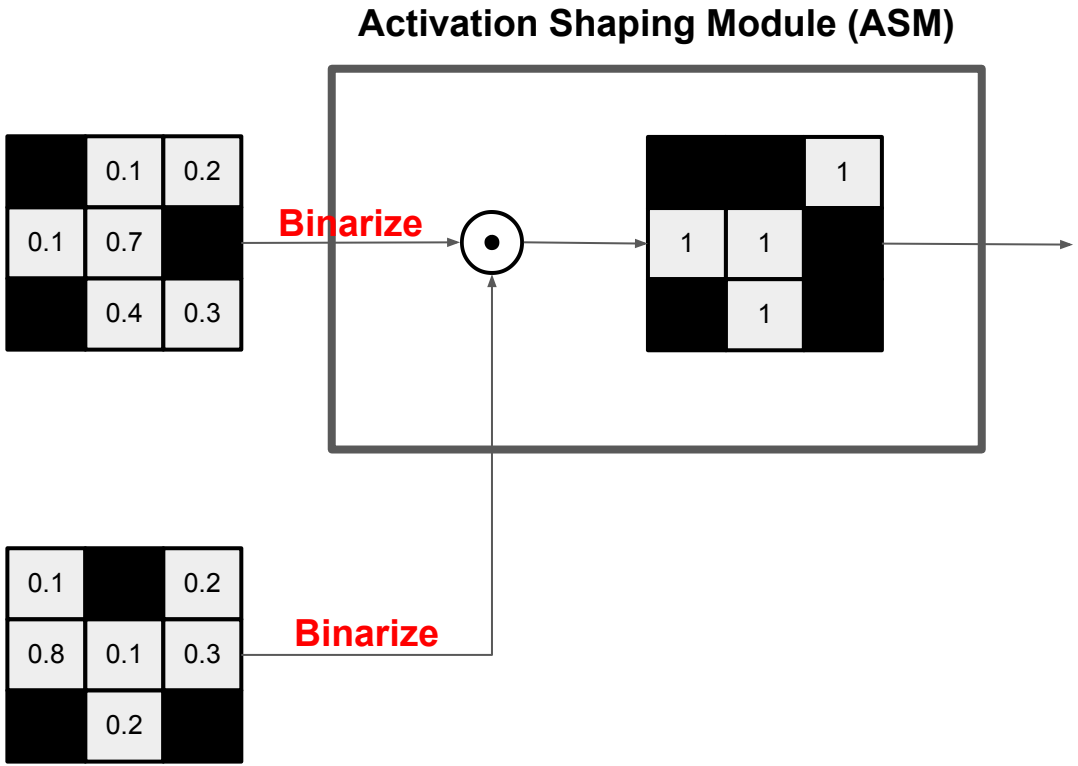


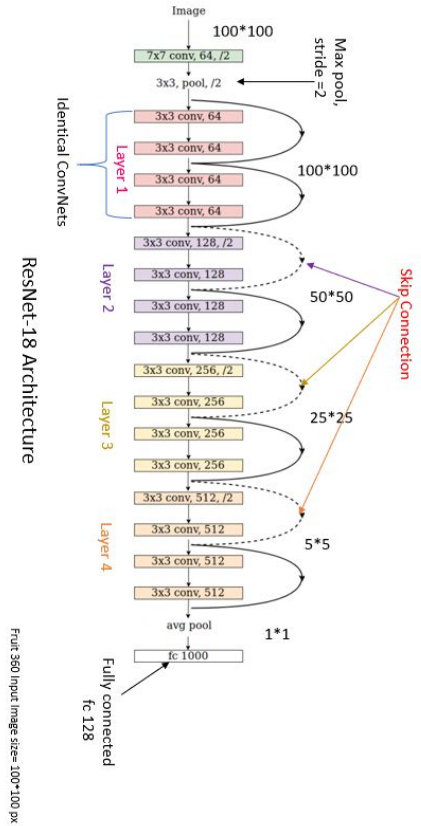
1. ASM - Implementation



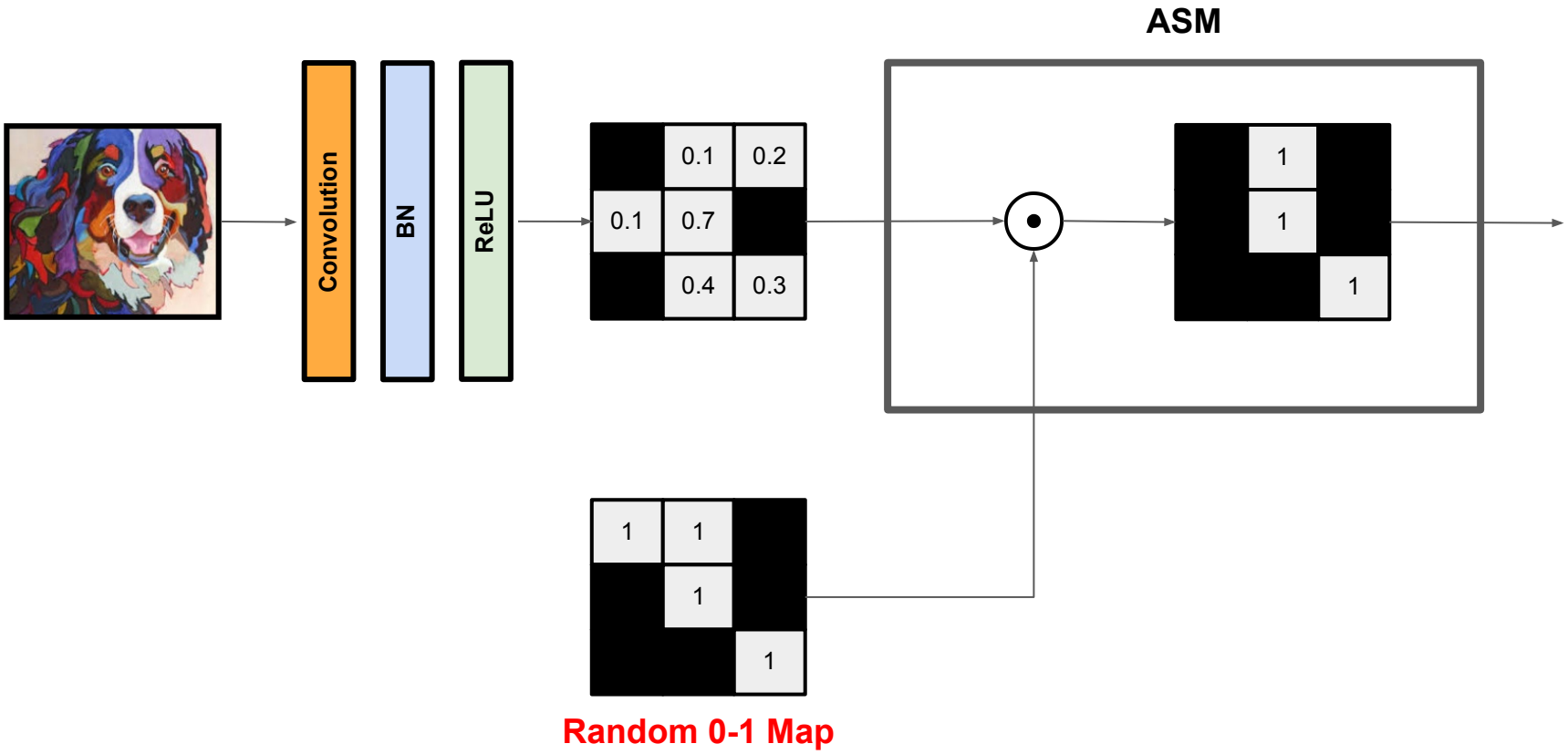
1. ASM - Implementation



Try multiple configurations



2. ASM - Random Maps Ablation



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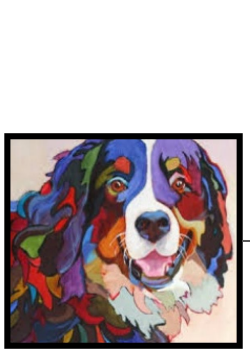


Convolution

BN

ReLU

	0.1	0.2
0.1	0.7	
	0.4	0.3

ASM

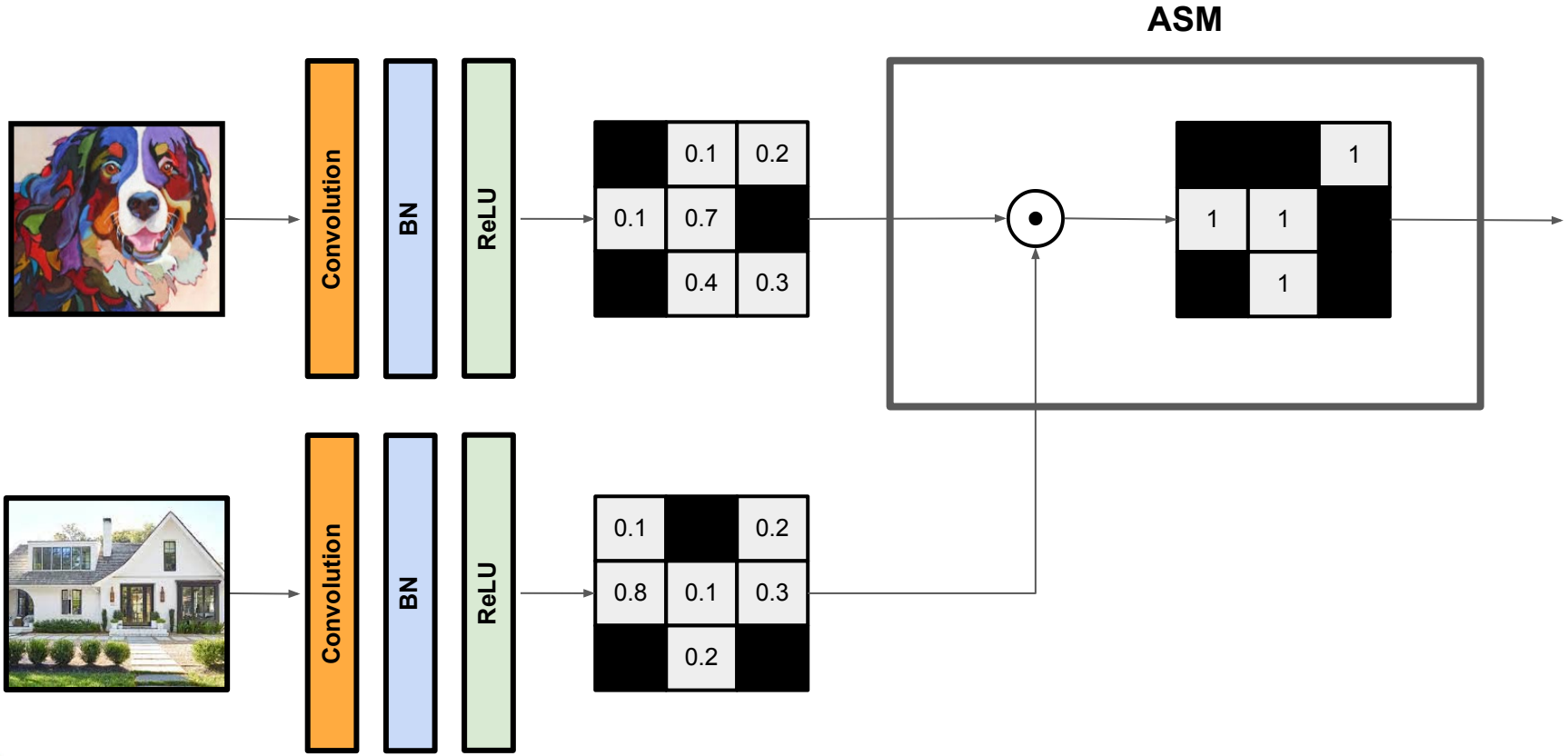
	1	
	1	
		1

1	1	
	1	
		1

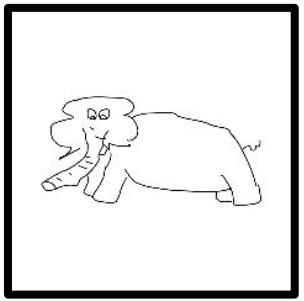
Random 0-1 Map

Try varying the ratio of 0s and 1s
(eg. all 1s; 50% 1s; …)

3. ASM - Unsupervised Domain Adaptation



[Ext.1] - Domain Generalization



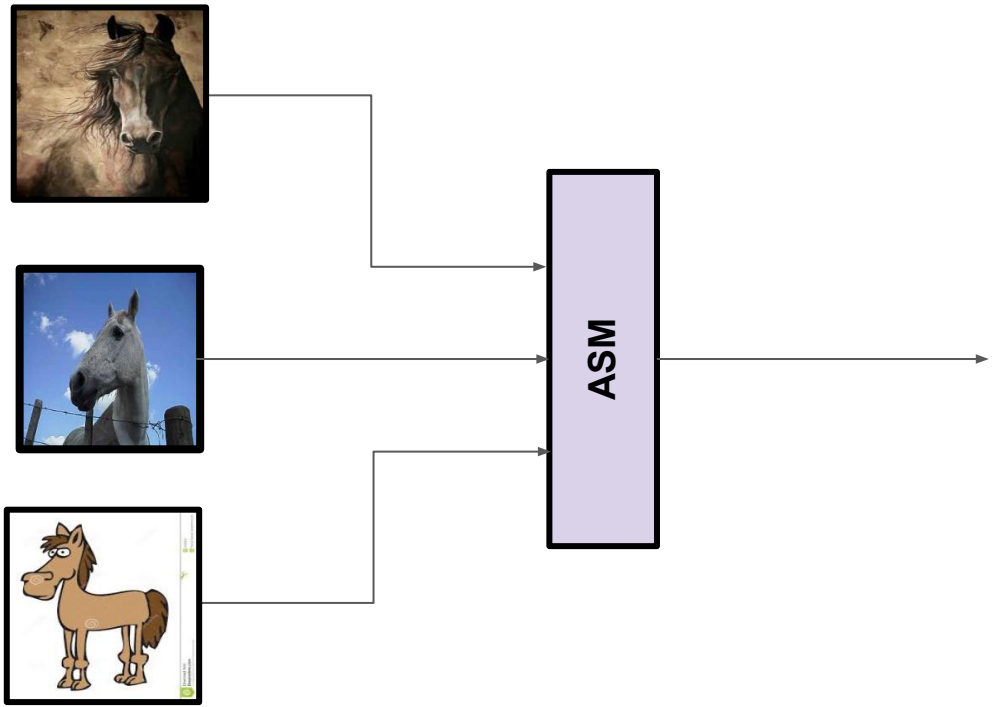
Source Domains

- **Training Set (Labeled)**

Target Domain

- **Test Set**

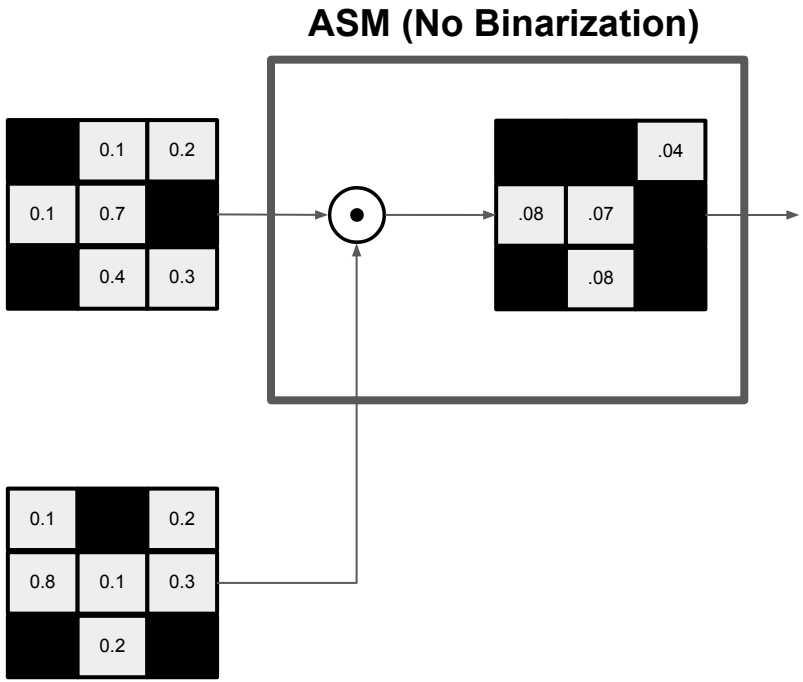
[Ext.1] - Domain Generalization



NOTE: all pictures have the same label here

[Ext.2] - Binarization Ablations

[Ext.2] - Binarization Ablations



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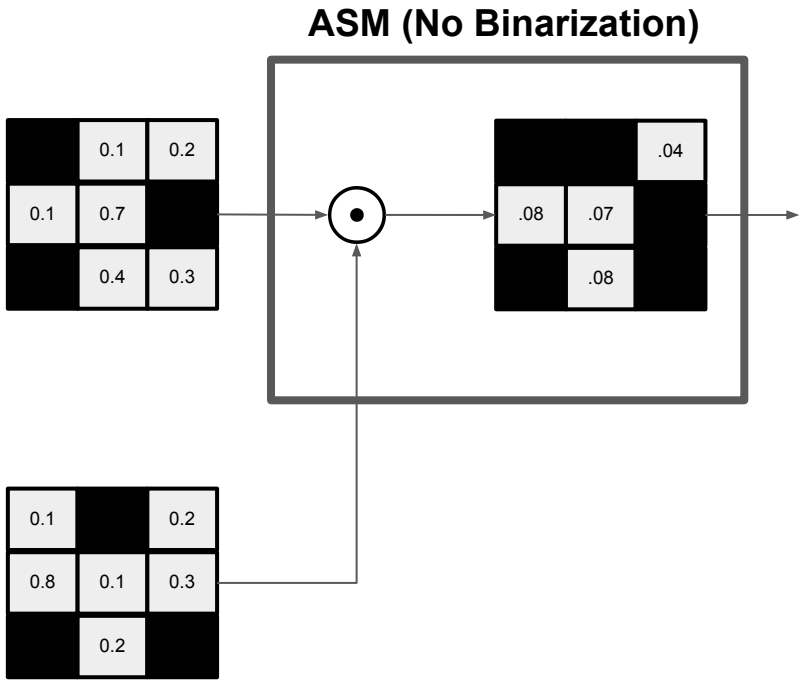

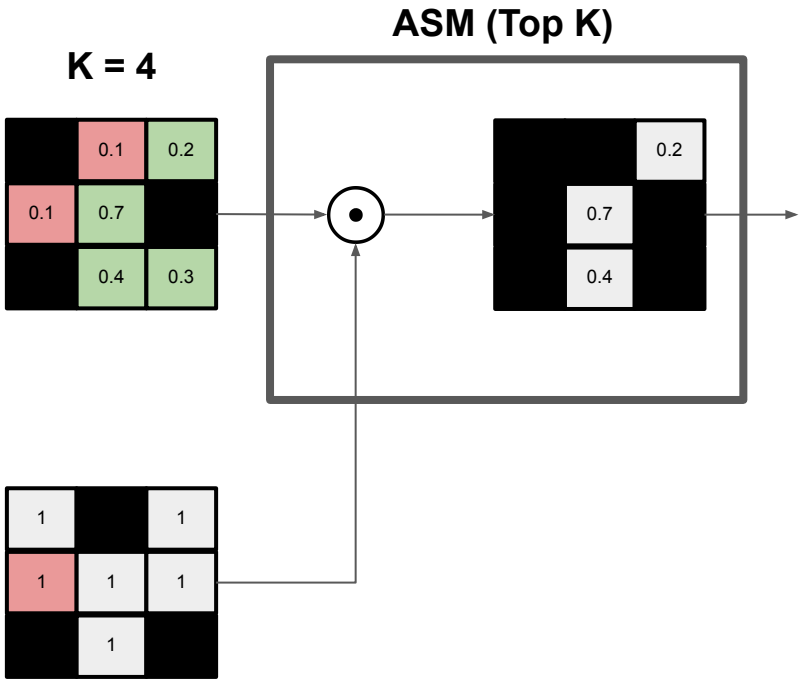

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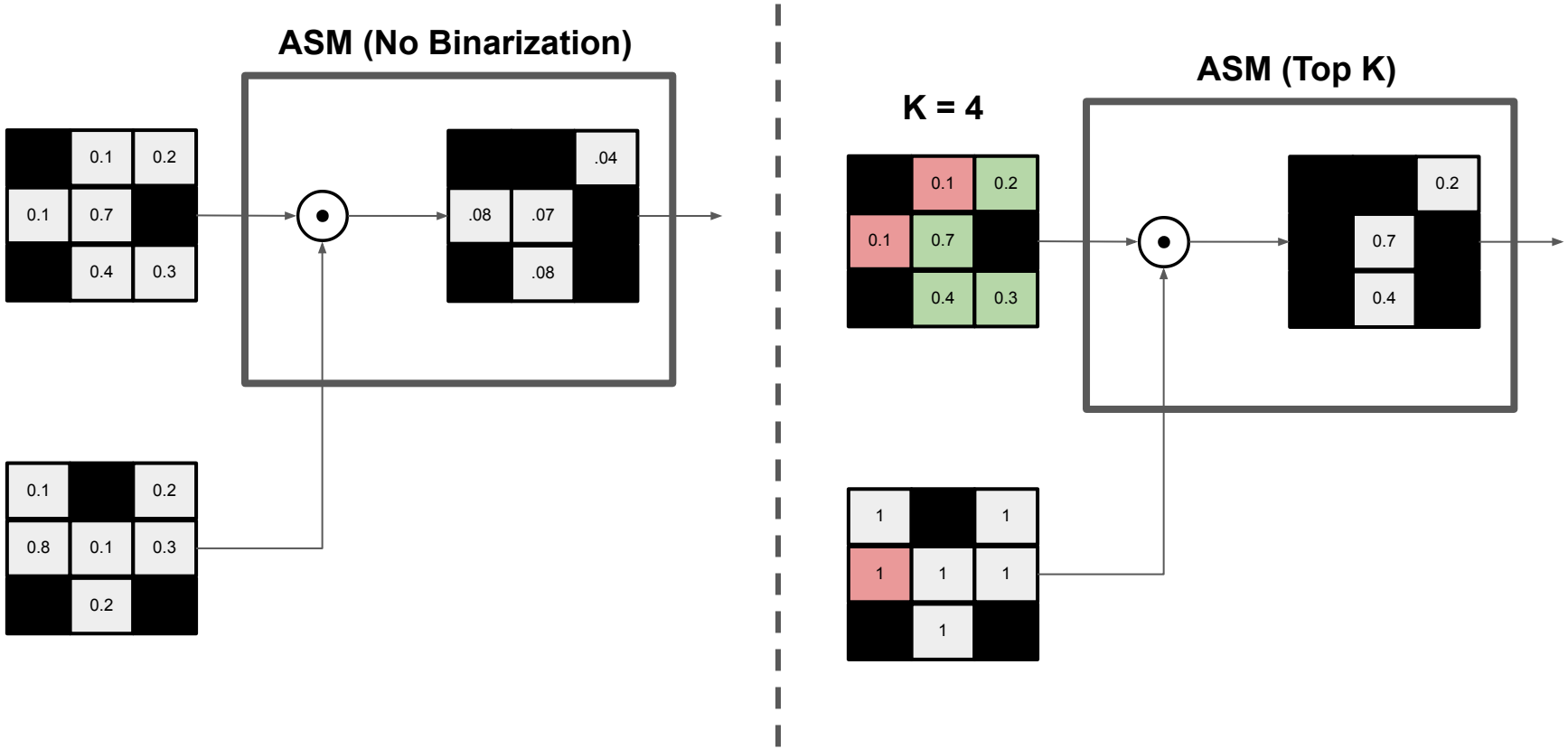

Repeat points 2. and 3. of the project