CPSC 425: Computer Vision

Image Credit: https://docs.adaptive-vision.com/4.7/studio/machine_vision_guide/TemplateMatching.html

Lecture 8: Template Matching (intro)

(unless otherwise stated slides are taken or adopted from **Bob Woodham, Jim Little** and **Fred Tung**)

Template Matching

How can we find a part of one image that matches another?

or,

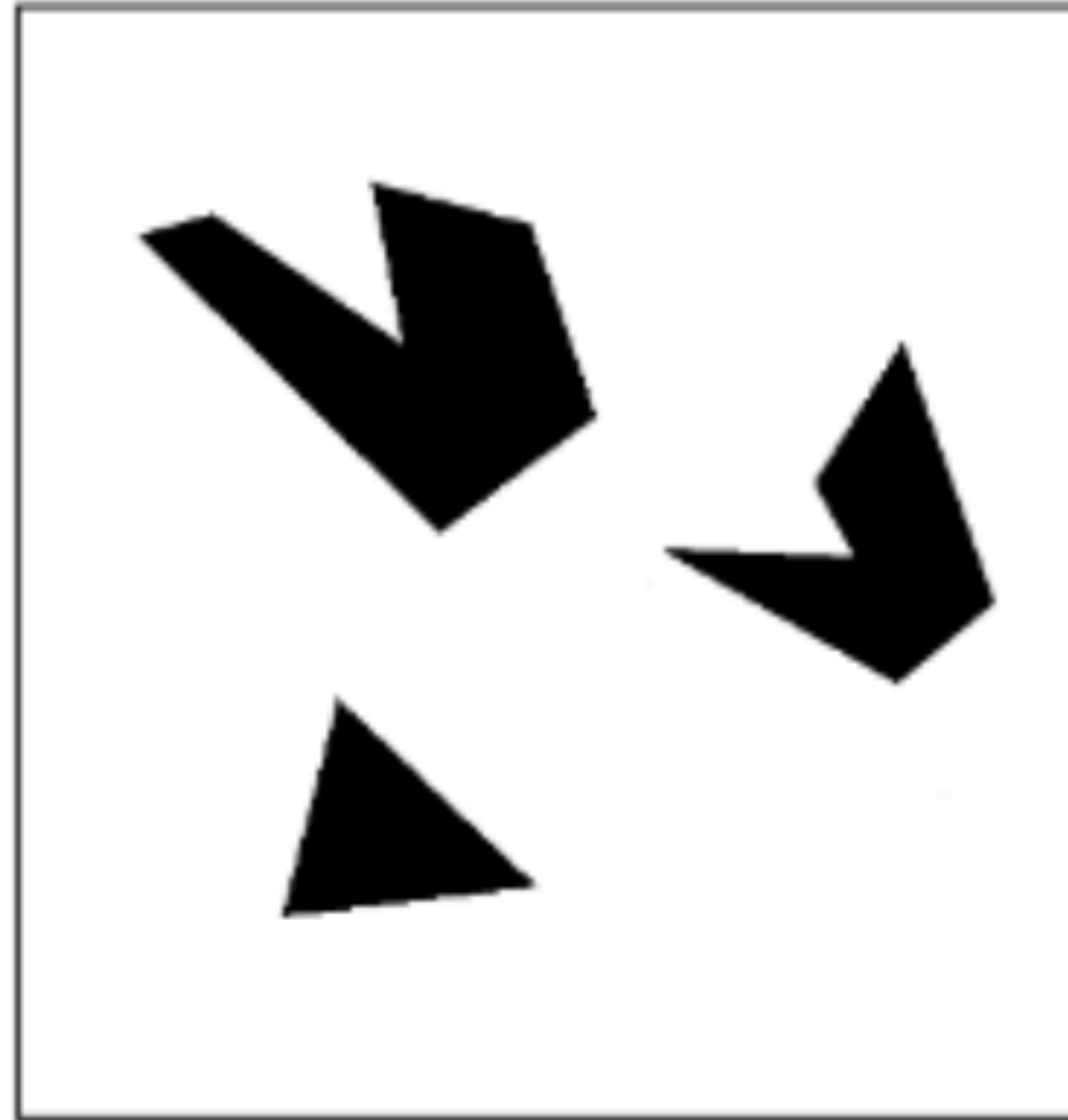How can we find instances of a pattern in an image?

Template Matching

How can we find a part of one image that matches another?

or,

How can we find instances of a pattern in an image?

Key Idea: Use the pattern as a **template**

Template Matching

Scene

Template (mask)

A toy example

Template Matching

We can think of convolution/**correlation** as comparing a template (the filter) with each local image patch.

— Consider the filter and image patch as vectors.

— Applying a filter at an image location can be interpreted as computing the dot product between the filter and the local image patch.

Template Matching

We can think of convolution/**correlation** as comparing a template (the filter) with each local image patch.

— Consider the filter and image patch as vectors.

— Applying a filter at an image location can be interpreted as computing the dot product between the filter and the local image patch.

Vector

Template

0	0	0
0	1	0
0	1	1

$\longrightarrow$

0
0
0
0
1
1
0
0
1

Template Matching

We can think of convolution/**correlation** as comparing a template (the filter) with each local image patch.

— Consider the filter and image patch as vectors.

— Applying a filter at an image location can be interpreted as computing the dot product between the filter and the local image patch.

Image Patch 1

0	0	0
0	1	0
0	1	1

Image Patch 2

1	0	1
0	1	0
0	0	0

Template

0	0	0
0	1	0
0	1	1

Template Matching

We can think of convolution/**correlation** as comparing a template (the filter) with each local image patch.

— Consider the filter and image patch as vectors.

— Applying a filter at an image location can be interpreted as computing the dot product between the filter and the local image patch.

Image Patch 1

0	0	0
0	1	0
0	1	1

Image Patch 2

1	0	1
0	1	0
0	0	0

Template

0	0	0
0	1	0
0	1	1

element multiply

0	0	0
0	1	0
0	1	1

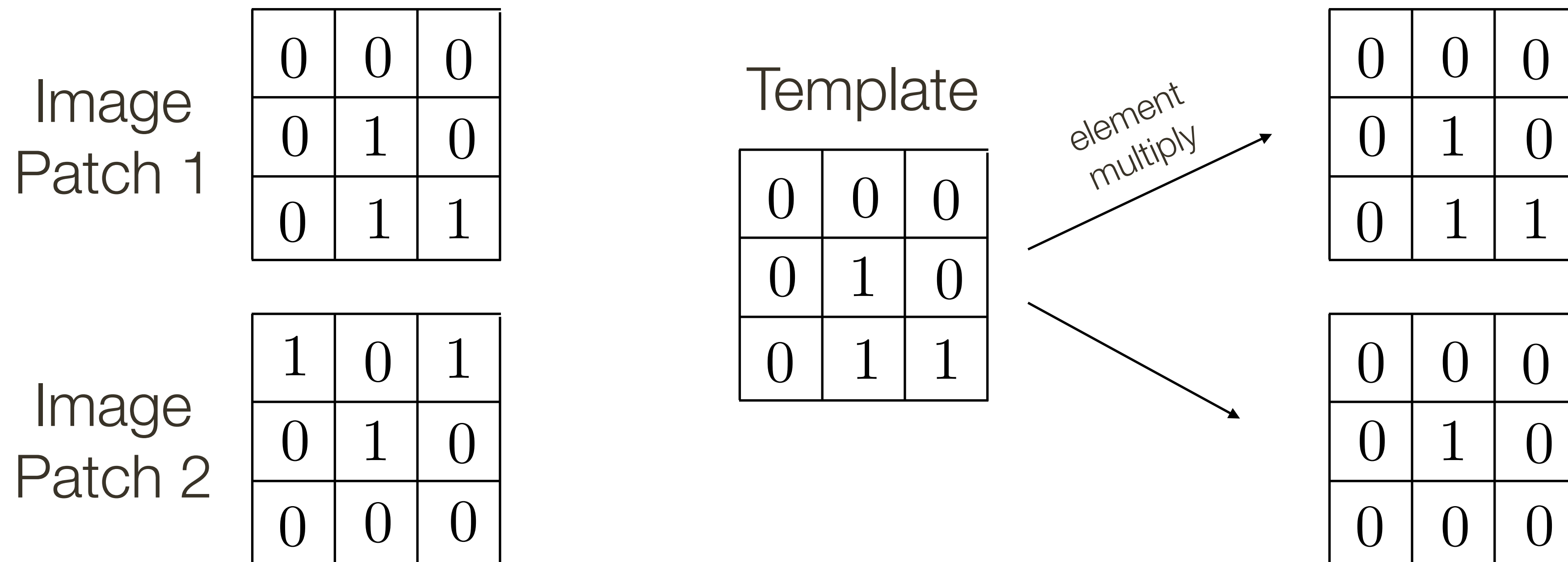| 0	0	0
0	1	0
0	0	0

Template Matching

We can think of convolution/**correlation** as comparing a template (the filter) with each local image patch.

— Consider the filter and image patch as vectors.

— Applying a filter at an image location can be interpreted as computing the dot product between the filter and the local image patch.

Image Patch 1

0	0	0
0	1	0
0	1	1

Template

0	0	0
0	1	0
0	1	1

element multiply

0	0	0
0	1	0
0	1	1

$= 3$

Image Patch 2

1	0	1
0	1	0
0	0	0

0	0	0
0	1	0
0	0	0

$= 1$