

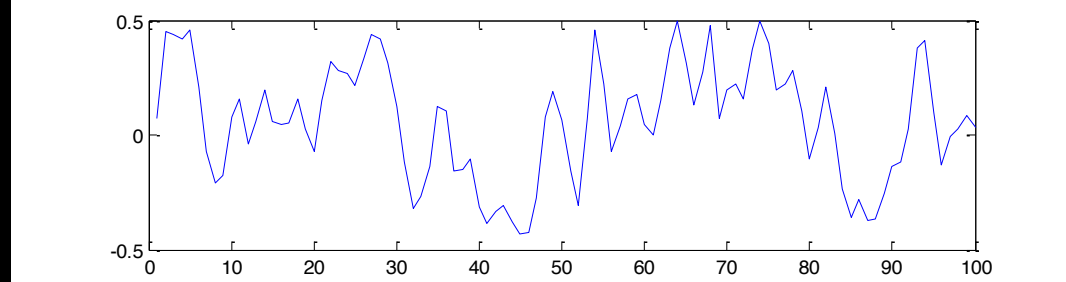
CS4495/6495

Introduction to Computer Vision

2A-L4 *Filters as templates*

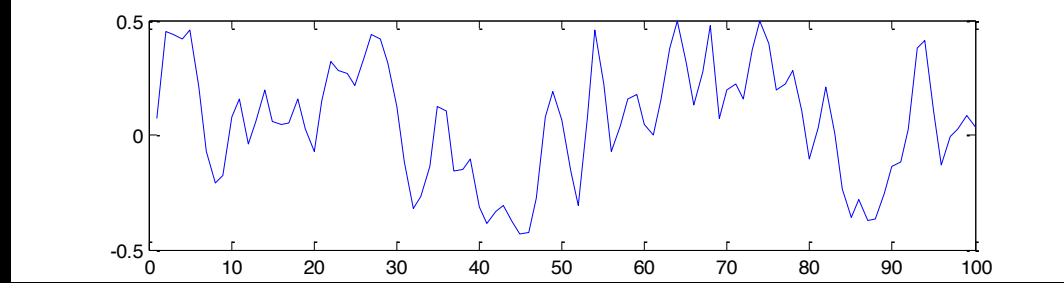
1D (nx)correlation

Signal

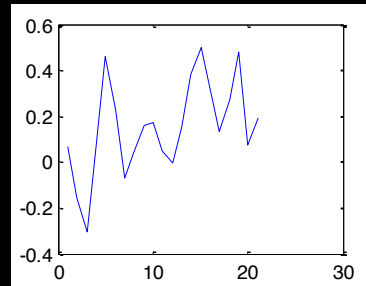


1D (nx)correlation

Signal

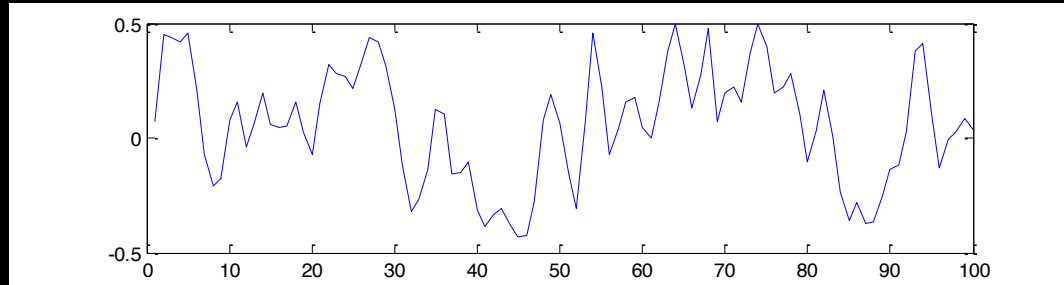


Filter

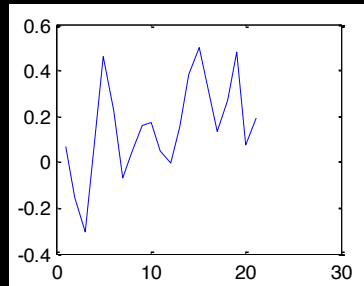


1D (nx)correlation

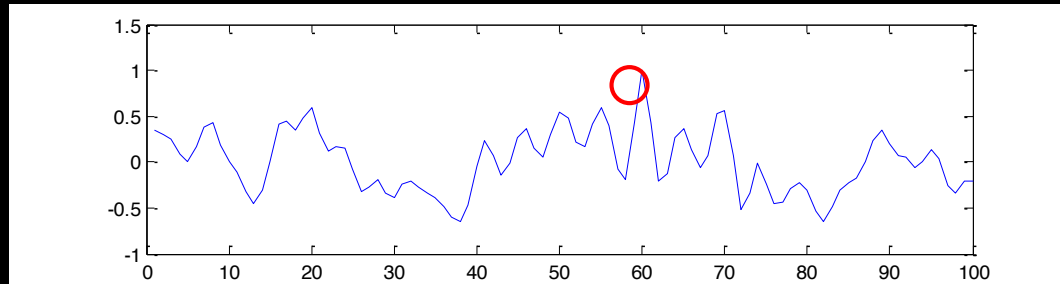
Signal



Filter

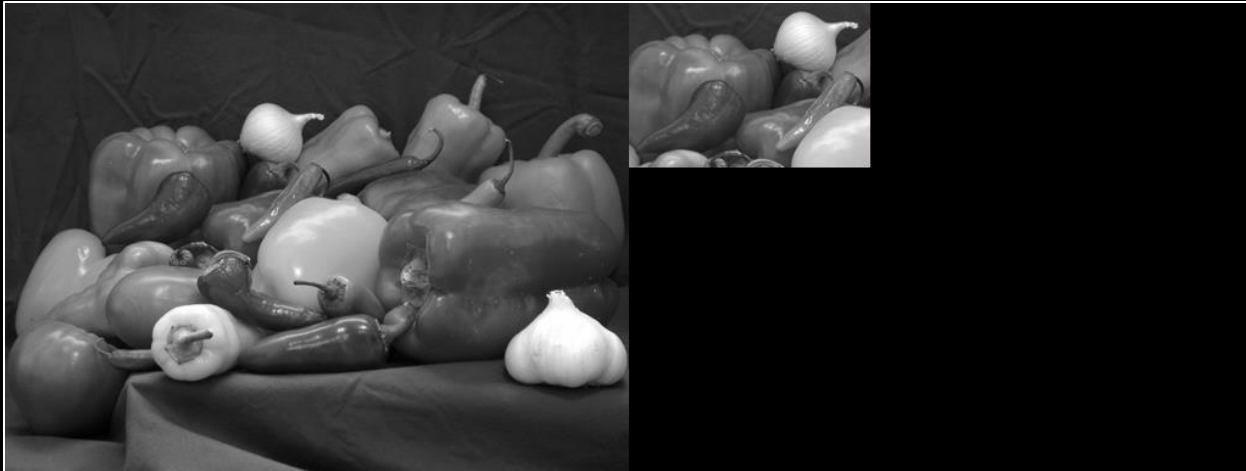


Normalized
cross-correlation



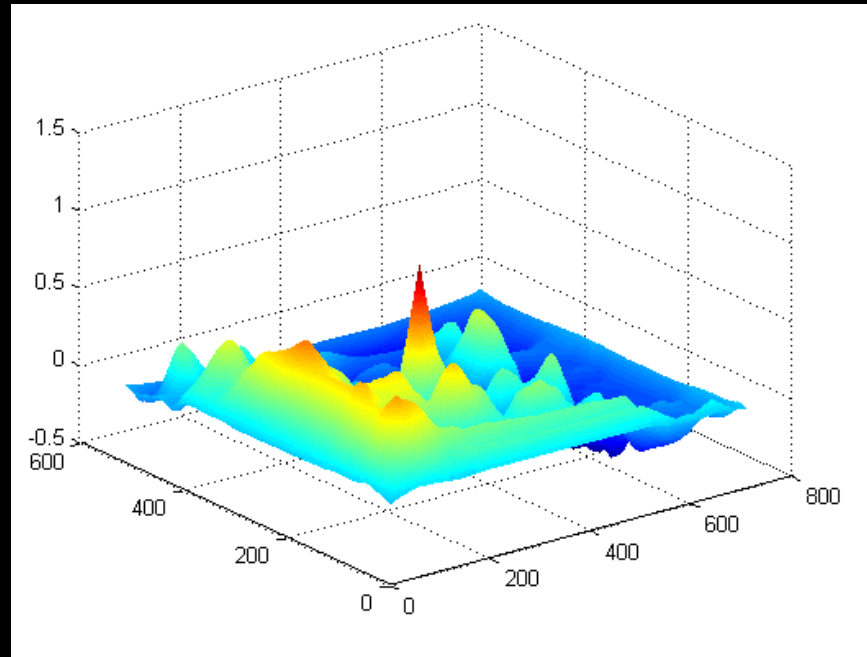
Matlab cross-correlation doc

```
onion    = rgb2gray(imread('onion.png')) ;  
peppers = rgb2gray(imread('peppers.png')) ;  
imshowpair(peppers, onion, 'montage')
```

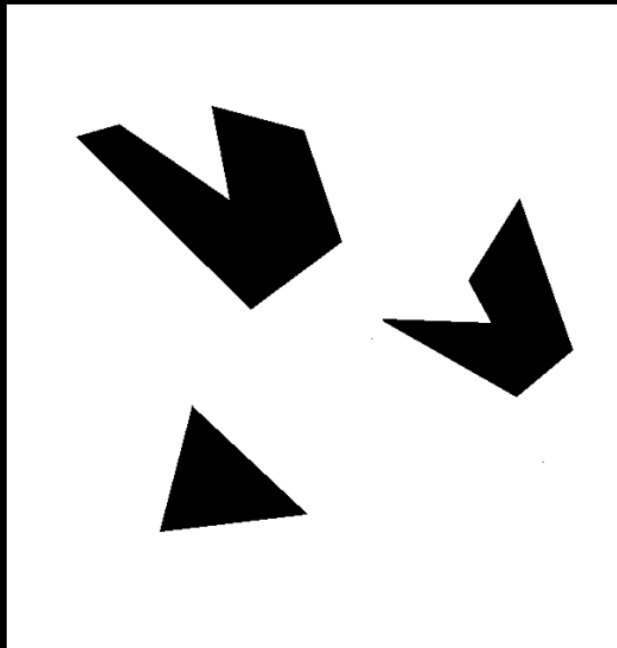


Matlab cross-correlation doc

```
c = normxcorr2 (onion,peppers) ;  
figure, surf(c), shading flat;
```

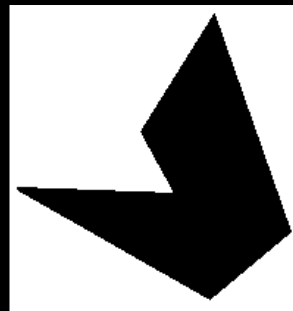


Template matching



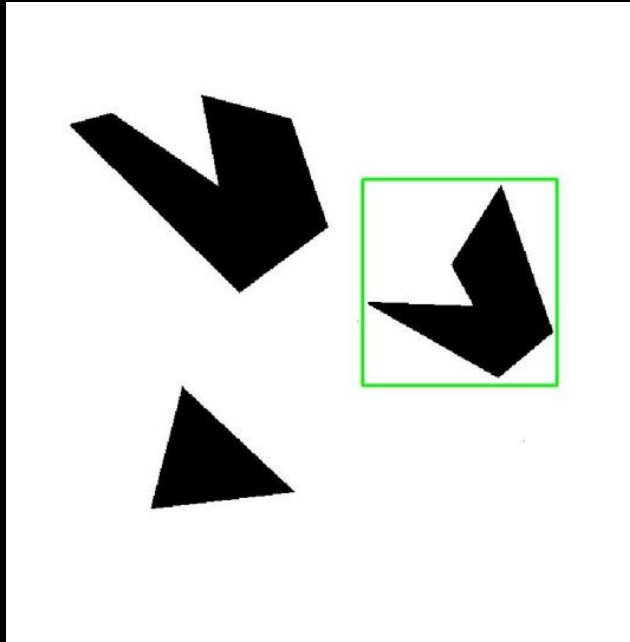
Scene

A toy example



Template (mask)

Template matching

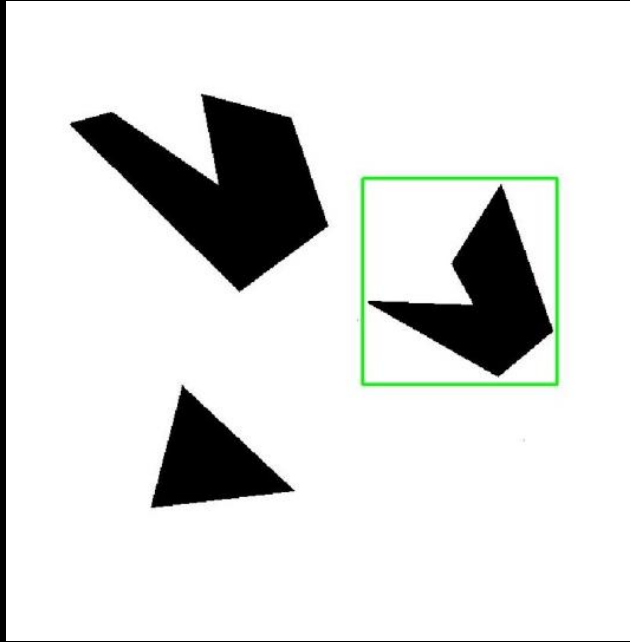


Detected template

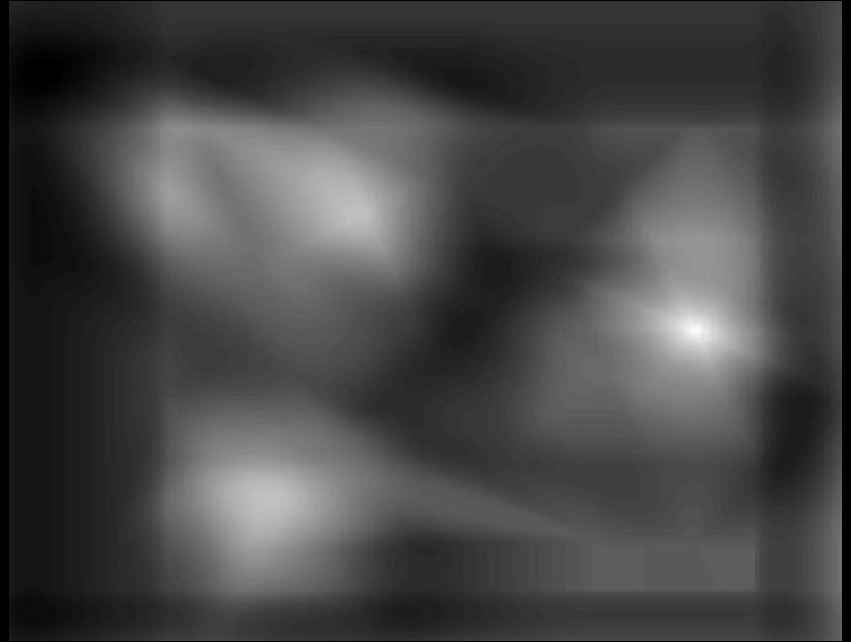


Template (mask)

Template matching



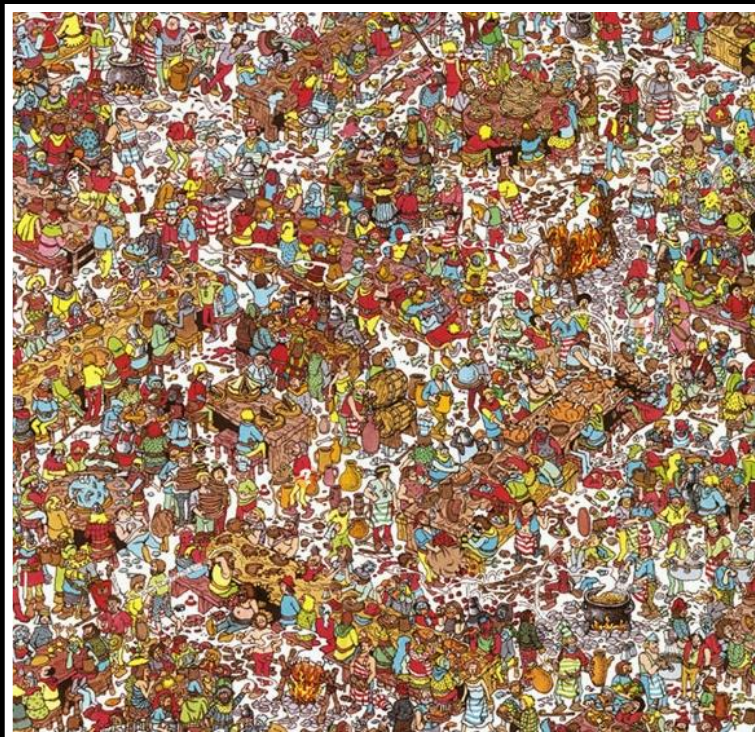
Detected template



Correlation map

Where's Waldo?

Scene

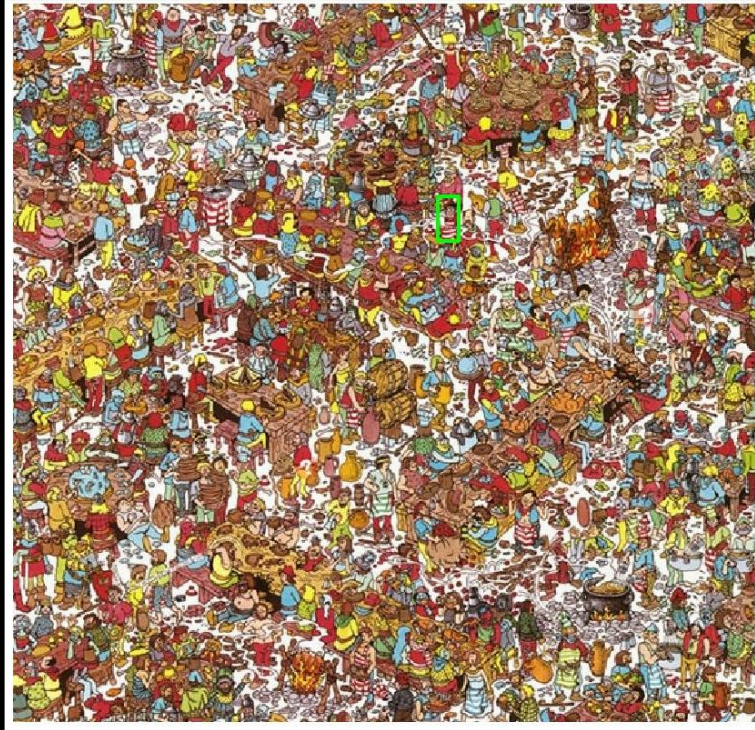


Template

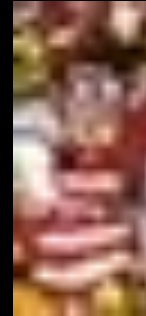


K. Grauman

Where's Waldo?

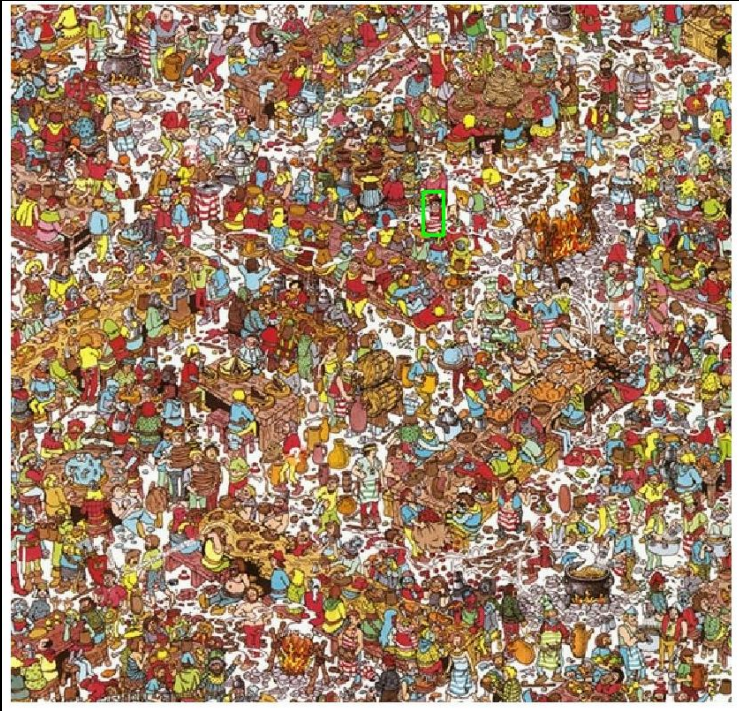


Detected Template

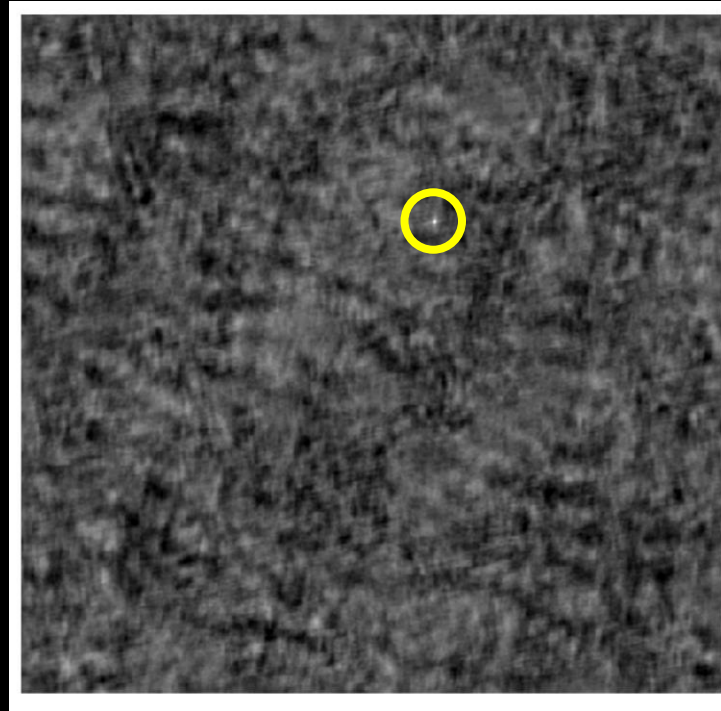


Template

Where's Waldo?



Detected template



Correlation map

Quiz

Would this method work for finding Waldo in most situations?

- Yes – normalized correlation is powerful.
- No – we don't have the right template.
- Partially – explain how?

Template matching

What if the template is not identical to some sub-image in the scene?



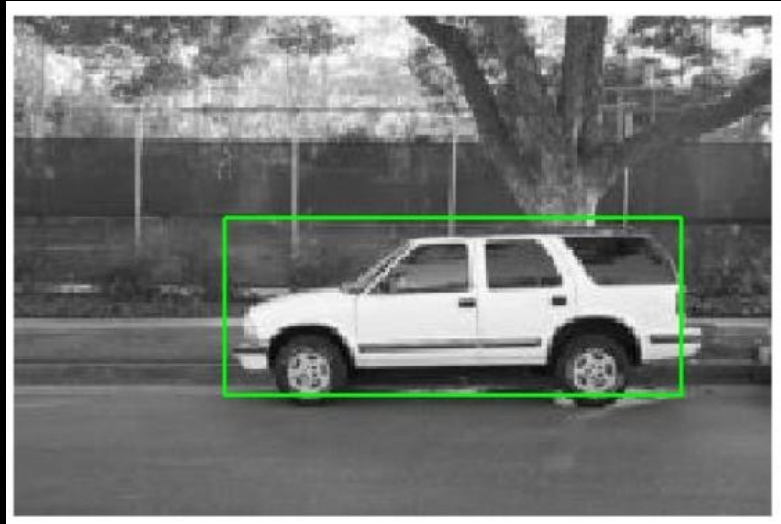
Scene



Template

Template matching

Match can be meaningful, if scale, orientation, and general appearance is right.



Detected template



Template

Summary

- We can use filters to localize “interesting” areas in an image by looking at how well a filter responds at different locations.
- Going forward we will use filters both to compute functions (like the smoothing) and to find strong responses to those functions (like templates).