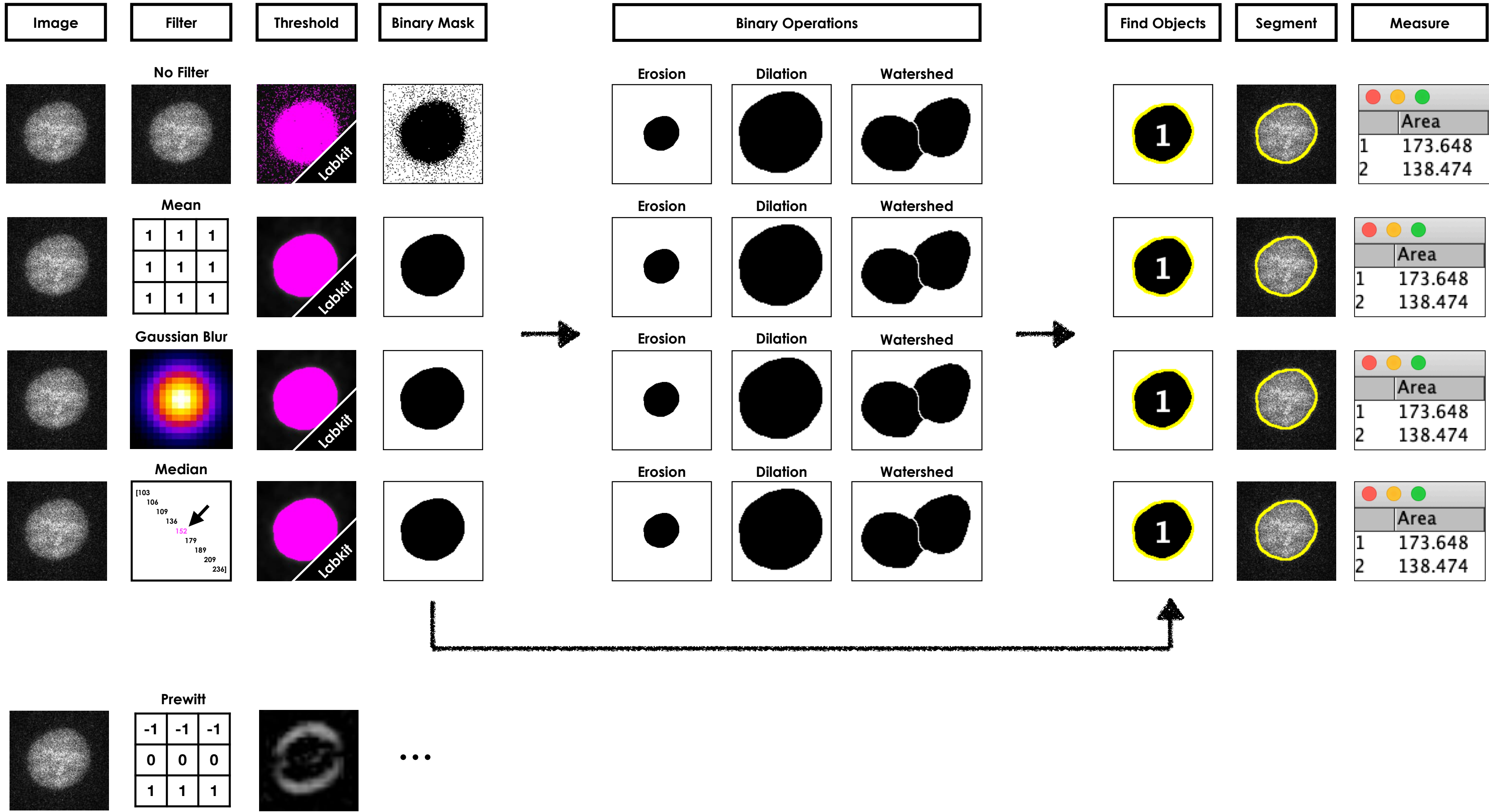


Summary



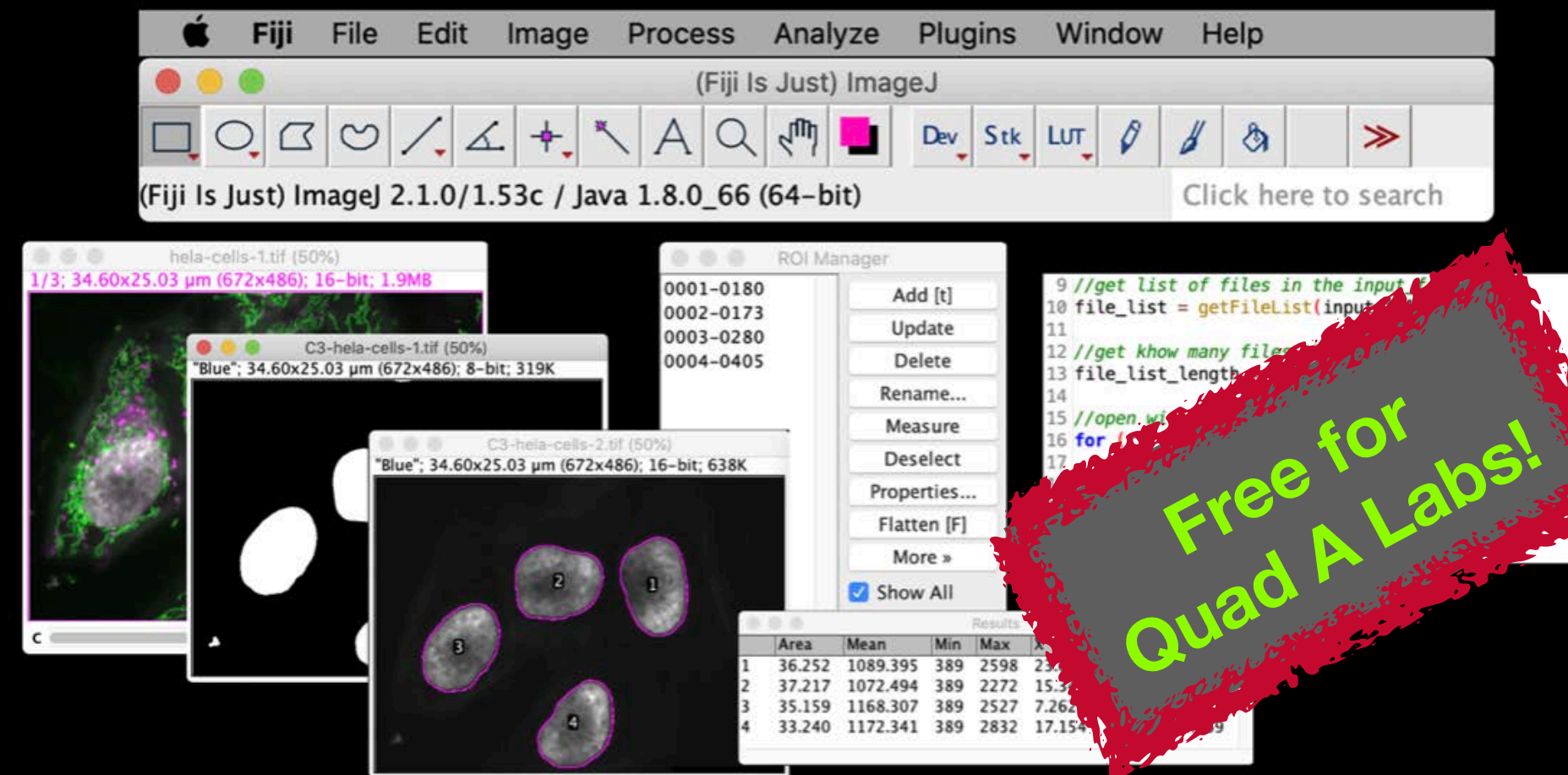


HARVARD
MEDICAL SCHOOL



<https://iac.hms.harvard.edu/>

**The Image Analysis Collaboratory
is organizing two workshops!**



**Free for
Quad A Labs!**

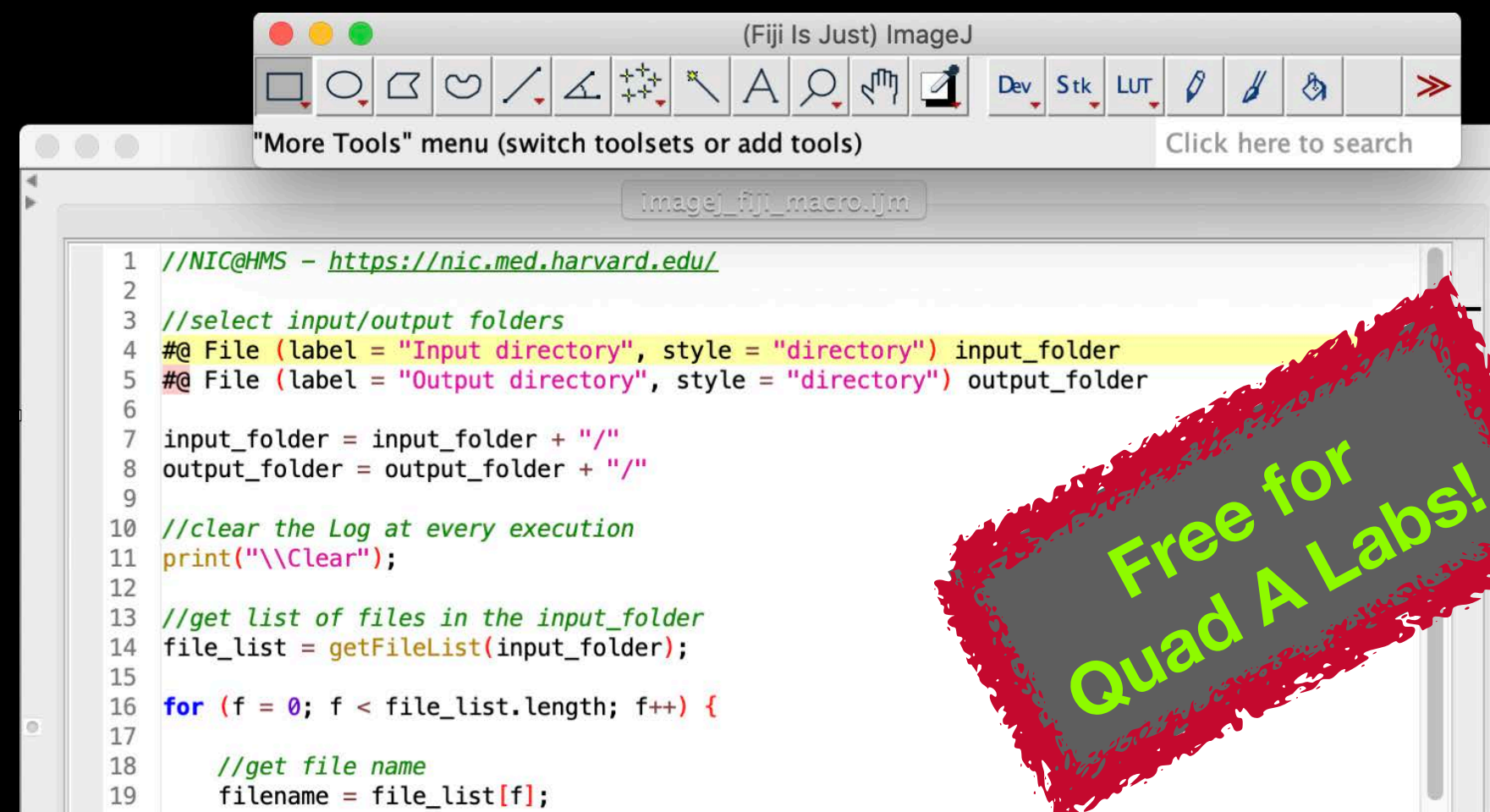
Introduction to Image Analysis using ImageJ/Fiji

📅 January 22nd & January 24th, 1pm-5:30pm

🕒 Application Deadline: January 17th

📍 In Person @ HMS - Registration Required

🔗 <https://tinyurl.com/iac-fiji-20250122>



**Free for
Quad A Labs!**

Introduction to Macro writing in ImageJ/Fiji

📅 January 28th, 10am-5:30pm

🕒 Application Deadline: January 24th

📍 In Person @ HMS - Registration Required

🔗 <https://tinyurl.com/iac-fiji-macro-20250128>

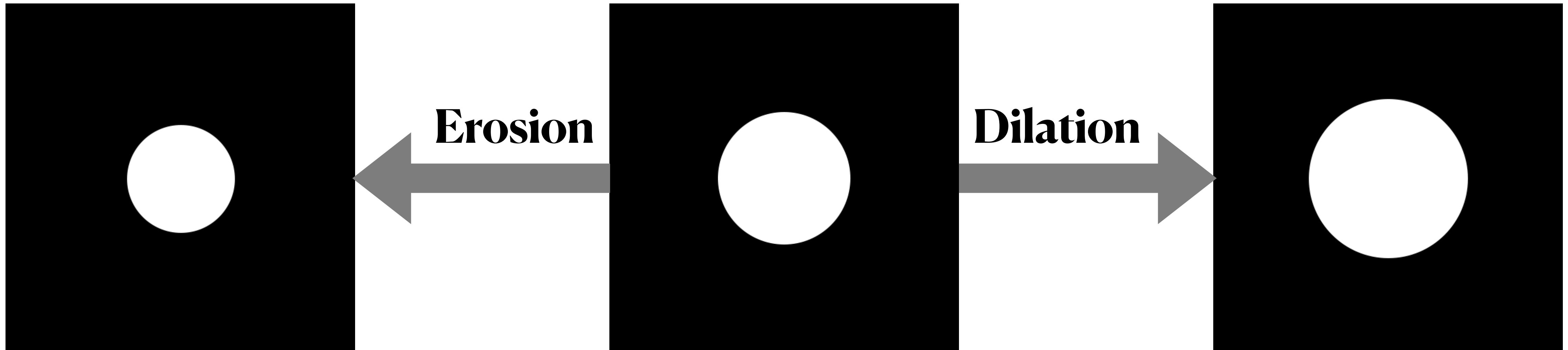


Morphological Filters

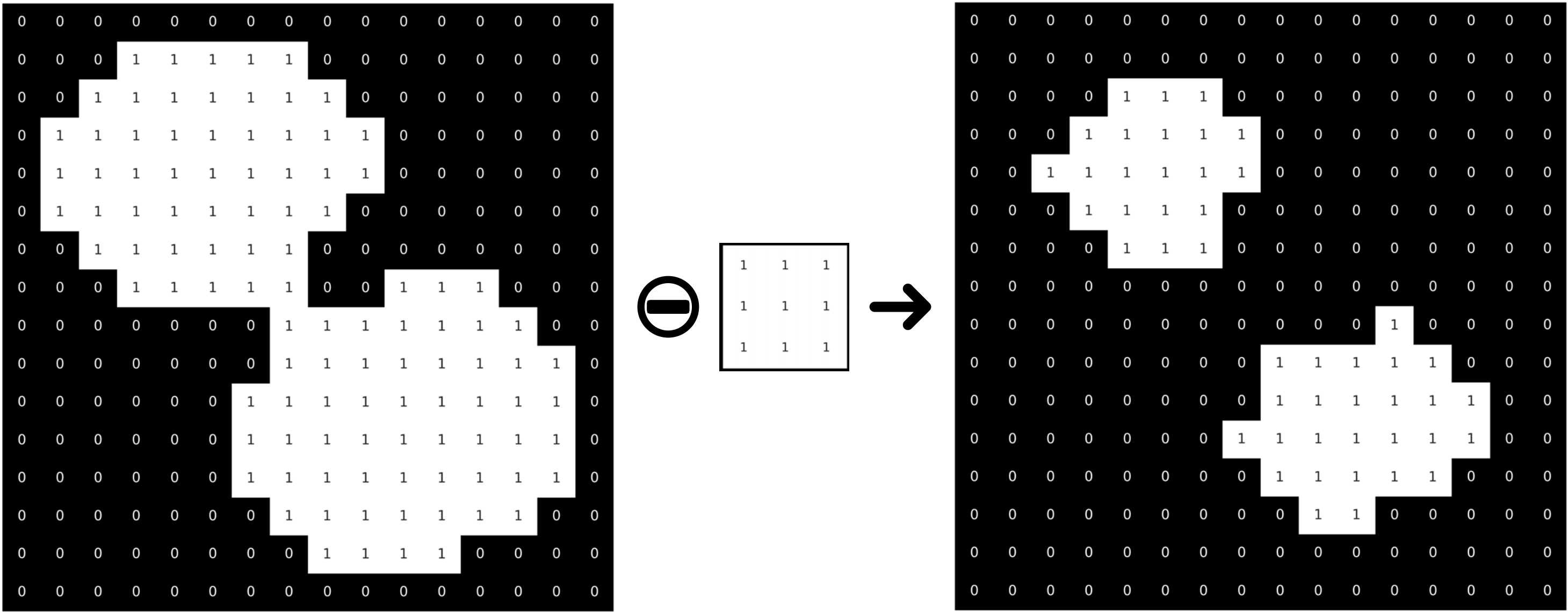
Two Primary Morphological Operations

Erosion

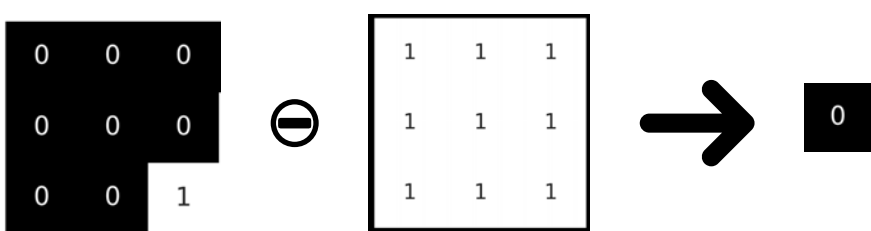
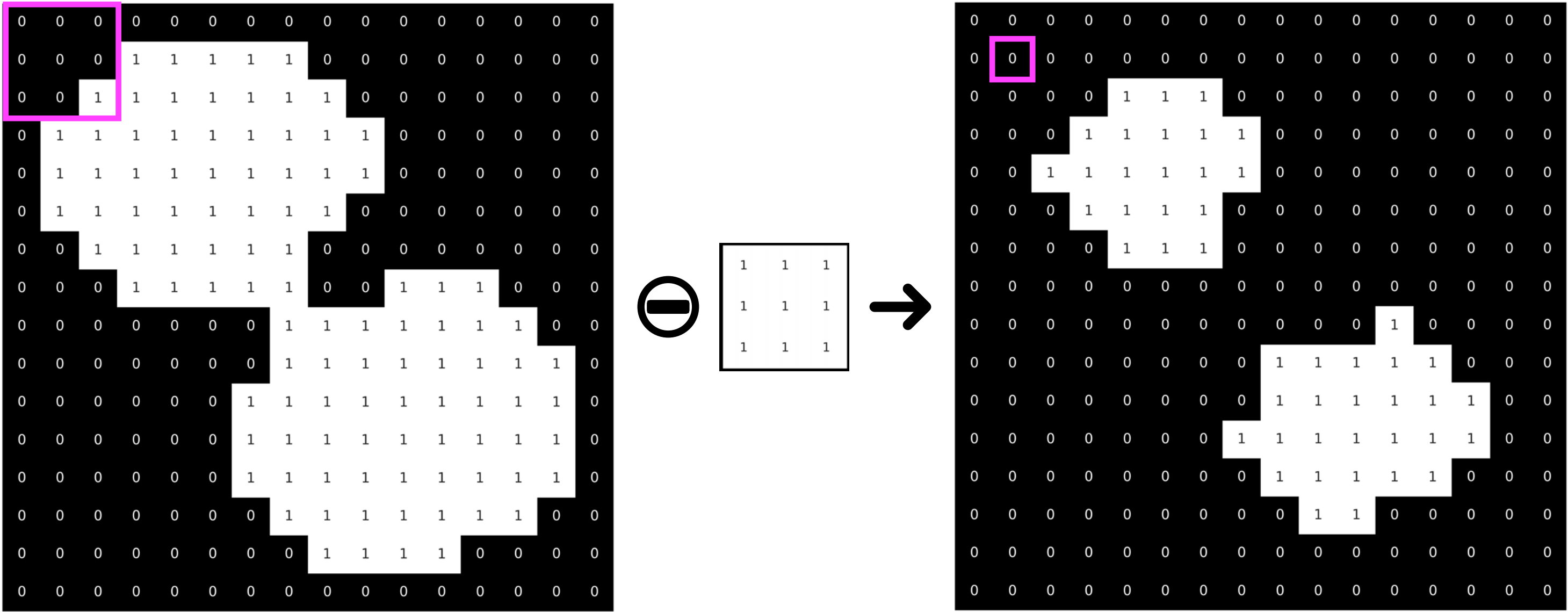
Dilation



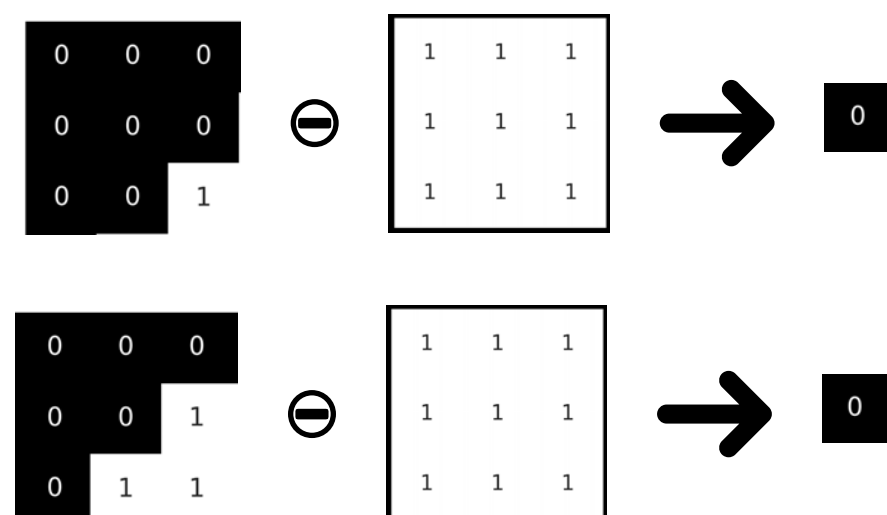
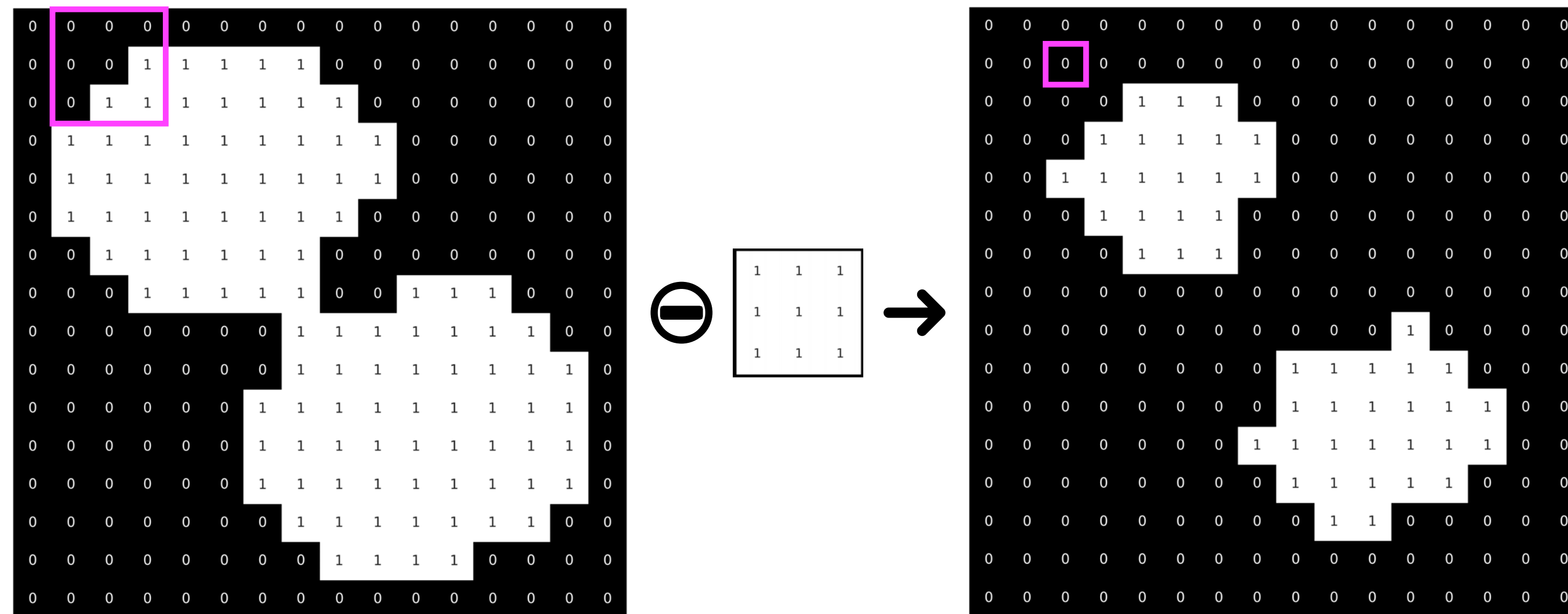
Erosion Operation



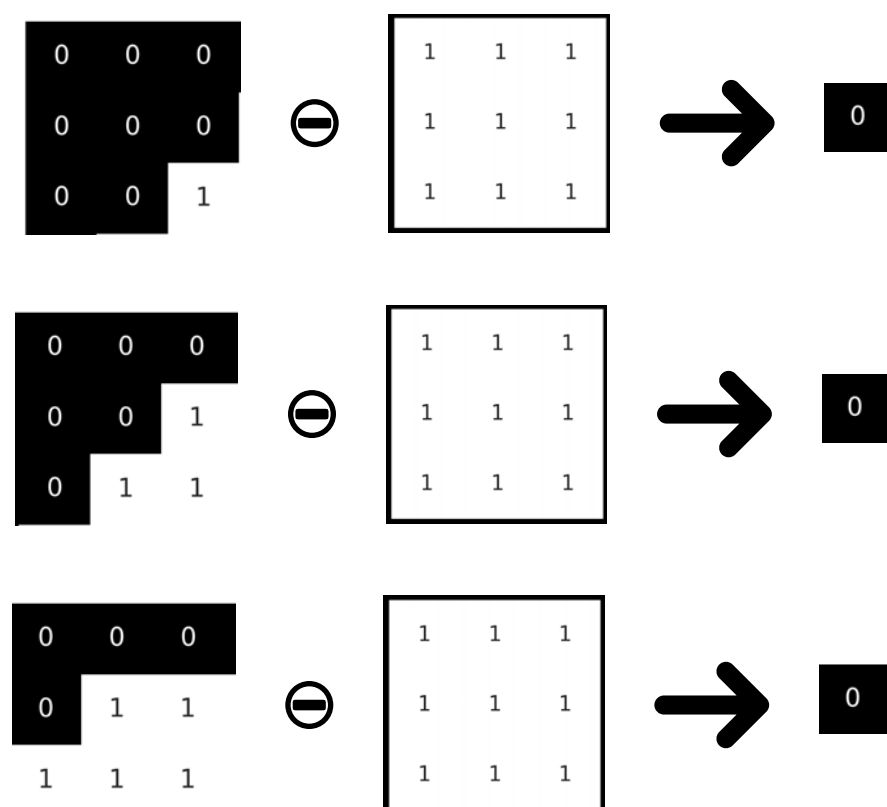
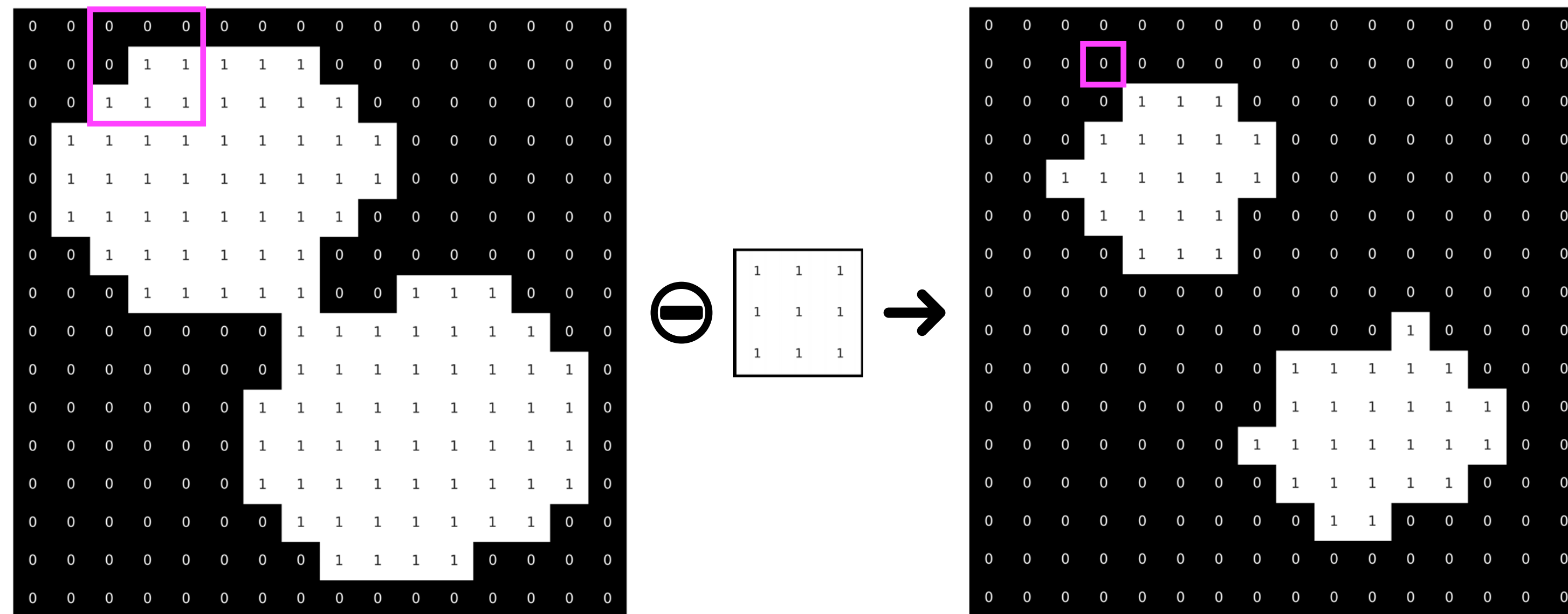
Erosion Operation



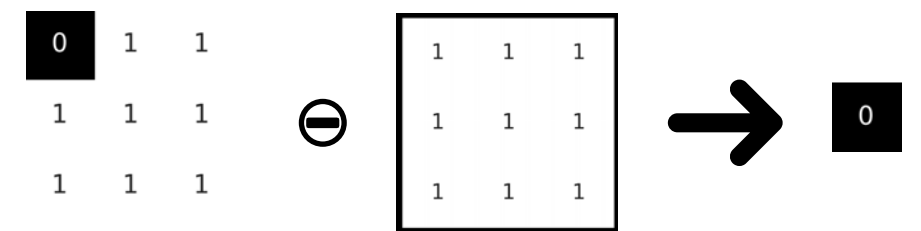
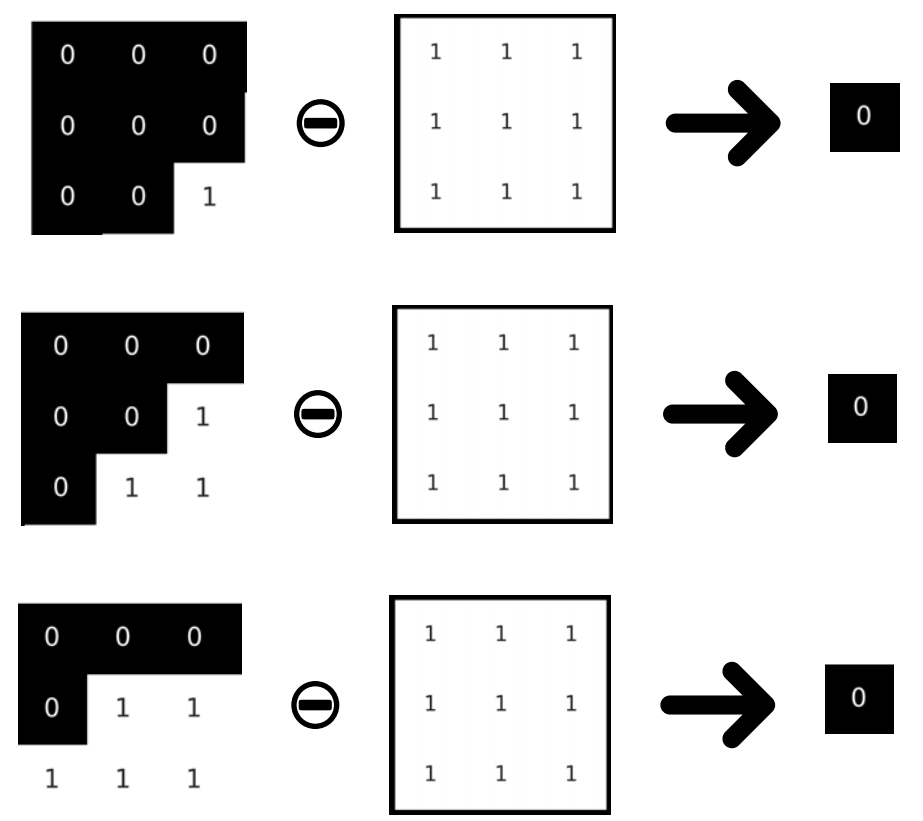
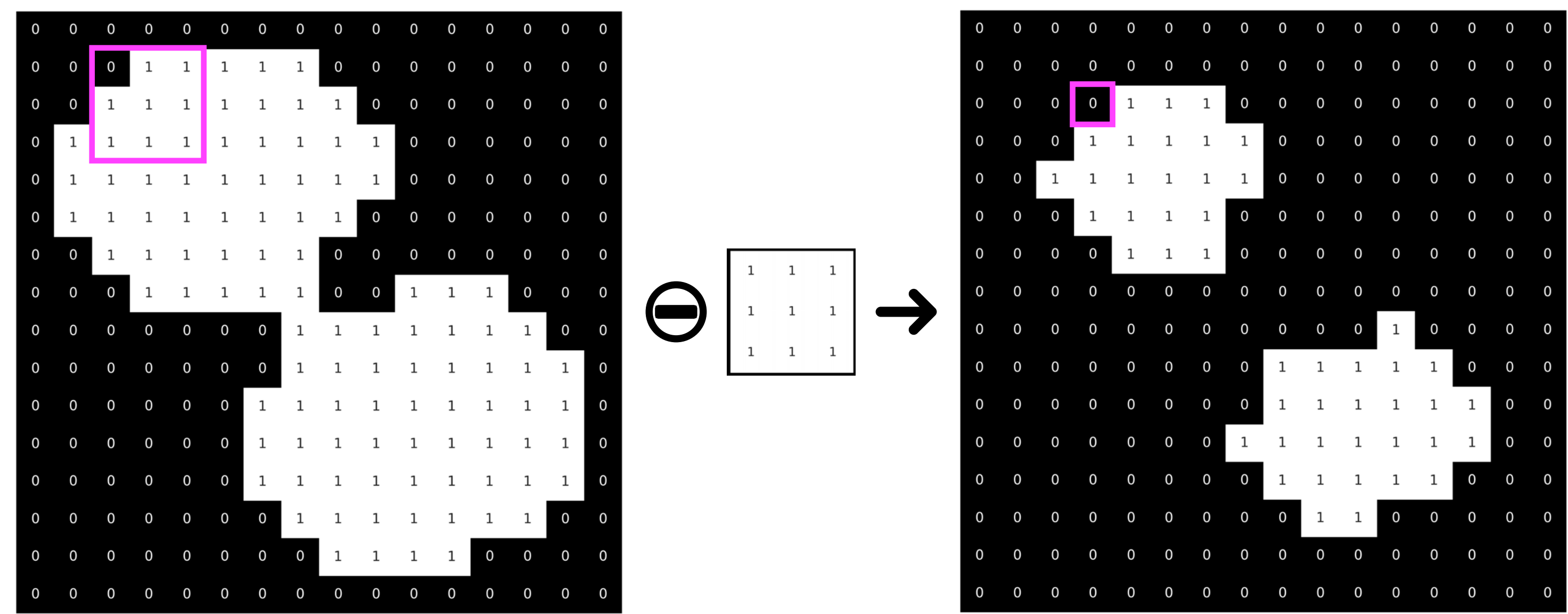
Erosion Operation



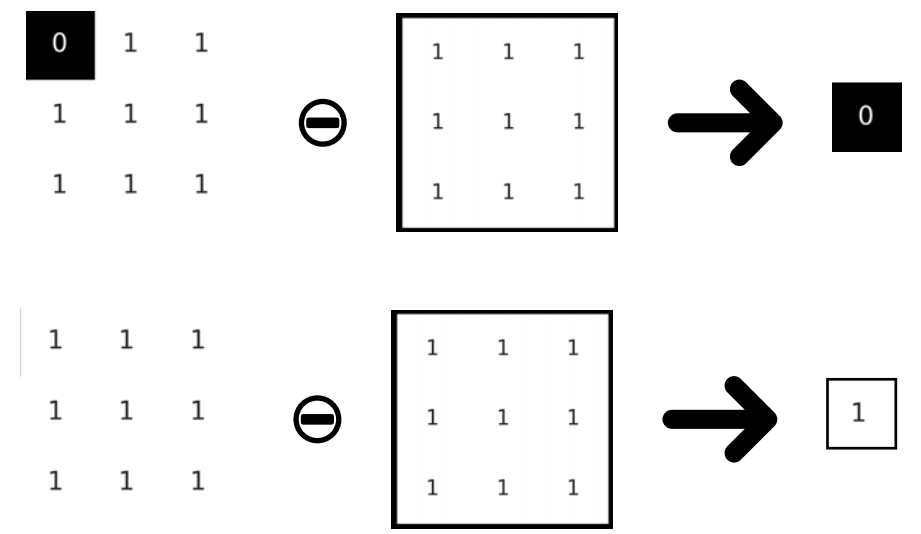
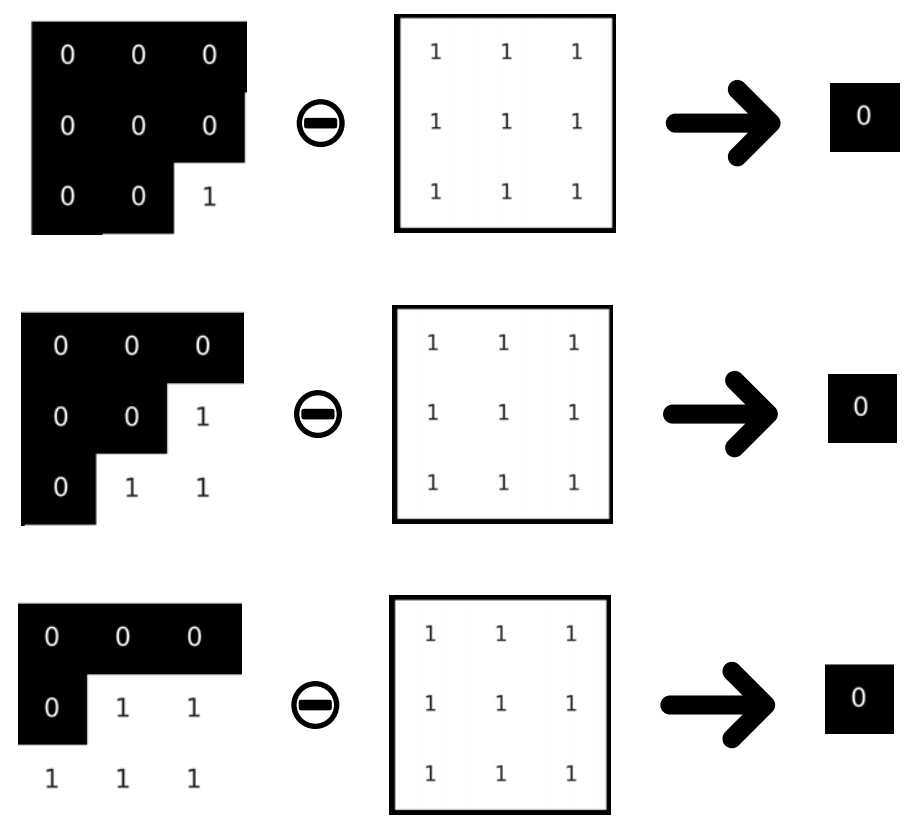
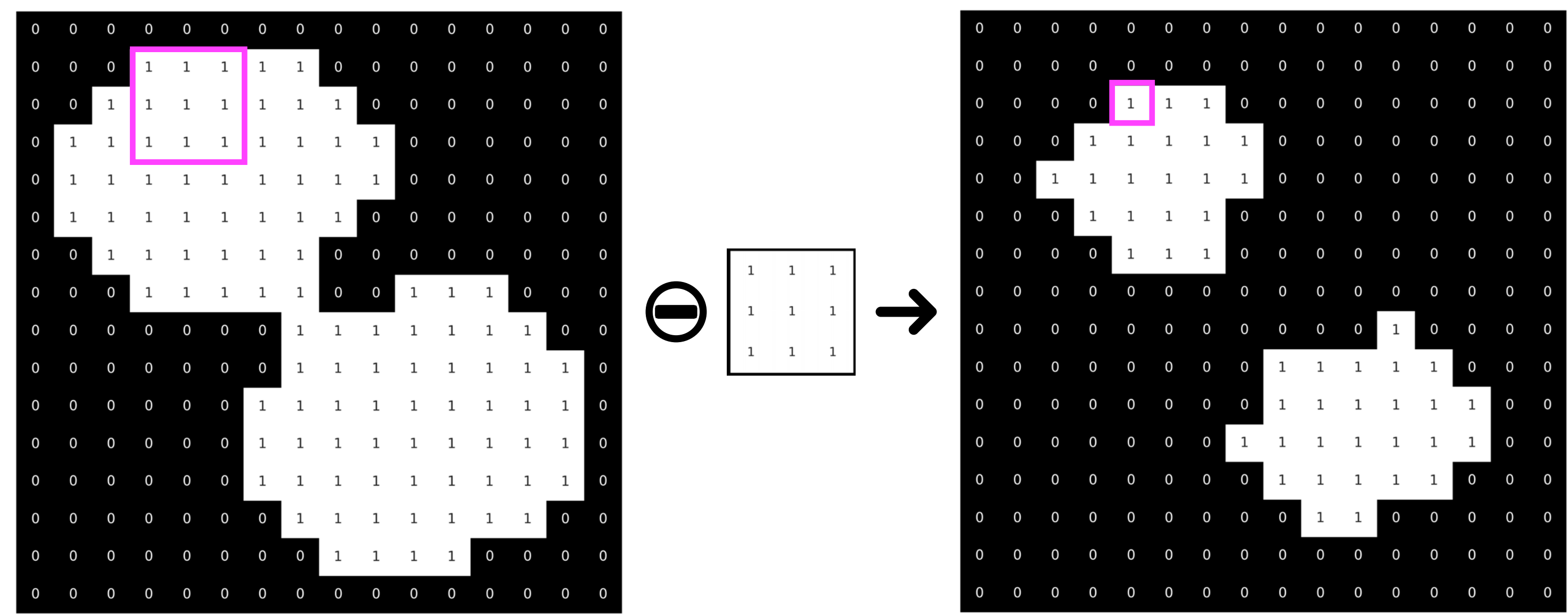
Erosion Operation



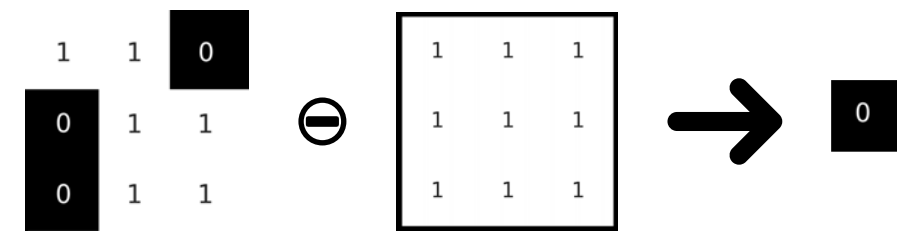
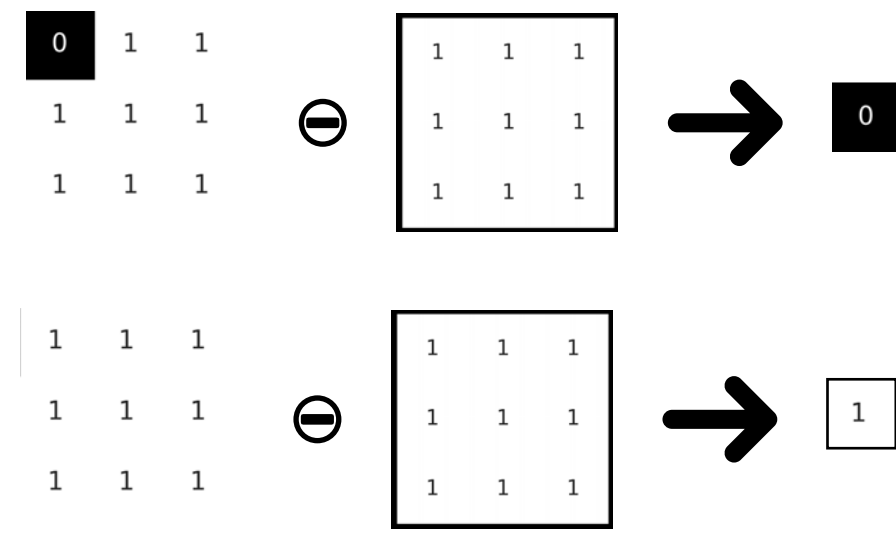
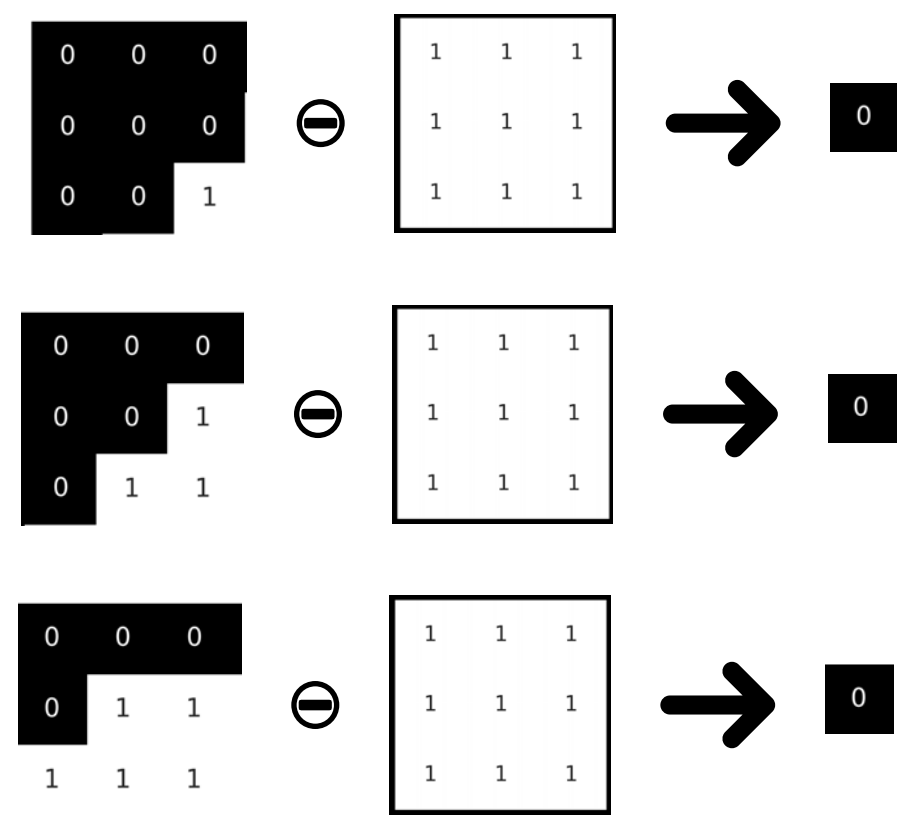
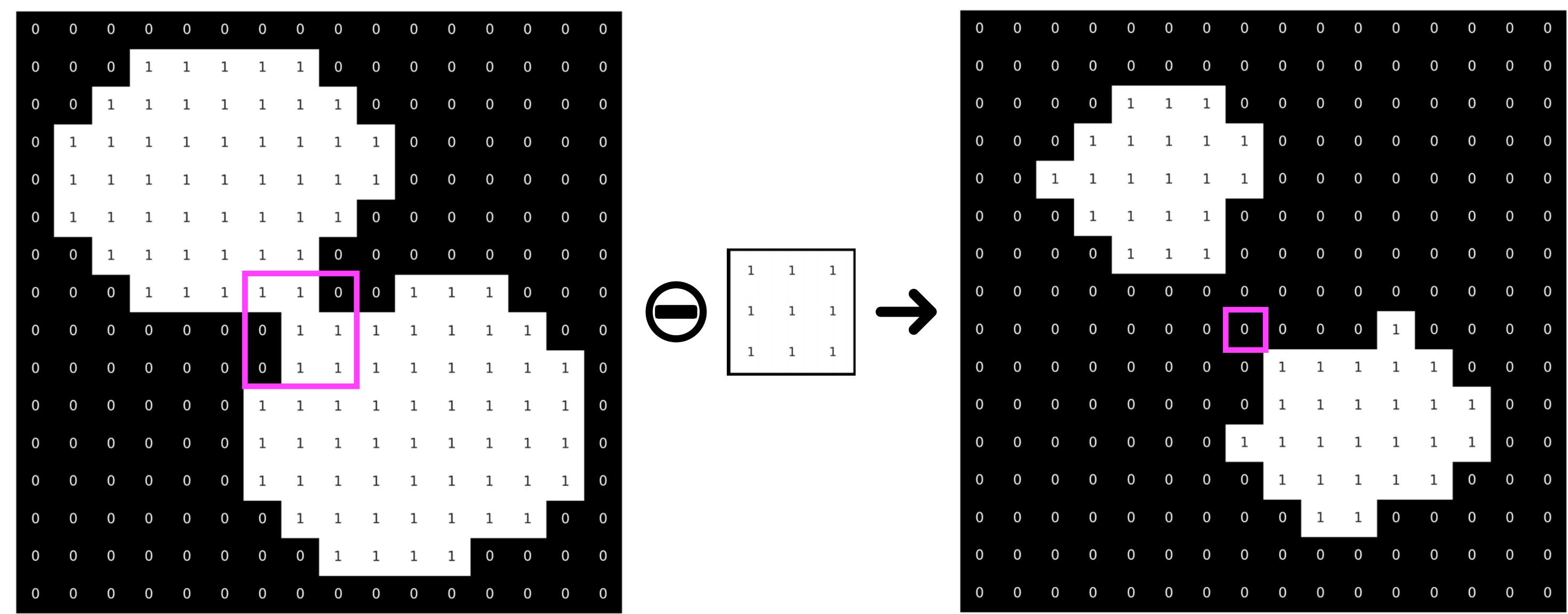
Erosion Operation



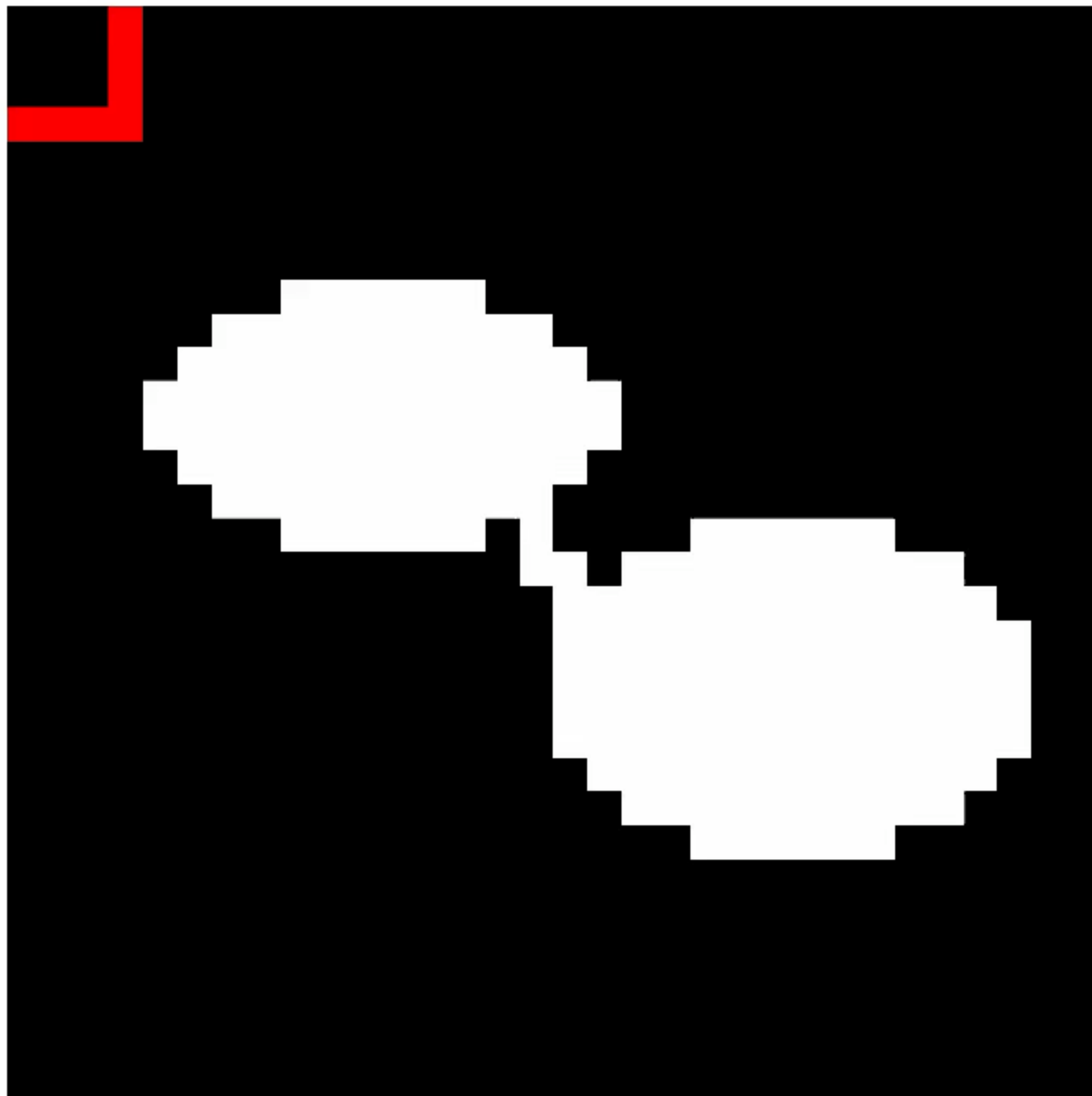
Erosion Operation

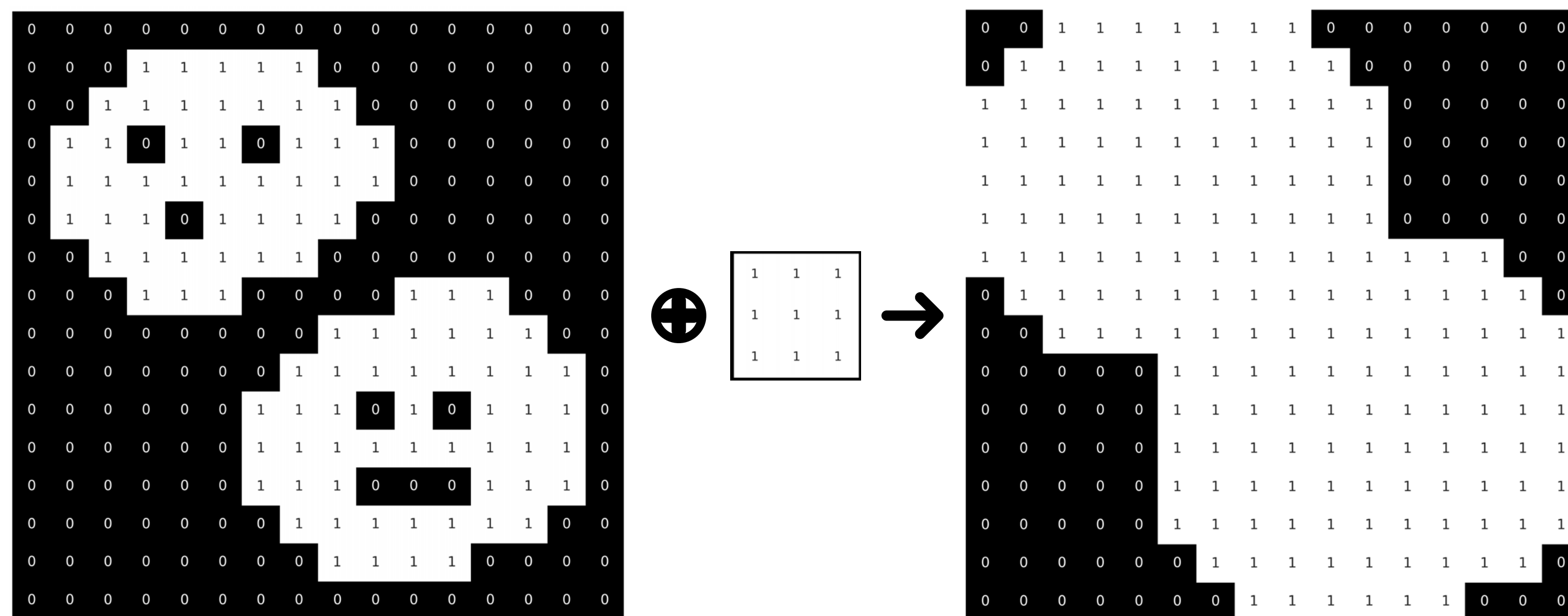


Erosion Operation

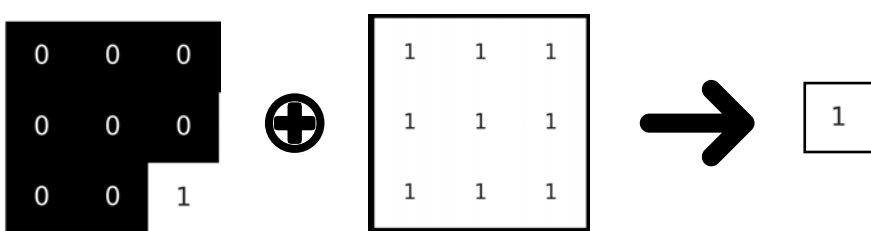
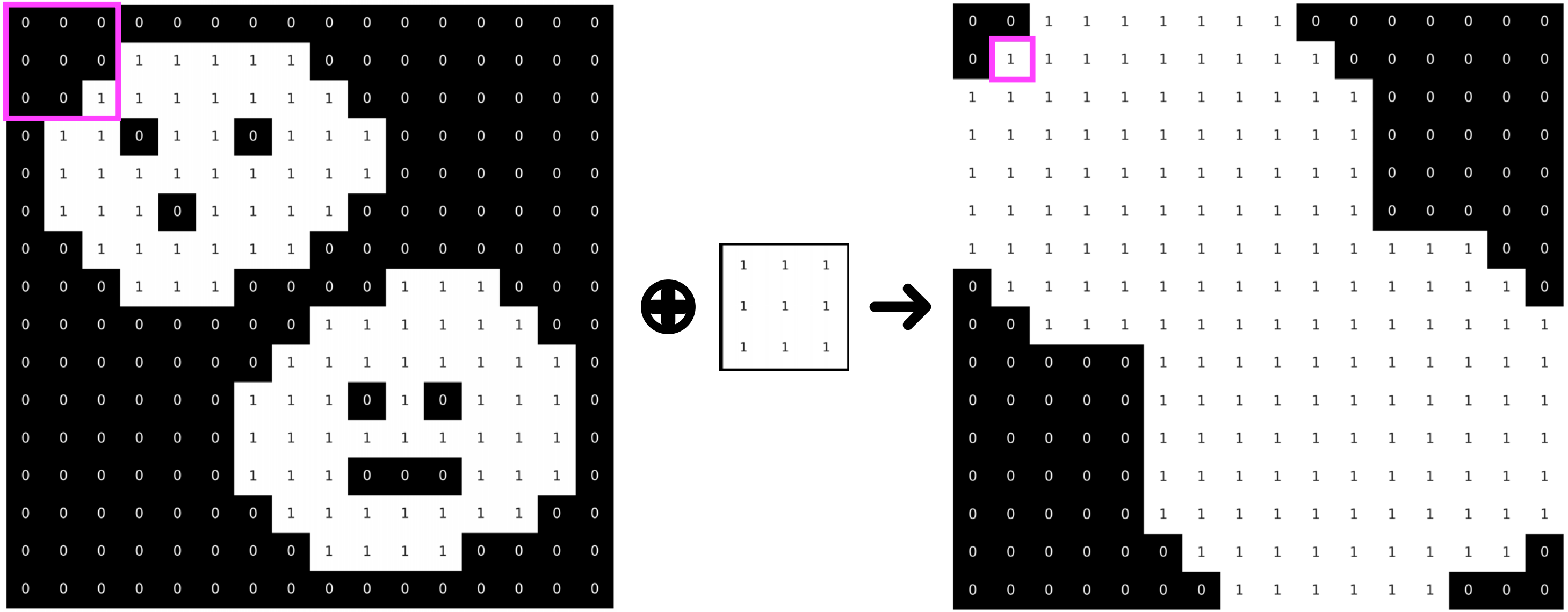


Erosion - The Movie

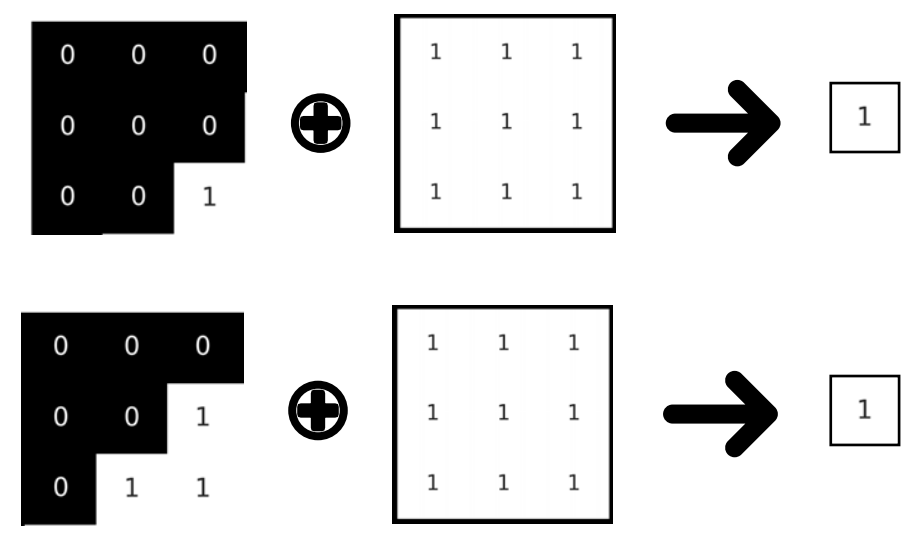
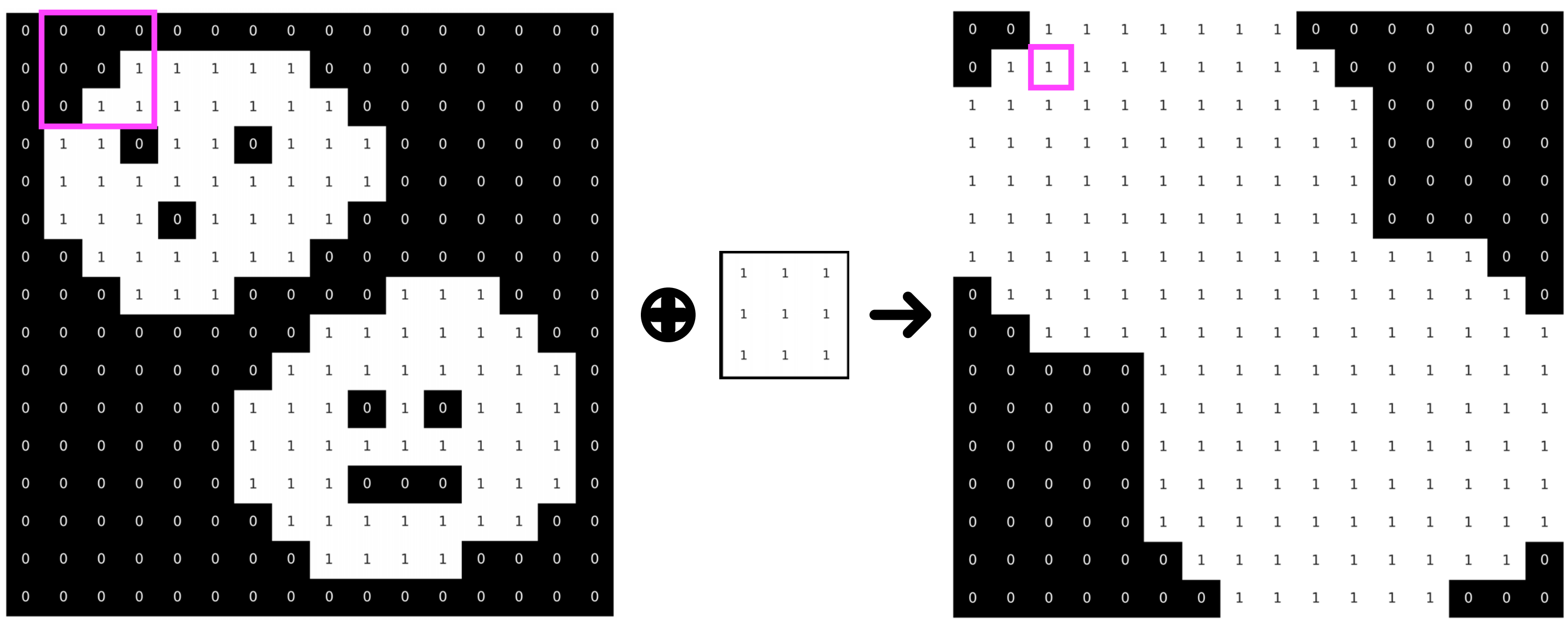




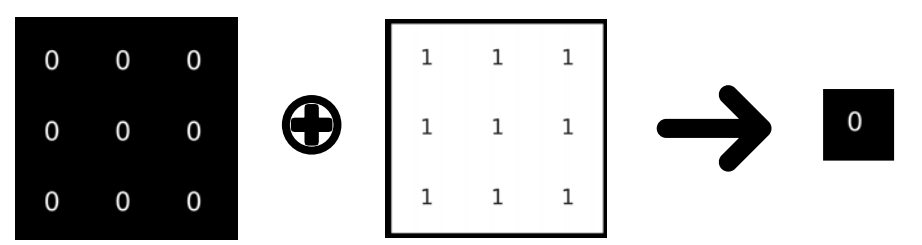
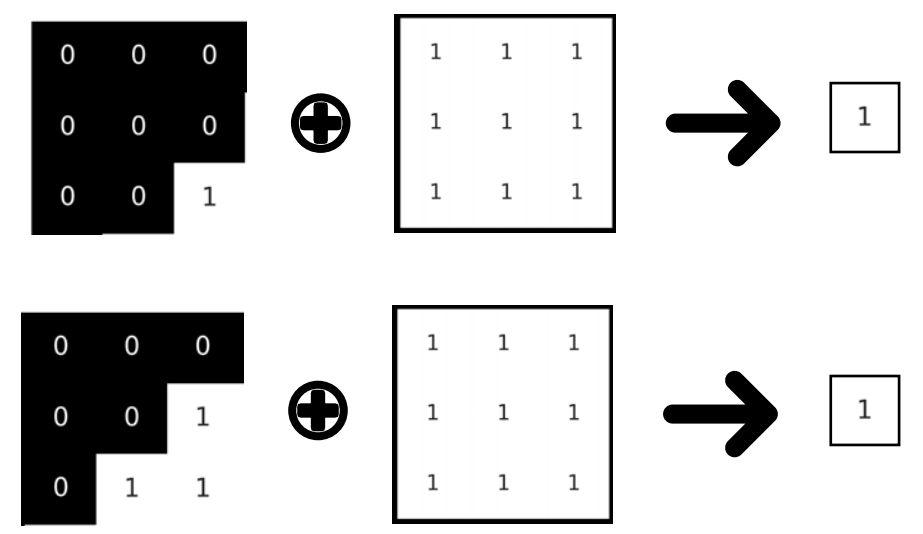
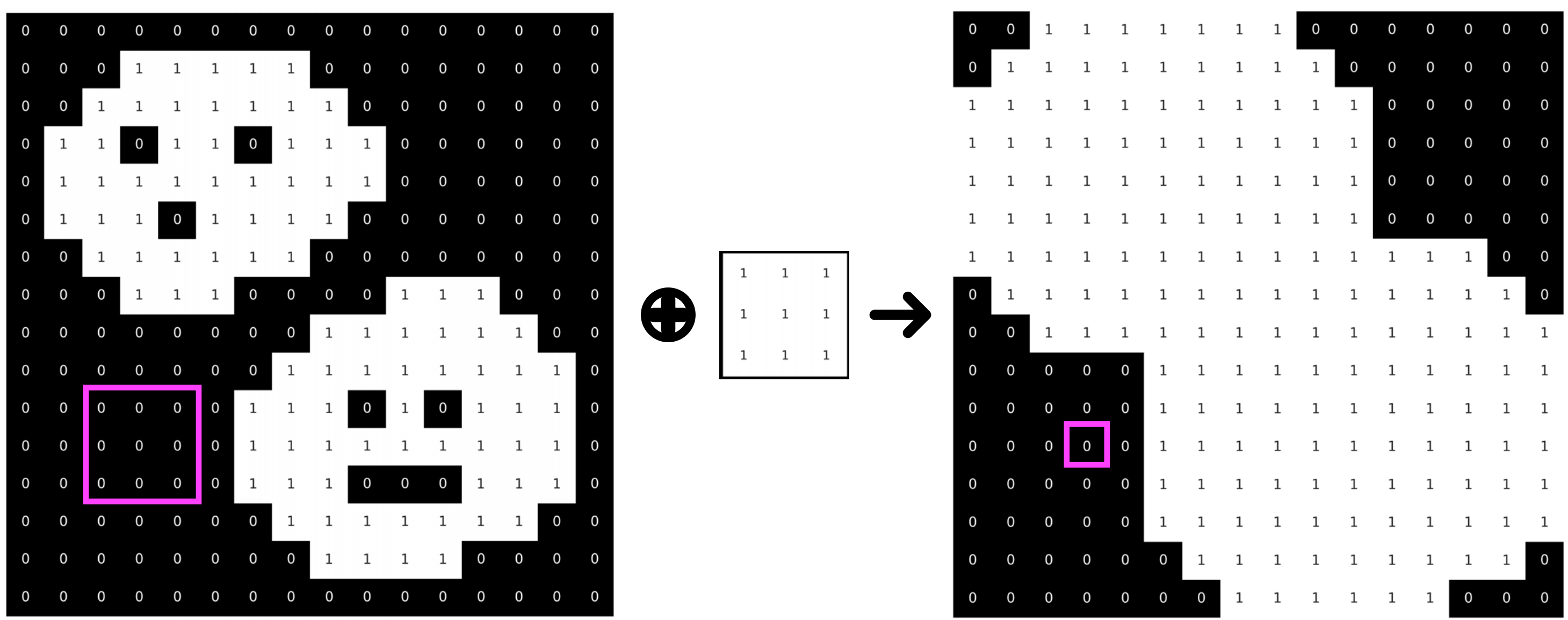
Dilation Operation



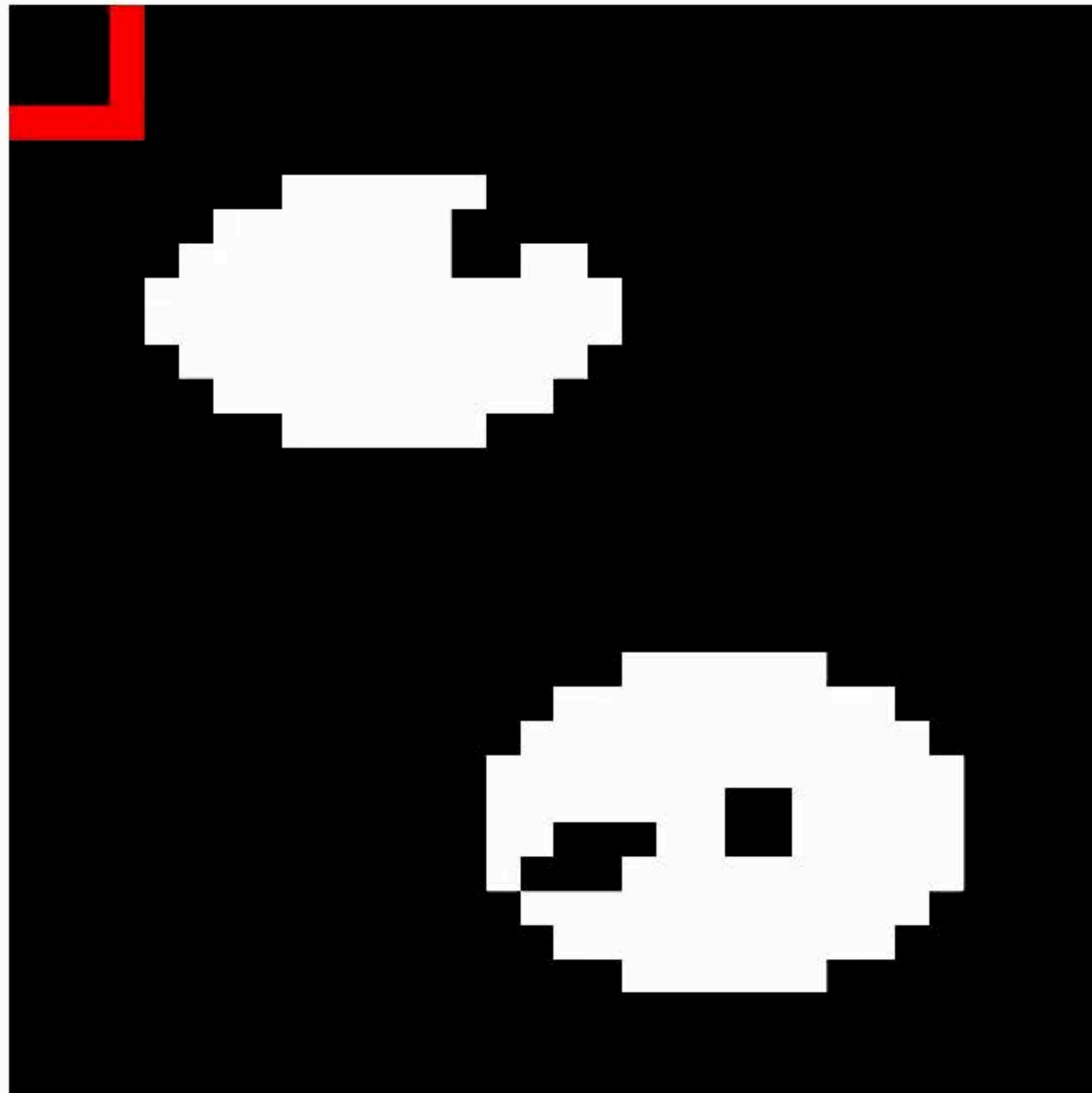
Dilation Operation



Dilation Operation



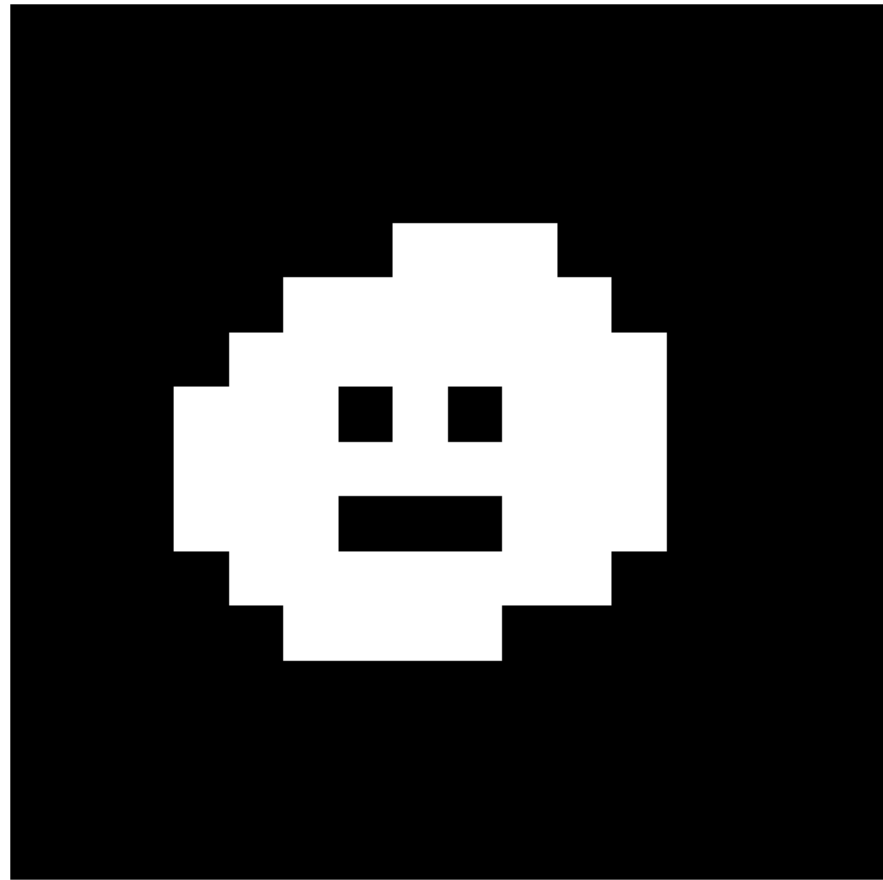
Dilation - The Movie



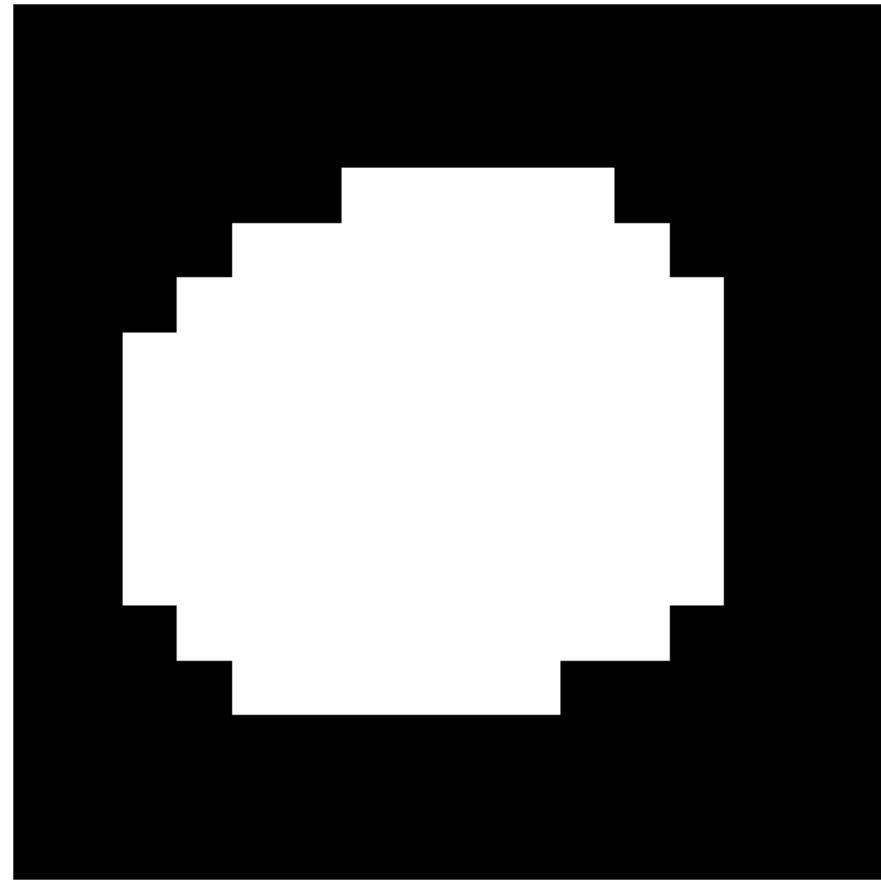
**But wait,
there is a problem.**

Together We Stand

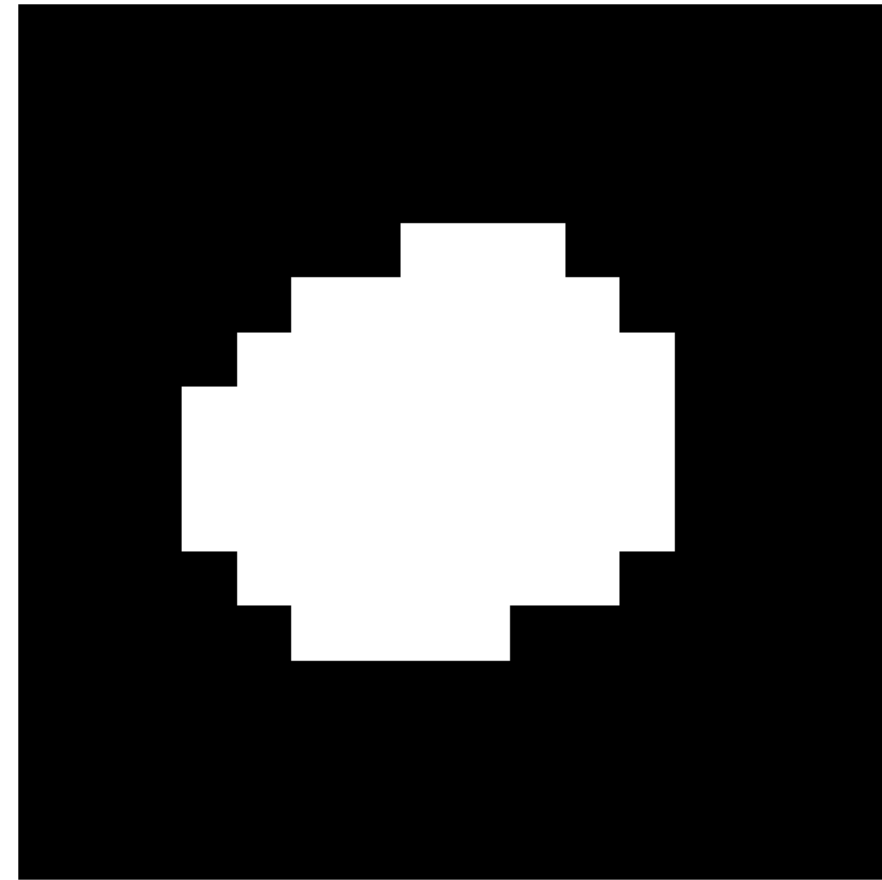
Main image



Dilated image

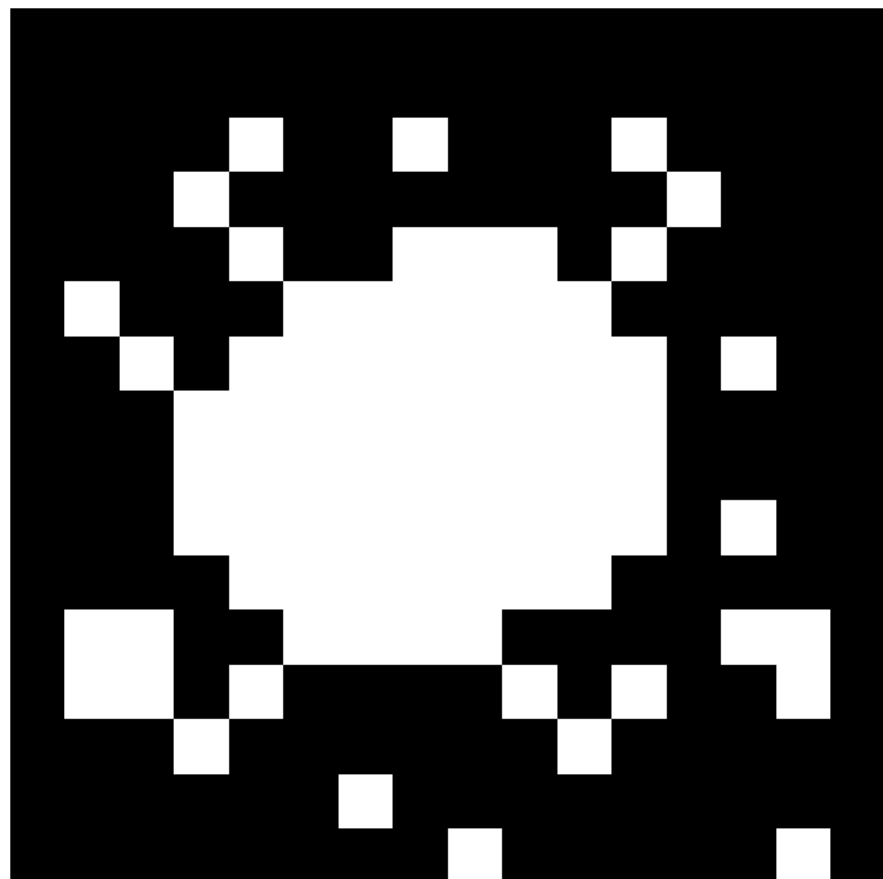


Closed image

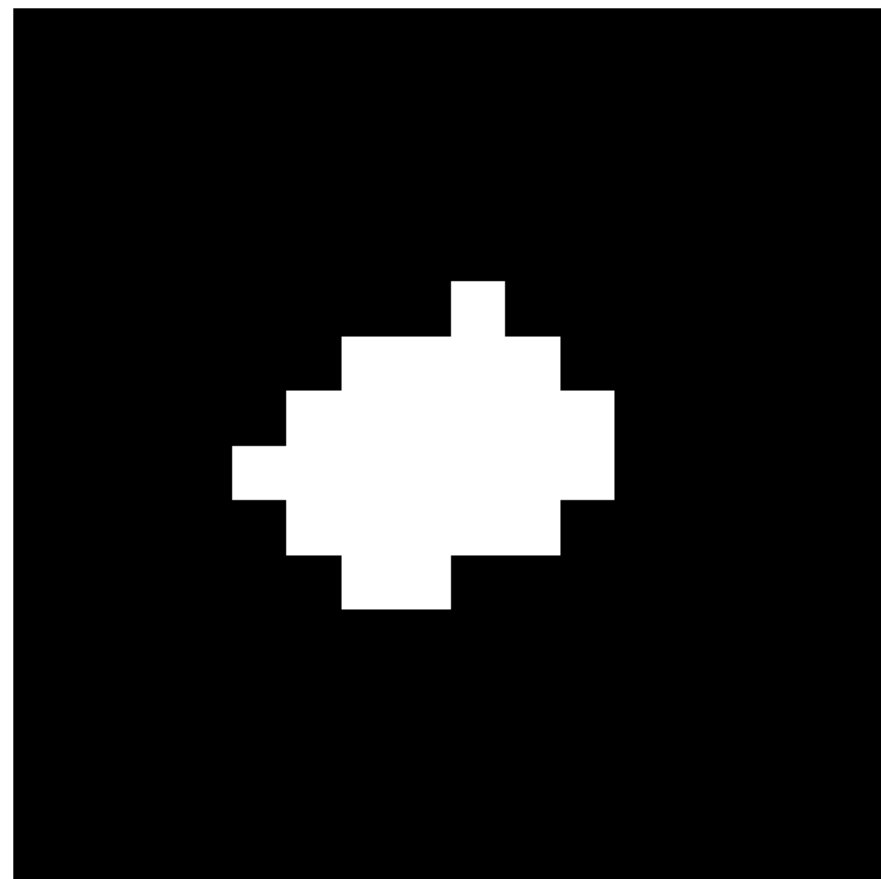


Closing:
Erosion of the dilation.

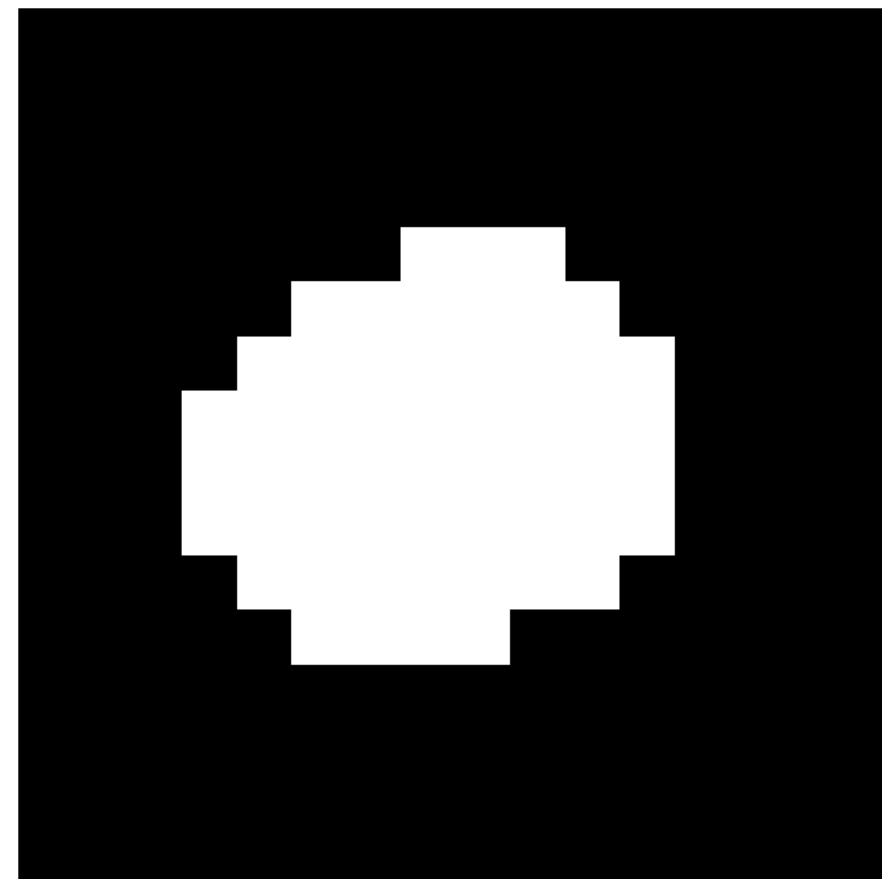
Main image



Eroded image



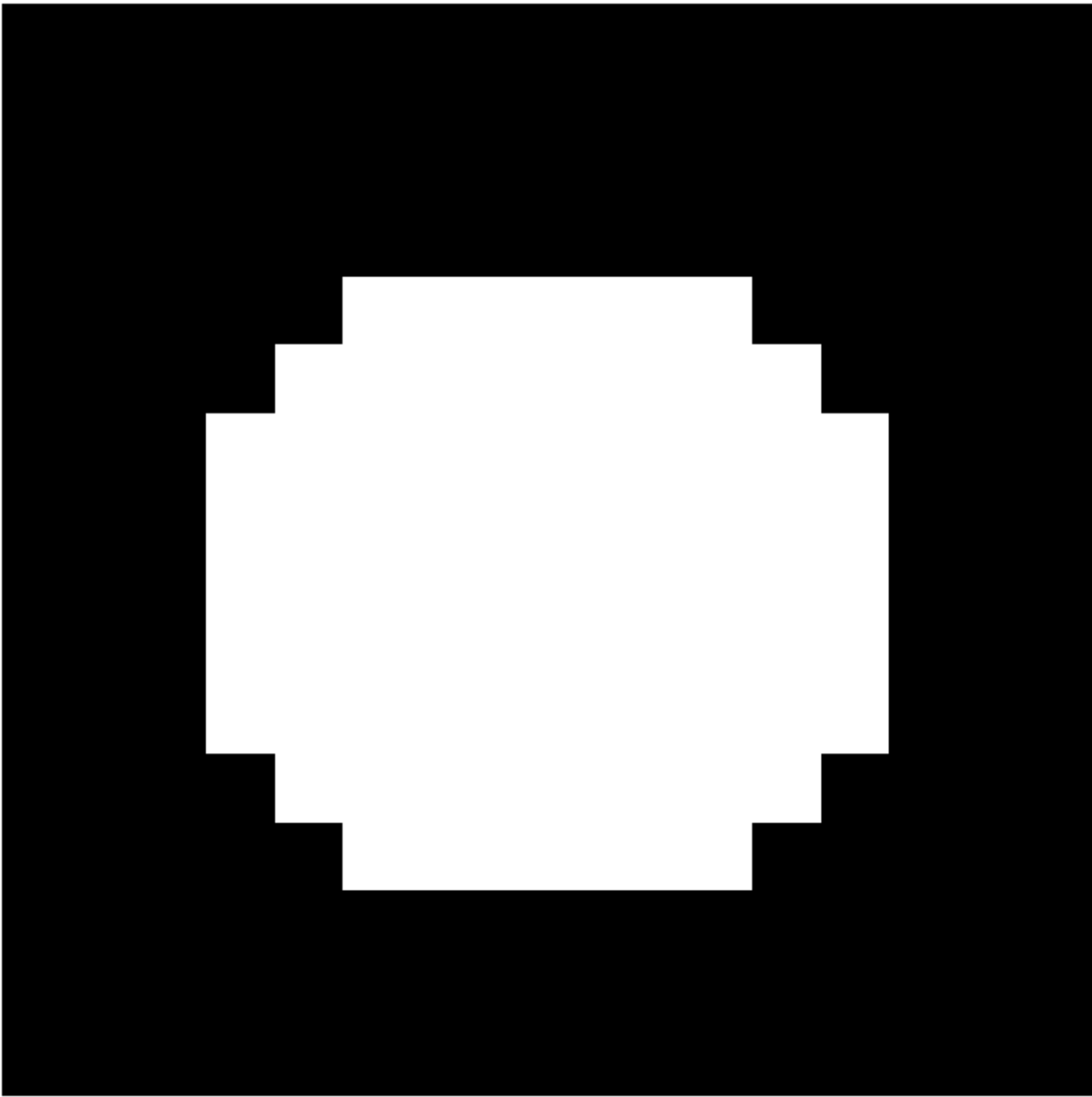
Opened image



Opening:
Dilation of the erosion.

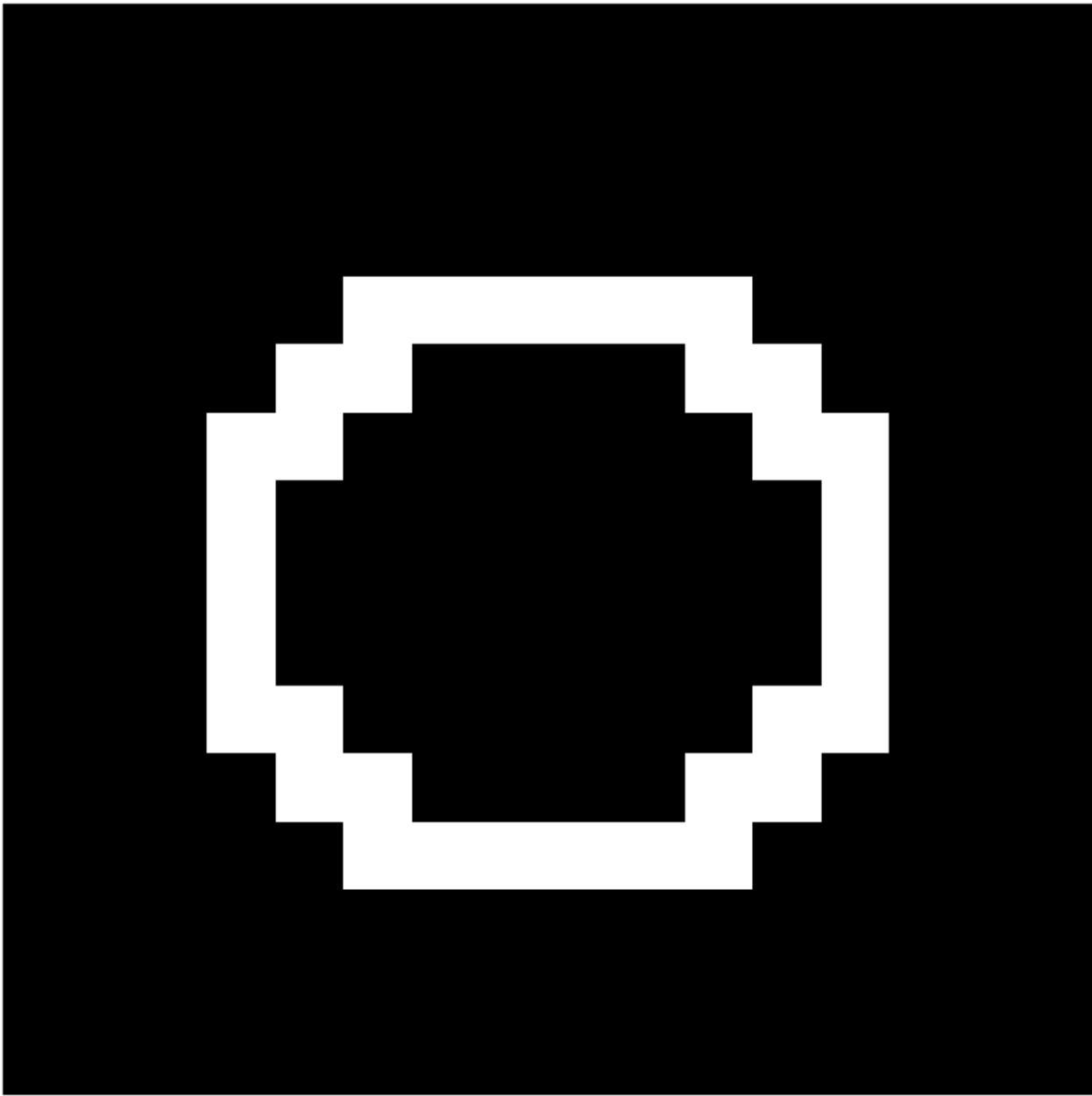
Bonus Example

Main image



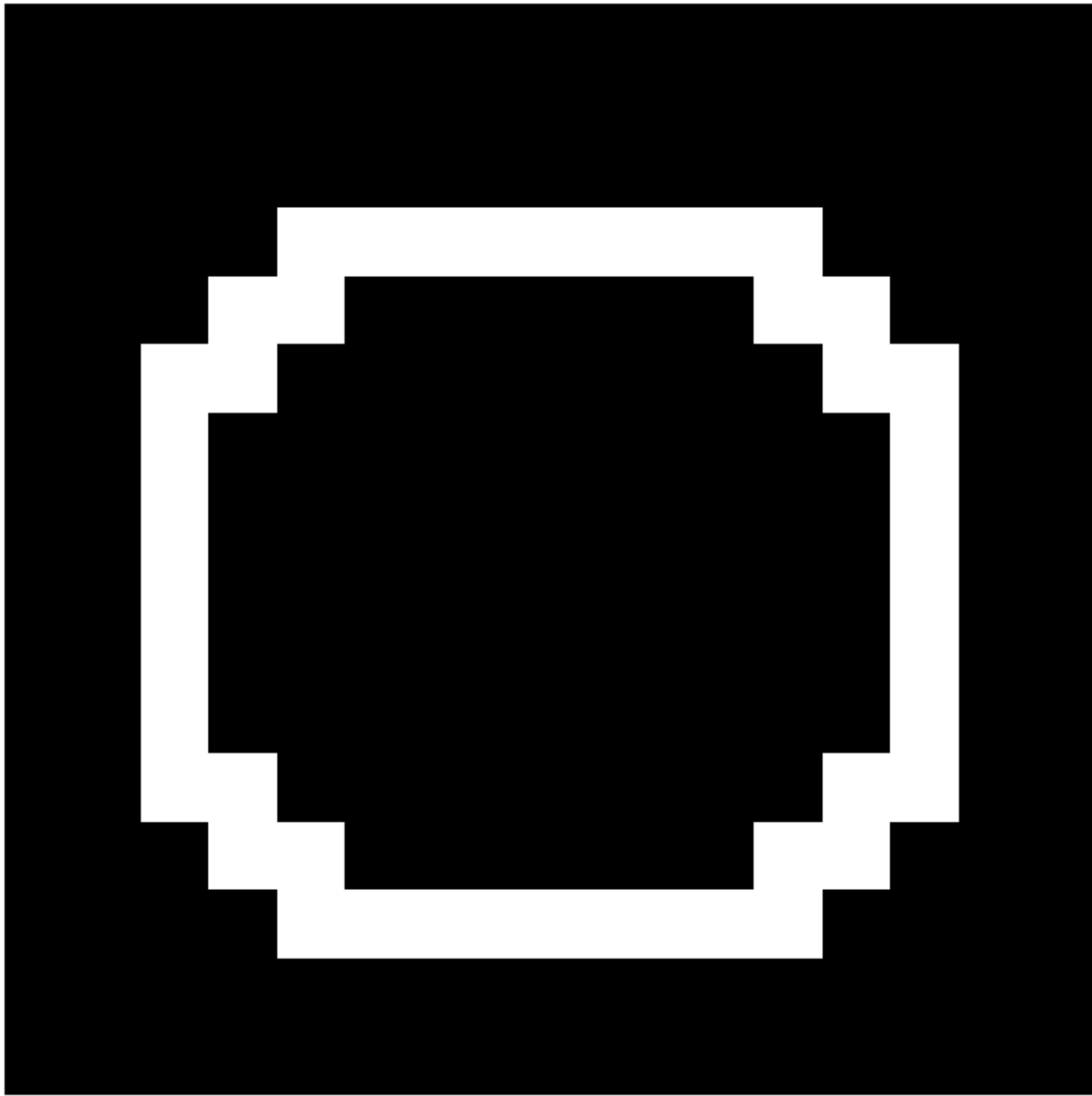
Inner edge

Erode more, dilate less, then subtract

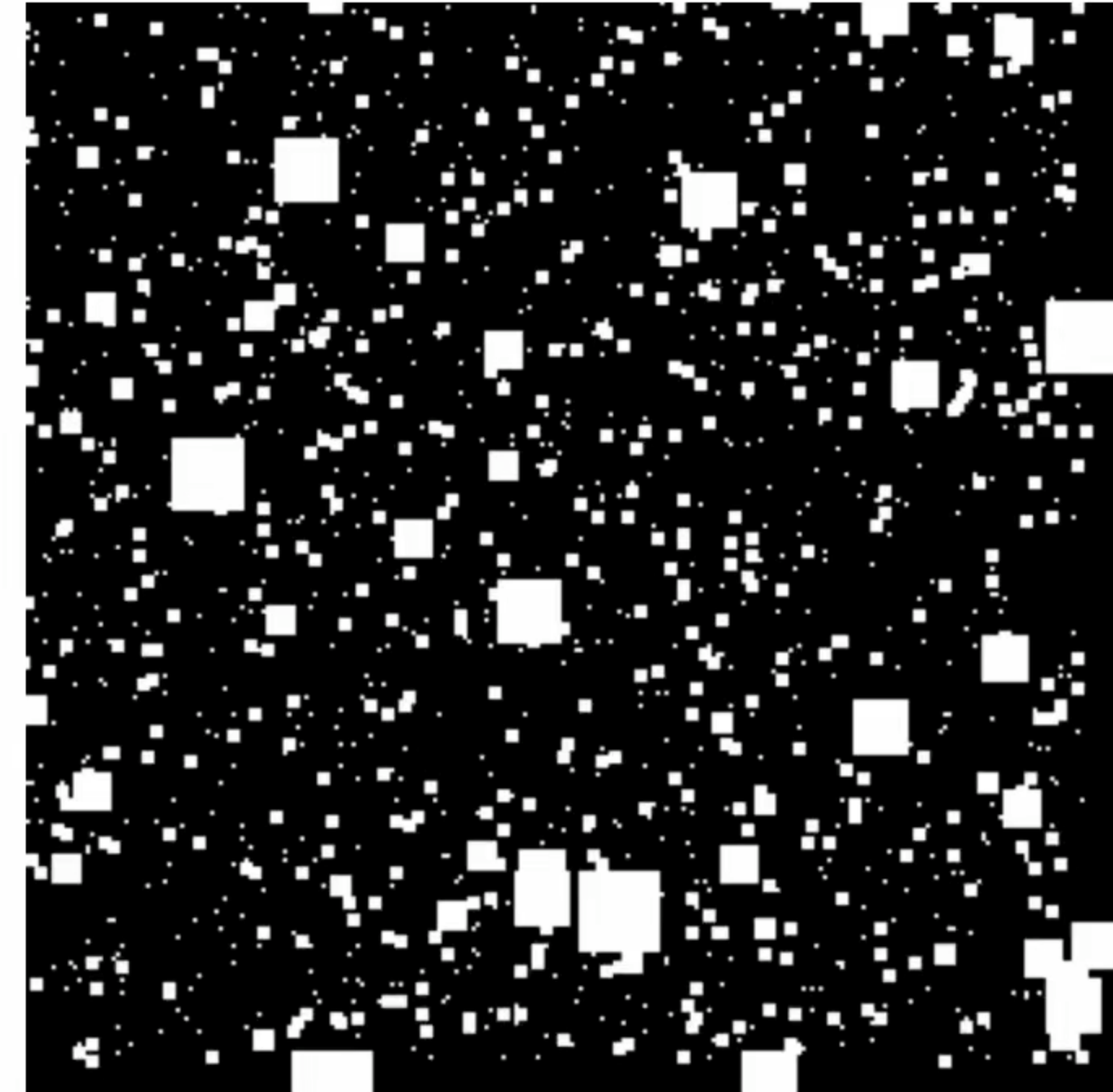
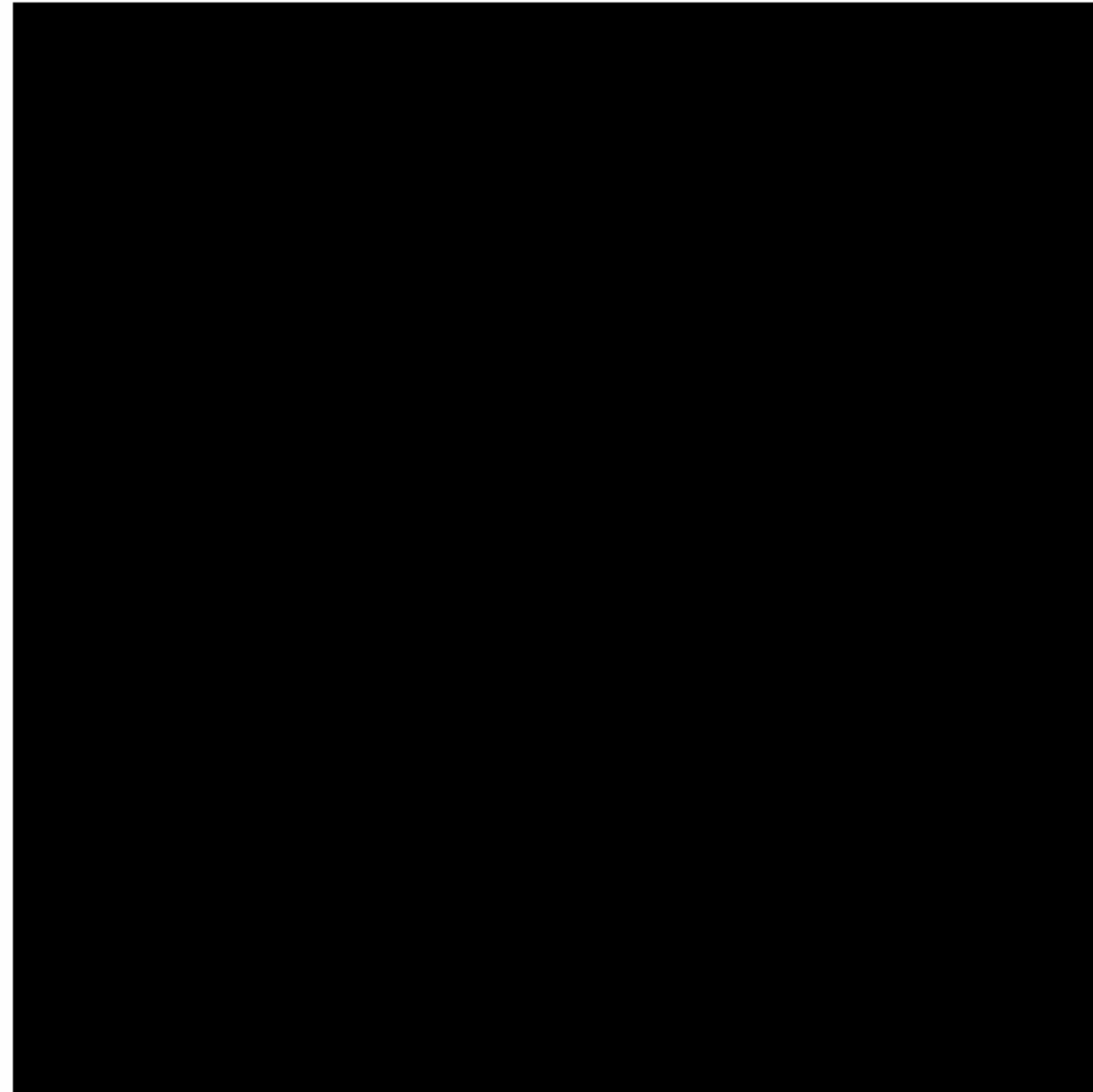


Outer edge

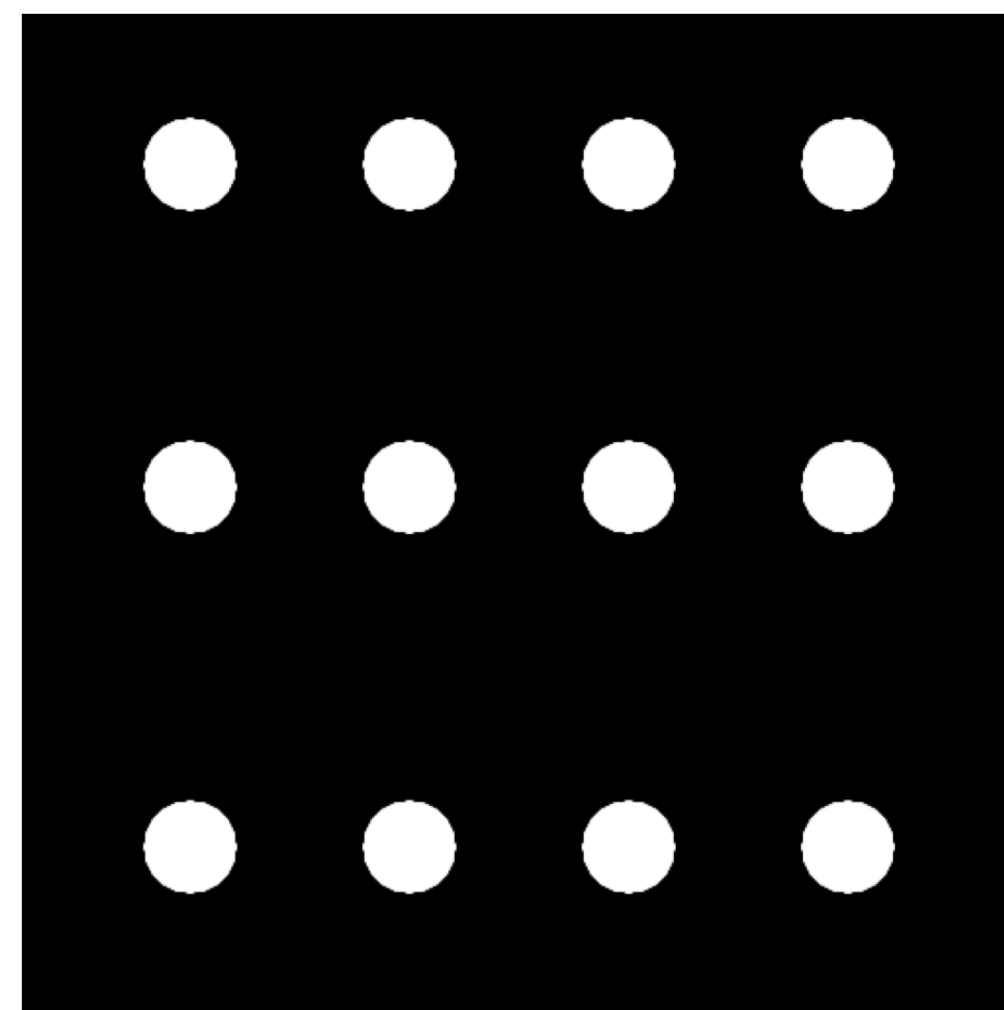
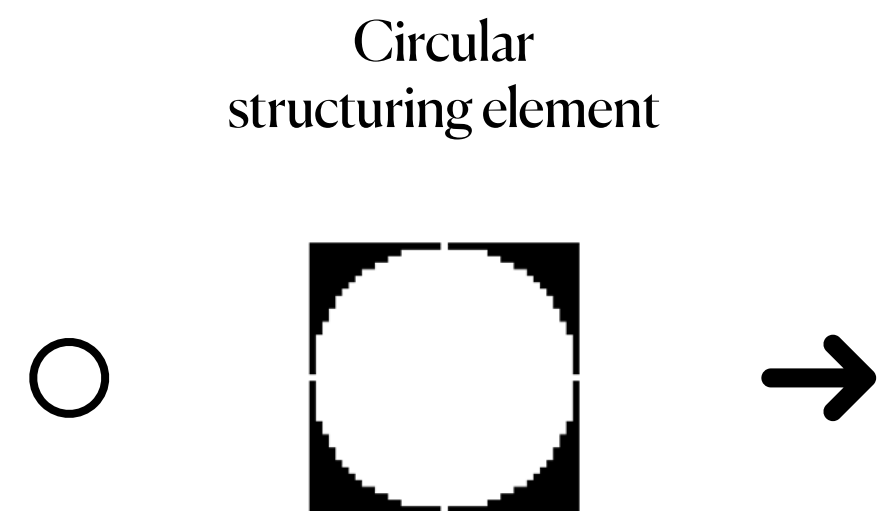
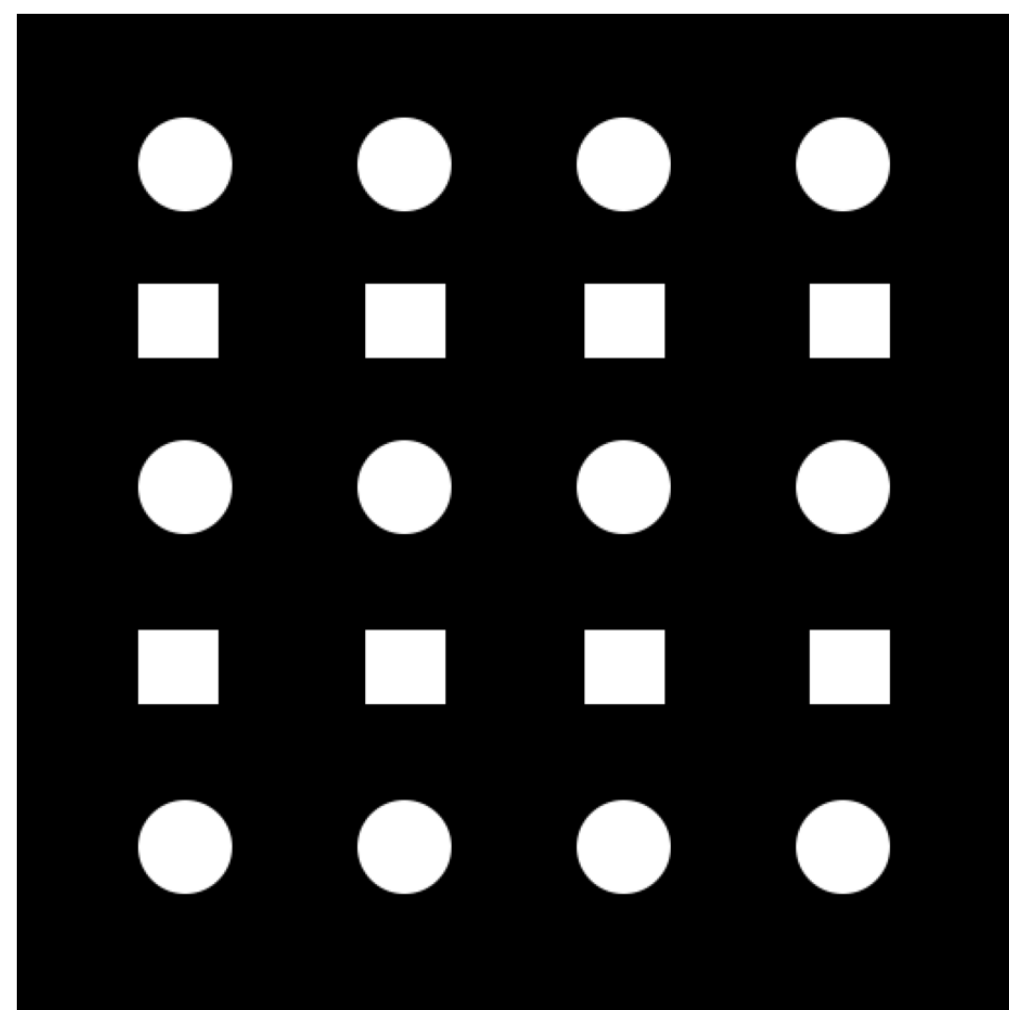
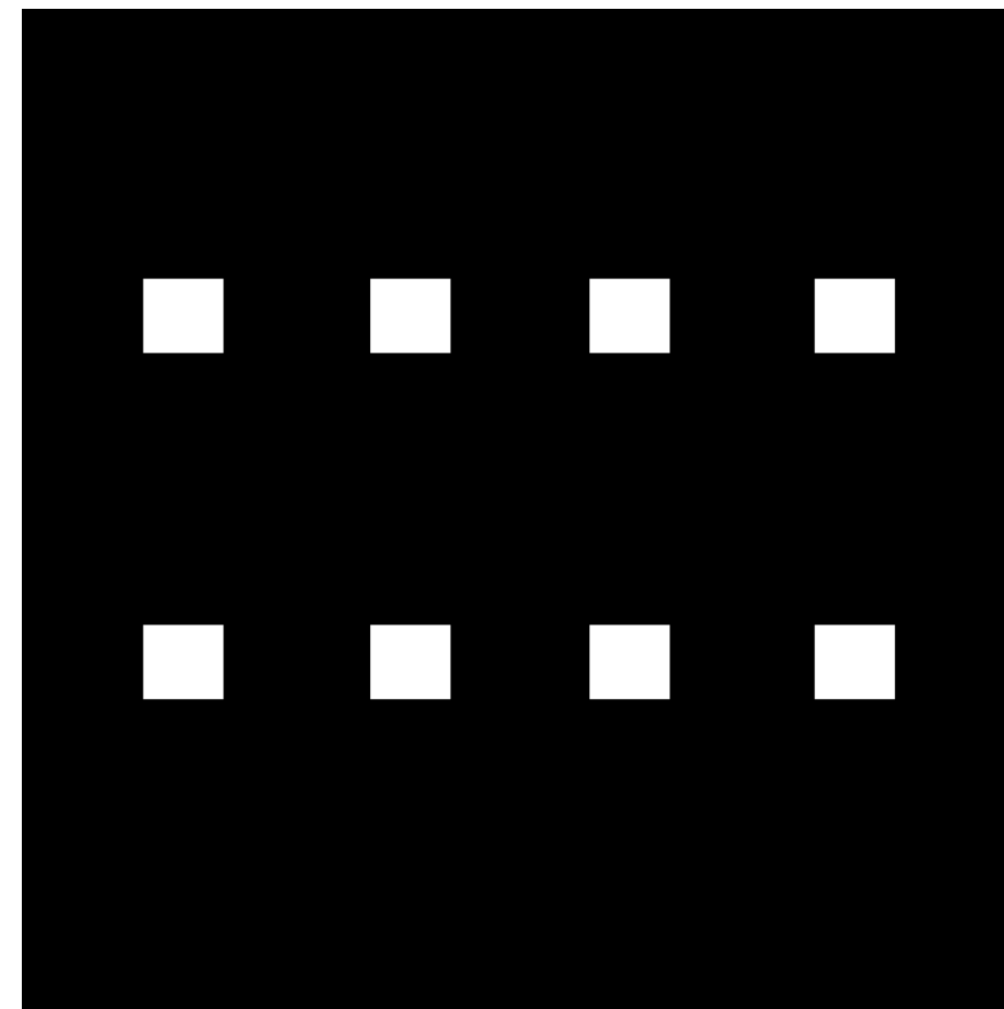
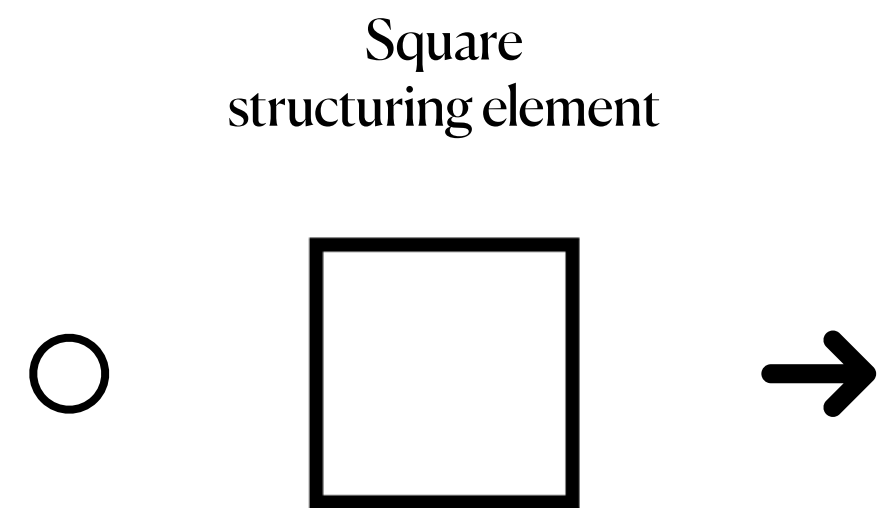
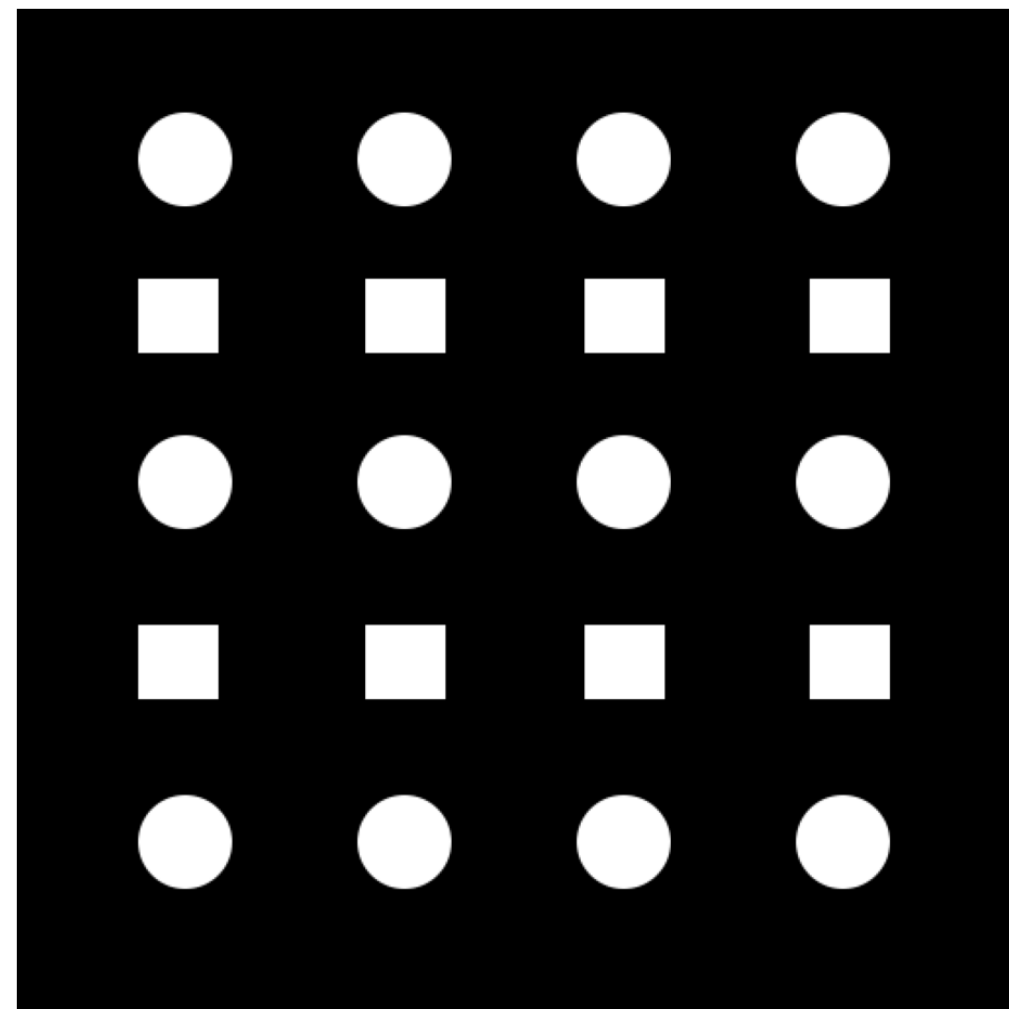
Dilate more, erode less, then subtract



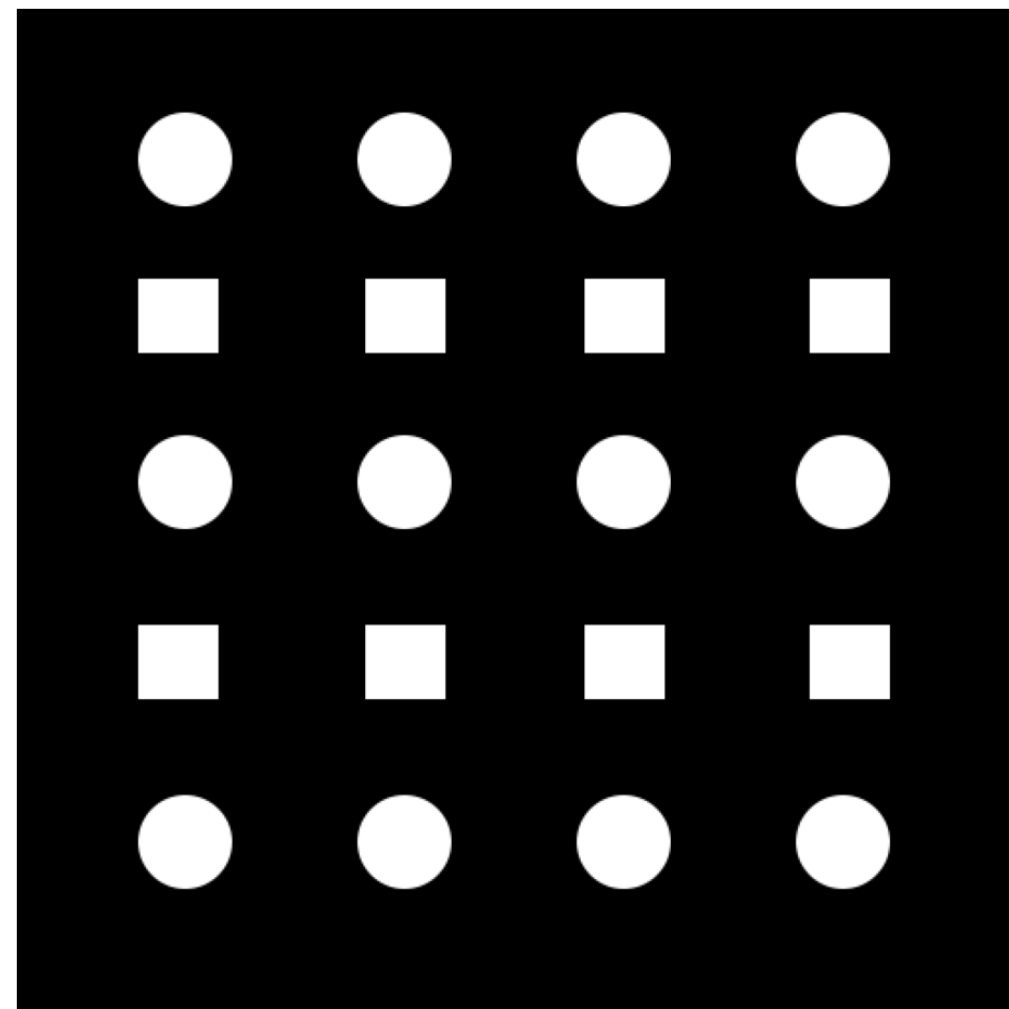
Structuring Element Size



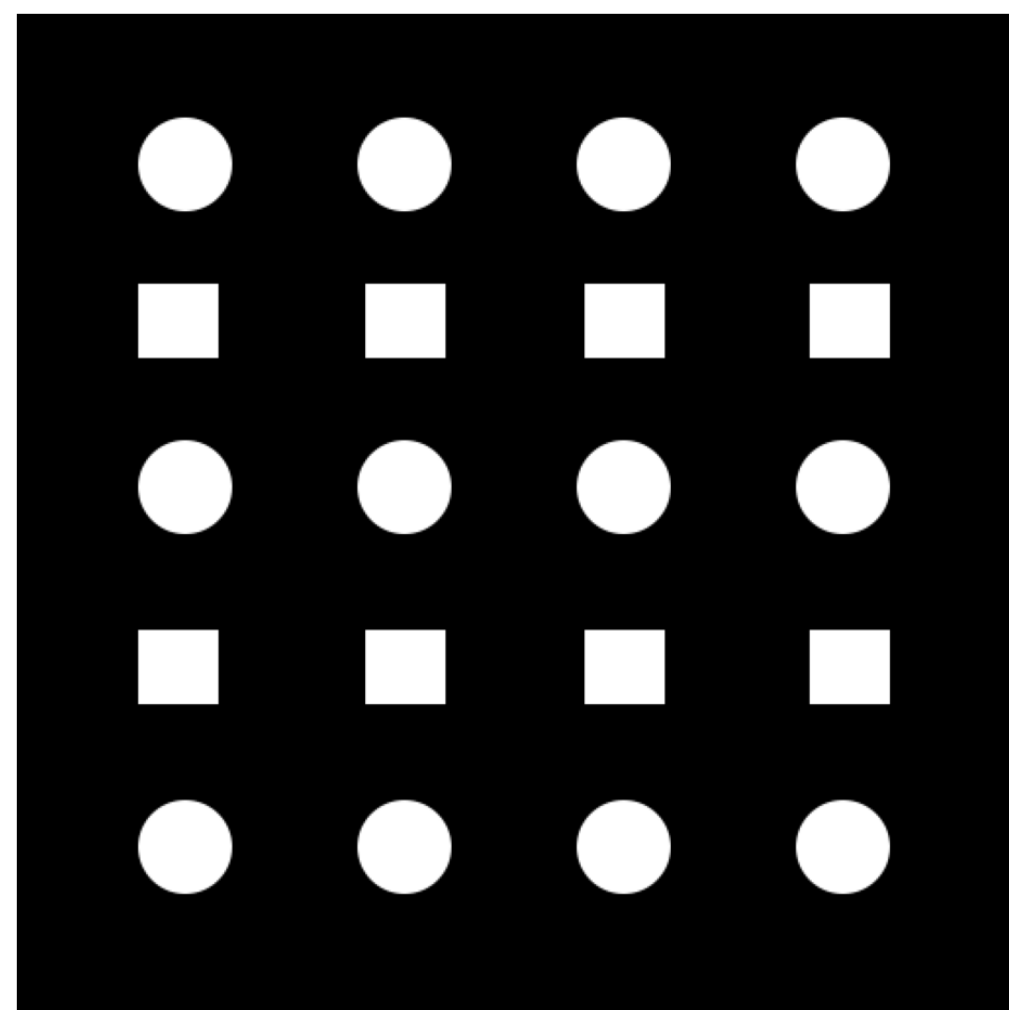
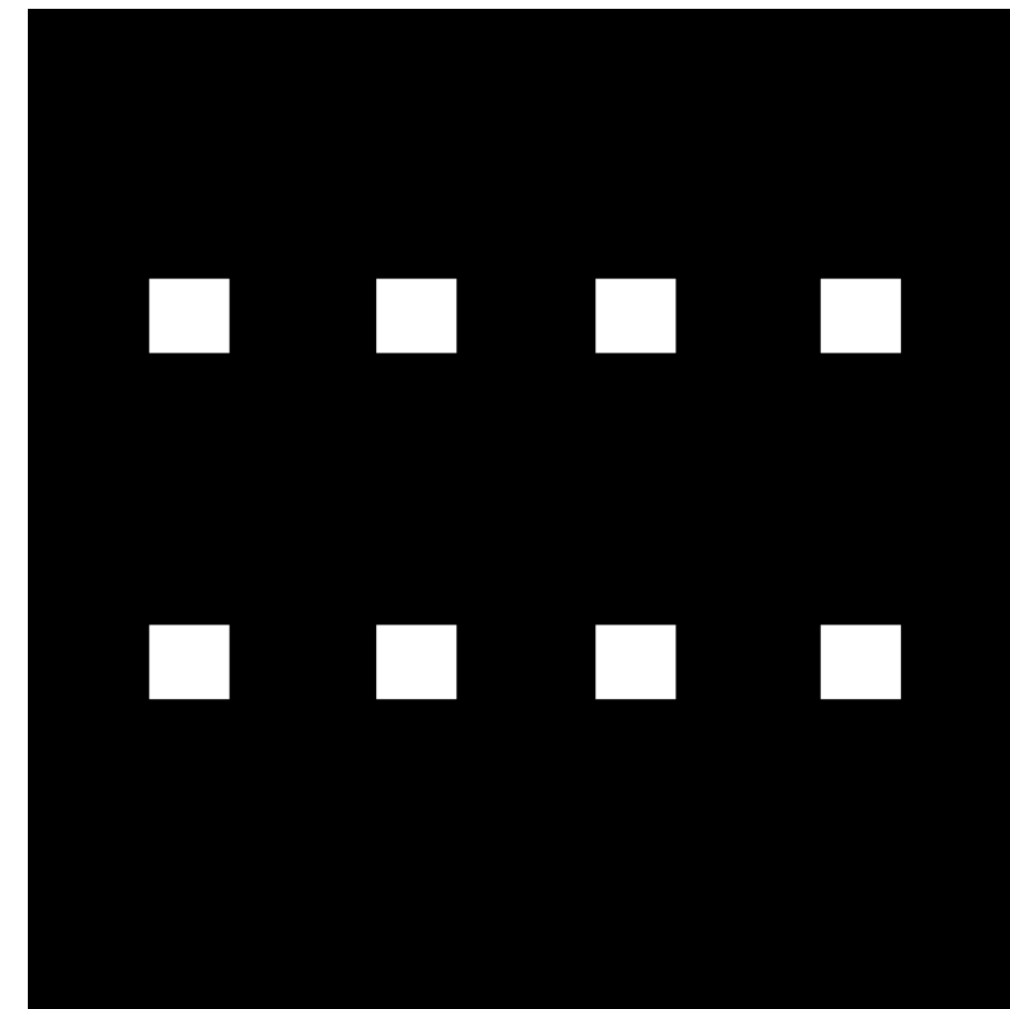
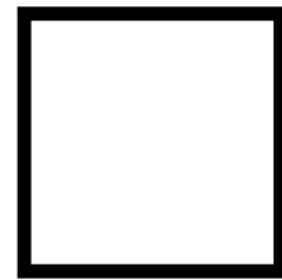
Structuring Element Shape



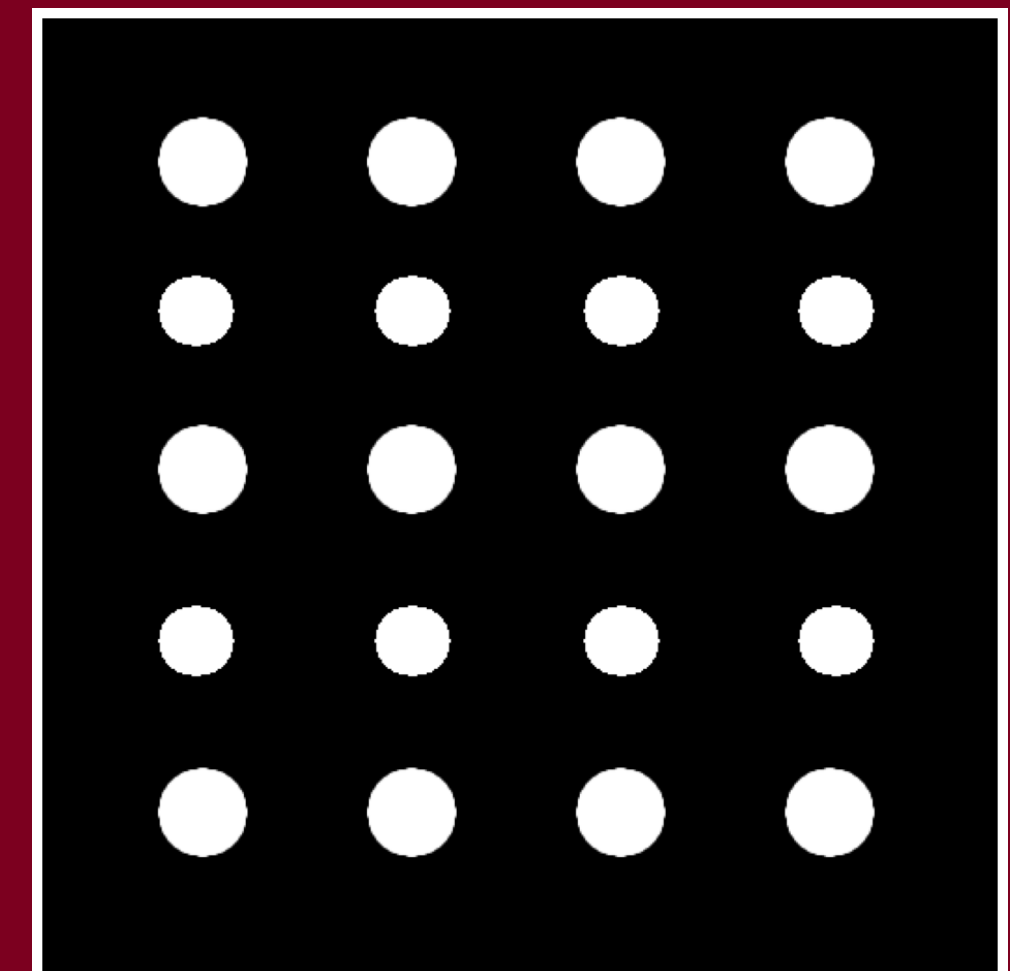
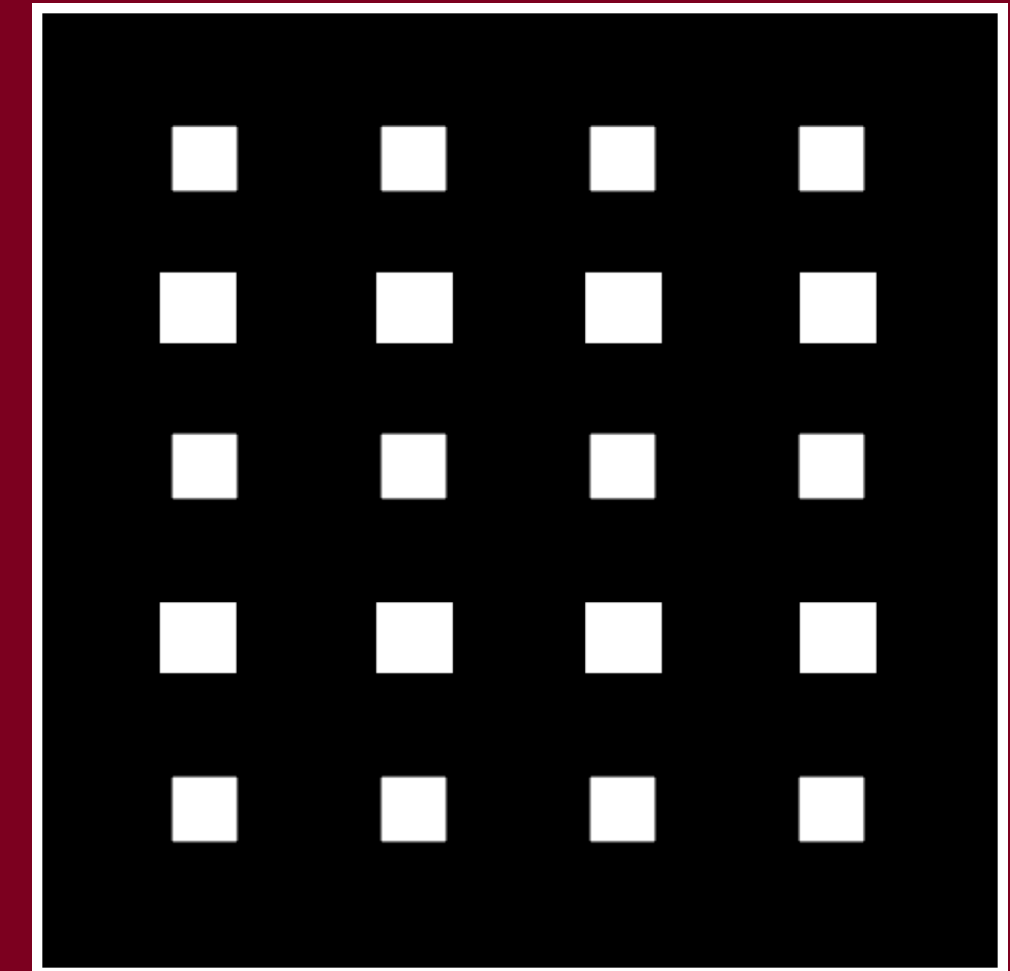
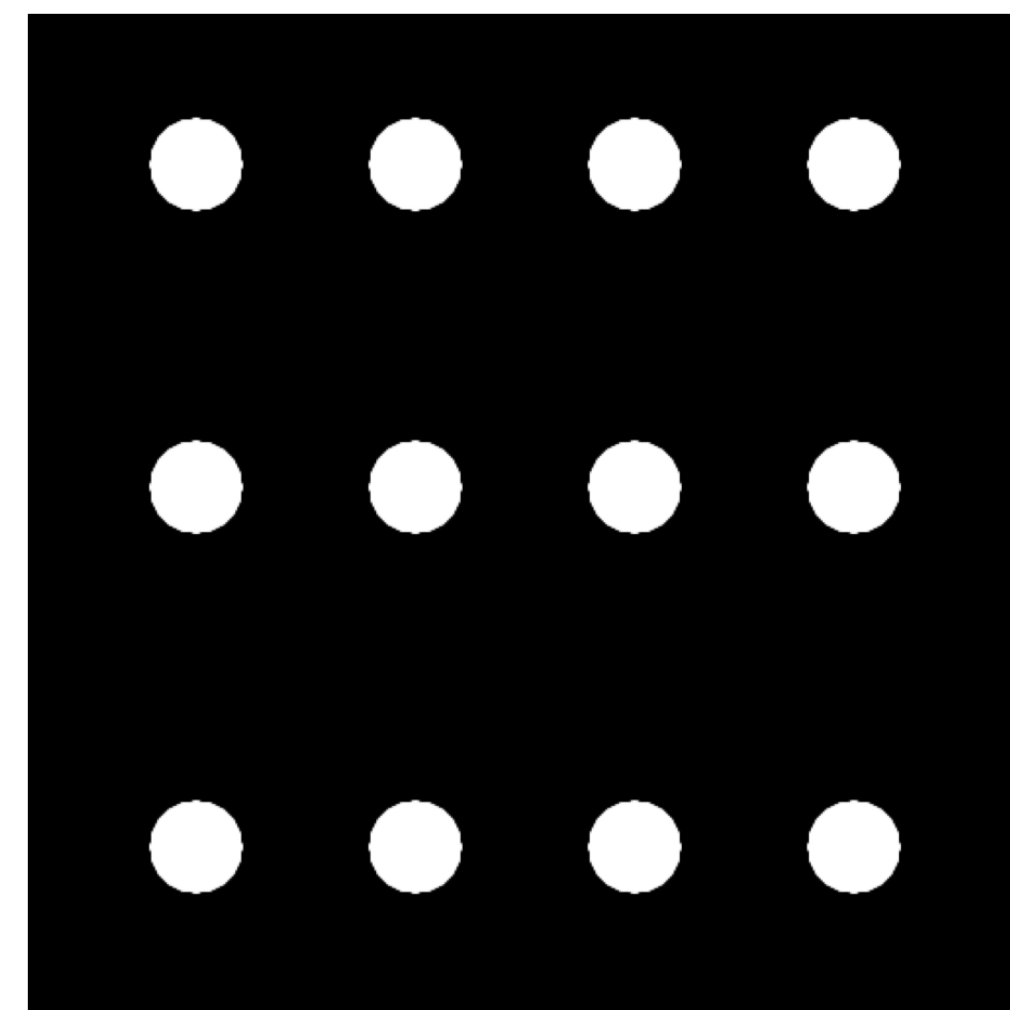
Structuring Element Shape



Square
structuring element

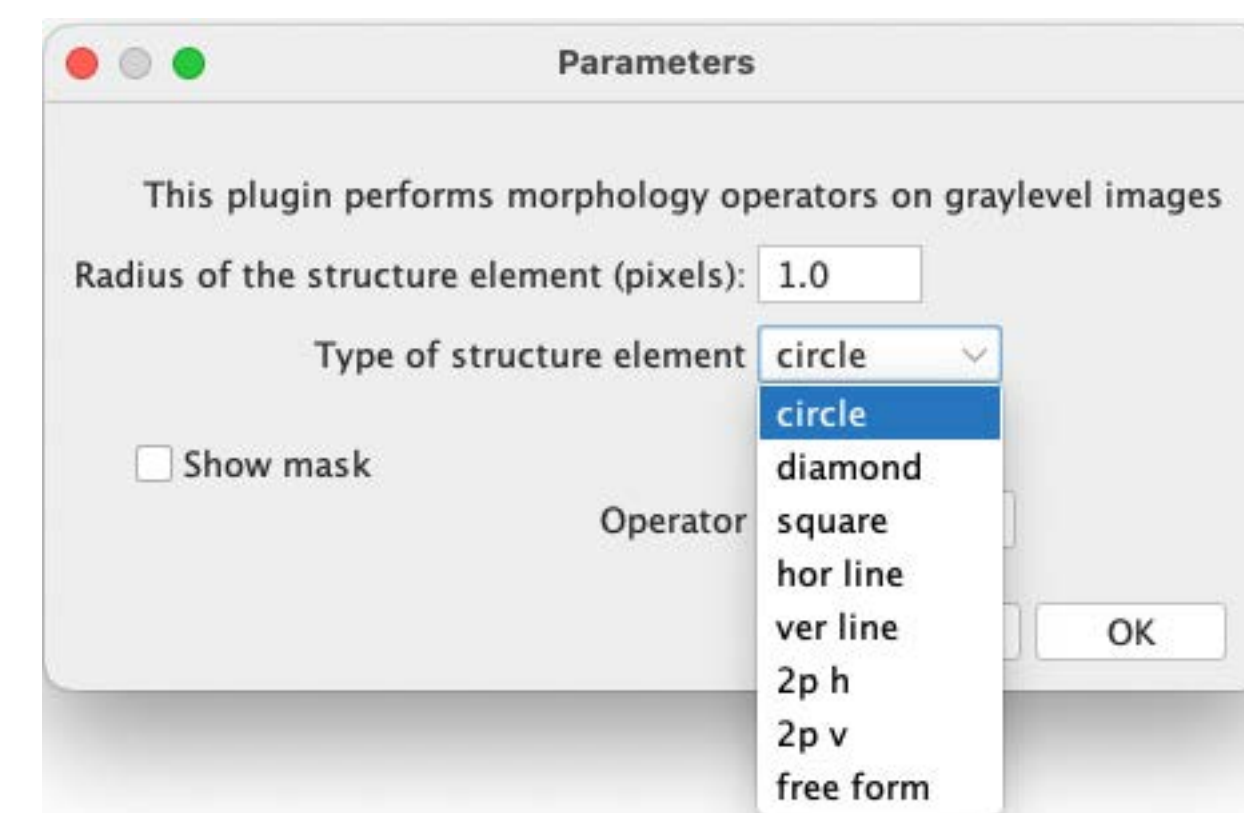
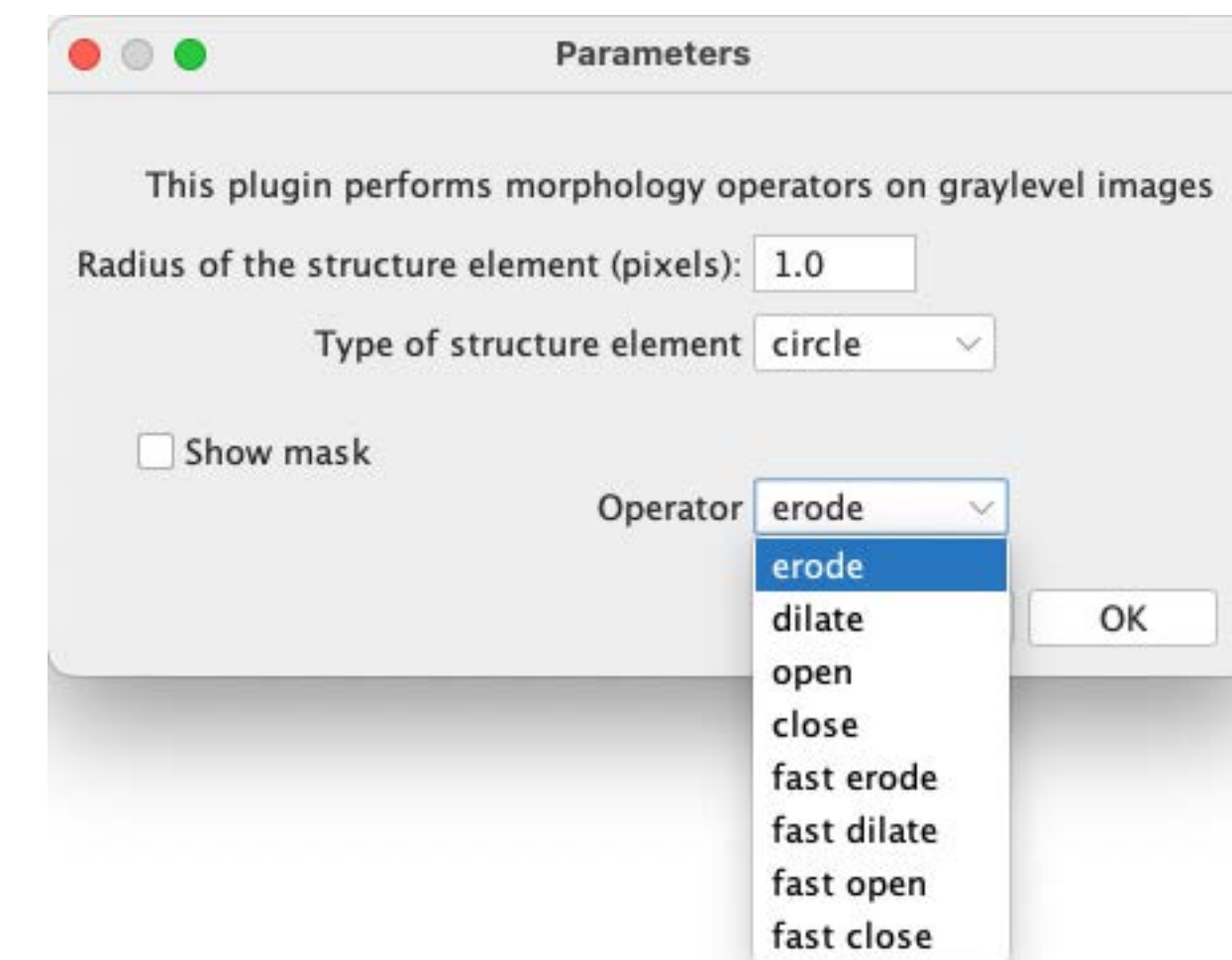
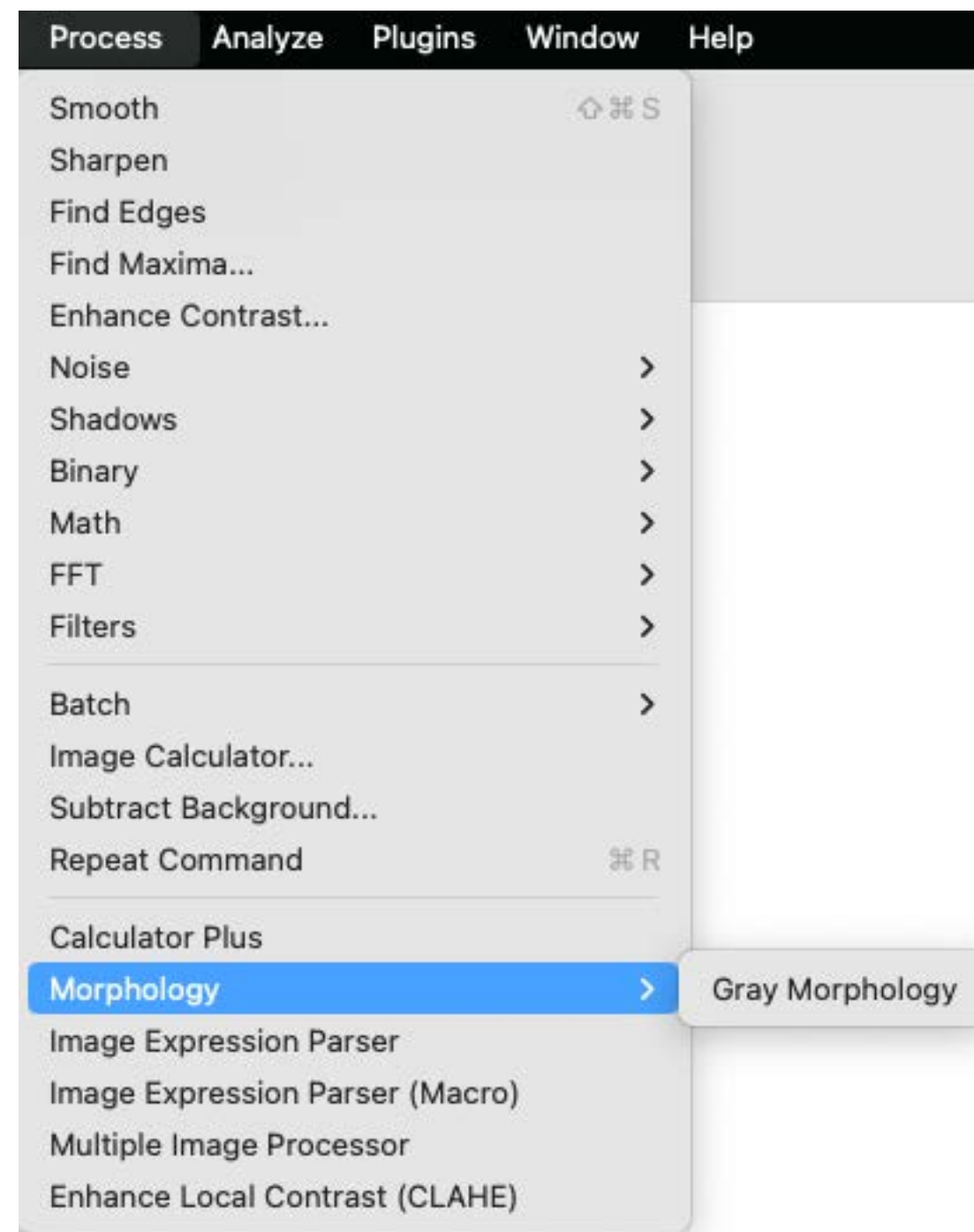
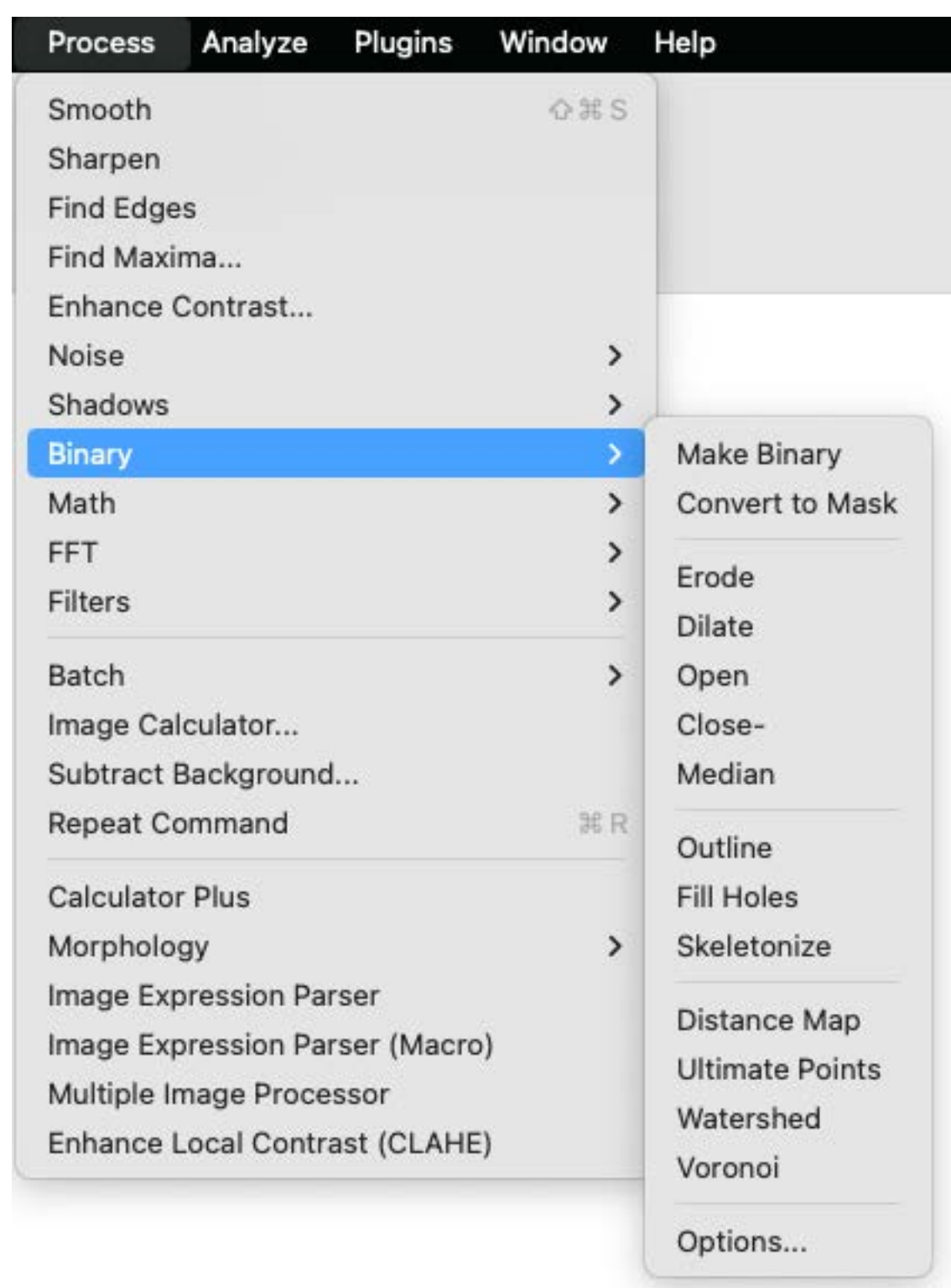


Circular
structuring element



BE CAREFUL!

Morphology in Fiji



Morphology — exercises



3.4 - Morphological filters - Binary

3.5 - Morphological filters - Gray