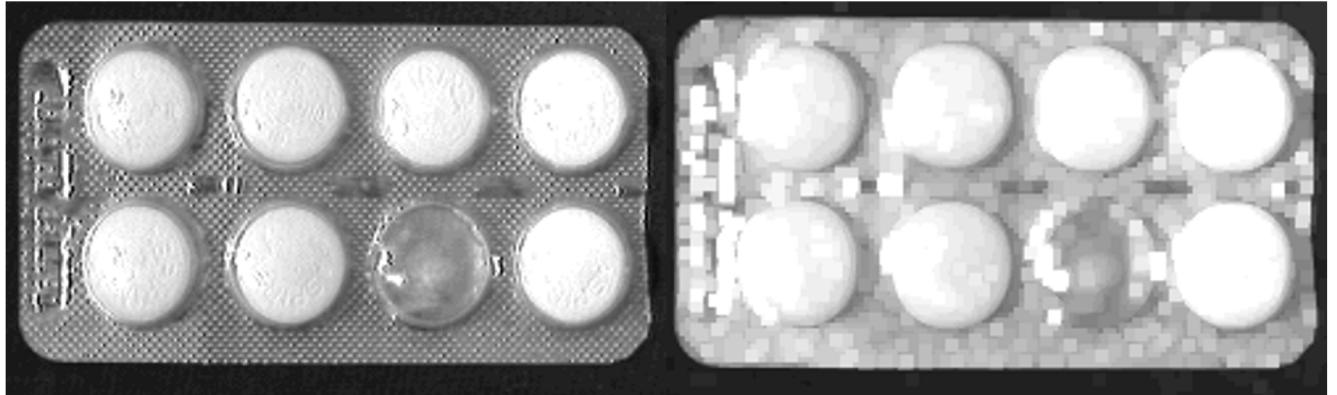


E6

Morfologia multinivell

```
I = imread('astablet.tif');
SE = ones(5, 5);
ID = imdilate(I, SE);
montage({I, ID});
```

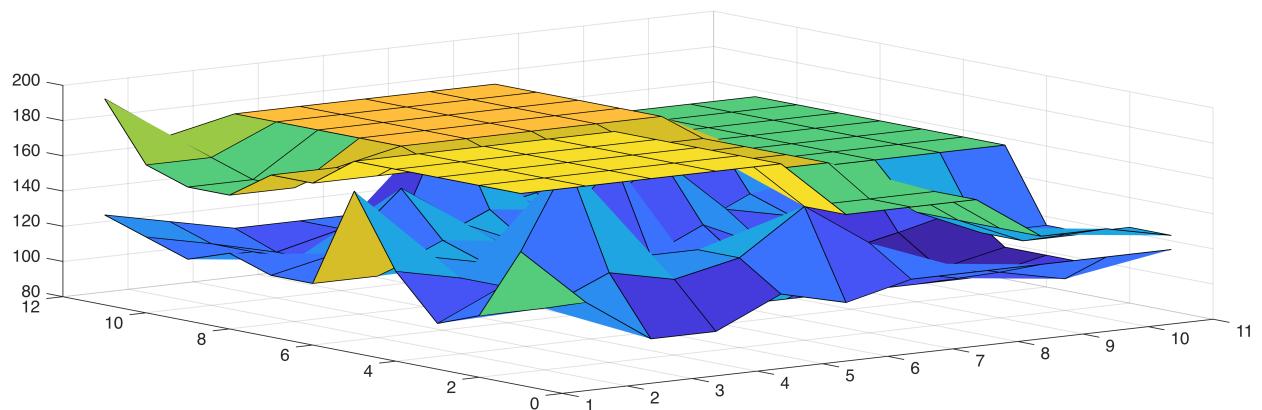


```
[f, c] = size(I);
```

mirem què ha passat

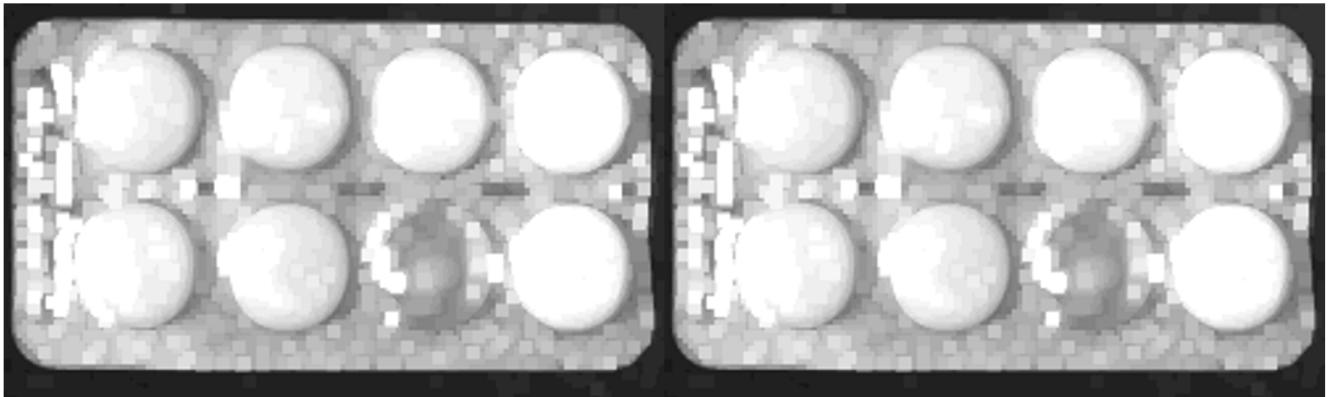
```
ICrop = I(floor(f/2)-5:floor(f/2)+5, floor(c/2)-5:floor(c/2)+5);
IDCrop = ID(floor(f/2)-5:floor(f/2)+5, floor(c/2)-5:floor(c/2)+5);

surf(ICrop);
hold on
surf(IDCrop);
hold off
```



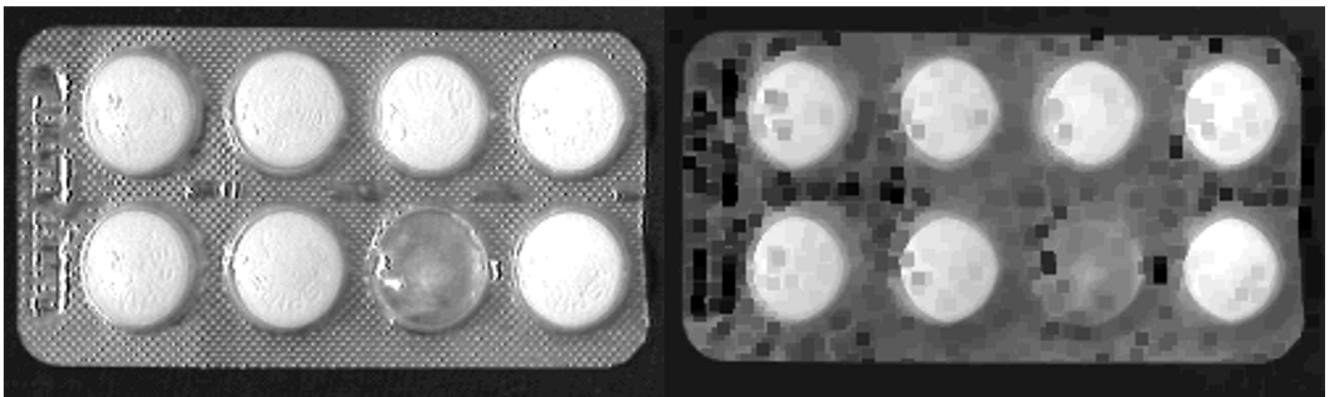
dilate = ? max dels seus veïns

```
ID2 = colfilt(I, [5 5], "sliding", @max);  
montage({ID, ID2});
```



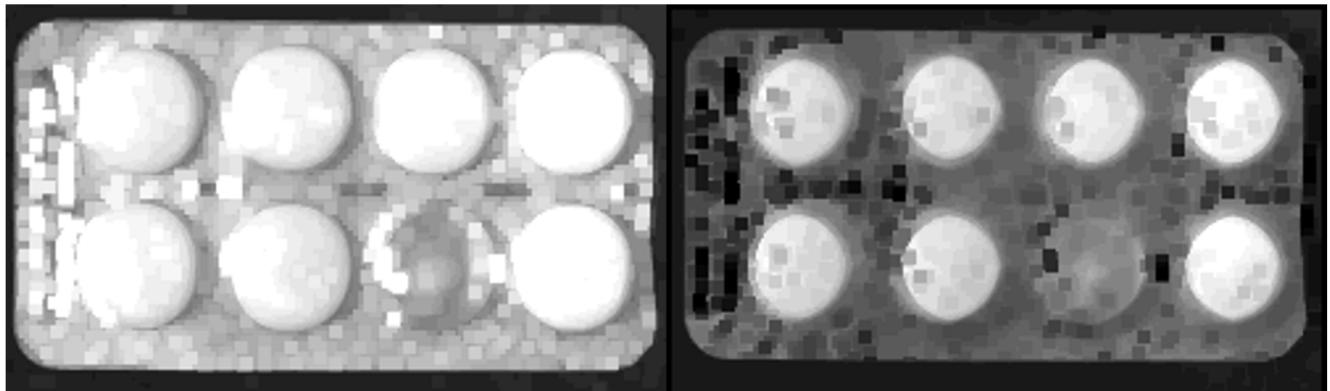
erode

```
SE = ones(5, 5);  
IE = imerode(I, SE);  
montage({I, IE});
```



erode = ? min dels seus veïns

```
IE2 = colfilt(I, [5 5], "sliding", @min);  
montage({ID, IE2});
```



open

```
SE = ones(3, 3);
IO = imopen(I, SE);
montage({I, IO});
```



close

```
SE = ones(3, 3);
IC = imclose(I, SE);
montage({I, IC});
```



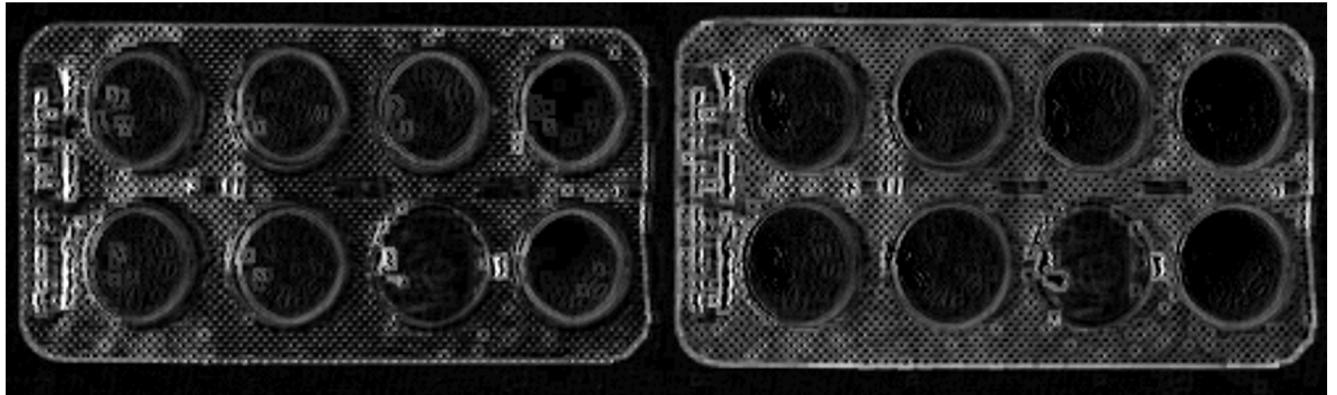
filtrer openclose

```
I0C = imclose(I0, SE);  
montage({I, I0C});
```

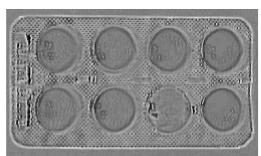


residus

```
RI = I - IE; % interns  
RE = ID - I; % externs  
L = double(RE) - double(RI); % laplacian  
montage({RI, RE});
```



```
imshow(L, []);
```



Top hat i bottom hat

```
I = imread('nshadow.tif');
SE = ones(10, 10);
IO = imopen(I,SE);
IC = imclose(I,SE);
% top hat
TH = I - IO;
imshow(TH, []);
```

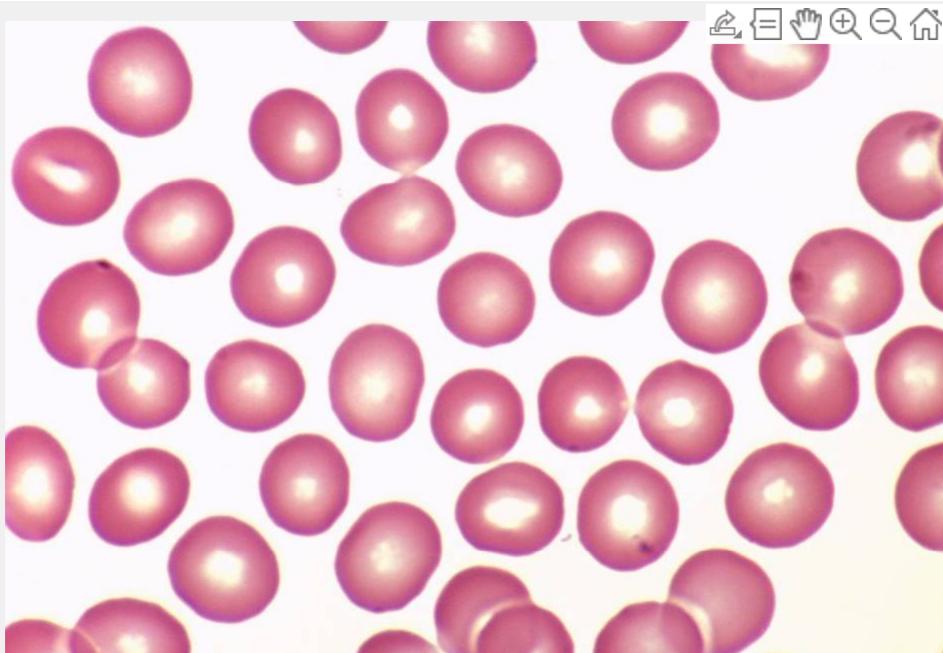
viewed by erosion
as filter
 $(f) = \Psi(\Psi(f))$
 $f < g \Rightarrow \Psi(f) <$

```
% bottom hat
BH = IC - I;
imshow(BH, []);
```



Reconstrucció a partir d'un punt

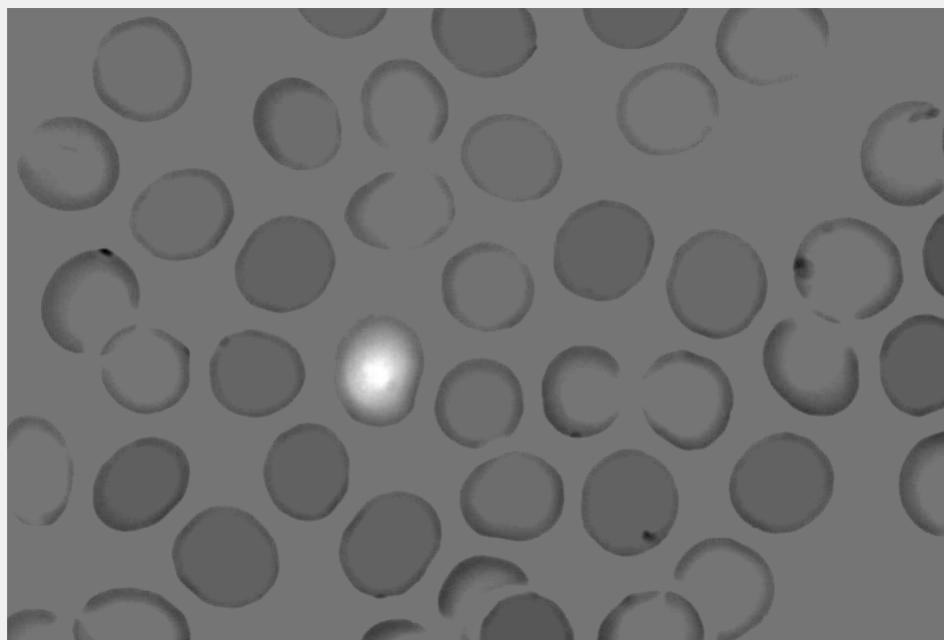
```
RGB = imread('normal-blood1.jpg');
I = rgb2gray(RGB);
imshow(RGB);
[x,y] = getpts;
```



```
[f, c] = size(I);

MARK = uint8(zeros([f,c]));
MARK(uint16(y),uint16(x)) = 255;

REC = imreconstruct(MARK,I);
imshow(REC,[]);
```



```
I = imread('nshadow.tif');
imshow(I);
[x,y] = getpts;
```

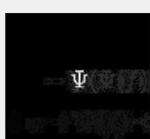
ved by erosion

cal filter

$$(f) = \Psi(\Psi(f))$$

$$\leq g \Rightarrow \Psi(f) \leq$$

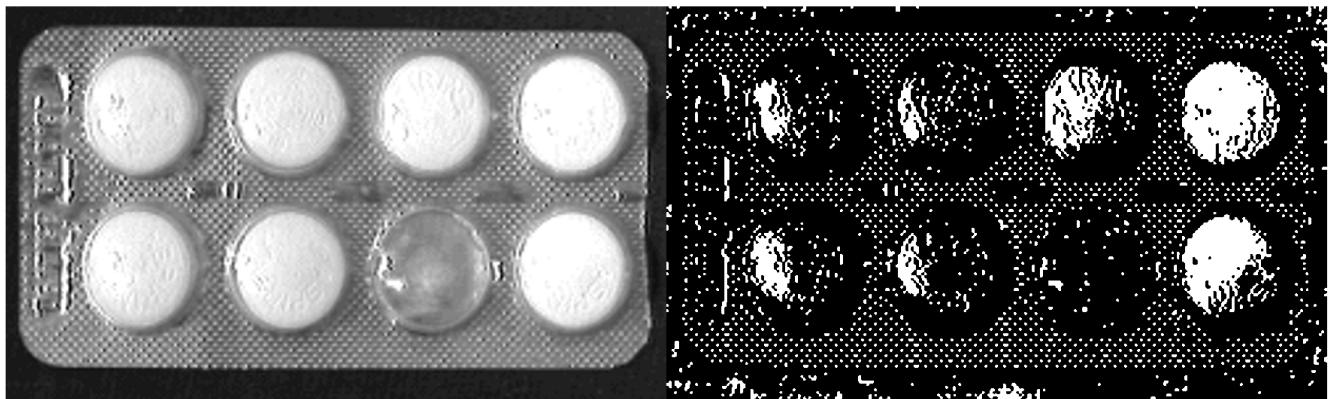
```
[f, c] = size(I);  
  
MARK = uint8(zeros([f,c]));  
MARK(uint16(y),uint16(x)) = 255;  
  
REC = imreconstruct(MARK,TH);  
imshow(REC,[]);
```



màxims i mínims regionals

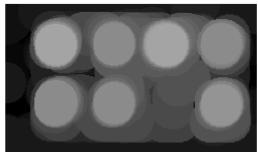
```
I = imread('astablet.tif');  
MR = imregionalmax(I);
```

```
montage({I,MR});
```

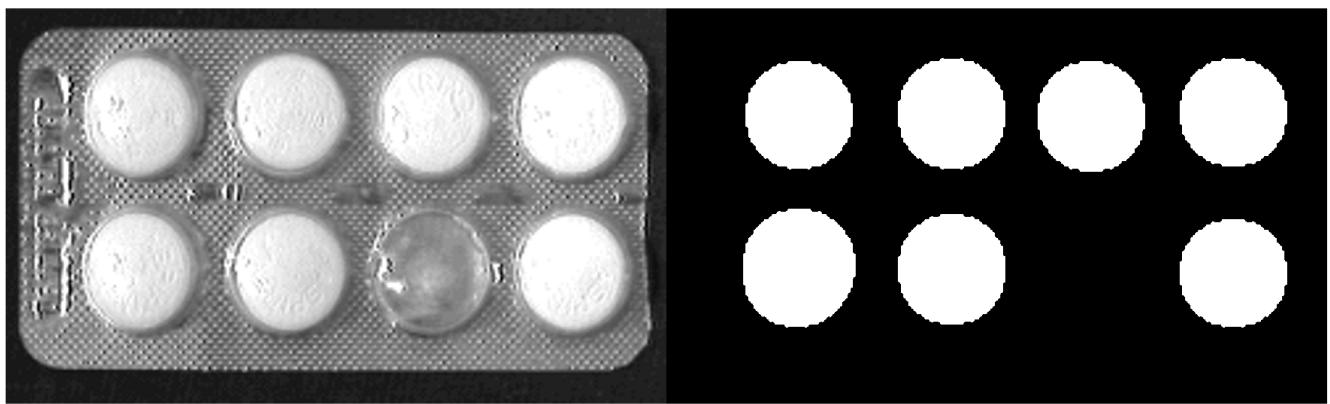


```
% masses maxims regionals
```

```
ES = fspecial("disk",20) > 0; % la mida del que estem buscant (mida de la pastilla)  
IO = imopen(I,ES);  
imshow(IO);
```



```
MRO = imregionalmax(IO);  
montage({I, MRO});
```



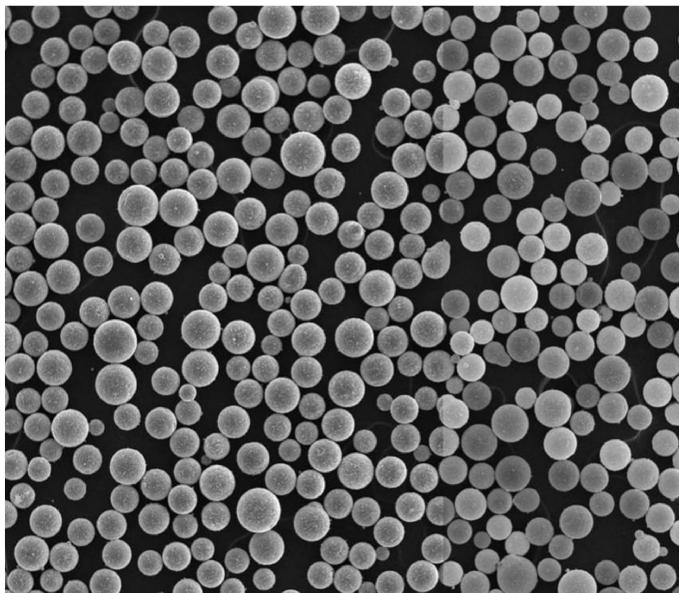
```
IM = I;  
IM(not(MR)) = 0;  
REC = imreconstruct(IM,I);
```

```
imshow(REC, []);
```



Exercici: realitzar un plot granulometric

```
RGB = imread("granulometria.png");
I = rgb2gray(RGB);
imshow(I);
```



```
for i = 1:30
    ES = fspecial("disk", i) > 0;
    I0 = imopen(I,ES);
    t = otsuthresh(imhist(I0));
    t = max(64, t*255);
    BW = I0 > t;
    if (sum(sum(BW)) > 0)
        BWUE = bwulterode(BW);
        CC = bwconncomp(BWUE);
        A(i) = CC.NumObjects;
    else
        A(i) = 0;
    end
```

```
end
```

```
plot(A)
```

