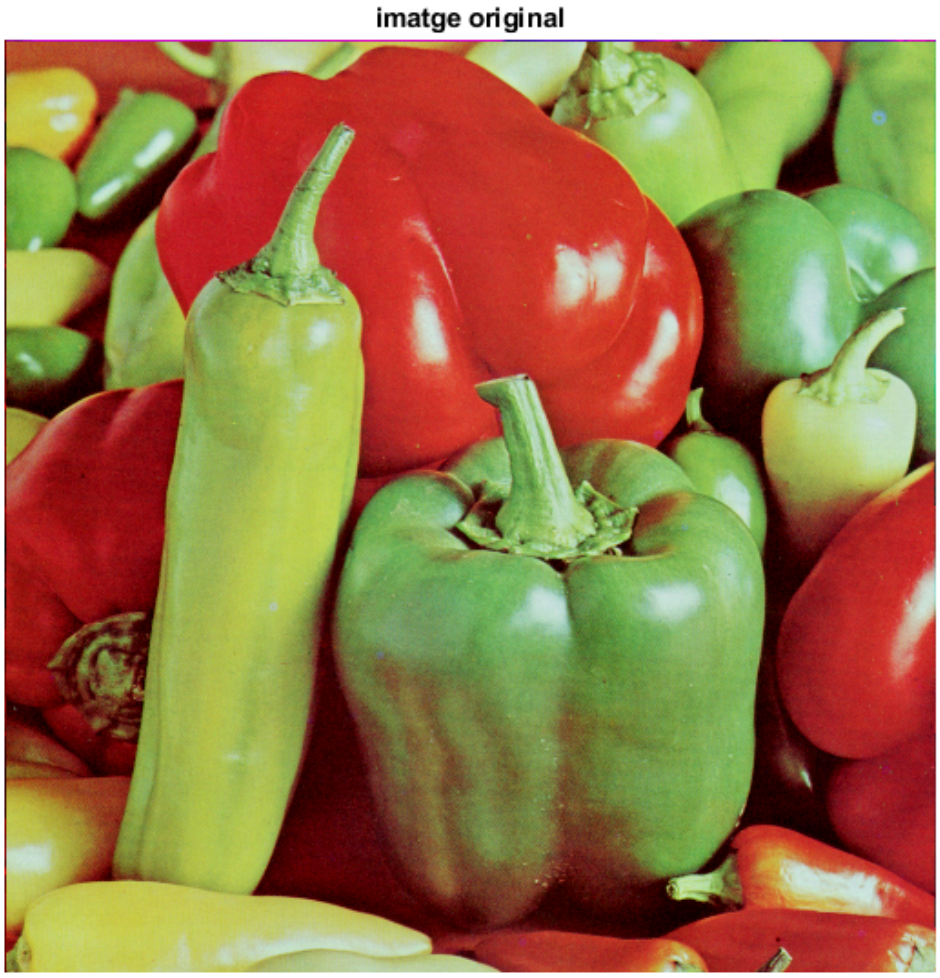
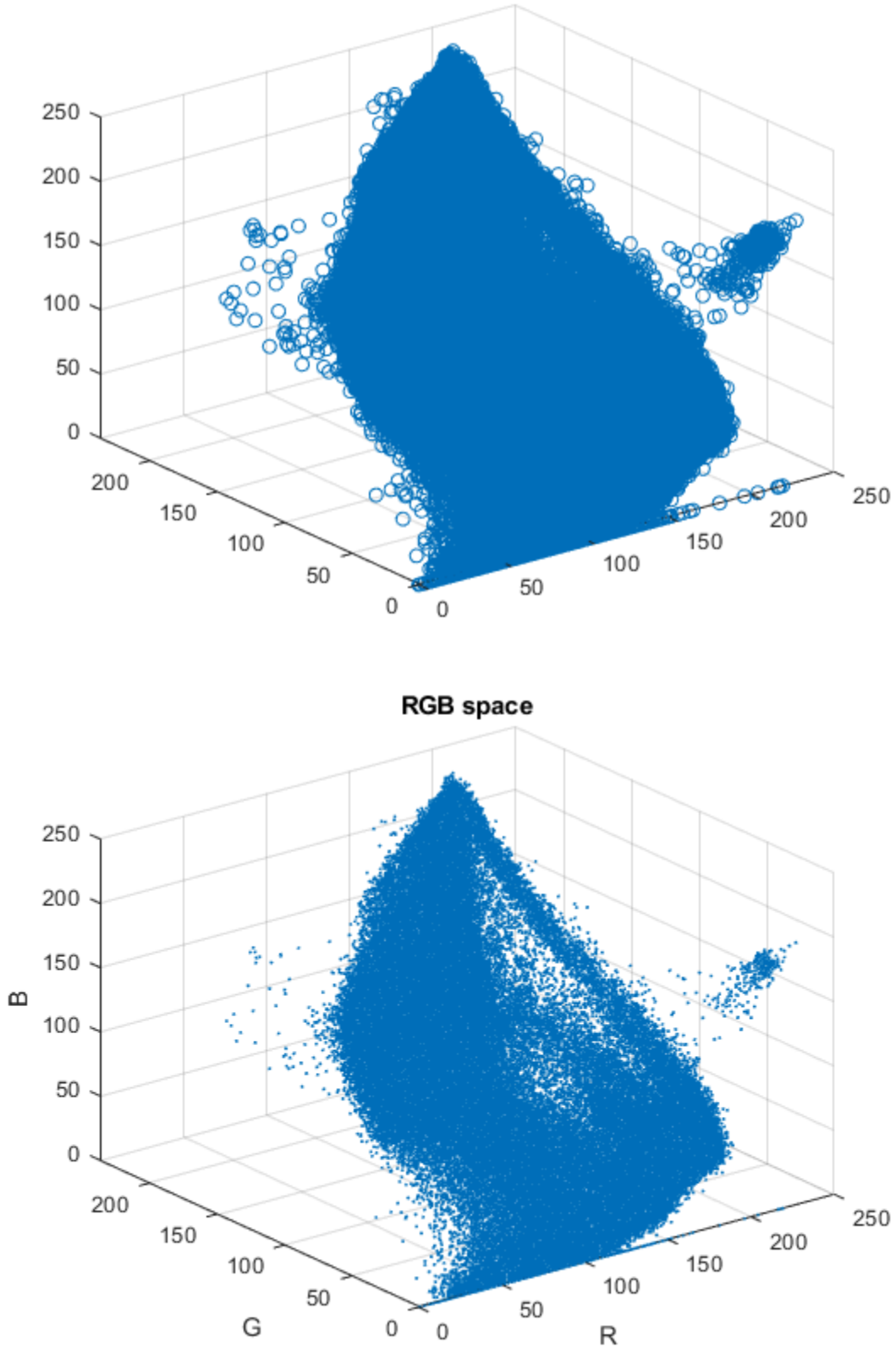
```
% Entrega 13
% Natalia Dai, Xenia Calisalvo Veciana,You Wu
% close all clear all cd('I:\vc\sample images')
```

Clustering

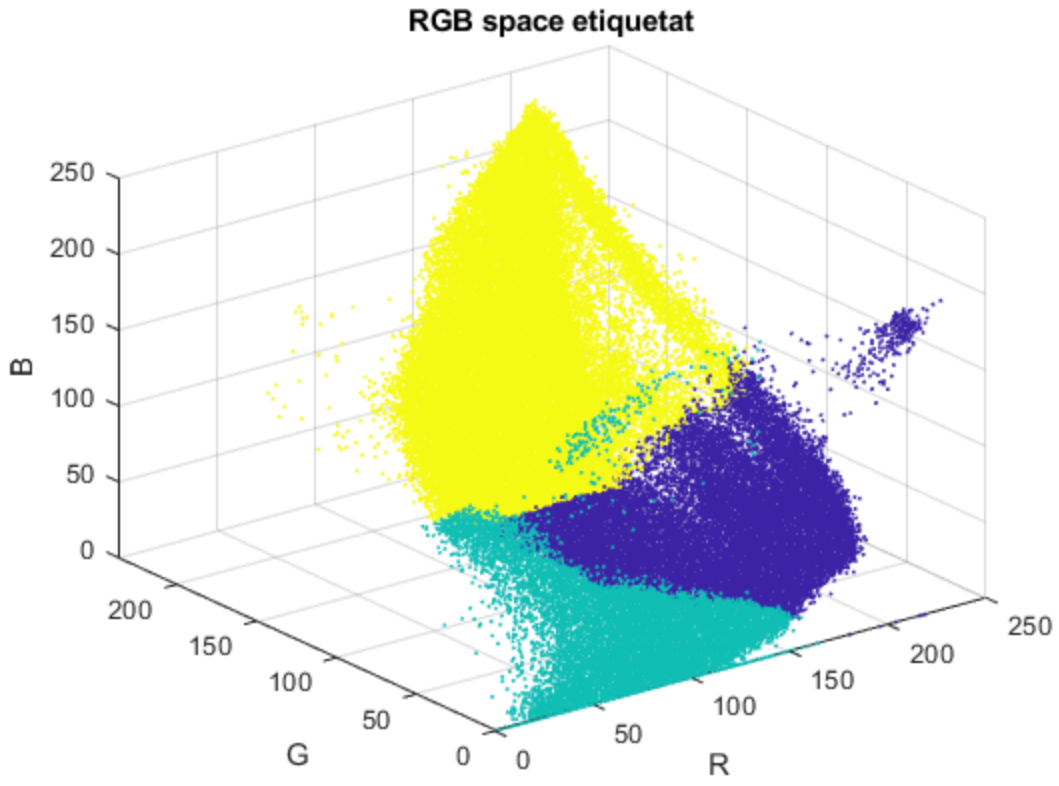
```
im = imread('peppers.png');
figure, imshow(im), title('imatge original')
vect = reshape(double(im), 512*512, 3); % vector de característiques
figure, scatter3(vect(:,1),vect(:,2),vect(:,3))
figure, scatter3(vect(:,1),vect(:,2),vect(:,3),1)
xlabel('R');ylabel('G');zlabel('B'), title('RGB space')
```

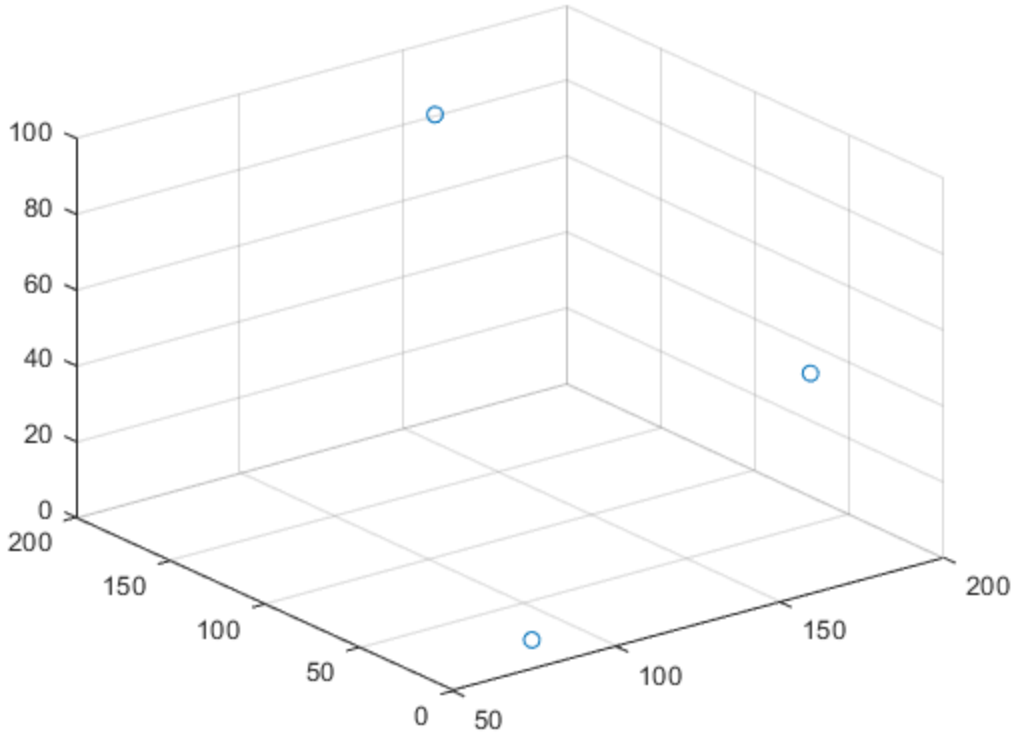



RGB space
B
G
R
250
200
150
100
50
0

Segmentació en 3 clusters, resultat -> etiquetades

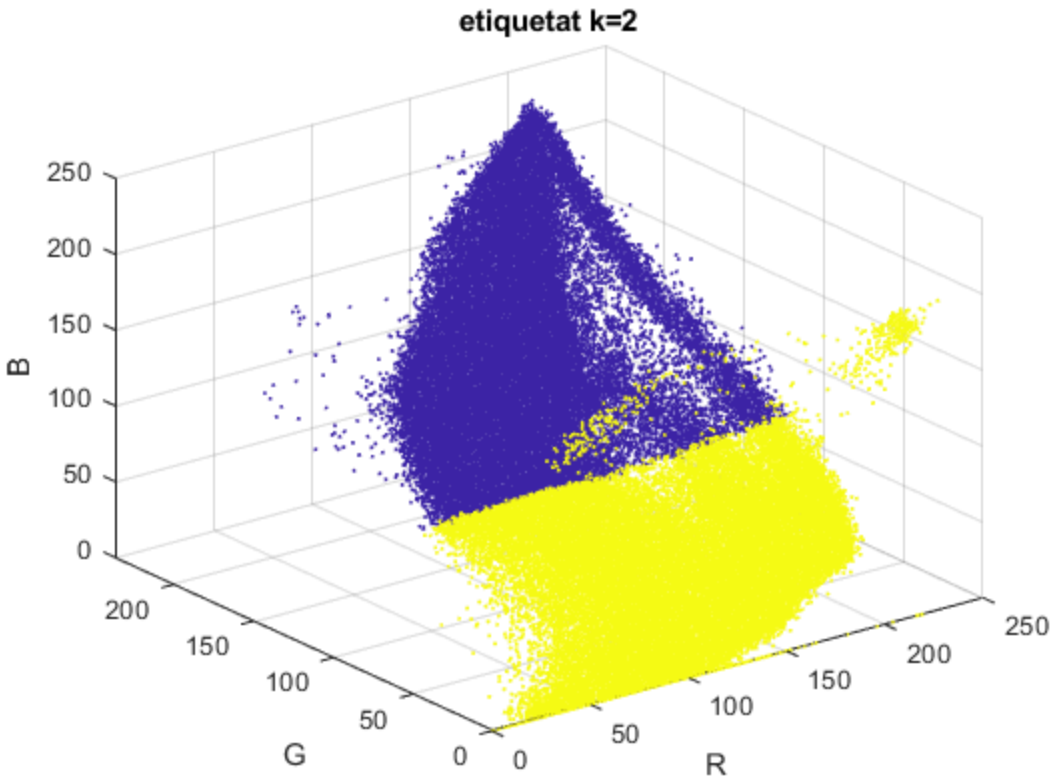
```
k = 3;
% Columnes RGB, files classes 1 2 i 3
[cl_eti, cl_ctr] = kmeans(vect, k, 'distance', 'cityblock');
figure, scatter3(vect(:,1),vect(:,2),vect(:,3),1,cl_eti)
xlabel('R');ylabel('G');zlabel('B'), title('RGB space etiquetat')
% Centres de les classes
figure, scatter3(cl_ctr(:,1),cl_ctr(:,2),cl_ctr(:,3))
eti = reshape(cl_eti, 512, 512);
% 3 nivells de gris per les 3 classes
figure, imshow(eti, []), title('imatge segmentada')
```




100
80
60
40
20
0
200
150
100
50
0
50
100
150
200

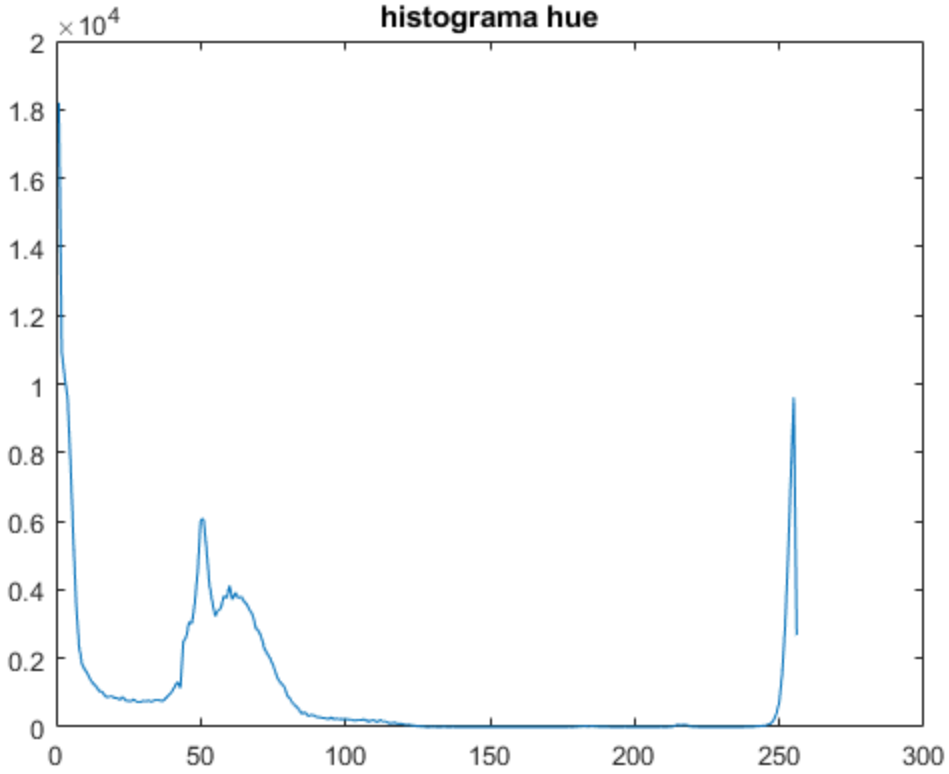
Ara en 2 clusters en comptes de 3

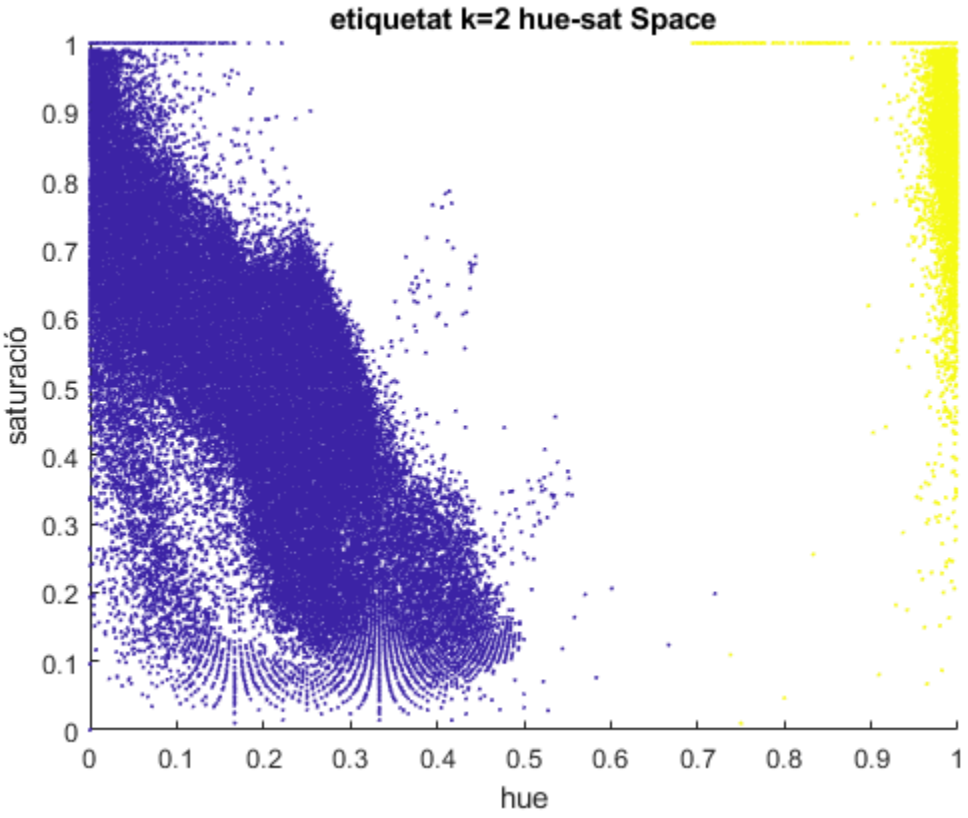
```
k = 2;
[cl_eti2, cl_ctr2] = kmeans(vect, k, 'distance', 'cityblock');
figure, scatter3(vect(:,1),vect(:,2),vect(:,3),1,cl_eti2)
xlabel('R');ylabel('G');zlabel('B'), title('etiquetat k=2')
eti2 = reshape(cl_eti2, 512, 512);
figure, imshow(eti2, []), title('imatge segmentada k=2')
```

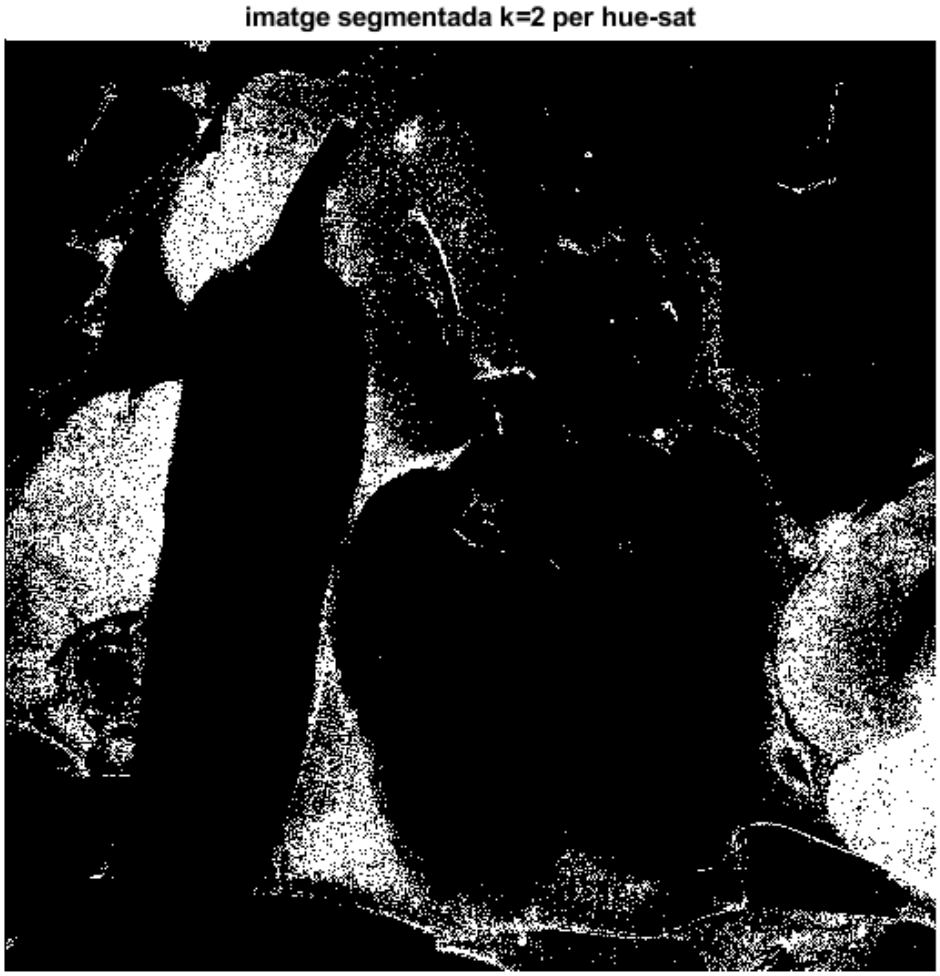

etiquetat k=2
B
250
200
150
100
50
0
G
200
150
100
50
0
R
0
50
100
150
200
250

Treballarem ara amb HSV

```
im_hsv = rgb2hsv(im);
hs = im_hsv(:,:,1:2); % espai de 2 característiques
h = imhist(hs(:,:,1)); % com estan distribuïts els hues
figure, plot(h), title('histograma hue')
vect2 = reshape(double(hs), 512*512, 2);
[cl_eti3, cl_ctr3] = kmeans(vect2, k, 'distance', 'cityblock');
figure, scatter(vect2(:,1),vect2(:,2),1,cl_eti3)
xlabel('hue');ylabel('saturació'), title('etiquetat k=2 hue-sat Space')
eti3 = reshape(cl_eti3, 512, 512);
figure, imshow(eti3, []), title('imatge segmentada k=2 per hue-sat')
% Problema: hue és cíclic (angle)
% No farem promig aritmética, pero com estem treballant amb hue-sat, podem
% solucioanr-ho amb aquesta transformació: sat*sin(hue) i sat*cos(hue)
```


histograma hue
×10^4
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
50
100
150
200
250
300

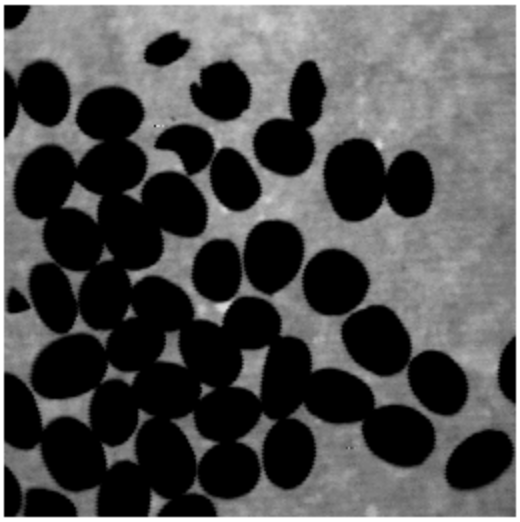

etiquetat k=2 hue-sat Space
saturació
hue
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1



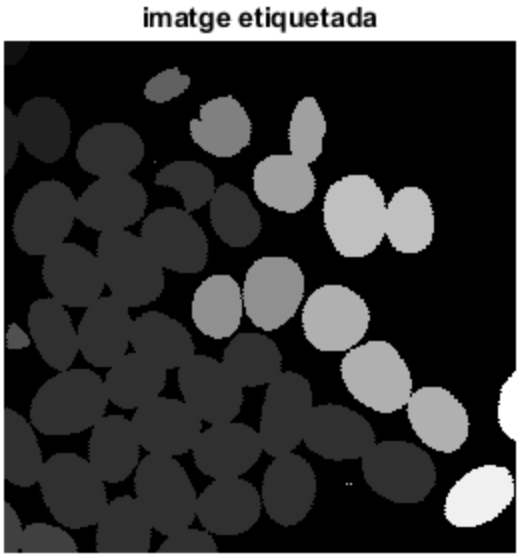
Exercici: separar els grans de cafe

```
im = imread('cafe.tif');
figure, imshow(im), title('imatge original')
imbw = im2bw(im, graythresh(im));
figure, imshow(imbw), title('binaritzada')
% Després de binaritzar etiquetem
eti = bwlabel(~imbw);
figure, imshow(eti, []), title('imatge etiquetada')
% Podem veure clarament que estan enganxats els grans
```

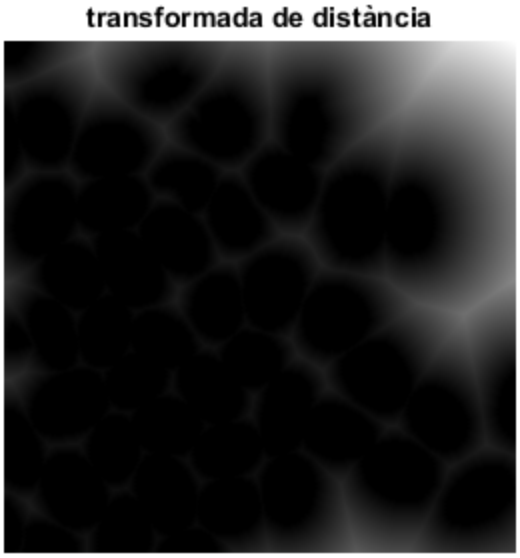
imatge original

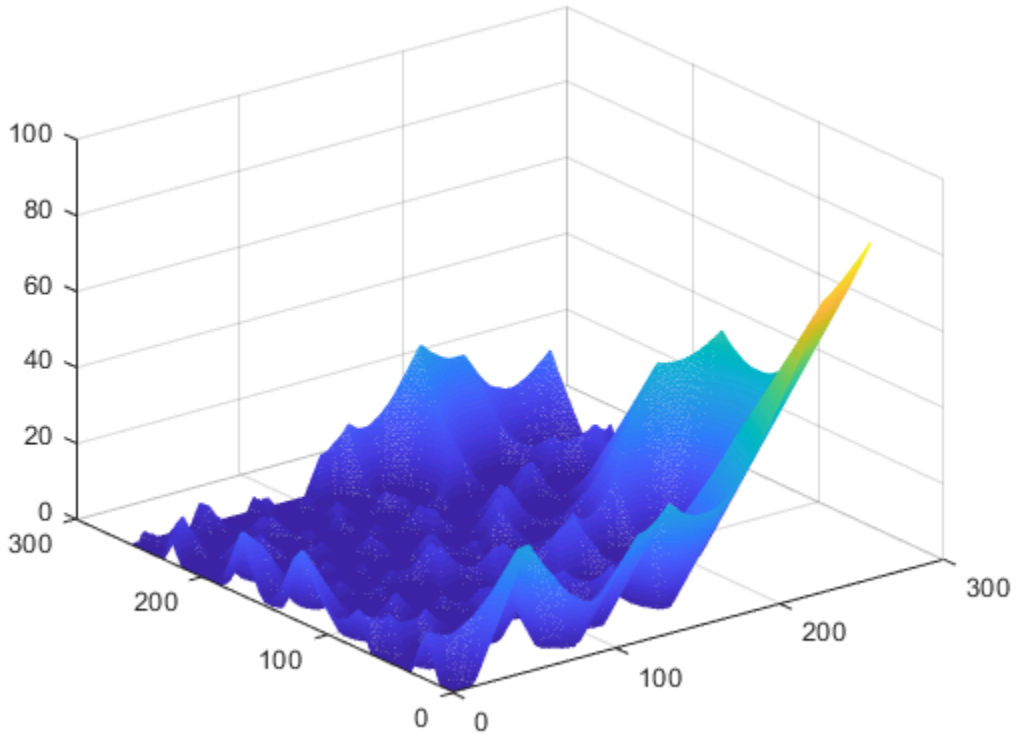


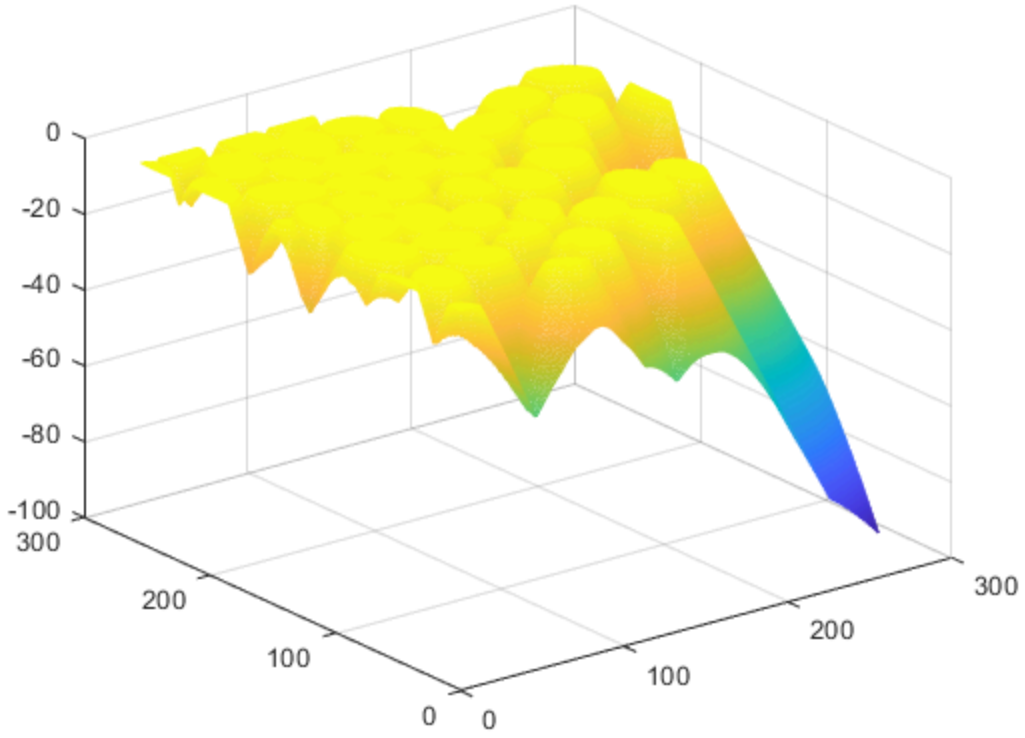
binaritzada

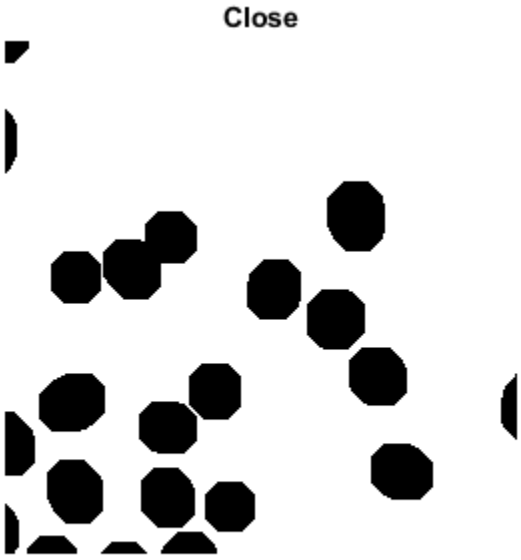


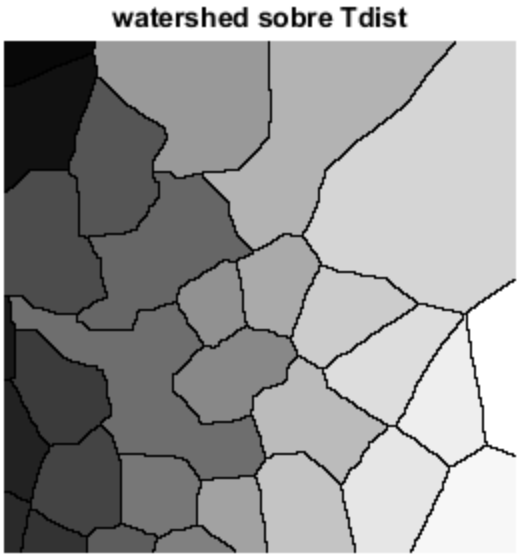

```
td = bwdist(~im);
figure, imshow(td, []), title('transformada de distància');
figure, mesh(td)
figure, mesh(-td)
ee = strel('disk', 13);
grad = imclose(td, ee);
figure, imshow(grad), title('Close')
segm = watershed(grad);
figure, imshow(segm, []), title('watershed sobre Tdist');
impixelinfo
res = im;
res(segm == 0) = 255;
figure, imshow(res), title('blobs separats');
```


transformada de distància

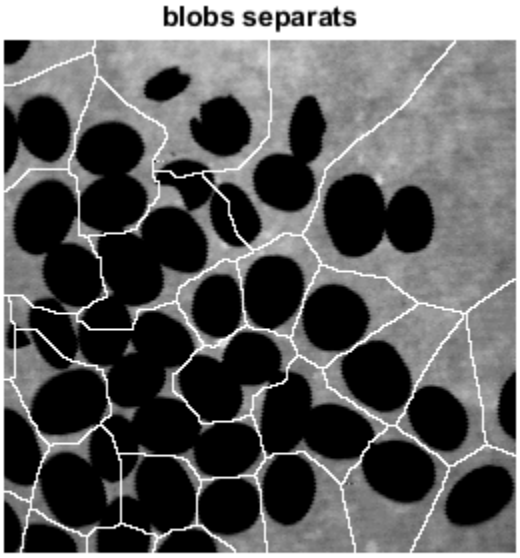

100
80
60
40
20
0
300
200
100
0
0
100
200
300


0
-20
-40
-60
-80
-100
300
200
100
0
0
100
200
300


Close



Pixel info: (X, Y) Pixel Value



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