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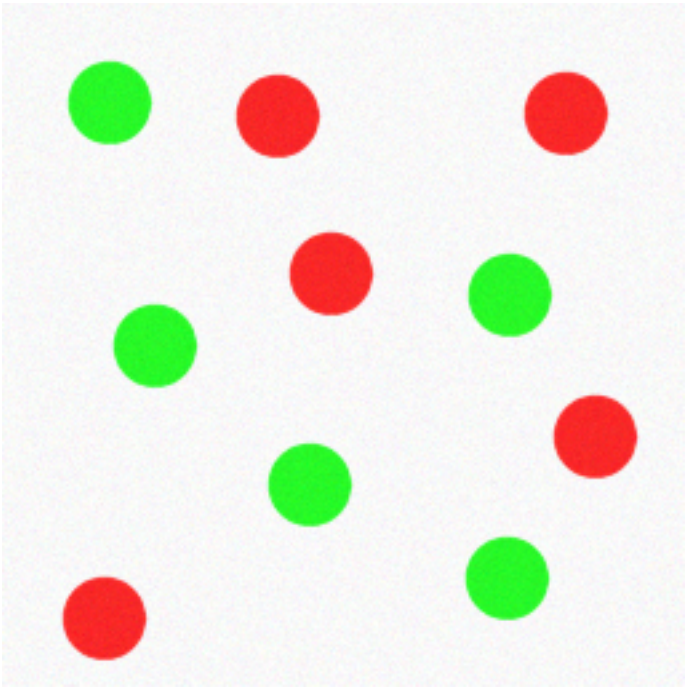
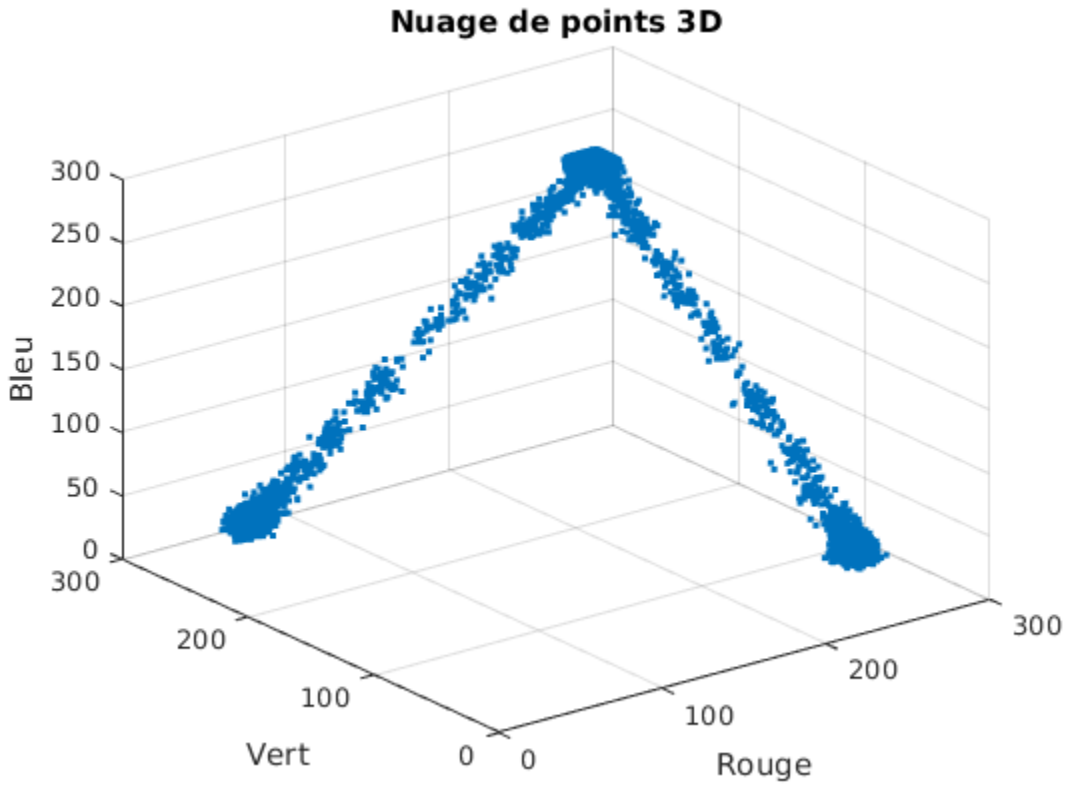
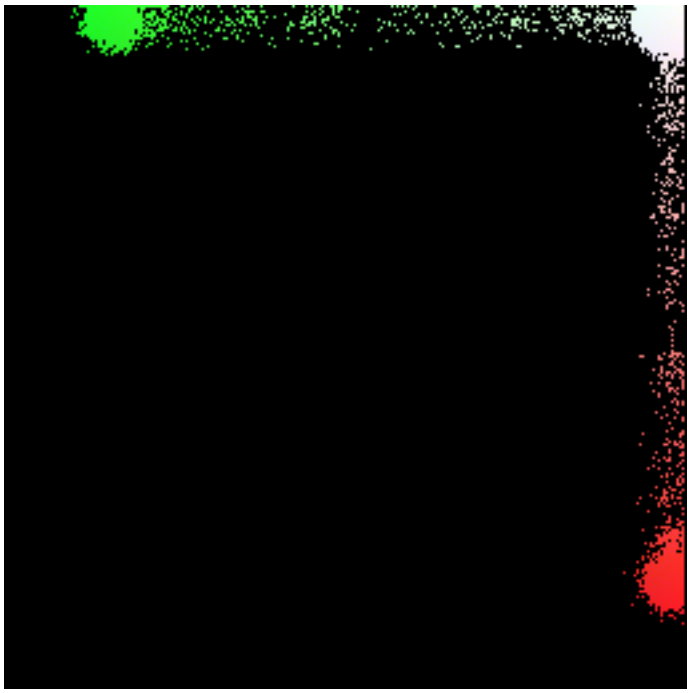
```
clear all;
close all;
```

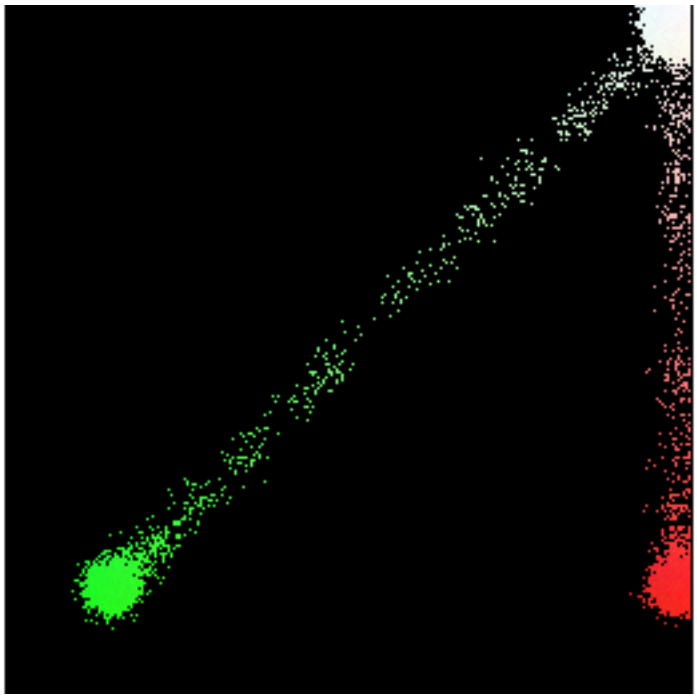
Question 2.1 : nuages de points représentant les pixels

```
f=imread('Images/BillesColoreesBruit.bmp');
figure(1),imshow(f);

% Nuage de points 3D
fr = f(:,:,1); fv = f(:,:,2); fb = f(:,:,3);
figure(2), plot3(fr(:),fv(:),fb(:),'.'); grid('on')
title('Nuage de points 3D');
xlabel('Rouge'); ylabel('Vert'); zlabel('Bleu');

% Nuages projetés en 2D
rv=zeros(256,256,3,'uint8');
rb=zeros(256,256,3,'uint8');
for i=1:size(f,1)
    for j=1:size(f,2)
        rv(256-f(i,j,2),f(i,j,1)+1,:)=f(i,j,:);
        rb(256-f(i,j,3),f(i,j,1)+1,:)=f(i,j,:);
    end
end
figure(3), imshow(rv);title('plan RV');
xlabel('Rouge'); ylabel('Vert');
figure(4), imshow(rb);title('plan RB');
xlabel('Rouge'); ylabel('Bleu');
```




Nuage de points 3D
Bleu
300
250
200
150
100
50
0
Vert
300
200
100
0
Rouge
0
100
200
300



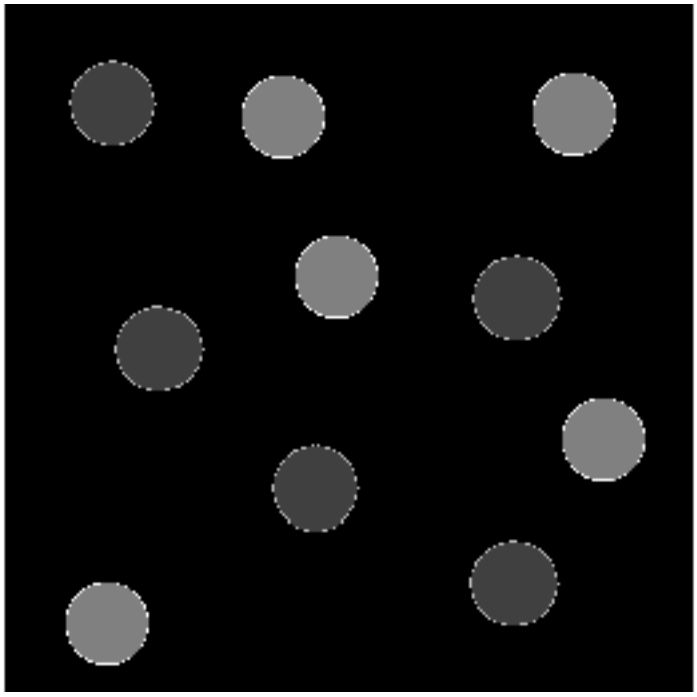


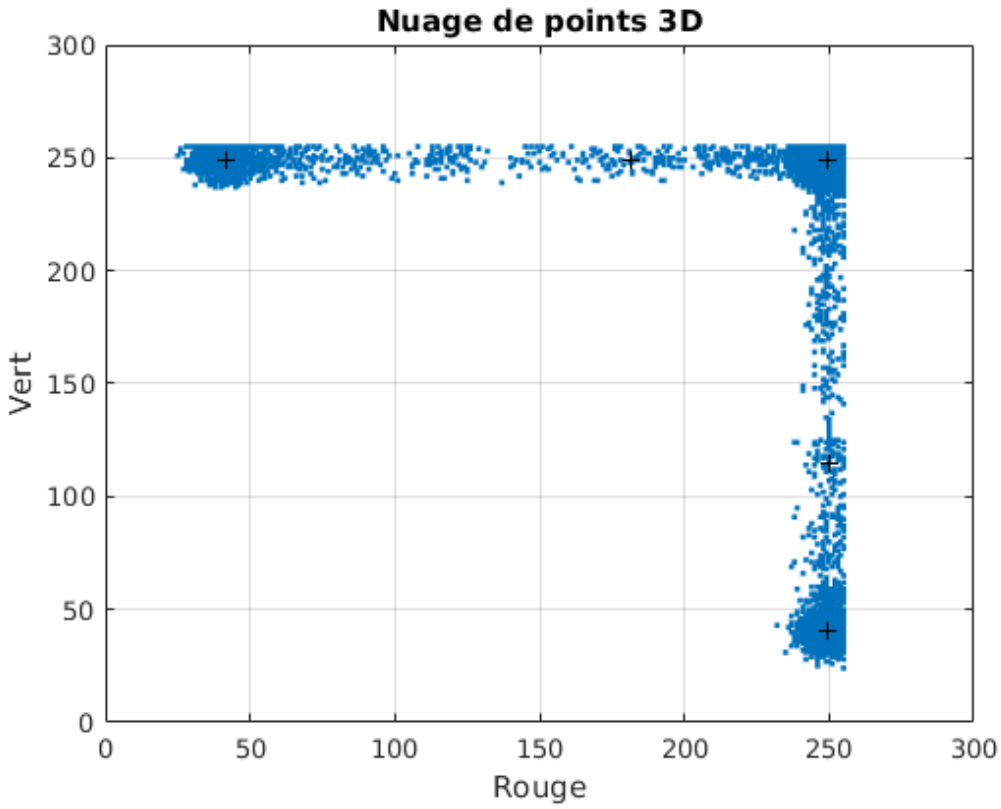
Question 2.2 : Segmentation par nuées dynamiques

```
[fs,centers]=tse_imkmeans(f,5);
figure(5), imshow(fs,[]);
fprintf('centres :\n');
fprintf('(%d %d %d)\n',round(centers'));
```

```
figure(6)
plot(fr(:),fv(:),'.',centers(:,1),centers(:,2),'+k'); grid('on')
title('Nuage de points 3D');
xlabel('Rouge'); ylabel('Vert'); zlabel('Bleu');
```

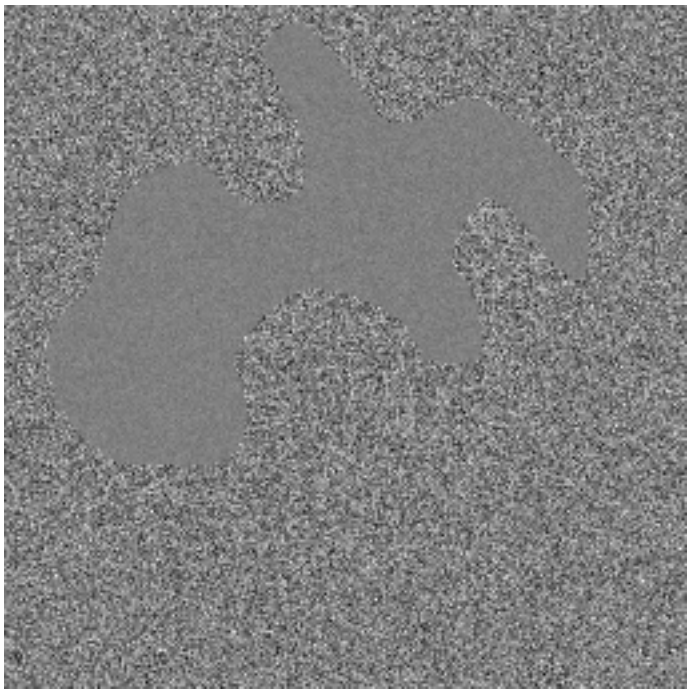
centres :
(249 249 249)
(42 249 42)
(250 40 41)
(181 249 181)
(250 115 115)

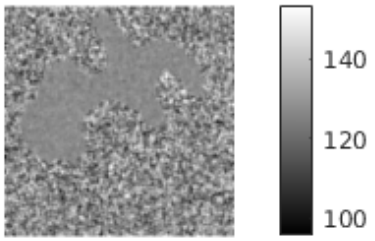


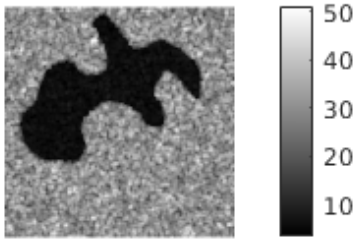


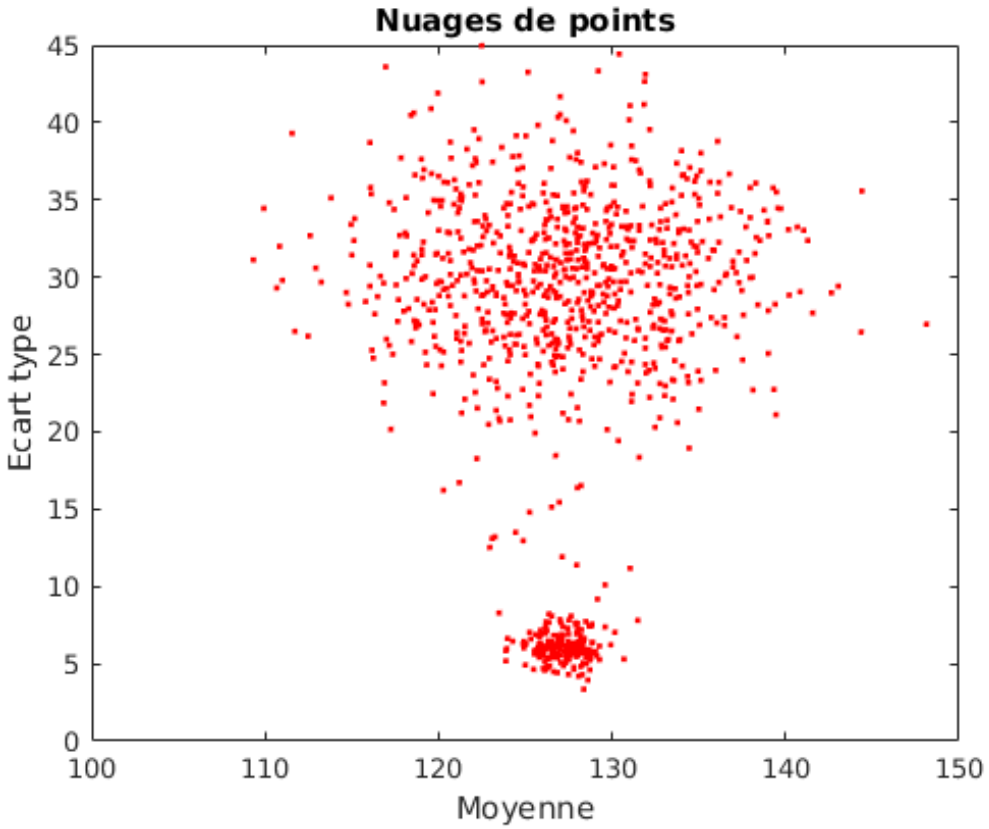
Question 2.3 : Images de textures

```
f=double(imread('Images/Forme2Bruits.bmp'));
figure(5),imshow(f,[]);

% Calcul des attributs
taille_vois=5;
fmoy=imfilter(f,fspecial('average',taille_vois),'symmetric');
fstd=stdfilt(f,ones(taille_vois));

% Affichage des images des attributs
figure(6),subplot(1,2,1);imshow(fmoy,[]),colorbar;
subplot(1,2,2);imshow(fstd,[]),colorbar;

% Tracé de l'espace des attributs
sel=ceil(numel(f)*rand(1000,1));
figure(7),plot(fmoy(sel),fstd(sel),'.r');
title('Nuages de points');
xlabel('Moyenne'); ylabel('Ecart type');
```




140
120
100


50
40
30
20
10

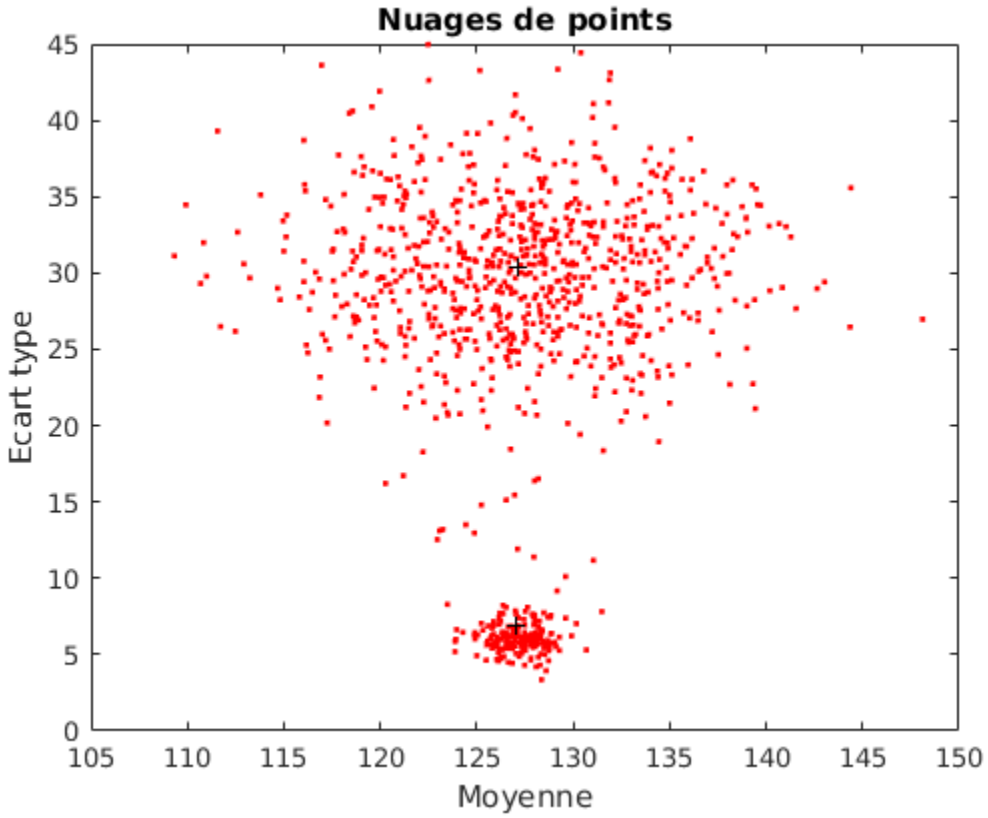


Question 2.4 Segmentation de l'image de texture

f2(:,:,1)=fmoy; f2(:,:,2)=fstd;

```
f2=cat(3,fmoy,fstd);
[fs,centers]=tse_imkmeans(f2,2);
figure(8),imshow(fs,[]);
centers

figure(9),plot(fmoy(sel),fstd(sel),'.r',centers(:,1),centers(:,2),'+k');
title('Nuages de points');
xlabel('Moyenne'); ylabel('Ecart type');
```

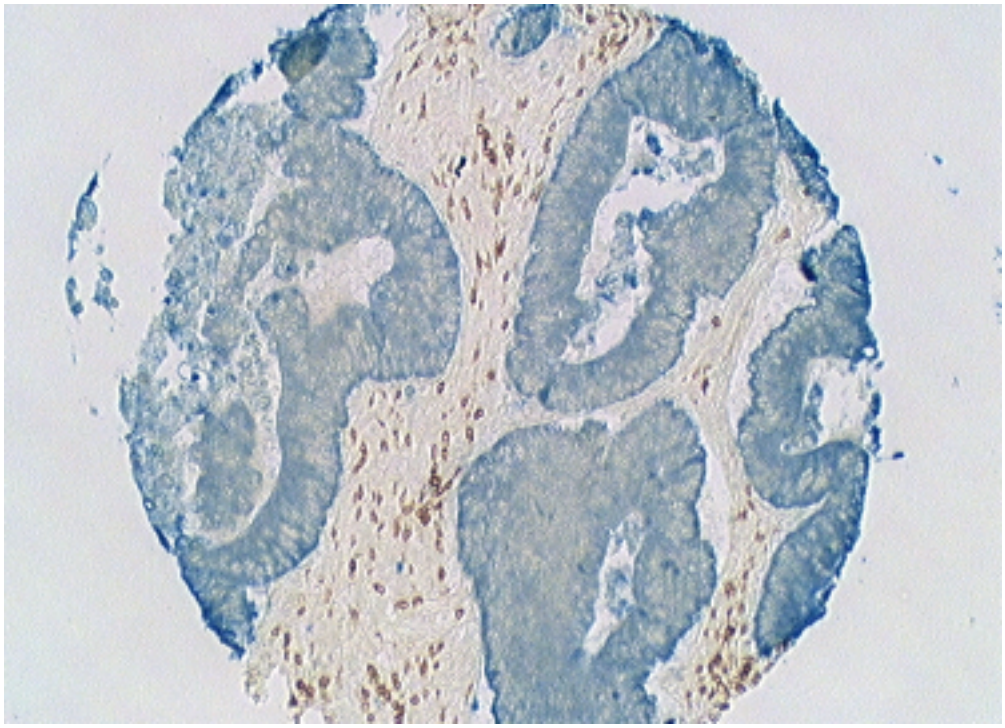
```
centers =

  127.1837   30.3449
  127.0492    6.9273
```

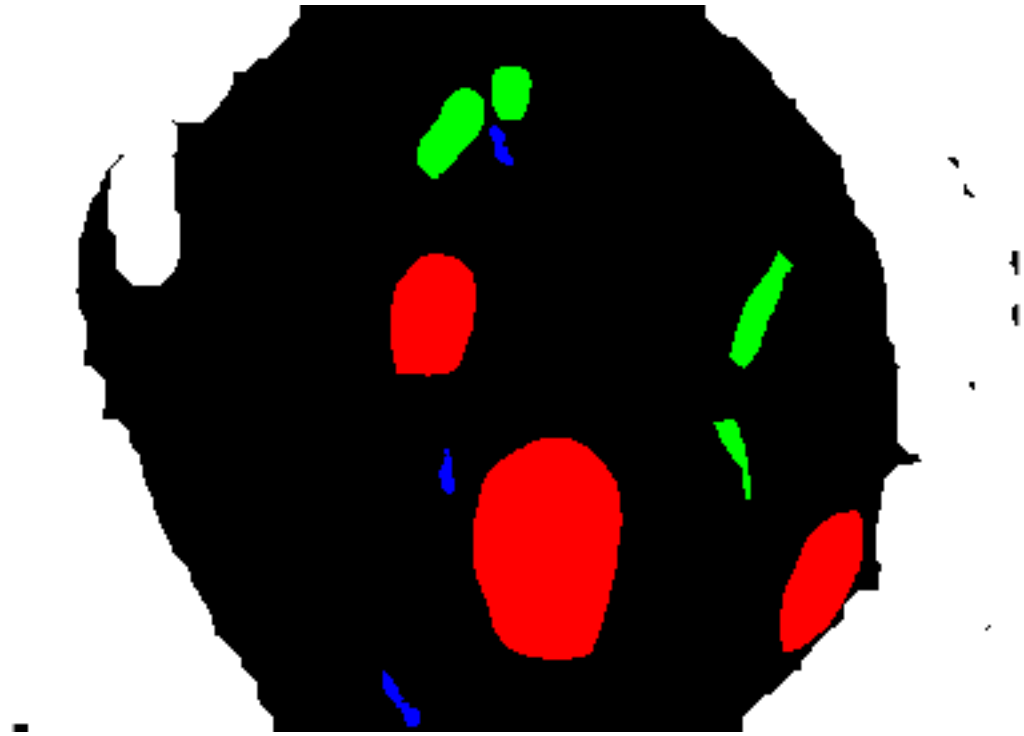


Question 2.5 : Couleur et texture

```
clear all;
close all;
```

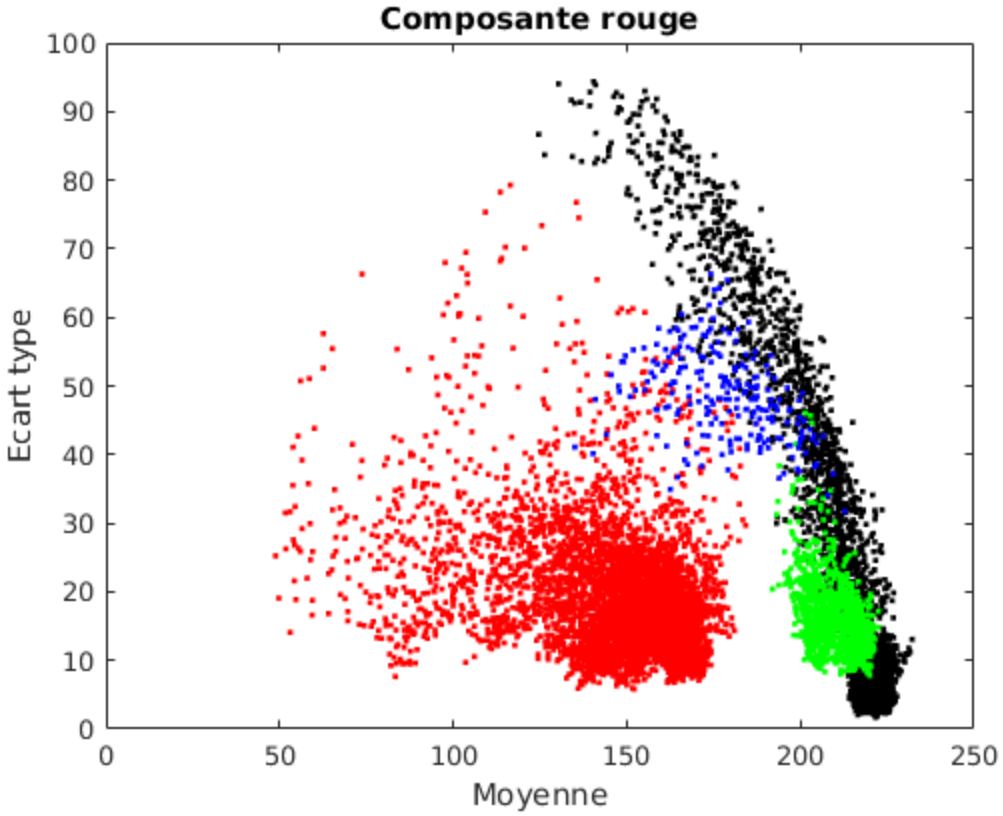
```
f=imread('Images/Colon_TMA01.bmp');
figure(1),imshow(f);

[label,color]=imread('Images/Colon_TMA01_Label.bmp');
figure(2),imshow(label),colormap(color);
```

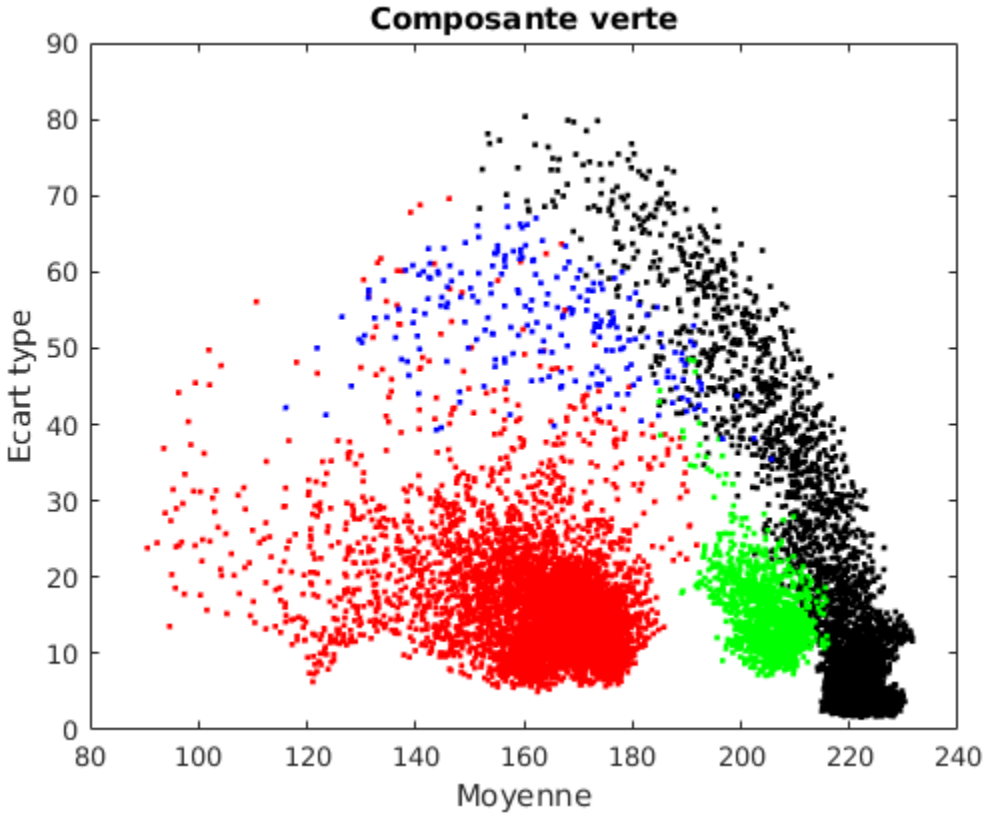


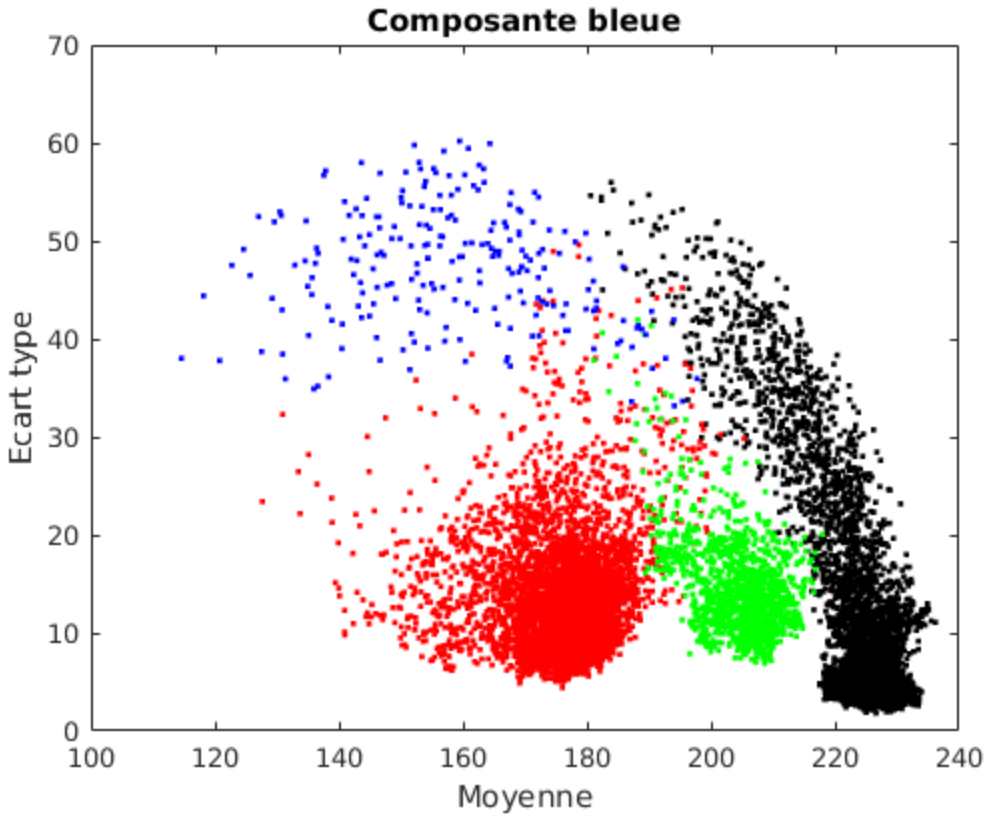


1. Calcul des attributs

```
% Calcul de la moyenne et de l'écart type
taille_vois=5;
fmoy=imfilter(double(f),fspecial('average',taille_vois),'symmetric');
fstd=stdfilt(f,ones(taille_vois));

% Image avec 6 composantes
fmoy_std=cat(3,fmoy,fstd);

% Label avec 6 composantes
label6=cat(3,label,label,label,label,label,label);

% Sélection des points de la classe 1
index1=find(label6==1);
fc1=fmoy_std(index1);
fc1=reshape(fc1,numel(index1)/6,1,6);

% Sélection des points de la classe 2
index2=find(label6==2);
fc2=fmoy_std(index2);
fc2=reshape(fc2,numel(index2)/6,1,6);

% Sélection des points de la classe 3
index3=find(label6==3);
fc3=fmoy_std(index3);
fc3=reshape(fc3,numel(index3)/6,1,6);

% Sélection des points de la classe 4
index4=find(label6==4);
fc4=fmoy_std(index4);
fc4=reshape(fc4,numel(index4)/6,1,6);

% Tracé des points des 4 classes
figure(3),plot(fc1(:,1,1),fc1(:,1,4),'.k',fc2(:,1,1),fc2(:,1,4),'.r',fc3(:,1,1),fc
 title('Composante rouge');
 xlabel('Moyenne'); ylabel('Ecart type');

figure(4),plot(fc1(:,1,2),fc1(:,1,5),'.k',fc2(:,1,2),fc2(:,1,5),'.r',fc3(:,1,2),fc
 title('Composante verte');
 xlabel('Moyenne'); ylabel('Ecart type');

figure(5),plot(fc1(:,1,3),fc1(:,1,6),'.k',fc2(:,1,3),fc2(:,1,6),'.r',fc3(:,1,3),fc
 title('Composante bleue');
 xlabel('Moyenne'); ylabel('Ecart type');
```

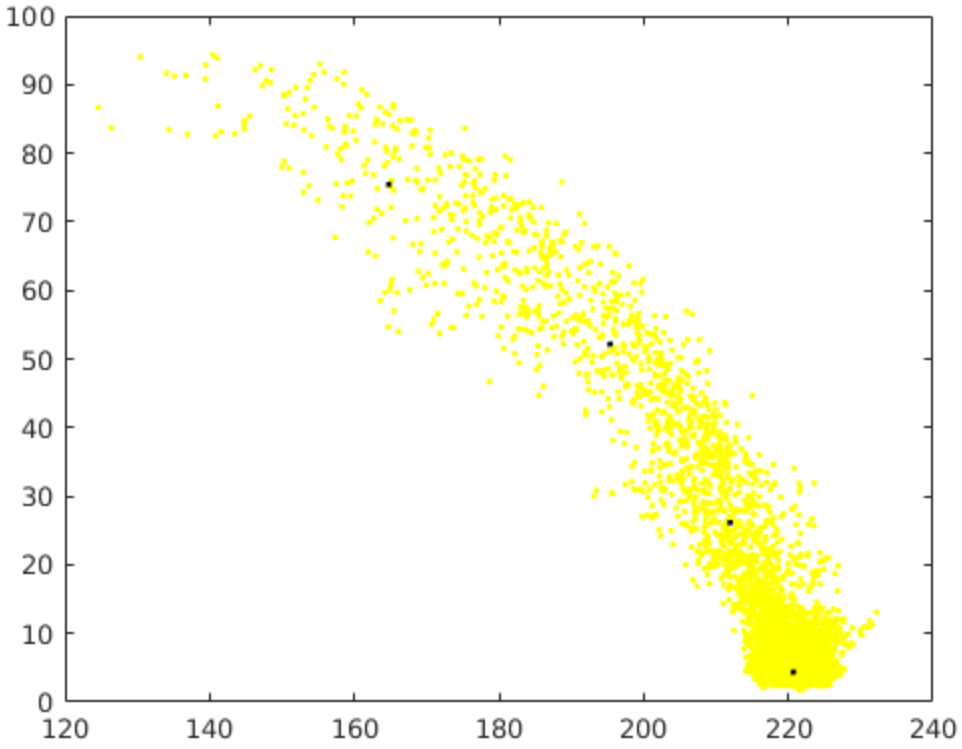

Composante rouge
Ecart type
Moyenne
0
10
20
30
40
50
60
70
80
90
100
0
50
100
150
200
250

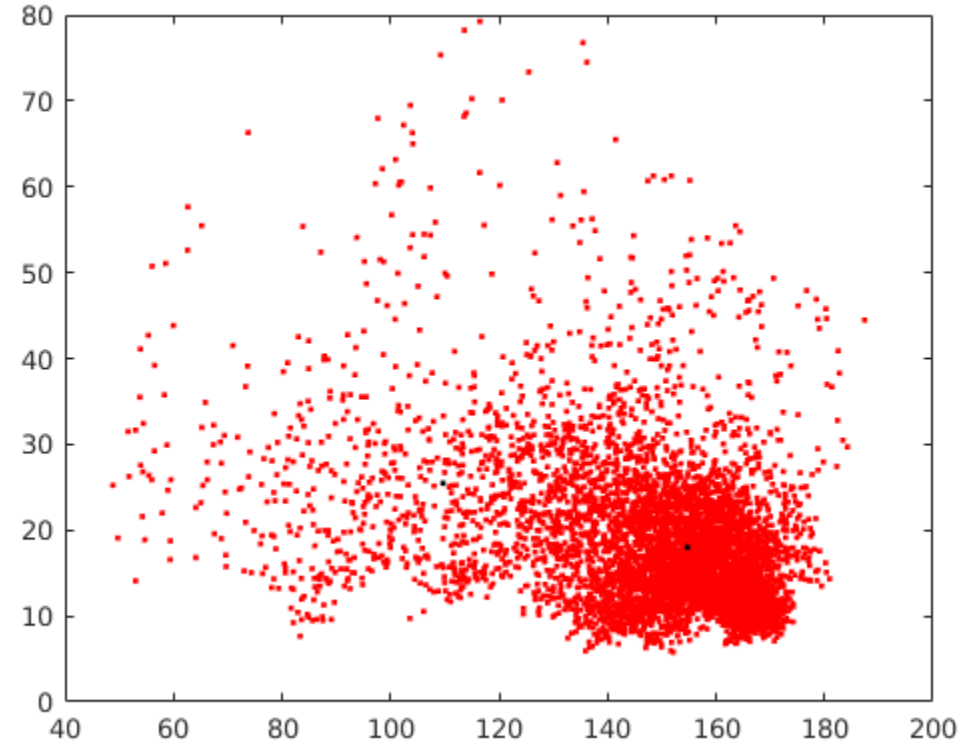

Composante verte
Ecart type
Moyenne
0
10
20
30
40
50
60
70
80
90
80
100
120
140
160
180
200
220
240

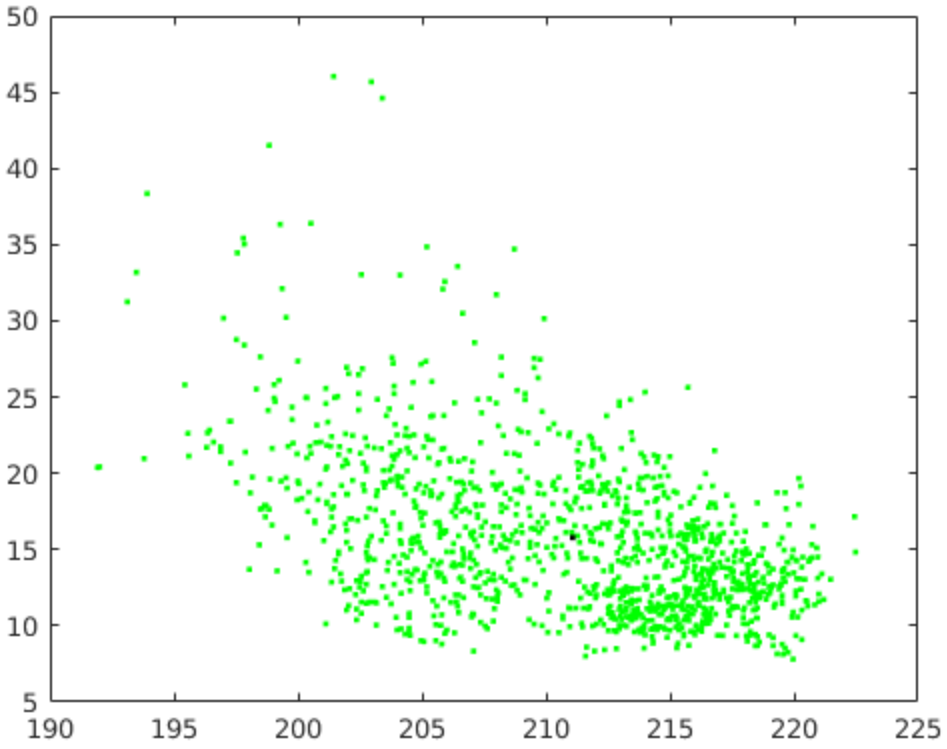


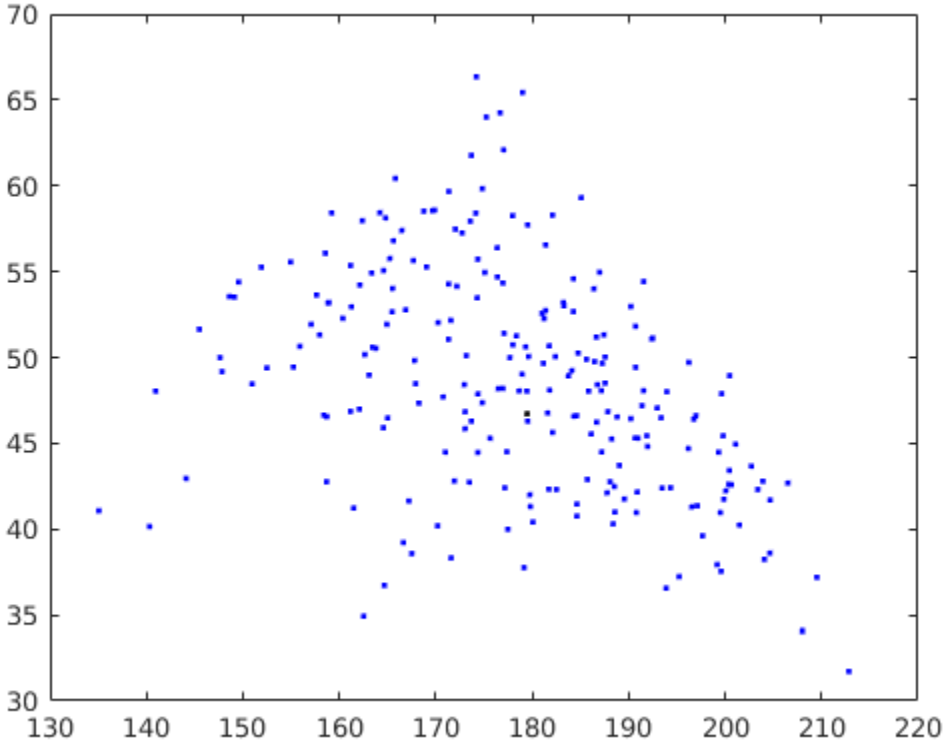
2. Calcul des prototypes

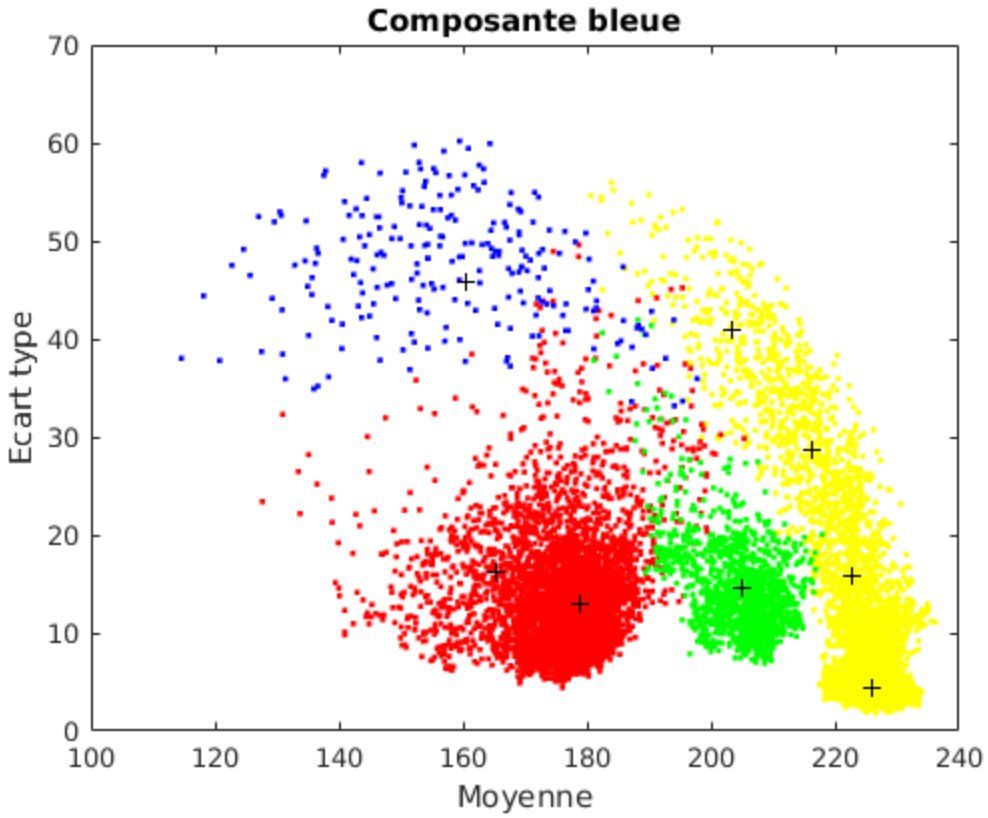
```
% Classe 1
[fce,p1]=tse_imkmeans(fc1,4);
figure(6),plot(fc1(:,1,1),fc1(:,1,4),'.y',p1(:,1),p1(:,4),'.k');

% Classe 2
[fce,p2]=tse_imkmeans(fc2,2);
figure(7),plot(fc2(:,1,1),fc2(:,1,4),'.r',p2(:,1),p2(:,4),'.k');

% Classe 3
[fce,p3]=tse_imkmeans(fc3,1);
figure(8),plot(fc3(:,1,1),fc3(:,1,4),'.g',p3(:,1),p3(:,4),'.k');

% Classe 4
[fce,p4]=tse_imkmeans(fc4,1);
figure(9),plot(fc4(:,1,1),fc4(:,1,4),'.b',p4(:,1),p4(:,4),'.k');

p=cat(1,p1,p2,p3,p4);

figure(10),plot(fc1(:,1,3),fc1(:,1,6),'.y',fc2(:,1,3),fc2(:,1,6),'.r',fc3(:,1,3),f
 title('Composante bleue');
 xlabel('Moyenne'); ylabel('Ecart type');
```


100
90
80
70
60
50
40
30
20
10
0
120
140
160
180
200
220
240


80
70
60
50
40
30
20
10
0
40
60
80
100
120
140
160
180
200

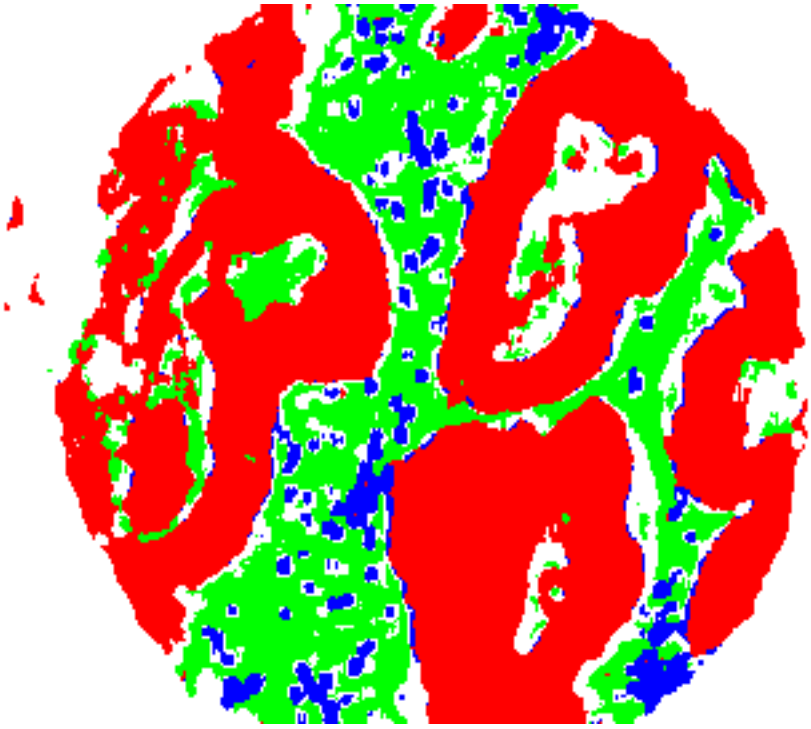

50
45
40
35
30
25
20
15
10
5
190
195
200
205
210
215
220
225


70
65
60
55
50
45
40
35
30
130
140
150
160
170
180
190
200
210
220



3. Affectation d'un label aux prototypes et segmentation d'une image

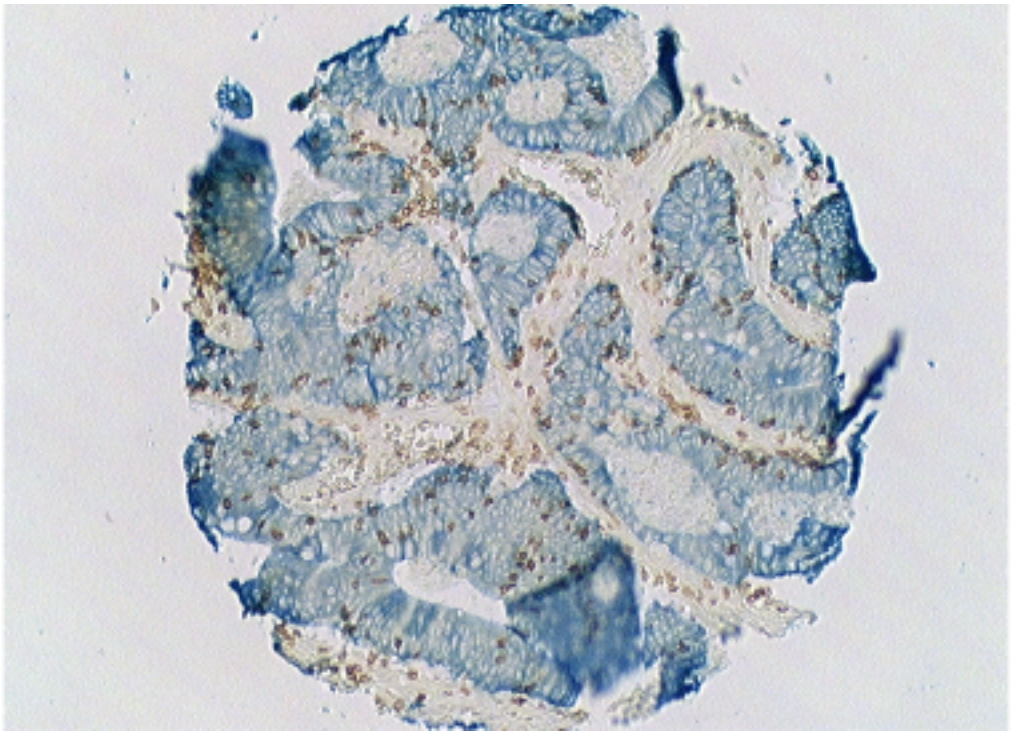
```
fs=tse_imnearestcenter(fmoy_std,p,[1,1,1,1,2,2,3,4]);
figure(11),imshow(fs),colormap(color);
```

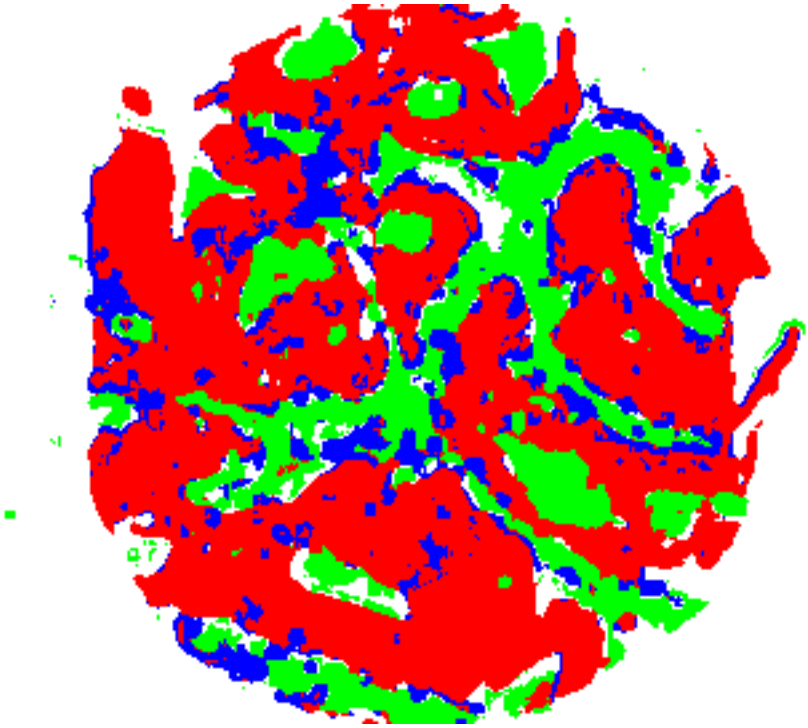


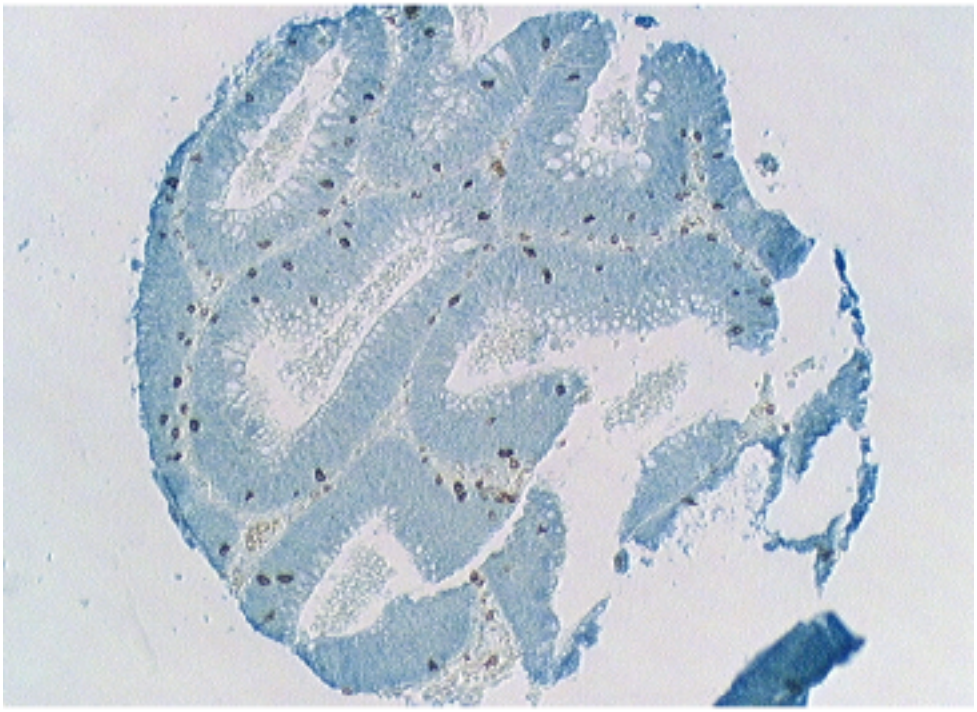
4. Segmentation des autres images

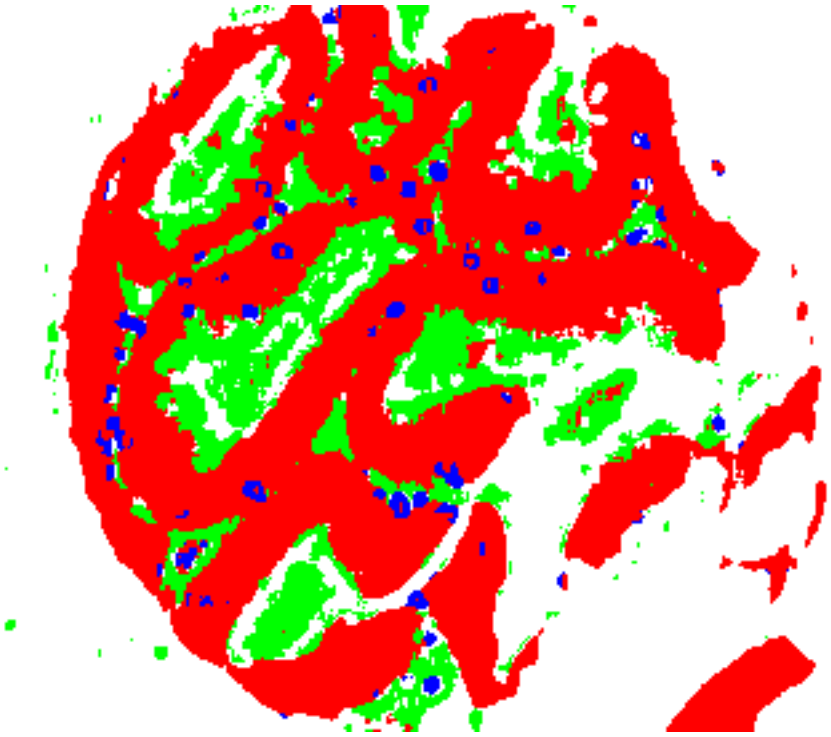
```
close all;

f=imread('Images/Colon_TMA03.bmp');
figure(1),imshow(f);

% Calcul de la moyenne et de l'écart type

fmoy=imfilter(double(f),fspecial('average',taille_vois),'symmetric');
fstd=stdfilt(f,ones(taille_vois));

% Image avec 6 composantes
fmoy_std=cat(3,fmoy,fstd);

% Segmentation
fs=tse_imnearestcenter(fmoy_std,p,[1,1,1,1,2,2,3,4]);
figure(2),imshow(fs),colormap(color);

f=imread('Images/Colon_TMA04.bmp');
figure(3),imshow(f);

% Calcul de la moyenne et de l'écart type

fmoy=imfilter(double(f),fspecial('average',taille_vois),'symmetric');
fstd=stdfilt(f,ones(taille_vois));

% Image avec 6 composantes
fmoy_std=cat(3,fmoy,fstd);
```

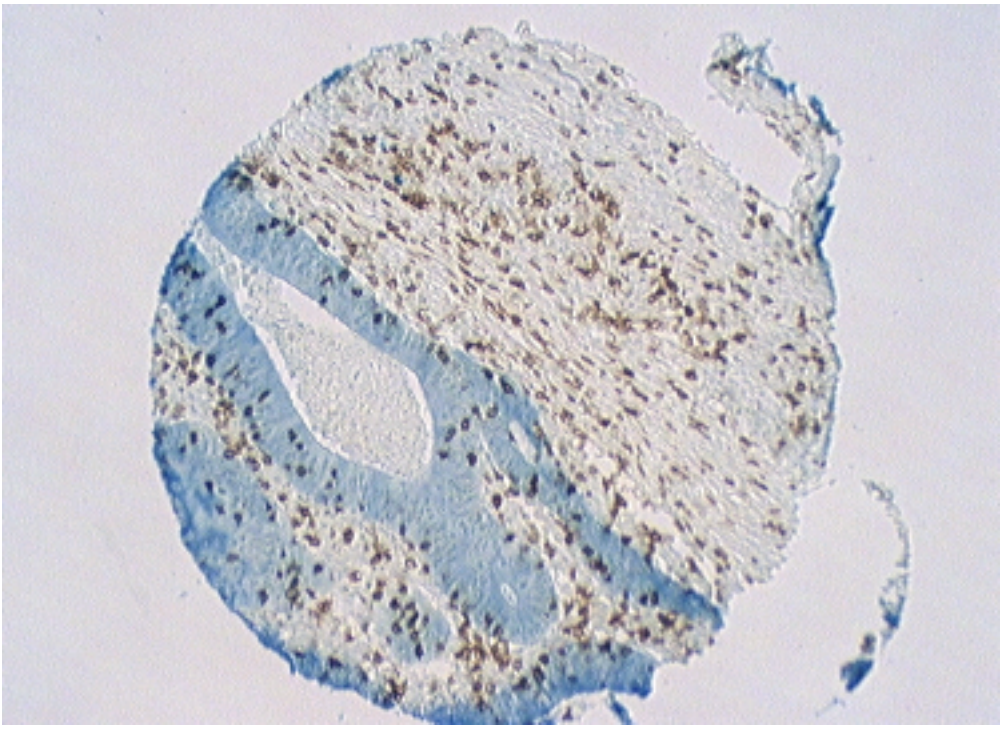
```
% Segmentation
fs=tse_imnearestcenter(fmoy_std,p,[1,1,1,1,2,2,3,4]);
figure(4),imshow(fs),colormap(color);

f=imread('Images/Colon_TMA05.bmp');
figure(5),imshow(f);

% Calcul de la moyenne et de l'écart type

fmoy=imfilter(double(f),fspecial('average',taille_vois),'symmetric');
fstd=stdfilt(f,ones(taille_vois));

% Image avec 6 composantes
fmoy_std=cat(3,fmoy,fstd);

% Segmentation
fs=tse_imnearestcenter(fmoy_std,p,[1,1,1,1,2,2,3,4]);
figure(6),imshow(fs),colormap(color);
```

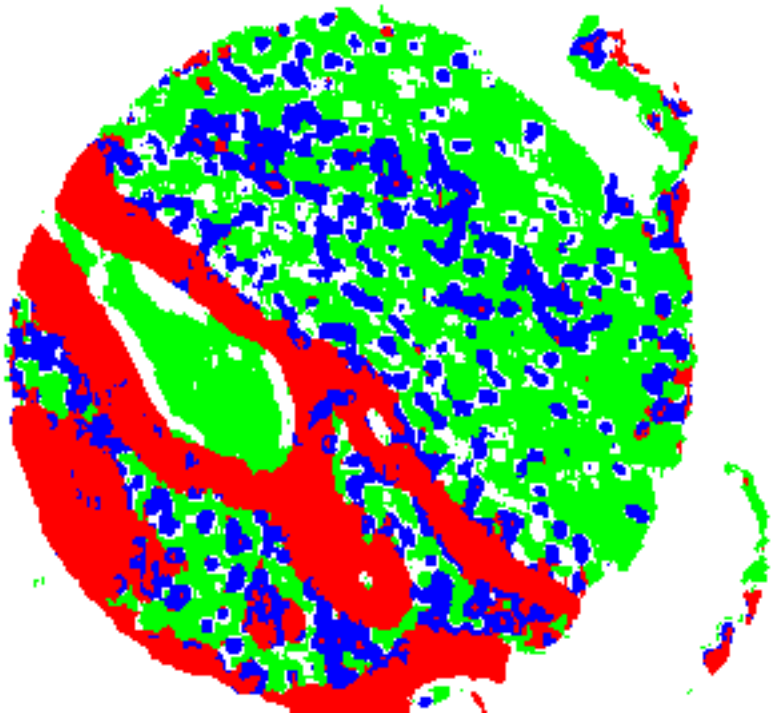












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