

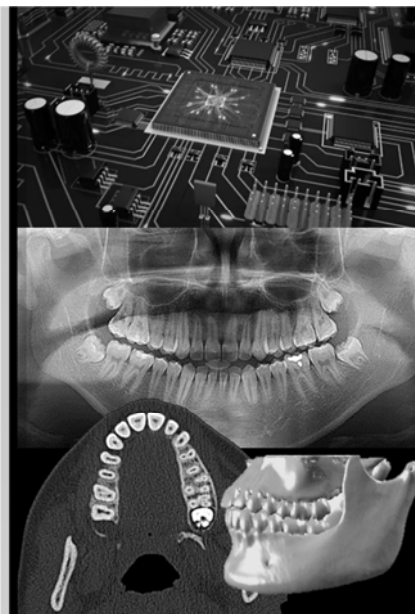
# 計算機概論 *for Dentist*

## TARGET/LESION DETECTION (THRESHOLDING AND ROI)

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## 請先下載本週上課資料

- 下載網址 [http://www.ym.edu.tw/~cflu/CFLu\\_course\\_DoDCompArch.html](http://www.ym.edu.tw/~cflu/CFLu_course_DoDCompArch.html)
- 下載第13週 [ 上課資料 ] [CAmaterials\\_L13.zip](#)

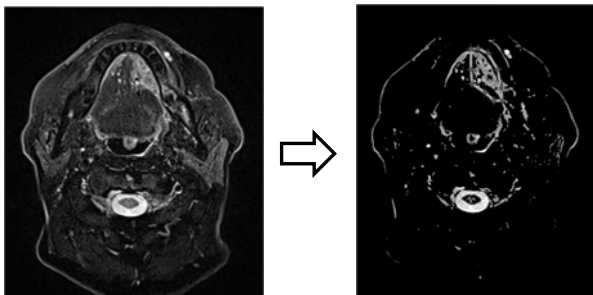
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## 目標/病兆偵測-基本方法

- 閾值處理 Thresholding
- Thresholding + 區域圈選 Manual ROI



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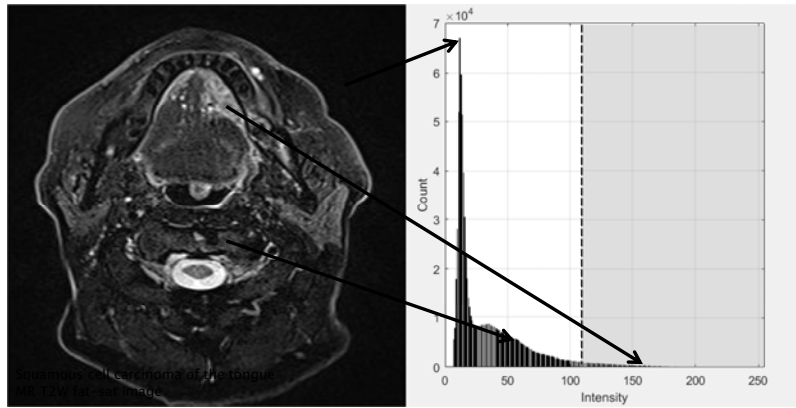
## 閾值處理 THRESHOLDING

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# INTENSITY & HISTOGRAM



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# FIND

- `find` Find indices of nonzero elements.  
`I = find(X)` returns the linear indices corresponding to the nonzero entries of the array X. X may be a logical expression.  
 Use `IND2SUB(SIZE(X),I)` to calculate multiple subscripts from the linear indices I.

% Relation operators

Equal	==
Not equal	~=
Less than	<
Greater than	>
Less than or equal	<=
Greater than or equal	>=

% logical operators

And	&
Or	
Not	~

return column-wise index!

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# TRY IT - FIND

- `ind=find(A==4)`
- `ind=find(A>=10)`
- `ind=find(A>=10 & A<40)`

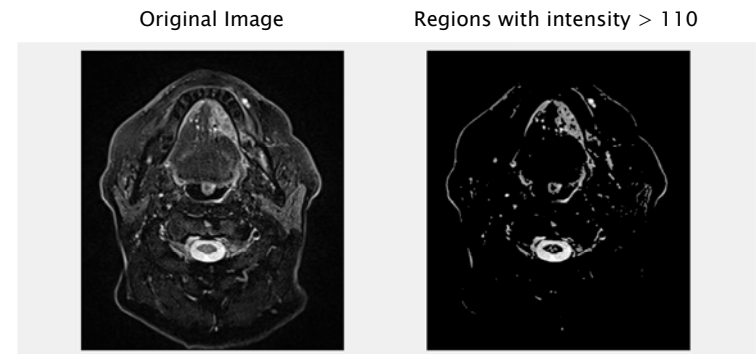
	<b>A</b>				
12	2	33	4	46	
3	7	4	6	5	
4	6	64	6	84	
6	5	6	7	37	
7	4	45	23	78	

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# EXERCISE #1



開啟並執行 `CAmaterial_L13\Ex1_threshold.m`

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## EXERCISE #1

```
4 %% read JPEG image and display with thresholding
5 - img=imread('SCCtongue.jpg');
6 - figure,
7 - subplot(1,2,1),image(img),axis off
8
9 - ind=find(img<110);
10 - img(ind)=0;
11 - subplot(1,2,2),image(img),axis off
```

開啟並執行CAmaterial\_L13\Ex1\_threshold.m

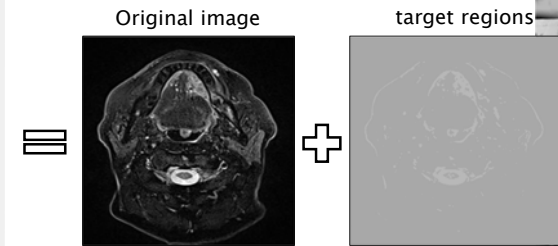
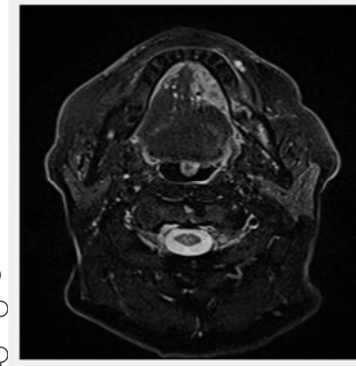
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## EXERCISE #2

Label target regions by transparent red.



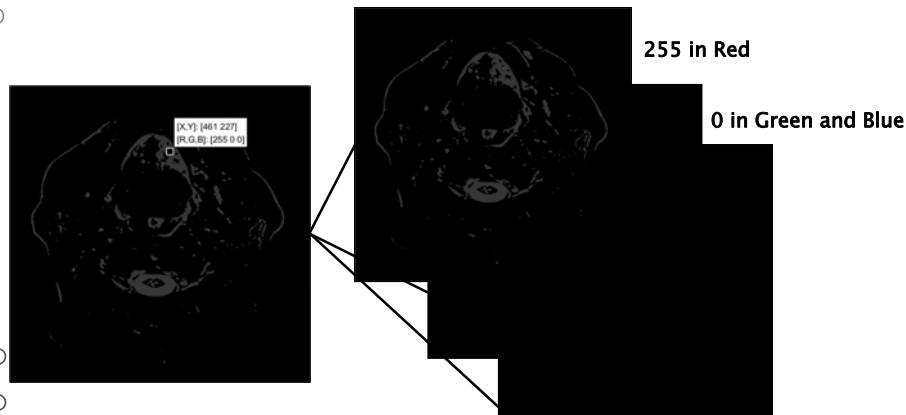
開啟並執行CAmaterial\_L13\Ex2\_threshold.m

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## COLOR LAYERS



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## IF-ELSE-END

```
if condition1
    statement1
else
    statement2
end
```

```
1 a=99;
2 b=81;
3
4 if a >= b
5     winnerScore=a;
6 else
7     winnerScore=b;
8 end
```

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## EXERCISE #2

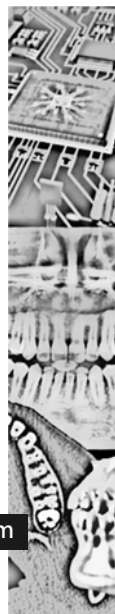
```
10 % set pixels with intensity less than 110 to be 0
11 ind=find(img<110);
12 img(ind)=0;
13
14 % set pixels with intensity larger than 110 to be red
15 % (255 in the first layer and 0 in the second and third layers)
16 for layer=1:3 % red, green, and blue layer
17 tmpimg=img(:,:,layer);
18 ind=find(tmpimg>=110);
19 if layer==1 % red
20 tmpimg(ind)=255;
21 else % green and blue layers
22 tmpimg(ind)=0;
23 end
24 img(:,:,layer)=tmpimg;
25 end
26 image(img,'alphadata',0.3),axis off
```

開啟並執行C:\material\_L13\Ex2\_threshold.m

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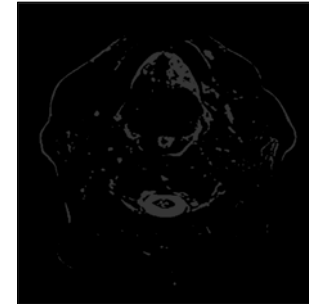
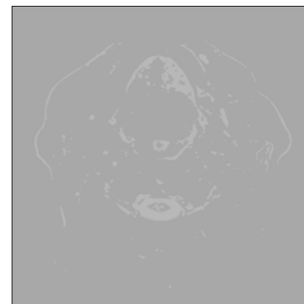
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## TRANSPARENCY (BETWEEN 0 AND 1)

```
26 - image(img,'alphadata',0.3),axis off 26 - image(img,'alphadata',1.0),axis off
```



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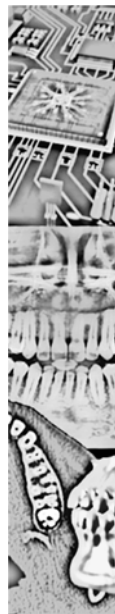
## MATLAB函式列表

- find – Find indices of element with specific values
- for-loop – Recursive process
- If-else – Flow control.

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## THRESHOLDING + 區域圈選 MANUAL ROI

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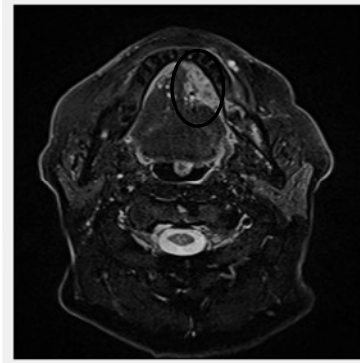
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## CHALLENGE

- Can we further delineate the lesion site (region of interest, ROI)?
- Manual ROI process



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## ROI POLY

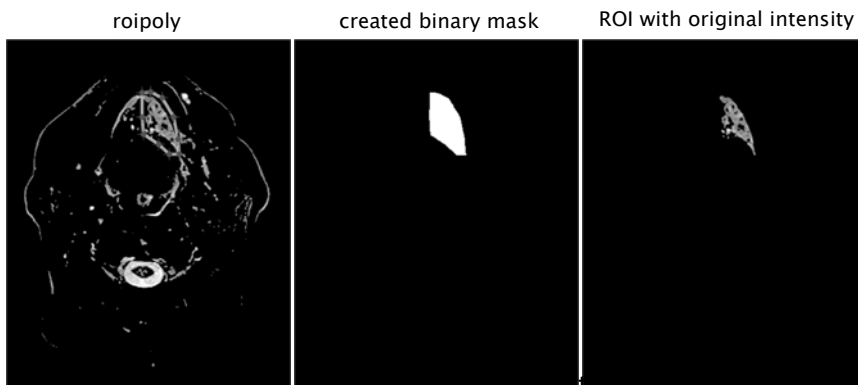
- roipoly Select polygonal region of interest.  
Use roipoly to select a polygonal region of interest within an image. roipoly returns a binary image that you can use as a mask for masked filtering.  
  
BW = roipoly creates an interactive polygon tool, associated with the image displayed in the current figure, called the target image.

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## MANUAL ROI - ROI POLY



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## EXERCISE #3

```
11 %% perform roipoly
12 BW=roipoly; % create a binary mask
13 subplot(1,3,2),imagesc(BW),axis off
14
15 for i=1:3 % 3 layers
16     img(:,:,i)=img(:,:,i).*uint8(BW);
17 end
18 subplot(1,3,3),image(img),axis off
```

開啟並執行CAmaterial\_L13\Ex3\_roipoly.m

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## MATRIX OPERATION: TOP RULE

- **A+B or A-B**
  - Matrix A and matrix B must have same matrix dimension.
- **A\*B**
  - Inner matrix dimension must agree.
  - Ex: A is M x N and B is N x P

Matrix Dimension!

## MATRIX OPERATION: TOP RULE

- **A.\*B or A./B**
  - Matrix A and matrix B must have same matrix dimension.
  - The matrix operation was conducted element-by-element.

```
>> A.*B
ans =
  6  6  6  6  6
  6  6  6  6  6
  6  6  6  6  6
  6  6  6  6  6
  6  6  6  6  6
```

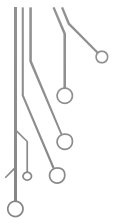
## DATA PRECISION

- **double** - Convert to 64-bit floating point.
- **single** - Convert to 32-bit floating point.
- **uint8** - Convert to unsigned 8-bit integer.
- **uint16** - Convert to unsigned 16-bit integer.
- **uint32** - Convert to unsigned 32-bit integer.
- **uint64** - Convert to unsigned 64-bit integer.
- **int8** - Convert to signed 8-bit integer.
- **int16** - Convert to signed 16-bit integer.
- **int32** - Convert to signed 32-bit integer.
- **int64** - Convert to signed 64-bit integer.
- **logical** - Convert numeric values to logical (8-bit).

```
15 - for i=1:3 % 3 layers
16 -     img(:,:,i)=img(:,:,i).*uint8(BW);
17 - end
```

## MATLAB 函式列表

- **roipoly** – Select polygonal region of interest
- **imagesc** – Display image with scaled color
- **uint8** – Convert to unsigned 8-bit integer
- **colormap** – Color look-up table



# THE END

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