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```
clear all;
OAR=xlsread('OAR.csv'); %OAR
VC=xlsread('VC.csv'); %Targets
param=xlsread('param2.csv'); %BMI & age
format long;
```

Config matrix for Targets

```
%1 3D_PTVSein_D98   // 14 VMAT_PTVSein_D98      // 27 Hybrid_PTVSein_D98
%2 3D_PTVSein_D2    // 15 VMAT_PTVSein_D2       // 28 Hybrid_PTVSein_D2
%3 3D_PTVSein_D50   // 16 VMAT_PTVSein_D50      // 29 Hybrid_PTVSein_D50
%4 3D_PTVSein_HI    // 17 VMAT_PTVSein_HI       // 30 Hybrid_PTVSein_HI
%5 3D_Vol_PTV50Eval // 18 VMAT_Vol_PTV50Eval    // 31 Hybrid_Vol_PTV50Eval
%6 3D_Vol_iso95     // 19 VMAT_Vol_iso95        // 32 Hybrid_Vol_iso95
%7 3D_vol_intersec  // 20 VMAT_vol_intersec     // 33 Hybrid_vol_intersec
%8 3D_PTVSein_CI    // 21 VMAT_PTVSein_CI       // 34 Hybrid_PTVSein_CI
%9 3D_PTVSein_V107  // 22 VMAT_PTVSein_V107     // 35 Hybrid_PTVSein_V107
%10 3D_PTVSein_V95  // 23 VMAT_PTVSein_V95      // 36 Hybrid_PTVSein_V95
%11 3D_PTVSein_V98  // 24 VMAT_PTVSein_V98      // 37 Hybrid_PTVSein_V98
%12 3D_PTVNodes_V95 // 25 VMAT_PTVNodes_V95     // 38 Hybrid_PTVNodes_V95
%13 3D_PTVNodes_V98 // 26 VMAT_PTVNodes_V98     // 39 Hybrid_PTVNodes_V98
```

Config matrix for OAR

```
%1 3D_PoumonHomo_Dmean     // 16 VMAT_PoumonHomo_Dmean      // 31 Hybrid_PoumonHomo_Dmean
%2 3D_PoumonHomo_V20       // 17 VMAT_PoumonHomo_V20        // 32 Hybrid_PoumonHomo_V20
%3 3D_PoumonHomo_V30       // 18 VMAT_PoumonHomo_V30        // 33 Hybrid_PoumonHomo_V30
%4 3D_PoumonHomo_NTCP      // 19 VMAT_PoumonHomo_NTCP       // 34 Hybrid_PoumonHomo_NTCP
%5 3D_PoumonContro_Dmean   // 20 VMAT_PoumonContro_Dmean    // 35 Hybrid_PoumonContro_Dmean
%6 3D_PoumonHomoContro_V5  // 21 VMAT_PoumonHomoContro_V5   // 36 Hybrid_PoumonHomoContro_V5
%7 3D_Coeur_Dmean          // 22 VMAT_Coeur_Dmean           // 37 Hybrid_Coeur_Dmean
%8 3D_Coeur_V25            // 23 VMAT_Coeur_V25             // 38 Hybrid_Coeur_V25
%9 3D_IVA_V30              // 24 VMAT_IVA_V30               // 39 Hybrid_IVA_V30
%10 3D_Foie_V5             // 25 VMAT_Foie_V5               // 40 Hybrid_Foie_V5
%11 3D_SeinContro_Dmean    // 26 VMAT_SeinContro_Dmean      // 41 Hybrid_SeinContro_Dmean
%12 3D_TH_Dmean            // 27 VMAT_TH_Dmean              // 42 Hybrid_TH_Dmean
%13 3D_PRVMoelle_Dmax      // 28 VMAT_PRVMoelle_Dmax        // 43 Hybrid_PRVMoelle_Dmax
%14 3D_Oeso_V35            // 29 VMAT_Oeso_V35              // 44 Hybrid_Oeso_V35
%15 3D_Trachee_V35         // 30 VMAT_Trachee_V35           // 45 Hybrid_Trachee_V35
```

Indices to use

```
VC_Index_3D=[1:13]'; % for targets
VC_Index_VMAT=VC_Index_3D+13;
VC_Index_Hybrid=VC_Index_3D+26;
N_VC=size(VC_Index_3D);

OAR_Index_3D=[1:15]'; % for OAR
OAR_Index_VMAT=[16:30]';
OAR_Index_Hybrid=[31:45]';
N_OAR=size(OAR_Index_3D);
```

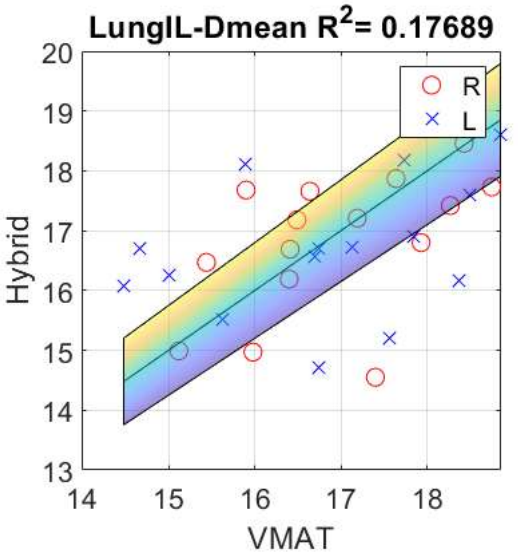
Means for Breasts R&L : 3D // VMAT // Hybrid

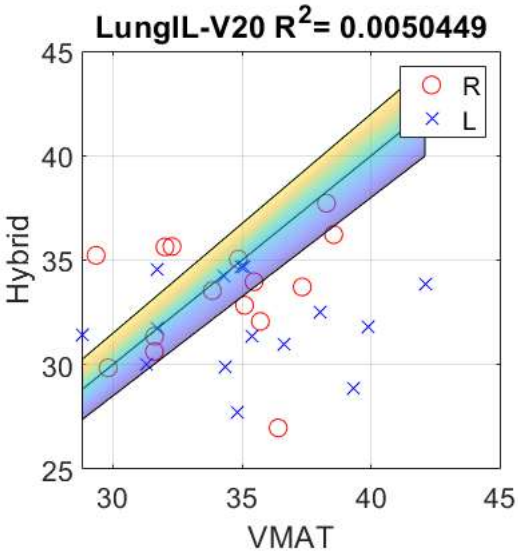
```
Param_OAR=["LungIL-Dmean","LungIL-V20","LungIL-V30","LungIL-NTCP","LungCL-Dmean","LungIL&CL-V5","Heart-Dmean","Heart-V25","AIV-V30","Liver-V5","BreastCL-Dmean","HH-
Param_VC=["PTV50-D98","PTV50-D2","PTV50-D50","PTV50-HI","Vol-PTV50","Vol-iso95","vol-intersec","PTV50-CI","PTV50-V107","PTV50-V95","PTV50-V98","PTV47-V95","PTV47-V9

mean_OAR_3D=mean(OAR(:,1:15));
mean_OAR_VMAT=mean(OAR(:,16:30));
mean_OAR_Hybrid=mean(OAR(:,31:45));
mean_VC_3D=mean(VC(:,1:13));
mean_VC_VMAT=mean(VC(:,14:26));
mean_VC_Hybrid=mean(VC(:,27:39));
b_mean_OAR=[Param_OAR;mean_OAR_3D;mean_OAR_VMAT;mean_OAR_Hybrid];
b_mean_VC=[Param_VC;mean_VC_3D;mean_VC_VMAT;mean_VC_Hybrid];

fprintf('Paramètre // 3DCRT // VMAT // Hybrid \n')
fprintf('%s // %7.4g // %7.4g // %7.4g \n',b_mean_VC)
fprintf('%s // %7.4g // %7.4g // %7.4g \n',b_mean_OAR)
```

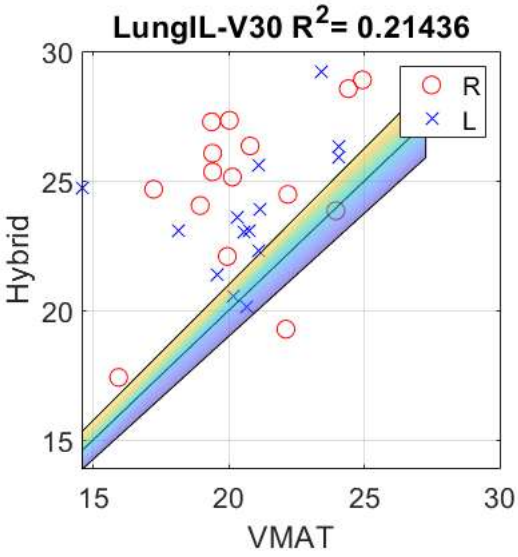
```
Paramètre // 3DCRT // VMAT // Hybrid
PTV50-D98 //   45.02 //   45.38 //    45.4
PTV50-D2 //    52.3 //   52.68 //   52.88
PTV50-D50 //   50.01 //   50.29 //   51.04
PTV50-HI //   0.145 //   0.145 //  0.1463
Vol-PTV50 //   663.3 //   663.3 //   663.3
Vol-iso95 //   980.1 //   804.9 //   891.5
vol-intersec //   576.7 //     603 //   609.2
PTV50-CI //  0.4873 //  0.6453 //  0.5917
PTV50-V107 //       0 //  0.3923 //   0.612
PTV50-V95 //   88.94 //   92.24 //   93.33
PTV50-V98 //   70.91 //   77.04 //   83.07
PTV47-V95 //   91.51 //   94.03 //   95.73
PTV47-V98 //   81.19 //   82.49 //   90.06
LungIL-Dmean //   15.74 //   16.86 //   16.73
LungIL-V20 //   33.51 //   34.69 //   32.63
LungIL-V30 //   26.31 //   20.85 //   24.36
LungIL-NTCP //     6.6 //     6.3 //   6.267
LungCL-Dmean //   1.075 //   3.357 //   3.736
LungIL&CL-V5 //   26.94 //   50.02 //   45.99
Heart-Dmean //   3.004 //   5.378 //   4.867
Heart-V25 //   2.502 //   1.428 //   2.049
AIV-V30 //   25.25 //   7.075 //   16.88
Liver-V5 //   43.16 //     172 //   178.8
BreastCL-Dmean //   1.918 //   4.405 //   4.047
HH-Dmean //   25.16 //   20.46 //    20.1
PRVSP-Dmax //   19.21 //   24.01 //   27.62
Eso-V35 //  0.5827 //   1.728 //   1.471
Trachea-V35 //   2.468 //   3.545 //    3.32
```

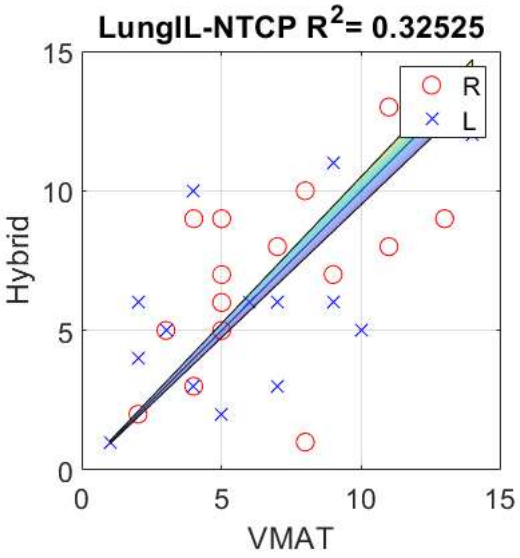
OAR : regression plots between VMAT and Hybrid only if linear determination coefficient is different than 1

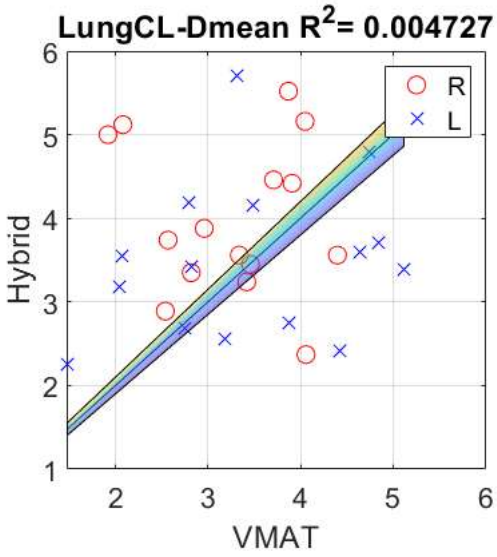
```
for l=1:15;
tt=corr([OAR(:,l+15),OAR(:,l+30)]);
if tt(1,2)^2 < 0.8
figure;
plot(OAR(1:15,l+15),OAR(1:15,l+30),'or', 'MarkerSize', 10);
hold on;
plot(OAR(16:30,l+15),OAR(16:30,l+30),'xb', 'MarkerSize', 10);
title([num2str(Param_OAR(l),1),' R^2= ', num2str(tt(1,2)^2)]);
        hold on; axis square; grid on; xlabel('VMAT','FontSize',16); ylabel('Hybrid','FontSize',16);
        plot([min(OAR(:,l+15)) max(OAR(:,l+15))],[min(OAR(:,l+15)) max(OAR(:,l+15))], '-k', 'LineWidth', 0.5);
        hold on
        plot([min(OAR(:,l+15)) max(OAR(:,l+15))],[0.95*min(OAR(:,l+15)) 0.95*max(OAR(:,l+15))],'LineStyle',':');
        hold on
        plot([min(OAR(:,l+15)) max(OAR(:,l+15))],[1.05*min(OAR(:,l+15)) 1.05*max(OAR(:,l+15))],'LineStyle',':');
        X=[min(OAR(:,l+15)) min(OAR(:,l+15)) max(OAR(:,l+15)) max(OAR(:,l+15))];
        Y=[0.95*min(OAR(:,l+15)) 1.05*min(OAR(:,l+15)) 1.05*max(OAR(:,l+15)) 0.95*max(OAR(:,l+15))];
        C=[0 10 10 0];
        patch(X,Y,C,'FaceAlpha','0.5');
        legend({'R','L'})
        set(gca, 'fontsize', 16)
end
end
```

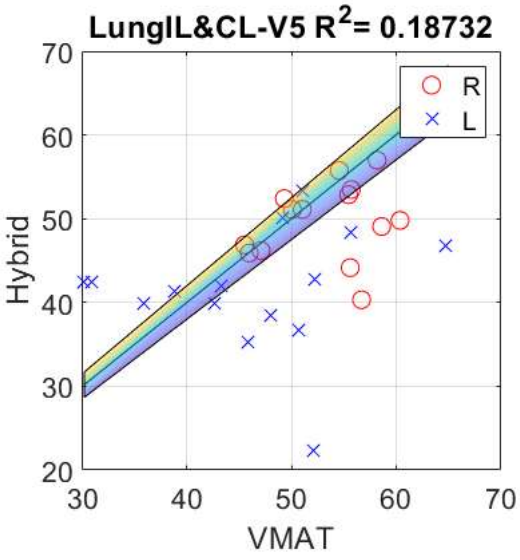

LungIL-Dmean R2= 0.17689
R
L
Hybrid
VMAT
20
19
18
17
16
15
14
13
14
15
16
17
18

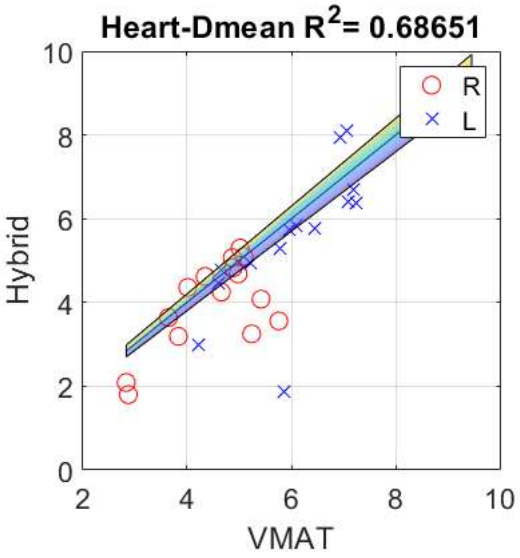

LungIL-V20 R2= 0.0050449
R
L
Hybrid
VMAT
45
40
35
30
25
30
35
40
45

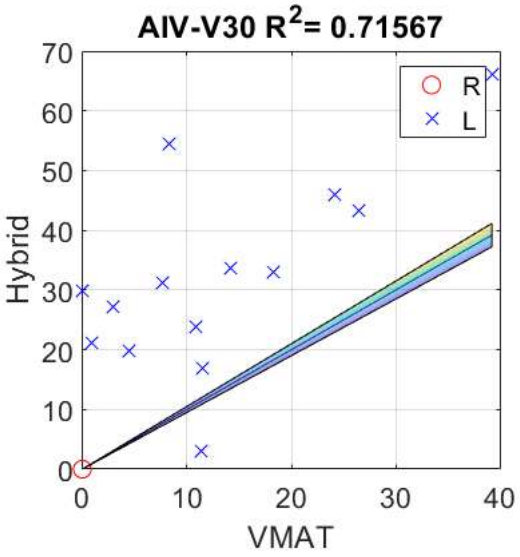

LungIL-V30 R2= 0.21436
R
L
Hybrid
VMAT
30
25
20
15
15
20
25
30

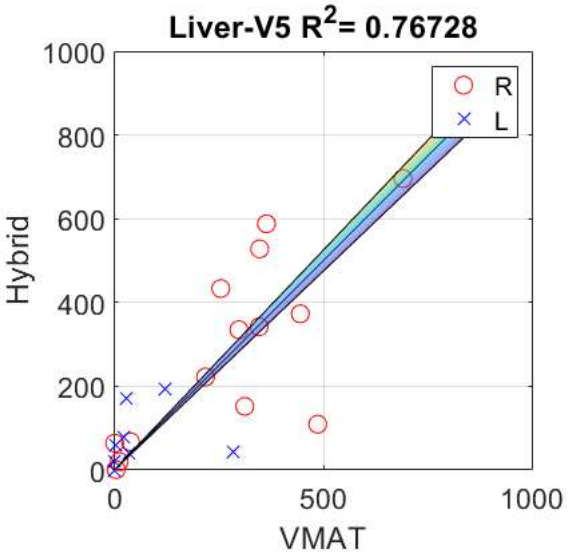

LungIL-NTCP R2= 0.32525
R
L
Hybrid
VMAT
0
5
10
15

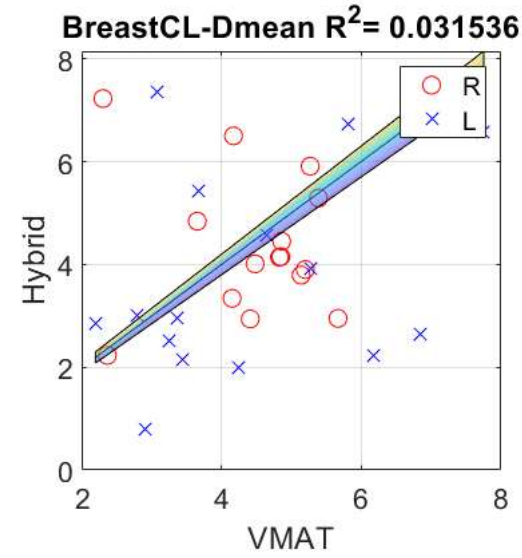

LungCL-Dmean R2= 0.004727
R
L
Hybrid
VMAT
1
2
3
4
5
6

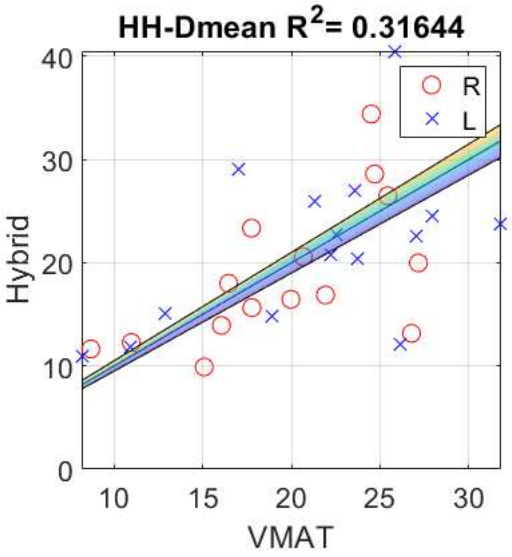

LungIL&CL-V5 R2= 0.18732
R
L
Hybrid
VMAT
20
30
40
50
60
70

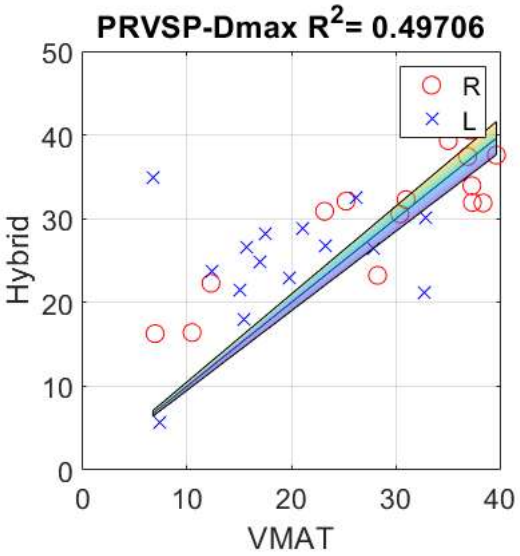

Heart-Dmean R^2= 0.68651
R
L
Hybrid
VMAT
0
2
4
6
8
10

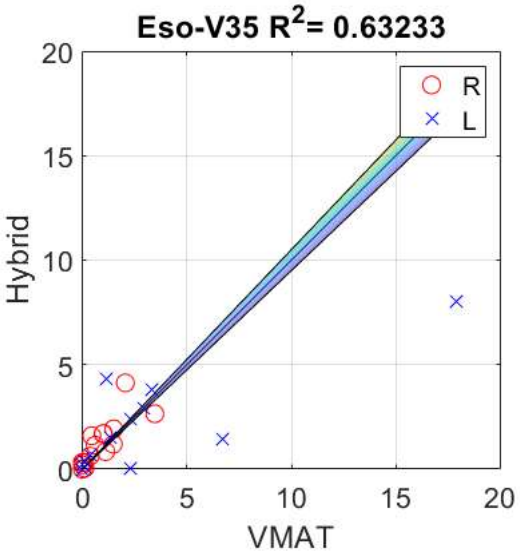

AIV-V30 R^2= 0.71567
R
L
Hybrid
VMAT
0
10
20
30
40
50
60
70


Liver-V5 R^2= 0.76728
R
L
Hybrid
VMAT
0
200
400
600
800
1000
500


BreastCL-Dmean R2= 0.031536
R
L
Hybrid
VMAT
0
2
4
6
8

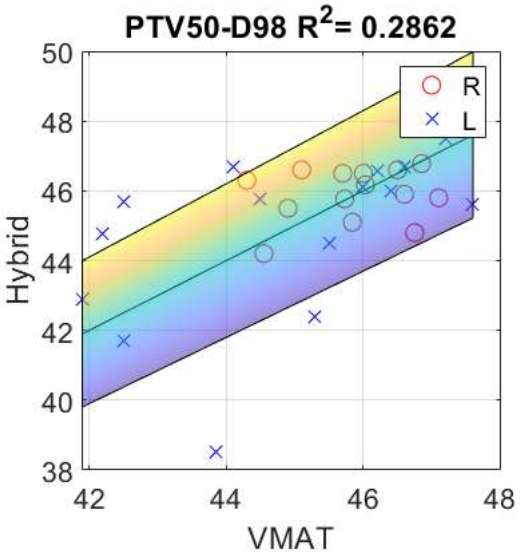

HH-Dmean R2= 0.31644
R
L
Hybrid
VMAT
0
10
20
30
40
10
15
20
25
30

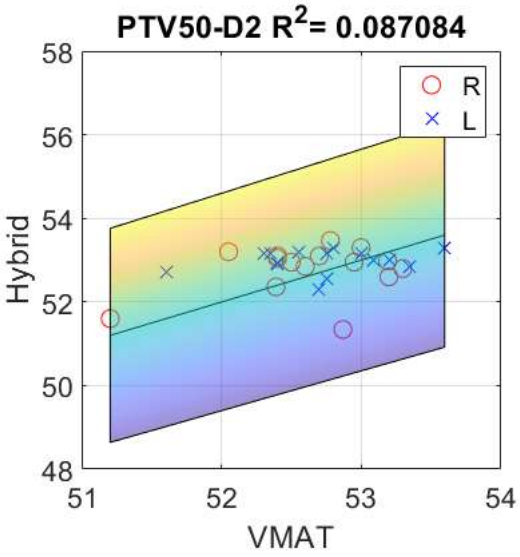


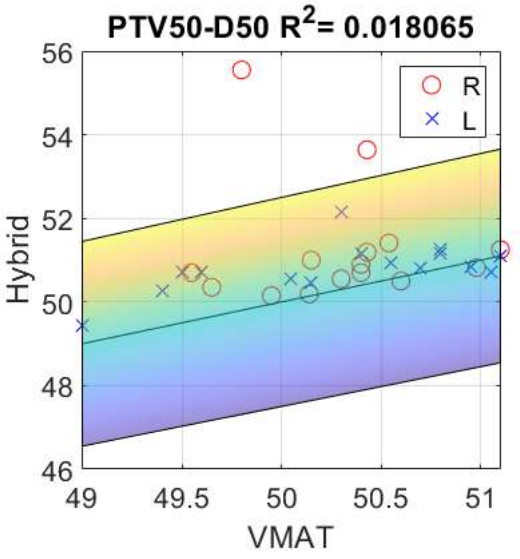


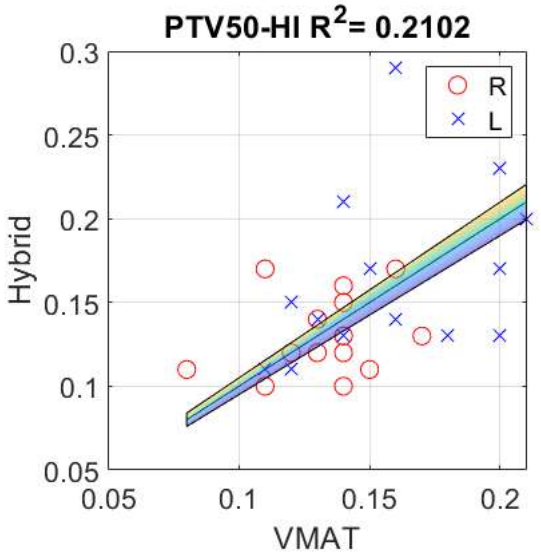
Targets : regression plots between VMAT and Hybrid only if linear determination coefficient is different than 1

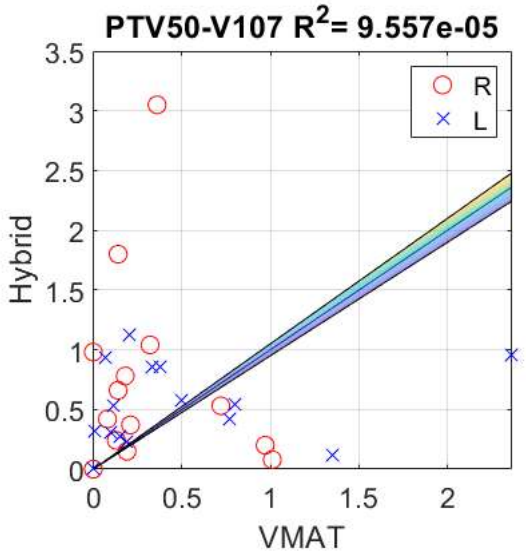
```
for l=1:13;
tt=corr([VC(:,l+13),VC(:,l+26)]);
if tt(1,2)^2 < 0.8
figure;
plot(VC(1:15,l+13),VC(1:15,l+26),'or', 'MarkerSize', 10);
hold on;
plot(VC(16:30,l+13),VC(16:30,l+26),'xb', 'MarkerSize', 10);
title([num2str(Param_VC(l),1),' R^2= ', num2str(tt(1,2)^2)]);
        hold on; axis square; grid on; xlabel('VMAT','FontSize',16); ylabel('Hybrid','FontSize',16);
        plot([min(VC(:,l+13)) max(VC(:,l+13))],[min(VC(:,l+13)) max(VC(:,l+13))], '-k', 'LineWidth', 0.5);
        hold on
        plot([min(VC(:,l+13)) max(VC(:,l+13))],[0.95*min(VC(:,l+13)) 0.95*max(VC(:,l+13))],'LineStyle',':');
        hold on
        plot([min(VC(:,l+13)) max(VC(:,l+13))],[1.05*min(VC(:,l+13)) 1.05*max(VC(:,l+13))],'LineStyle',':');
        X=[min(VC(:,l+13)) min(VC(:,l+13)) max(VC(:,l+13)) max(VC(:,l+13))];
        Y=[0.95*min(VC(:,l+13)) 1.05*min(VC(:,l+13)) 1.05*max(VC(:,l+13)) 0.95*max(VC(:,l+13))];
        C=[0 10 10 0];
        patch(X,Y,C,'FaceAlpha','0.5');
        legend({'R','L'})
        set(gca, 'fontsize', 16)
end
end
```

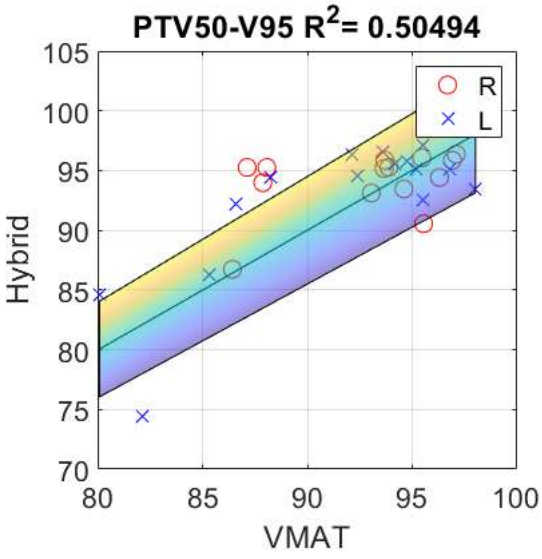

PTV50-D98 R2= 0.2862
R
L
Hybrid
VMAT
50
48
46
44
42
40
38
42
44
46
48

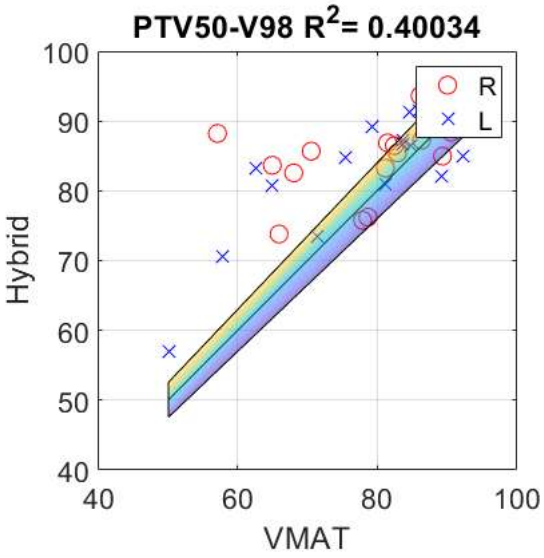

PTV50-D2 R2= 0.087084
R
L
Hybrid
VMAT
58
56
54
52
50
48
51
52
53
54

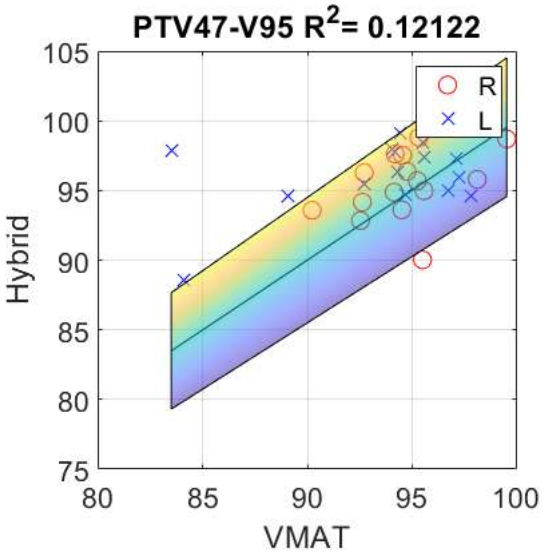

PTV50-D50 R2= 0.018065
R
L
Hybrid
VMAT
56
54
52
50
48
46
49
49.5
50
50.5
51

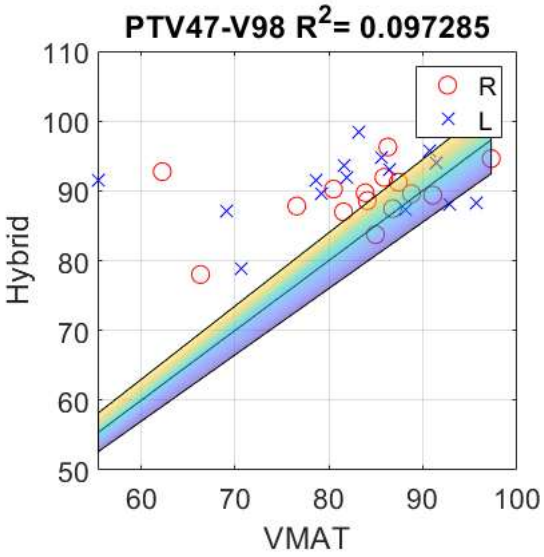

PTV50-HI R^2= 0.2102
Hybrid
VMAT
R
L
0.3
0.25
0.2
0.15
0.1
0.05
0.05
0.1
0.15
0.2


PTV50-V107 R^2= 9.557e-05
Hybrid
VMAT
R
L
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2


PTV50-V95 R^2= 0.50494
Hybrid
VMAT
R
L
105
100
95
90
85
80
75
70
80
85
90
95
100







Non Parametric Tests of Wilcoxon (Wilcoxon Rank Sum Test) for Breasts R&L

```
for i=1:N_OAR(1,1)
p_OAR_DG_3D_Vs_VMAT(i,1)=ranksum(OAR(:,OAR_Index_3D(i,1)),OAR(:,OAR_Index_VMAT(i,1)));
p_OAR_DG_3D_Vs_Hybrid(i,1)=ranksum(OAR(:,OAR_Index_3D(i,1)),OAR(:,OAR_Index_Hybrid(i,1)));
p_OAR_DG_VMAT_Vs_Hybrid(i,1)=ranksum(OAR(:,OAR_Index_VMAT(i,1)),OAR(:,OAR_Index_Hybrid(i,1)));
end
```

```
for i=1:N_VC(1,1)
p_VC_DG_3D_Vs_VMAT(i,1)=ranksum(VC(:,VC_Index_3D(i,1)),VC(:,VC_Index_VMAT(i,1)));
p_VC_DG_3D_Vs_Hybrid(i,1)=ranksum(VC(:,VC_Index_3D(i,1)),VC(:,VC_Index_Hybrid(i,1)));
p_VC_DG_VMAT_Vs_Hybrid(i,1)=ranksum(VC(:,VC_Index_VMAT(i,1)),VC(:,VC_Index_Hybrid(i,1)));
end

n_OAR_DG_3D_Vs_VMAT=find(p_OAR_DG_3D_Vs_VMAT<0.05);
n_OAR_DG_3D_Vs_Hybrid=find(p_OAR_DG_3D_Vs_Hybrid<0.05);
n_OAR_DG_VMAT_Vs_Hybrid=find(p_OAR_DG_VMAT_Vs_Hybrid<0.05);
b_OAR_DG_3D_Vs_VMAT=[Param_OAR(n_OAR_DG_3D_Vs_VMAT);p_OAR_DG_3D_Vs_VMAT(n_OAR_DG_3D_Vs_VMAT)'];
b_OAR_DG_3D_Vs_Hybrid=[Param_OAR(n_OAR_DG_3D_Vs_Hybrid);p_OAR_DG_3D_Vs_Hybrid(n_OAR_DG_3D_Vs_Hybrid)'];
b_OAR_DG_VMAT_Vs_Hybrid=[Param_OAR(n_OAR_DG_VMAT_Vs_Hybrid);p_OAR_DG_VMAT_Vs_Hybrid(n_OAR_DG_VMAT_Vs_Hybrid)'];

n_VC_DG_3D_Vs_VMAT=find(p_VC_DG_3D_Vs_VMAT<0.05);
n_VC_DG_3D_Vs_Hybrid=find(p_VC_DG_3D_Vs_Hybrid<0.05);
n_VC_DG_VMAT_Vs_Hybrid=find(p_VC_DG_VMAT_Vs_Hybrid<0.05);
b_VC_DG_3D_Vs_VMAT=[Param_VC(n_VC_DG_3D_Vs_VMAT);p_VC_DG_3D_Vs_VMAT(n_VC_DG_3D_Vs_VMAT)'];
b_VC_DG_3D_Vs_Hybrid=[Param_VC(n_VC_DG_3D_Vs_Hybrid);p_VC_DG_3D_Vs_Hybrid(n_VC_DG_3D_Vs_Hybrid)'];
b_VC_DG_VMAT_Vs_Hybrid=[Param_VC(n_VC_DG_VMAT_Vs_Hybrid);p_VC_DG_VMAT_Vs_Hybrid(n_VC_DG_VMAT_Vs_Hybrid)'];

%3D Vs VMAT
fprintf('Les Param VC Signific entre 3D et VMAT sont %s (p_value=%7.4g) \n',b_VC_DG_3D_Vs_VMAT)
fprintf('Les Param OAR Signific entre 3D et VMAT sont %s (p_value=%7.4g) \n',b_OAR_DG_3D_Vs_VMAT)

%3D Vs Hybrid
fprintf('Les Param VC Signific entre 3D et Hybrid sont %s (p_value=%7.4g) \n',b_VC_DG_3D_Vs_Hybrid)
fprintf('Les Param OAR Signific entre 3D et Hybrid sont %s (p_value=%7.4g) \n',b_OAR_DG_3D_Vs_Hybrid)

%Hybrid Vs VMAT
fprintf('Les Param VC Signific entre VMAT et Hybrid sont %s (p_value=%7.4g) \n',b_VC_DG_VMAT_Vs_Hybrid)
fprintf('Les Param OAR Signific entre VMAT et Hybrid sont %s (p_value=%7.4g) \n',b_OAR_DG_VMAT_Vs_Hybrid)
```

```
Les Param VC Signific entre 3D et VMAT sont PTV50-CI (p_value=1.009e-05)
Les Param VC Signific entre 3D et VMAT sont PTV50-V107 (p_value=1.932e-10)
Les Param VC Signific entre 3D et VMAT sont PTV50-V95 (p_value=0.008683)
Les Param VC Signific entre 3D et VMAT sont PTV50-V98 (p_value=0.01412)
Les Param VC Signific entre 3D et VMAT sont PTV47-V95 (p_value= 0.0013)
Les Param OAR Signific entre 3D et VMAT sont LungIL-Dmean (p_value=0.03987)
Les Param OAR Signific entre 3D et VMAT sont LungIL-V30 (p_value=3.591e-05)
Les Param OAR Signific entre 3D et VMAT sont LungCL-Dmean (p_value=7.008e-11)
Les Param OAR Signific entre 3D et VMAT sont LungIL&CL-V5 (p_value=1.462e-10)
Les Param OAR Signific entre 3D et VMAT sont Heart-Dmean (p_value=5.269e-06)
Les Param OAR Signific entre 3D et VMAT sont Liver-V5 (p_value=0.02901)
Les Param OAR Signific entre 3D et VMAT sont BreastCL-Dmean (p_value=1.554e-08)
Les Param OAR Signific entre 3D et VMAT sont HH-Dmean (p_value=0.03325)
Les Param OAR Signific entre 3D et VMAT sont Eso-V35 (p_value=0.00272)
Les Param VC Signific entre 3D et Hybrid sont PTV50-D2 (p_value=1.259e-05)
Les Param VC Signific entre 3D et Hybrid sont PTV50-D50 (p_value=8.357e-07)
Les Param VC Signific entre 3D et Hybrid sont PTV50-CI (p_value=0.0005053)
Les Param VC Signific entre 3D et Hybrid sont PTV50-V107 (p_value=1.654e-11)
Les Param VC Signific entre 3D et Hybrid sont PTV50-V95 (p_value=0.0001493)
Les Param VC Signific entre 3D et Hybrid sont PTV50-V98 (p_value=7.04e-07)
Les Param VC Signific entre 3D et Hybrid sont PTV47-V95 (p_value=2.313e-06)
Les Param VC Signific entre 3D et Hybrid sont PTV47-V98 (p_value=4.616e-07)
Les Param OAR Signific entre 3D et Hybrid sont LungCL-Dmean (p_value=3.012e-11)
Les Param OAR Signific entre 3D et Hybrid sont LungIL&CL-V5 (p_value=2.87e-10)
Les Param OAR Signific entre 3D et Hybrid sont Heart-Dmean (p_value=0.000168)
Les Param OAR Signific entre 3D et Hybrid sont Liver-V5 (p_value=0.01529)
Les Param OAR Signific entre 3D et Hybrid sont BreastCL-Dmean (p_value=2.312e-06)
Les Param OAR Signific entre 3D et Hybrid sont HH-Dmean (p_value=0.02369)
Les Param OAR Signific entre 3D et Hybrid sont PRVSP-Dmax (p_value=0.0003092)
Les Param OAR Signific entre 3D et Hybrid sont Eso-V35 (p_value=0.0006319)
Les Param VC Signific entre VMAT et Hybrid sont PTV50-D50 (p_value=0.0003329)
Les Param VC Signific entre VMAT et Hybrid sont PTV50-CI (p_value=0.04043)
Les Param VC Signific entre VMAT et Hybrid sont PTV50-V107 (p_value=0.03315)
Les Param VC Signific entre VMAT et Hybrid sont PTV50-V98 (p_value=0.01988)
Les Param VC Signific entre VMAT et Hybrid sont PTV47-V95 (p_value=0.01661)
Les Param VC Signific entre VMAT et Hybrid sont PTV47-V98 (p_value=0.0001325)
Les Param OAR Signific entre VMAT et Hybrid sont LungIL-V20 (p_value=0.01412)
Les Param OAR Signific entre VMAT et Hybrid sont LungIL-V30 (p_value=2.958e-05)
```

Means for Breasts R : 3D // VMAT // Hybrid

```
clear p_* n_* b_* mean_*;

mean_OAR_3D=mean(OAR(1:15,1:15));
mean_OAR_VMAT=mean(OAR(1:15,16:30));
mean_OAR_Hybrid=mean(OAR(1:15,31:45));
mean_VC_3D=mean(VC(1:15,1:13));
mean_VC_VMAT=mean(VC(1:15,14:26));
mean_VC_Hybrid=mean(VC(1:15,27:39));
b_mean_OAR=[Param_OAR;mean_OAR_3D;mean_OAR_VMAT;mean_OAR_Hybrid];
b_mean_VC=[Param_VC;mean_VC_3D;mean_VC_VMAT;mean_VC_Hybrid];
```

```
fprintf('Paramètre // 3DCRT // VMAT // Hybrid \n')
fprintf('%s // %7.4g // %7.4g // %7.4g \n',b_mean_VC)
fprintf('%s // %7.4g // %7.4g // %7.4g \n',b_mean_OAR)
```

```
Paramètre // 3DCRT // VMAT // Hybrid
PTV50-D98 //   45.21 //   45.93 //   46.03
PTV50-D2 //   52.48 //   52.64 //   52.78
PTV50-D50 //   49.95 //   50.29 //   51.26
PTV50-HI //  0.1447 //  0.1327 //    0.13
Vol-PTV50 //   657.3 //   657.3 //   657.3
Vol-iso95 //    1004 //   812.1 //   910.8
vol-intersec //     574 //   604.6 //   611.1
PTV50-CI //  0.4707 //  0.6293 //   0.578
PTV50-V107 //       0 //  0.2967 //  0.6867
PTV50-V95 //    89.4 //   93.12 //    94.4
PTV50-V98 //   70.28 //    77.6 //   84.14
PTV47-V95 //   90.46 //   94.64 //   95.39
PTV47-V98 //   78.88 //   82.91 //   89.22
LungIL-Dmean //    16.5 //   16.93 //   16.79
LungIL-V20 //   35.32 //   34.15 //   33.36
LungIL-V30 //   27.81 //   20.58 //   24.71
LungIL-NTCP //   8.333 //   6.667 //     6.8
LungCL-Dmean //   1.067 //   3.274 //   3.981
LungIL&CL-V5 //   30.67 //   53.97 //   50.51
Heart-Dmean //   1.468 //   4.501 //   3.988
Heart-V25 // 0.008667 //   0.052 // 0.01933
AIV-V30 //       0 //       0 //       0
Liver-V5 //   85.74 //   310.9 //   317.5
BreastCL-Dmean //   2.482 //   4.448 //   4.378
HH-Dmean //   24.99 //   19.59 //   18.75
PRVSP-Dmax //   24.14 //   28.62 //   30.45
Eso-V35 //   0.206 //   0.888 //   1.229
Trachea-V35 //   3.056 //   4.227 //   4.673
```

Non Parametric Tests of Wilcoxon (Wilcoxon Rank Sum Test) for Breast R

```
for i=1:N_OAR(1,1)
p_OAR_DG_3D_Vs_VMAT(i,1)=ranksum(OAR(1:15,OAR_Index_3D(i,1)),OAR(1:15,OAR_Index_VMAT(i,1)));
p_OAR_DG_3D_Vs_Hybrid(i,1)=ranksum(OAR(1:15,OAR_Index_3D(i,1)),OAR(1:15,OAR_Index_Hybrid(i,1)));
p_OAR_DG_VMAT_Vs_Hybrid(i,1)=ranksum(OAR(1:15,OAR_Index_VMAT(i,1)),OAR(1:15,OAR_Index_Hybrid(i,1)));
end
for i=1:N_VC(1,1)
p_VC_DG_3D_Vs_VMAT(i,1)=ranksum(VC(1:15,VC_Index_3D(i,1)),VC(1:15,VC_Index_VMAT(i,1)));
p_VC_DG_3D_Vs_Hybrid(i,1)=ranksum(VC(1:15,VC_Index_3D(i,1)),VC(1:15,VC_Index_Hybrid(i,1)));
p_VC_DG_VMAT_Vs_Hybrid(i,1)=ranksum(VC(1:15,VC_Index_VMAT(i,1)),VC(1:15,VC_Index_Hybrid(i,1)));
end


n_OAR_DG_3D_Vs_VMAT=find(p_OAR_DG_3D_Vs_VMAT<0.05);
n_OAR_DG_3D_Vs_Hybrid=find(p_OAR_DG_3D_Vs_Hybrid<0.05);
n_OAR_DG_VMAT_Vs_Hybrid=find(p_OAR_DG_VMAT_Vs_Hybrid<0.05);
b_OAR_DG_3D_Vs_VMAT=[Param_OAR(n_OAR_DG_3D_Vs_VMAT);p_OAR_DG_3D_Vs_VMAT(n_OAR_DG_3D_Vs_VMAT)'];
b_OAR_DG_3D_Vs_Hybrid=[Param_OAR(n_OAR_DG_3D_Vs_Hybrid);p_OAR_DG_3D_Vs_Hybrid(n_OAR_DG_3D_Vs_Hybrid)'];
b_OAR_DG_VMAT_Vs_Hybrid=[Param_OAR(n_OAR_DG_VMAT_Vs_Hybrid);p_OAR_DG_VMAT_Vs_Hybrid(n_OAR_DG_VMAT_Vs_Hybrid)'];

n_VC_DG_3D_Vs_VMAT=find(p_VC_DG_3D_Vs_VMAT<0.05);
n_VC_DG_3D_Vs_Hybrid=find(p_VC_DG_3D_Vs_Hybrid<0.05);
n_VC_DG_VMAT_Vs_Hybrid=find(p_VC_DG_VMAT_Vs_Hybrid<0.05);
b_VC_DG_3D_Vs_VMAT=[Param_VC(n_VC_DG_3D_Vs_VMAT);p_VC_DG_3D_Vs_VMAT(n_VC_DG_3D_Vs_VMAT)'];
b_VC_DG_3D_Vs_Hybrid=[Param_VC(n_VC_DG_3D_Vs_Hybrid);p_VC_DG_3D_Vs_Hybrid(n_VC_DG_3D_Vs_Hybrid)'];
b_VC_DG_VMAT_Vs_Hybrid=[Param_VC(n_VC_DG_VMAT_Vs_Hybrid);p_VC_DG_VMAT_Vs_Hybrid(n_VC_DG_VMAT_Vs_Hybrid)'];

%3D Vs VMAT
fprintf('Les Param VC Signific entre 3D et VMAT sont %s (p_value=%7.4g) \n',b_VC_DG_3D_Vs_VMAT)
fprintf('Les Param OAR Signific entre 3D et VMAT sont %s (p_value=%7.4g) \n',b_OAR_DG_3D_Vs_VMAT)

%3D Vs Hybrid
fprintf('Les Param VC Signific entre 3D et Hybrid sont %s (p_value=%7.4g) \n',b_VC_DG_3D_Vs_Hybrid)
fprintf('Les Param OAR Signific entre 3D et Hybrid sont %s (p_value=%7.4g) \n',b_OAR_DG_3D_Vs_Hybrid)

%Hybrid Vs VMAT
fprintf('Les Param VC Signific entre VMAT et Hybrid sont %s (p_value=%7.4g) \n',b_VC_DG_VMAT_Vs_Hybrid)
fprintf('Les Param OAR Signific entre VMAT et Hybrid sont %s (p_value=%7.4g) \n',b_OAR_DG_VMAT_Vs_Hybrid)
```

```
Les Param VC Signific entre 3D et VMAT sont PTV50-CI (p_value=0.004189)
Les Param VC Signific entre 3D et VMAT sont PTV50-V107 (p_value=2.764e-05)
Les Param VC Signific entre 3D et VMAT sont PTV50-V95 (p_value= 0.0114)
Les Param VC Signific entre 3D et VMAT sont PTV50-V98 (p_value=0.03618)
Les Param VC Signific entre 3D et VMAT sont PTV47-V95 (p_value=0.0007749)
Les Param OAR Signific entre 3D et VMAT sont LungIL-V30 (p_value=0.0002225)
Les Param OAR Signific entre 3D et VMAT sont LungCL-Dmean (p_value=5.028e-06)
Les Param OAR Signific entre 3D et VMAT sont LungIL&CL-V5 (p_value=3.392e-06)
Les Param OAR Signific entre 3D et VMAT sont Heart-Dmean (p_value=3.375e-06)
```

```
Les Param OAR Signific entre 3D et VMAT sont Liver-V5 (p_value=0.005452)
Les Param OAR Signific entre 3D et VMAT sont BreastCL-Dmean (p_value=0.0004561)
Les Param OAR Signific entre 3D et VMAT sont Eso-V35 (p_value=0.01349)
Les Param VC Signific entre 3D et Hybrid sont PTV50-D2 (p_value=0.01128)
Les Param VC Signific entre 3D et Hybrid sont PTV50-D50 (p_value=0.0002225)
Les Param VC Signific entre 3D et Hybrid sont PTV50-CI (p_value=0.006531)
Les Param VC Signific entre 3D et Hybrid sont PTV50-V107 (p_value=8.698e-06)
Les Param VC Signific entre 3D et Hybrid sont PTV50-V95 (p_value=0.001863)
Les Param VC Signific entre 3D et Hybrid sont PTV50-V98 (p_value=3.357e-05)
Les Param VC Signific entre 3D et Hybrid sont PTV47-V95 (p_value=0.0003598)
Les Param VC Signific entre 3D et Hybrid sont PTV47-V98 (p_value=0.0001603)
Les Param OAR Signific entre 3D et Hybrid sont LungIL-V30 (p_value= 0.0251)
Les Param OAR Signific entre 3D et Hybrid sont LungCL-Dmean (p_value=3.366e-06)
Les Param OAR Signific entre 3D et Hybrid sont LungIL&CL-V5 (p_value=3.392e-06)
Les Param OAR Signific entre 3D et Hybrid sont Heart-Dmean (p_value=7.442e-06)
Les Param OAR Signific entre 3D et Hybrid sont Liver-V5 (p_value=0.008972)
Les Param OAR Signific entre 3D et Hybrid sont BreastCL-Dmean (p_value=0.0007802)
Les Param OAR Signific entre 3D et Hybrid sont PRVSP-Dmax (p_value=0.03809)
Les Param OAR Signific entre 3D et Hybrid sont Eso-V35 (p_value=0.001216)
Les Param VC Signific entre VMAT et Hybrid sont PTV50-D50 (p_value=0.003927)
Les Param VC Signific entre VMAT et Hybrid sont PTV47-V98 (p_value=0.00794)
Les Param OAR Signific entre VMAT et Hybrid sont LungIL-V30 (p_value=0.001863)
```

Means for Breasts L : 3D // VMAT // Hybrid

```
clear p_* n_* b_* mean_*;

mean_OAR_3D=mean(OAR(16:30,1:15));
mean_OAR_VMAT=mean(OAR(16:30,16:30));
mean_OAR_Hybrid=mean(OAR(16:30,31:45));
mean_VC_3D=mean(VC(16:30,1:13));
mean_VC_VMAT=mean(VC(16:30,14:26));
mean_VC_Hybrid=mean(VC(16:30,27:39));
b_mean_OAR=[Param_OAR;mean_OAR_3D;mean_OAR_VMAT;mean_OAR_Hybrid];
b_mean_VC=[Param_VC;mean_VC_3D;mean_VC_VMAT;mean_VC_Hybrid];

fprintf('Paramètre // 3DCRT // VMAT // Hybrid \n')
fprintf('%s // %7.4g // %7.4g // %7.4g \n',b_mean_VC)
fprintf('%s // %7.4g // %7.4g // %7.4g \n',b_mean_OAR)
```

```
Paramètre // 3DCRT // VMAT // Hybrid
PTV50-D98 //   44.82 //   44.82 //   44.76
PTV50-D2 //   52.11 //   52.72 //   52.98
PTV50-D50 //   50.07 //   50.29 //   50.81
PTV50-HI //  0.1453 //  0.1573 //  0.1627
Vol-PTV50 //   669.3 //   669.3 //   669.3
Vol-iso95 //   956.6 //   797.7 //   872.2
vol-intersec //   579.3 //   601.4 //   607.3
PTV50-CI //   0.504 //  0.6613 //  0.6053
PTV50-V107 //       0 //   0.488 //  0.5373
PTV50-V95 //   88.48 //   91.36 //   92.27
PTV50-V98 //   71.53 //   76.49 //      82
PTV47-V95 //   92.57 //   93.41 //   96.06
PTV47-V98 //    83.5 //   82.06 //   90.91
LungIL-Dmean //   14.98 //   16.79 //   16.67
LungIL-V20 //    31.7 //   35.23 //   31.89
LungIL-V30 //    24.8 //   21.11 //   24.01
LungIL-NTCP //   4.867 //   5.933 //   5.733
LungCL-Dmean //   1.082 //    3.44 //    3.49
LungIL&CL-V5 //   23.21 //   46.08 //   41.47
Heart-Dmean //   4.541 //   6.255 //   5.746
Heart-V25 //   4.995 //   2.803 //   4.079
AIV-V30 //   50.49 //   14.15 //   33.75
Liver-V5 //  0.5764 //   33.14 //   40.15
BreastCL-Dmean //   1.355 //   4.362 //   3.716
HH-Dmean //   25.34 //   21.33 //   21.46
PRVSP-Dmax //   14.28 //   19.41 //   24.79
Eso-V35 //  0.9593 //   2.568 //   1.713
Trachea-V35 //    1.88 //   2.862 //   1.967
```

Non Parametric Tests of Wilcoxon (Wilcoxon Rank Sum Test) for Breasts L

```
clear p_* n_* b_*;

for i=1:N_OAR(1,1)
p_OAR_DG_3D_Vs_VMAT(i,1)=ranksum(OAR(16:30,OAR_Index_3D(i,1)),OAR(16:30,OAR_Index_VMAT(i,1)));
p_OAR_DG_3D_Vs_Hybrid(i,1)=ranksum(OAR(16:30,OAR_Index_3D(i,1)),OAR(16:30,OAR_Index_Hybrid(i,1)));
p_OAR_DG_VMAT_Vs_Hybrid(i,1)=ranksum(OAR(16:30,OAR_Index_VMAT(i,1)),OAR(16:30,OAR_Index_Hybrid(i,1)));
end
for i=1:N_VC(1,1)
p_VC_DG_3D_Vs_VMAT(i,1)=ranksum(VC(16:30,VC_Index_3D(i,1)),VC(16:30,VC_Index_VMAT(i,1)));
p_VC_DG_3D_Vs_Hybrid(i,1)=ranksum(VC(16:30,VC_Index_3D(i,1)),VC(16:30,VC_Index_Hybrid(i,1)));
p_VC_DG_VMAT_Vs_Hybrid(i,1)=ranksum(VC(16:30,VC_Index_VMAT(i,1)),VC(16:30,VC_Index_Hybrid(i,1)));
```

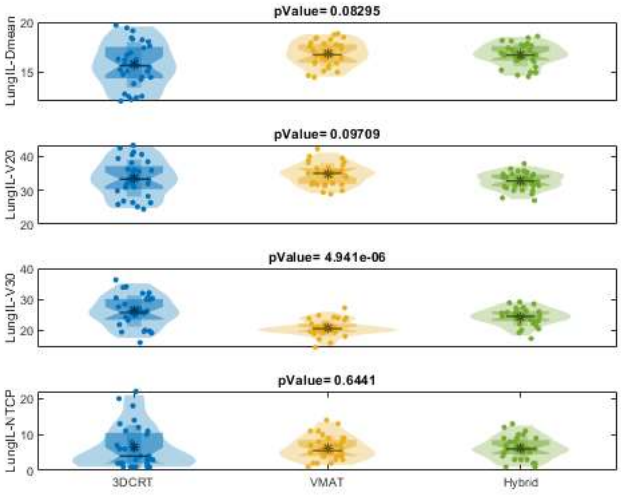
```
end

n_OAR_DG_3D_Vs_VMAT=find(p_OAR_DG_3D_Vs_VMAT<0.05);
n_OAR_DG_3D_Vs_Hybrid=find(p_OAR_DG_3D_Vs_Hybrid<0.05);
n_OAR_DG_VMAT_Vs_Hybrid=find(p_OAR_DG_VMAT_Vs_Hybrid<0.05);
b_OAR_DG_3D_Vs_VMAT=[Param_OAR(n_OAR_DG_3D_Vs_VMAT);p_OAR_DG_3D_Vs_VMAT(n_OAR_DG_3D_Vs_VMAT)'];
b_OAR_DG_3D_Vs_Hybrid=[Param_OAR(n_OAR_DG_3D_Vs_Hybrid);p_OAR_DG_3D_Vs_Hybrid(n_OAR_DG_3D_Vs_Hybrid)'];
b_OAR_DG_VMAT_Vs_Hybrid=[Param_OAR(n_OAR_DG_VMAT_Vs_Hybrid);p_OAR_DG_VMAT_Vs_Hybrid(n_OAR_DG_VMAT_Vs_Hybrid)'];

n_VC_DG_3D_Vs_VMAT=find(p_VC_DG_3D_Vs_VMAT<0.05);
n_VC_DG_3D_Vs_Hybrid=find(p_VC_DG_3D_Vs_Hybrid<0.05);
n_VC_DG_VMAT_Vs_Hybrid=find(p_VC_DG_VMAT_Vs_Hybrid<0.05);
b_VC_DG_3D_Vs_VMAT=[Param_VC(n_VC_DG_3D_Vs_VMAT);p_VC_DG_3D_Vs_VMAT(n_VC_DG_3D_Vs_VMAT)'];
b_VC_DG_3D_Vs_Hybrid=[Param_VC(n_VC_DG_3D_Vs_Hybrid);p_VC_DG_3D_Vs_Hybrid(n_VC_DG_3D_Vs_Hybrid)'];
b_VC_DG_VMAT_Vs_Hybrid=[Param_VC(n_VC_DG_VMAT_Vs_Hybrid);p_VC_DG_VMAT_Vs_Hybrid(n_VC_DG_VMAT_Vs_Hybrid)'];

%3D Vs VMAT
fprintf('Les Param VC Signific entre 3D et VMAT sont %s (p_value=%7.4g) \n',b_VC_DG_3D_Vs_VMAT)
fprintf('Les Param OAR Signific entre 3D et VMAT sont %s (p_value=%7.4g) \n',b_OAR_DG_3D_Vs_VMAT)

%3D Vs Hybrid
fprintf('Les Param VC Signific entre 3D et Hybrid sont %s (p_value=%7.4g) \n',b_VC_DG_3D_Vs_Hybrid)
fprintf('Les Param OAR Signific entre 3D et Hybrid sont %s (p_value=%7.4g) \n',b_OAR_DG_3D_Vs_Hybrid)

%Hybrid Vs VMAT
fprintf('Les Param VC Signific entre VMAT et Hybrid sont %s (p_value=%7.4g) \n',b_VC_DG_VMAT_Vs_Hybrid)
fprintf('Les Param OAR Signific entre VMAT et Hybrid sont %s (p_value=%7.4g) \n',b_OAR_DG_VMAT_Vs_Hybrid)
```

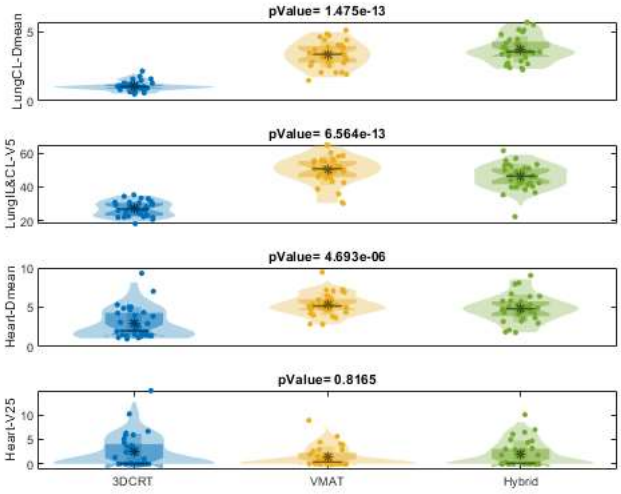
```
Les Param VC Signific entre 3D et VMAT sont PTV50-CI (p_value=0.0007187)
Les Param VC Signific entre 3D et VMAT sont PTV50-V107 (p_value=2.54e-06)
Les Param OAR Signific entre 3D et VMAT sont LungIL-Dmean (p_value=0.01805)
Les Param OAR Signific entre 3D et VMAT sont LungIL-V20 (p_value=0.04003)
Les Param OAR Signific entre 3D et VMAT sont LungCL-Dmean (p_value=4.565e-06)
Les Param OAR Signific entre 3D et VMAT sont LungIL&CL-V5 (p_value=3.383e-06)
Les Param OAR Signific entre 3D et VMAT sont Heart-Dmean (p_value=0.003691)
Les Param OAR Signific entre 3D et VMAT sont AIV-V30 (p_value=9.661e-05)
Les Param OAR Signific entre 3D et VMAT sont BreastCL-Dmean (p_value=4.143e-06)
Les Param VC Signific entre 3D et Hybrid sont PTV50-D2 (p_value=0.0003491)
Les Param VC Signific entre 3D et Hybrid sont PTV50-D50 (p_value=0.001285)
Les Param VC Signific entre 3D et Hybrid sont PTV50-CI (p_value=0.04369)
Les Param VC Signific entre 3D et Hybrid sont PTV50-V107 (p_value=6.844e-07)
Les Param VC Signific entre 3D et Hybrid sont PTV50-V95 (p_value=0.02792)
Les Param VC Signific entre 3D et Hybrid sont PTV50-V98 (p_value=0.004795)
Les Param VC Signific entre 3D et Hybrid sont PTV47-V95 (p_value=0.001215)
Les Param VC Signific entre 3D et Hybrid sont PTV47-V98 (p_value=0.0004554)
Les Param OAR Signific entre 3D et Hybrid sont LungIL-Dmean (p_value=0.01613)
Les Param OAR Signific entre 3D et Hybrid sont LungCL-Dmean (p_value=3.392e-06)
Les Param OAR Signific entre 3D et Hybrid sont LungIL&CL-V5 (p_value=1.602e-05)
Les Param OAR Signific entre 3D et Hybrid sont Heart-Dmean (p_value=0.04003)
Les Param OAR Signific entre 3D et Hybrid sont Liver-V5 (p_value=0.04802)
Les Param OAR Signific entre 3D et Hybrid sont BreastCL-Dmean (p_value=8.851e-05)
Les Param OAR Signific entre 3D et Hybrid sont PRVSP-Dmax (p_value=0.0004561)
Les Param VC Signific entre VMAT et Hybrid sont PTV50-D50 (p_value= 0.0377)
Les Param VC Signific entre VMAT et Hybrid sont PTV47-V95 (p_value=0.02132)
Les Param VC Signific entre VMAT et Hybrid sont PTV47-V98 (p_value=0.005452)
Les Param OAR Signific entre VMAT et Hybrid sont LungIL-V20 (p_value=0.005805)
Les Param OAR Signific entre VMAT et Hybrid sont LungIL-V30 (p_value= 0.0114)
Les Param OAR Signific entre VMAT et Hybrid sont AIV-V30 (p_value=0.001865)
Les Param OAR Signific entre VMAT et Hybrid sont PRVSP-Dmax (p_value=0.03809)
```

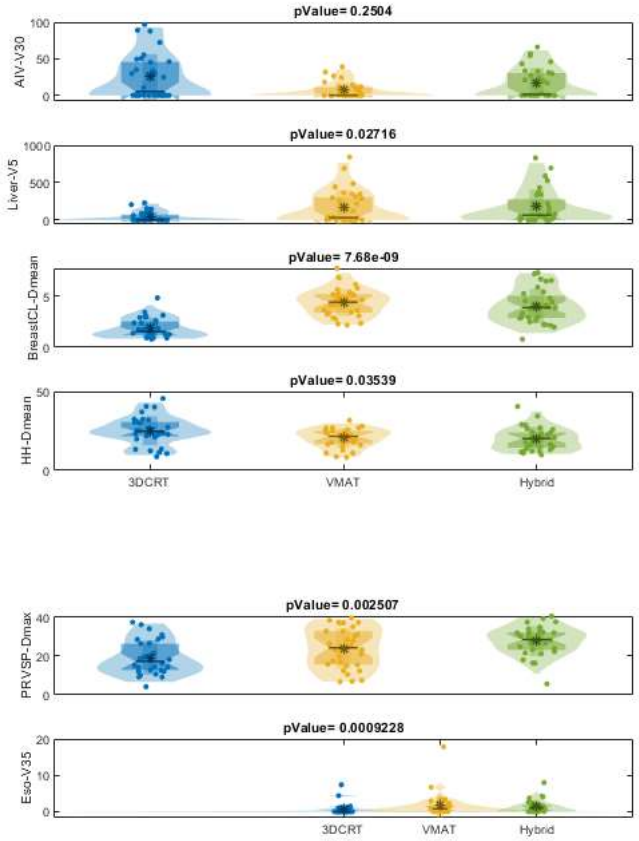
Violin Plots for OAR

```
figure; %%
for n=0:3
subplot(4,1,n+1)
al_goodplot(OAR(:,1+n),1,0.3,[],[],[],[],0.2);
al_goodplot(OAR(:,16+n),2,0.3,[],[],[],[],0.2);
al_goodplot(OAR(:,31+n),3,0.3,[],[],[],[],0.2);
xticks([])
grid
set(gca,'FontSize',7)
ylabel(Param_OAR(1+n))
Input=[OAR(:,1+n),OAR(:,16+n),OAR(:,31+n)];
p=kruskalwallis(Input,[],'off'); %%Test de Kruskal-Wallis non parametrique
title(['pValue= ' num2str(p,4)])
hold on;
end
xticks([1 2 3])
xticklabels({'3DCRT', 'VMAT','Hybrid'})

figure; %%
for n=0:3
subplot(4,1,n+1)
al_goodplot(OAR(:,5+n),1,0.3,[],[],[],[],0.2);
```

```
al_goodplot(OAR(:,20+n),2,0.3,[],[],[],[],0.2);
al_goodplot(OAR(:,35+n),3,0.3,[],[],[],[],0.2);
xticks([])
grid
set(gca,'FontSize',7)
ylabel(Param_OAR(5+n))
Input=[OAR(:,5+n),OAR(:,20+n),OAR(:,35+n)];
p=kruskalwallis(Input,[],'off'); %%Test de Kruskal-Wallis non parametrique
title(['pValue= ' num2str(p,4)])
hold on;
end
xticks([1 2 3])
xticklabels({'3DCRT', 'VMAT','Hybrid'})

figure; %%
for n=0:3
subplot(4,1,n+1)
al_goodplot(OAR(:,9+n),1,0.3,[],[],[],[],0.2);
al_goodplot(OAR(:,24+n),2,0.3,[],[],[],[],0.2);
al_goodplot(OAR(:,39+n),3,0.3,[],[],[],[],0.2);
xticks([])
grid
set(gca,'FontSize',7)
ylabel(Param_OAR(9+n))
Input=[OAR(:,9+n),OAR(:,24+n),OAR(:,39+n)];
p=kruskalwallis(Input,[],'off'); %%Test de Kruskal-Wallis non parametrique
title(['pValue= ' num2str(p,4)])
hold on;
end
xticks([1 2 3])
xticklabels({'3DCRT', 'VMAT','Hybrid'})

figure; %%
for n=0:1
subplot(4,1,n+1)
al_goodplot(OAR(:,13+n),1,0.3,[],[],[],[],0.2);
al_goodplot(OAR(:,28+n),2,0.3,[],[],[],[],0.2);
al_goodplot(OAR(:,43+n),3,0.3,[],[],[],[],0.2);
xticks([])
grid
set(gca,'FontSize',7)
ylabel(Param_OAR(13+n))
Input=[OAR(:,13+n),OAR(:,28+n),OAR(:,43+n)];
p=kruskalwallis(Input,[],'off'); %%Test de Kruskal-Wallis non parametrique
title(['pValue= ' num2str(p,4)])
hold on;
end
xticks([1 2 3])
xticklabels({'3DCRT', 'VMAT','Hybrid'})
```


pValue= 0.08295
LungIL-Dmean
20
15
pValue= 0.09709
LungIL-V20
40
30
20
pValue= 4.941e-06
LungIL-V30
40
30
20
pValue= 0.6441
LungIL-NTCP
20
10
0
3DCRT
VMAT
Hybrid

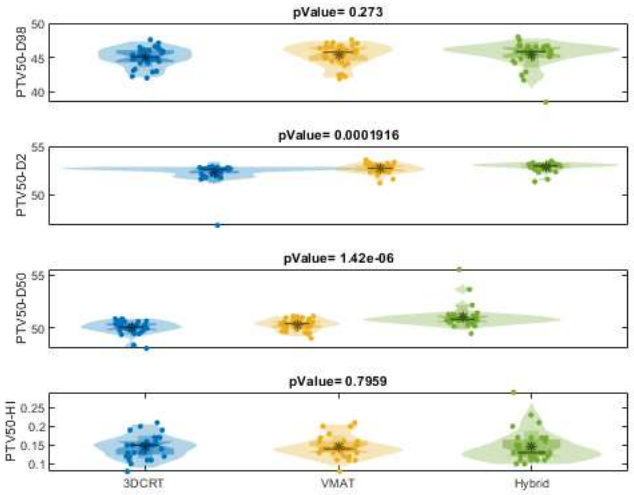

pValue= 1.475e-13
LungCL-Dmean
5
0
pValue= 6.564e-13
LungIL&CL-V5
60
40
20
pValue= 4.693e-06
Heart-Dmean
10
5
0
pValue= 0.8165
Heart-V25
10
5
0
3DCRT
VMAT
Hybrid

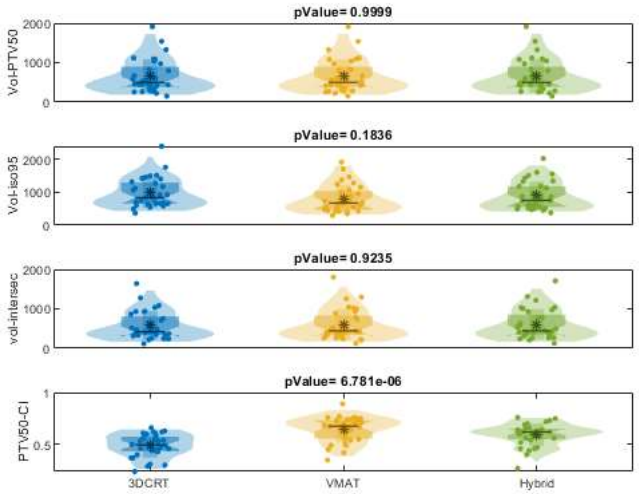


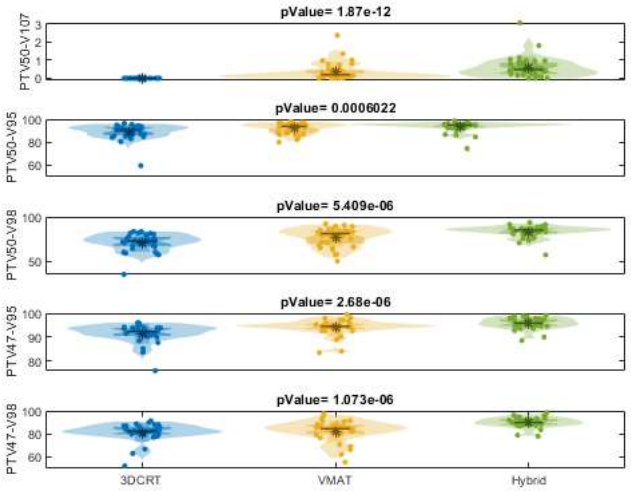
Violin Plots for Targets

```
figure; %%
for n=0:3
subplot(4,1,n+1)
al_goodplot(VC(:,1+n),1,0.3,[],[],[],[],0.2);
al_goodplot(VC(:,14+n),2,0.3,[],[],[],[],0.2);
al_goodplot(VC(:,27+n),3,0.3,[],[],[],[],0.2);
xticks([])
grid
set(gca,'FontSize',7)
ylabel(Param_VC(1+n))
Input=[VC(:,1+n),VC(:,14+n),VC(:,27+n)];
p=kruskalwallis(Input,[],'off'); %%Test de Kruskal-Wallis non parametrique
title(['pValue= ' num2str(p,4)])
hold on;
end
xticks([1 2 3])
xticklabels({'3DCRT', 'VMAT','Hybrid'})

figure; %%
for n=0:3
subplot(4,1,n+1)
al_goodplot(VC(:,5+n),1,0.3,[],[],[],[],0.2);
al_goodplot(VC(:,18+n),2,0.3,[],[],[],[],0.2);
al_goodplot(VC(:,31+n),3,0.3,[],[],[],[],0.2);
xticks([])
grid
set(gca,'FontSize',7)
ylabel(Param_VC(5+n))
Input=[VC(:,5+n),VC(:,18+n),VC(:,31+n)];
p=kruskalwallis(Input,[],'off'); %%Test de Kruskal-Wallis non parametrique
title(['pValue= ' num2str(p,4)])
hold on;
```

```
end
xticks([1 2 3])
xticklabels({'3DCRT', 'VMAT','Hybrid'})

figure; %%
for n=0:4
subplot(5,1,n+1)
al_goodplot(VC(:,9+n),1,0.3,[],[],[],[],0.2);
al_goodplot(VC(:,22+n),2,0.3,[],[],[],[],0.2);
al_goodplot(VC(:,35+n),3,0.3,[],[],[],[],0.2);
xticks([])
grid
set(gca,'FontSize',7)
ylabel(Param_VC(9+n))
Input=[VC(:,9+n),VC(:,22+n),VC(:,35+n)];
p=kruskalwallis(Input,[],'off'); %%Test de Kruskal-Wallis non parametrique
title(['pValue= ' num2str(p,4)])
hold on;
end
xticks([1 2 3]);
xticklabels({'3DCRT', 'VMAT','Hybrid'});
```

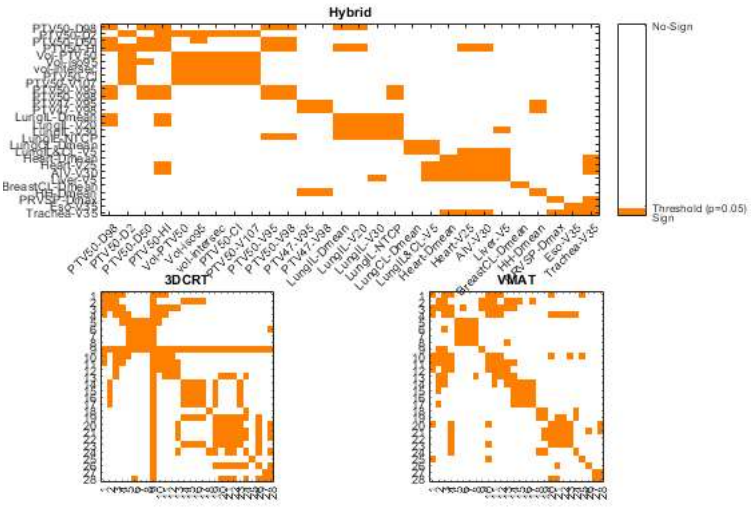






Spearman correlation Study

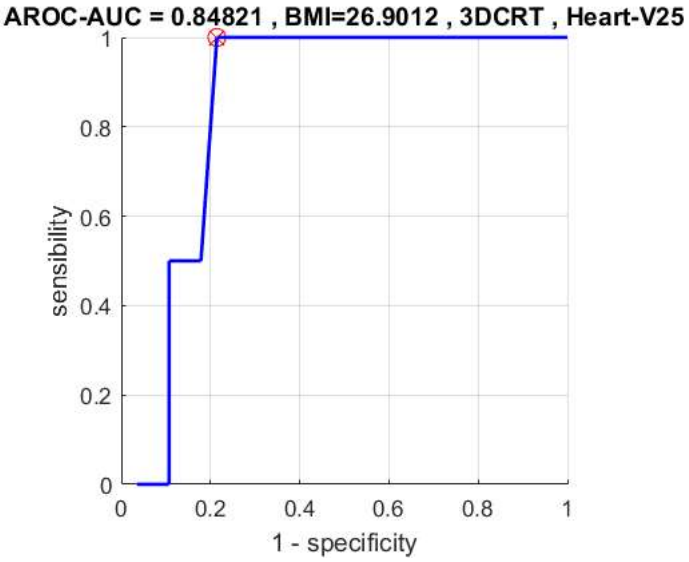
```
figure;
subplot(2,2,3)%pour le 3D
clear c
% en Rouge les Corrélations significatives
[RHO,PVAL] = corr([VC(:,1:13) OAR(:,1:15)],'Type','Spearman');
PVAL(PVAL==1)=0;
imagesc(PVAL);
xticks([1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28]);
yticks([1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28]);
m=100; % set max value
c=zeros(m,3); % start with all 0's
c(1:5,1)=1; %
c(1:5,2)=0.5;
c(5:end,:)=1; %
colorbar('Ticks',[0 0.05 0.99],'XTickLabel',{'Sign','Threshold','No-Sign'});
colormap(c);
title('3DCRT')
set(colorbar,'visible','off');
set(gca,'FontSize',7)

subplot(2,2,4)%pour le VMAT
clear c
[RHO,PVAL] = corr([VC(:,14:26) OAR(:,16:30)],'Type','Spearman');
PVAL(PVAL==1)=0;
imagesc(PVAL);
xticks([1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28]);
yticks([1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28]);
m=100; % set max value
c=zeros(m,3); % start with all 0's
c(1:5,1)=1; %
c(1:5,2)=0.5;
c(5:end,:)=1; %
colorbar('Ticks',[0 0.05 0.99],'XTickLabel',{'Sign','Threshold','No-Sign'});
colormap(c);
set(colorbar,'visible','off');
title('VMAT');
set(gca,'FontSize',7);

subplot(2,2,[1 2])%pour l'Hybrid
clear c
[RHO,PVAL] = corr([VC(:,27:39) OAR(:,31:45)],'Type','Spearman');
PVAL(PVAL==1)=0;
imagesc(PVAL);
xticks([1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28])
xticklabels([Param_VC Param_OAR])
xtickangle(45)
yticks([1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28])
yticklabels([Param_VC Param_OAR])
m=100; % set max value
c=zeros(m,3); % start with all 0's
c(1:5,1)=1; %
c(1:5,2)=0.5;
c(5:end,:)=1; %
colorbar('Ticks',[0 0.05 0.99],'XTickLabel',{'Sign','Threshold (p=0.05)','No-Sign'});
colormap(c)
title('Hybrid');
set(gca,'FontSize',7);
```

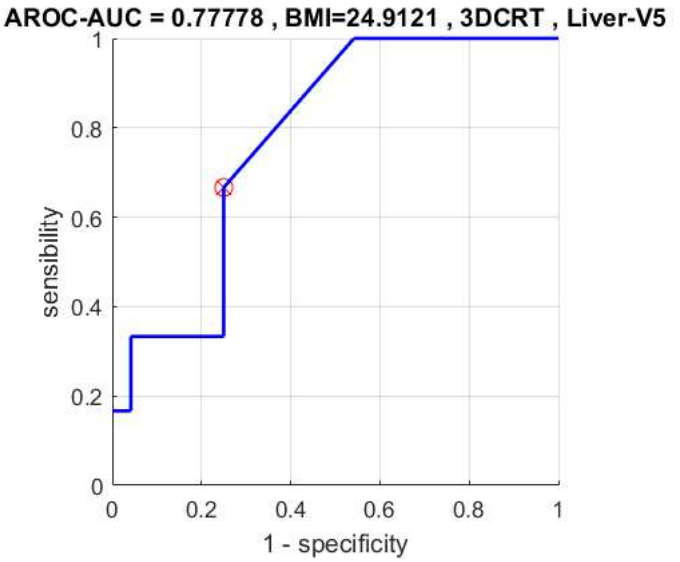


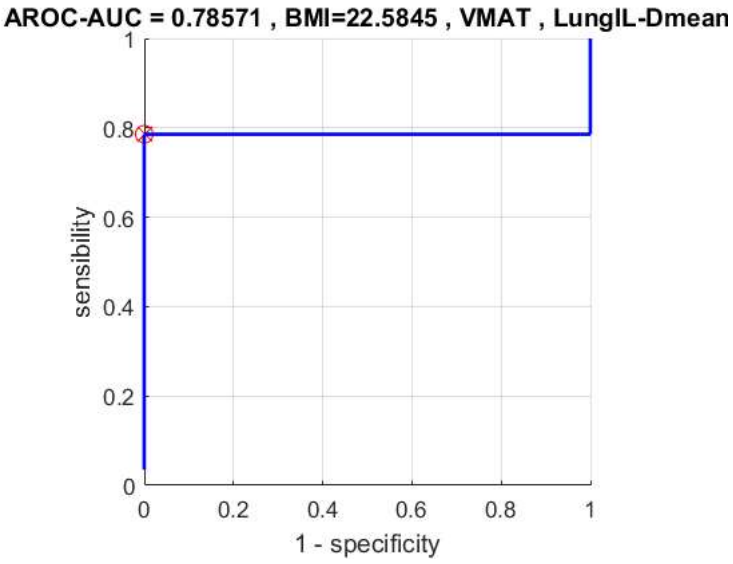
ROC analyze Breasts R&L

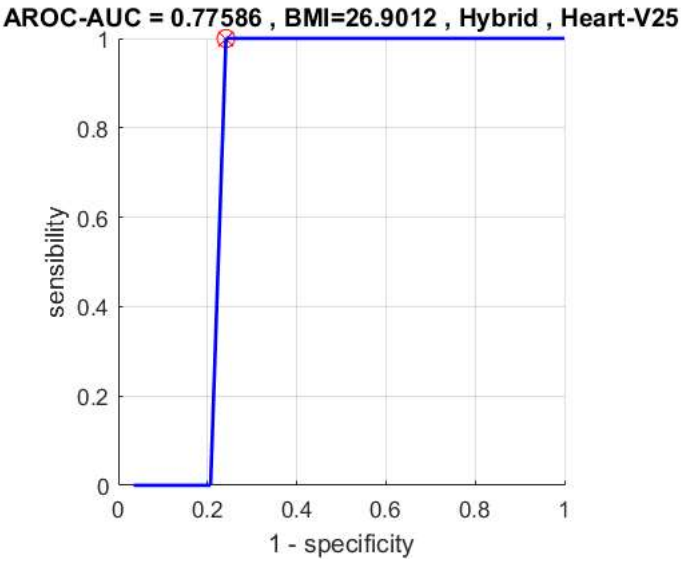
```
param(:,3)=VC(:,5);
for Input=1:3;   % 1=IMC 2=Age 3=VolPTV50-Eval
    Input_Name=["BMI","Age","Vol-PTV50"];
    for Mode=1:3;%1=3D 2=VMAT 3=Hybrid
        Mode_Name = ["3DCRT","VMAT","Hybrid"];
        for Output_OAR=1:15; % paramètres étudiés dans les OAR & Clinical  :
CG_OAR(1,1)=15;  %1 PoumonHomo_Dmean
CG_OAR(2,1)=30;  %2 PoumonHomo_V20
CG_OAR(3,1)=20;  %3 PoumonHomo_V30
CG_OAR(4,1)=5;   %4 PoumonHomo_NTCP
CG_OAR(5,1)=5;   %5 PoumonContro_Dmean
CG_OAR(6,1)=50;  %6 PoumonHomoContro_V5
CG_OAR(7,1)=5;   %7 Coeur_Dmean
CG_OAR(8,1)=10;  %8 Coeur_V25
CG_OAR(9,1)=30;  %9 IVA_V30
CG_OAR(10,1)=100;%10 Foie_V5
CG_OAR(11,1)=5;  %11 SeinContro_Dmean
CG_OAR(12,1)=20; %12 TH_Dmean
CG_OAR(13,1)=20; %13 PRVMoelle_Dmax
CG_OAR(14,1)=5;  %14 Oeso_V35
CG_OAR(15,1)=5;  %15 Trachee_V35

Sensitivity=ones(1000,1);Specificity=zeros(1000,1);distance=ones(1000,1);
FN=zeros(1000,1);

for i=1:30
    if OAR(i,Output_OAR+(Mode-1)*15)<CG_OAR(Output_OAR)
        diff(i,1)=0;
    else diff(i,1)=1;
    end
end

Threshold(1,1)=min(param(:,Input));
Delta_Threshold=(max(param(:,Input))-min(param(:,Input)))/1000;
for j=2:1000
    Threshold(j,1)=Delta_Threshold+Threshold(j-1,1);
    obj_pos=find(param(:,Input) >= Threshold(j,1));
    obj_neg=find(param(:,Input) < Threshold(j,1));
    TP(j,1)=sum(diff(obj_pos,1));
    FP(j,1)=length(obj_pos)-TP(j,1);
    FN(j,1)=sum(diff(obj_neg,1));
    TN(j,1)=length(obj_neg)-FN(j,1);
    Sensitivity(j,1)=TP(j,1)/(TP(j,1) + FN(j,1));
    Specificity(j,1)=TN(j,1)/(TN(j,1) + FP(j,1));
    distance(j,:)= sqrt((1-Sensitivity(j,1))^2+(Specificity(j,1)-1)^2);

end
        [~, opt] = min(distance);
        AUC=abs(trapz(1-Specificity,Sensitivity));
        if AUC > 0.7
        figure;
        hold on; plot(1-Specificity(opt,1), Sensitivity(opt,1), 'or', 'MarkerSize', 10);
        hold on; plot(1-Specificity(opt,1), Sensitivity(opt,1), 'xr', 'MarkerSize', 12);
        hold on; axis square; grid on; xlabel('1 - specificity'); ylabel('sensibility');
        plot(1-Specificity,Sensitivity, '-b', 'LineWidth', 2);
        set(gca, 'fontsize', 13)
        title(['AROC-AUC = ' num2str(AUC) ' , ' num2str(Input_Name(Input)) '='  num2str(Threshold(opt)) ' , ' num2str(Mode_Name(Mode)) ' , ' num2str(Param_OAR(Outpu
        clear diff obj_* TP FP FN TN Sensitivity Specificity distance;
```

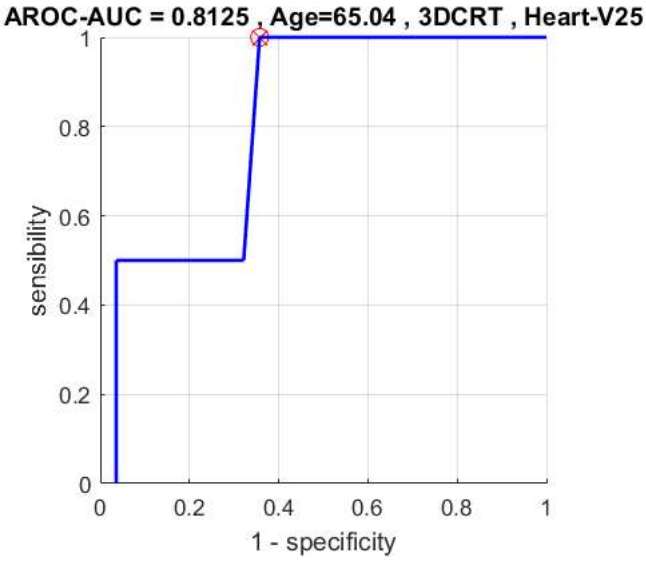
```
        end
        end
    end
end
```

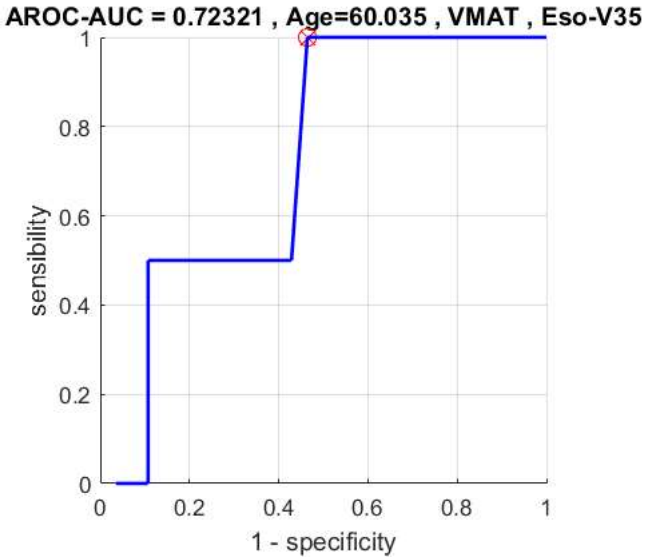


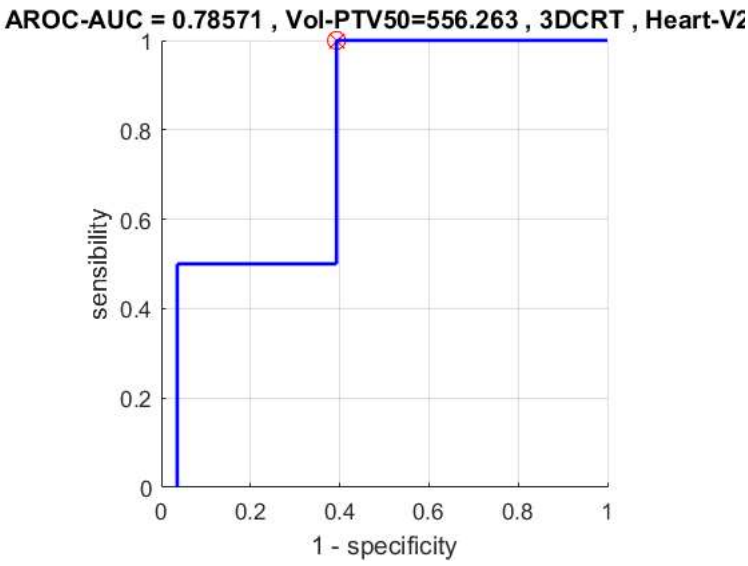


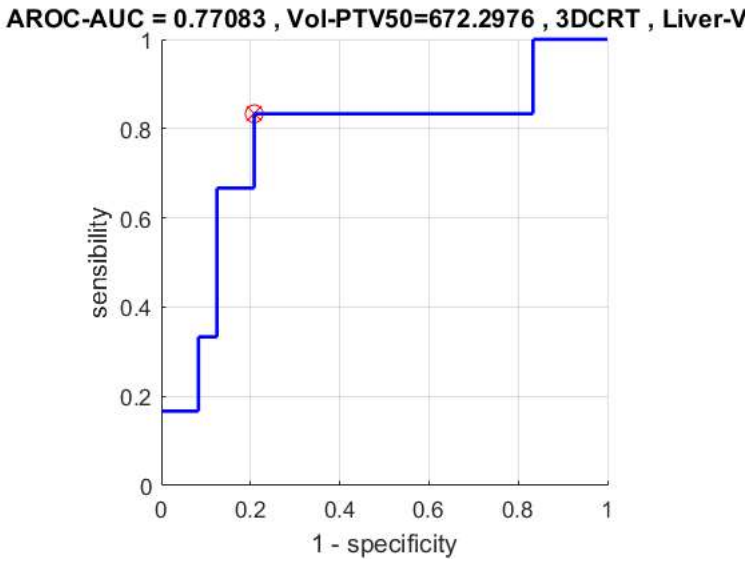


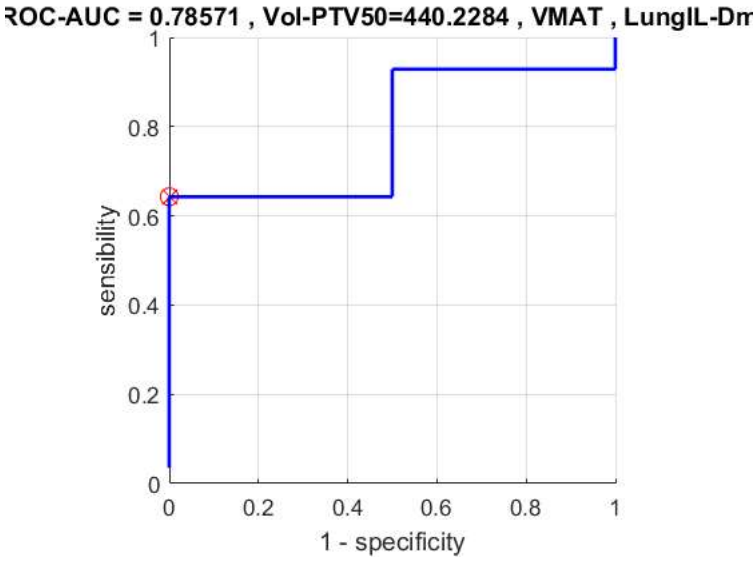

AROC-AUC = 0.77586 , BMI=26.9012 , Hybrid , Heart-V25
sensibility
1 - specificity
0
0.2
0.4
0.6
0.8
1


AROC-AUC = 0.8125 , Age=65.04 , 3DCRT , Heart-V25
sensibility
1 - specificity
0
0.2
0.4
0.6
0.8
1


AROC-AUC = 0.72321 , Age=60.035 , VMAT , Eso-V35
sensibility
1 - specificity
0
0.2
0.4
0.6
0.8
1





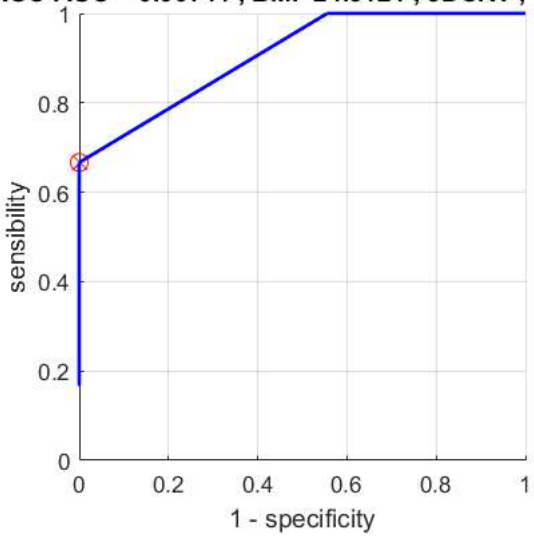


ROC analyze Breast R

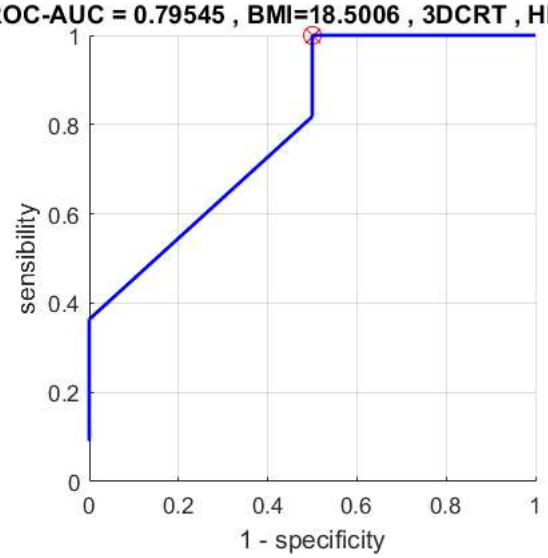
```
param(:,3)=VC(:,5);
for Input=1:3;   % 1=IMC 2=Age 3=VolPTV50-Eval
    Input_Name=["BMI","Age","Vol-PTV50"];
    for Mode=1:3;%1=3D 2=VMAT 3=Hybrid
        Mode_Name = ["3DCRT","VMAT","Hybrid"];
```

```
        for Output_OAR=1:15; % paramètres étudiés dans les OAR & Clinical  :
CG_OAR(1,1)=15;  %1 PoumonHomo_Dmean
CG_OAR(2,1)=30;  %2 PoumonHomo_V20
CG_OAR(3,1)=20;  %3 PoumonHomo_V30
CG_OAR(4,1)=5;   %4 PoumonHomo_NTCP
CG_OAR(5,1)=5;   %5 PoumonContro_Dmean
CG_OAR(6,1)=50;  %6 PoumonHomoContro_V5
CG_OAR(7,1)=5;   %7 Coeur_Dmean
CG_OAR(8,1)=10;  %8 Coeur_V25
CG_OAR(9,1)=30;  %9 IVA_V30
CG_OAR(10,1)=100;%10 Foie_V5
CG_OAR(11,1)=5;  %11 SeinContro_Dmean
CG_OAR(12,1)=20; %12 TH_Dmean
CG_OAR(13,1)=20; %13 PRVMoelle_Dmax
CG_OAR(14,1)=5;  %14 Oeso_V35
CG_OAR(15,1)=5;  %15 Trachee_V35

Sensitivity=ones(1000,1);Specificity=zeros(1000,1);distance=ones(1000,1);
FN=zeros(1000,1);

for i=1:15
    if OAR(i,Output_OAR+(Mode-1)*15)<CG_OAR(Output_OAR)
        diff(i,1)=0;
    else diff(i,1)=1;
    end
end

Threshold(1,1)=min(param(1:15,Input));
Delta_Threshold=(max(param(1:15,Input))-min(param(1:15,Input)))/1000;
for j=2:1000
    Threshold(j,1)=Delta_Threshold+Threshold(j-1,1);
    obj_pos=find(param(1:15,Input) >= Threshold(j,1));
    obj_neg=find(param(1:15,Input) < Threshold(j,1));
    TP(j,1)=sum(diff(obj_pos,1));
    FP(j,1)=length(obj_pos)-TP(j,1);
    FN(j,1)=sum(diff(obj_neg,1));
    TN(j,1)=length(obj_neg)-FN(j,1);
    Sensitivity(j,1)=TP(j,1)/(TP(j,1) + FN(j,1));
    Specificity(j,1)=TN(j,1)/(TN(j,1) + FP(j,1));
    distance(j,:)= sqrt((1-Sensitivity(j,1))^2+(Specificity(j,1)-1)^2);

end
        [~, opt] = min(distance);
        AUC=abs(trapz(1-Specificity,Sensitivity));
        if AUC > 0.7
        figure;
        hold on; plot(1-Specificity(opt,1), Sensitivity(opt,1), 'or', 'MarkerSize', 10);
        hold on; plot(1-Specificity(opt,1), Sensitivity(opt,1), 'xr', 'MarkerSize', 12);
        hold on; axis square; grid on; xlabel('1 - specificity'); ylabel('sensibility');
        plot(1-Specificity,Sensitivity, '-b', 'LineWidth', 2);
        set(gca, 'fontsize', 13)
        title(['AROC-AUC = ' num2str(AUC) ' , ' num2str(Input_Name(Input)) '='  num2str(Threshold(opt)) ' , ' num2str(Mode_Name(Mode)) ' , ' num2str(Param_OAR(Outpu
        clear diff obj_* TP FP FN TN Sensitivity Specificity distance;
        end
        end
    end
end
```

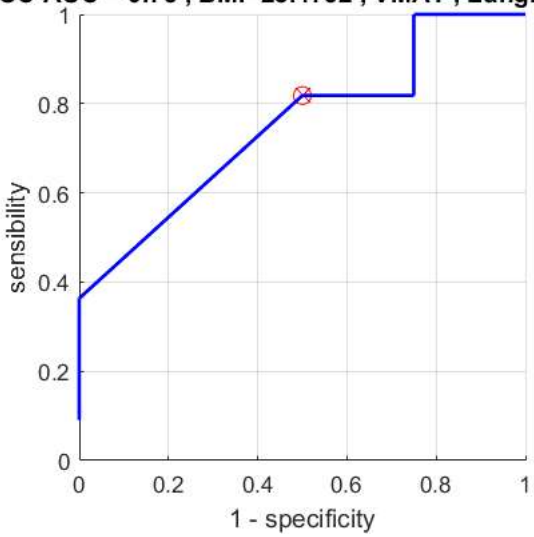
AROC-AUC = 0.90741 , BMI=24.9121 , 3DCRT , Liver-V5

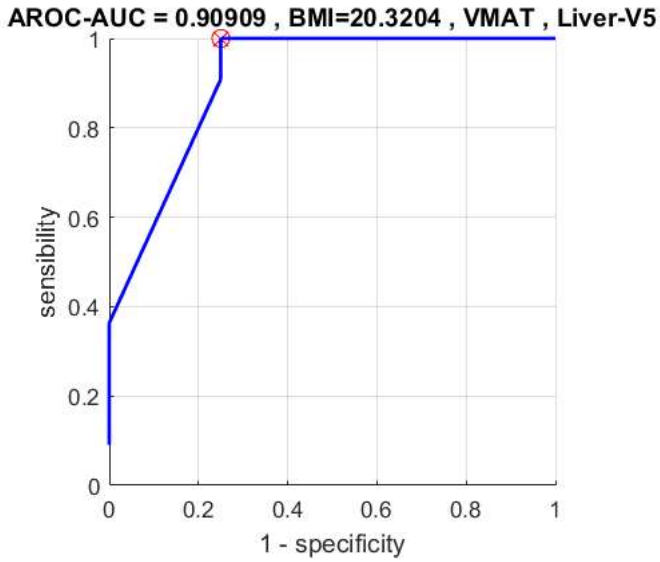


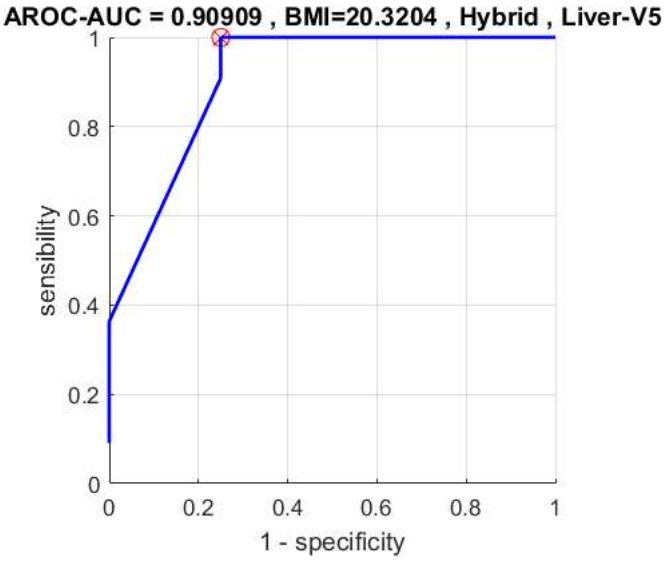
AROC-AUC = 0.79545 , BMI=18.5006 , 3DCRT , HH-Dmean

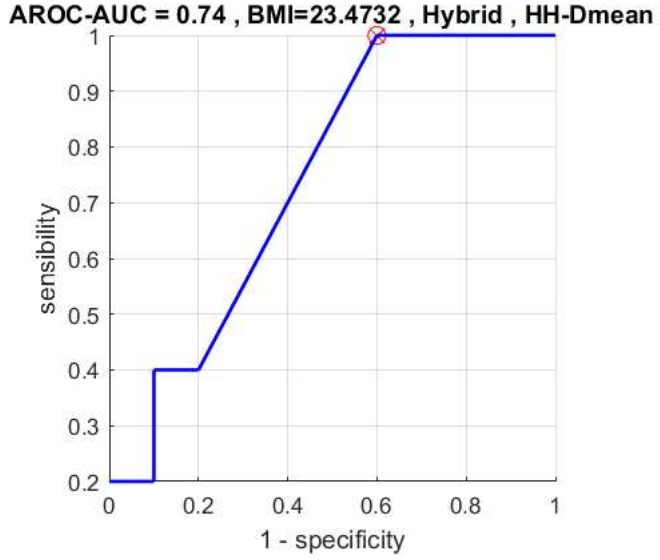


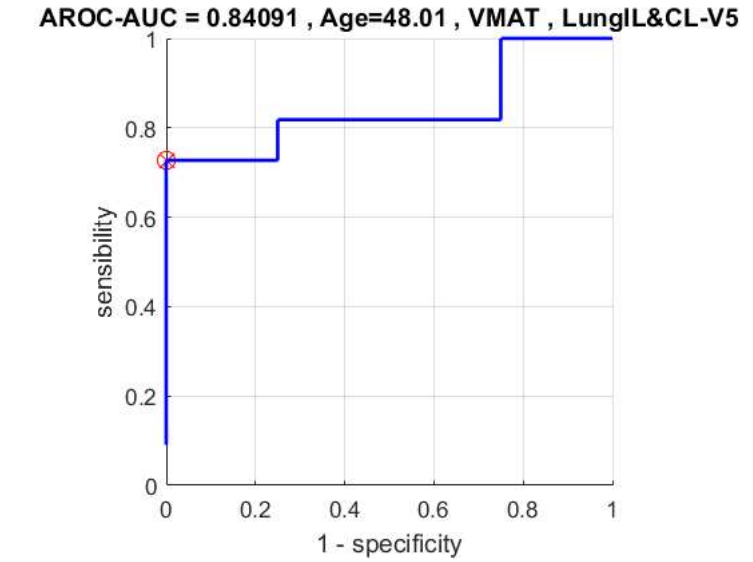
AROC-AUC = 0.75 , BMI=23.4732 , VMAT , LungIL&CL-V5

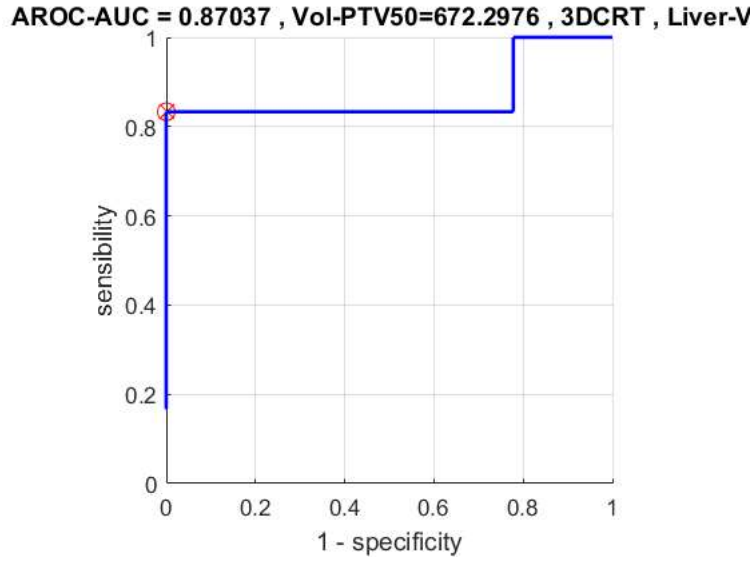


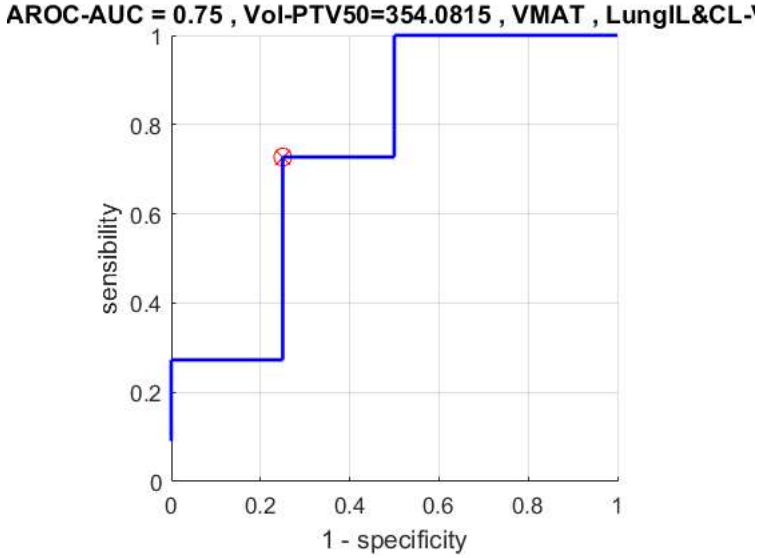

AROC-AUC = 0.90909 , BMI=20.3204 , VMAT , Liver-V5
sensibility
1 - specificity
0
0.2
0.4
0.6
0.8
1

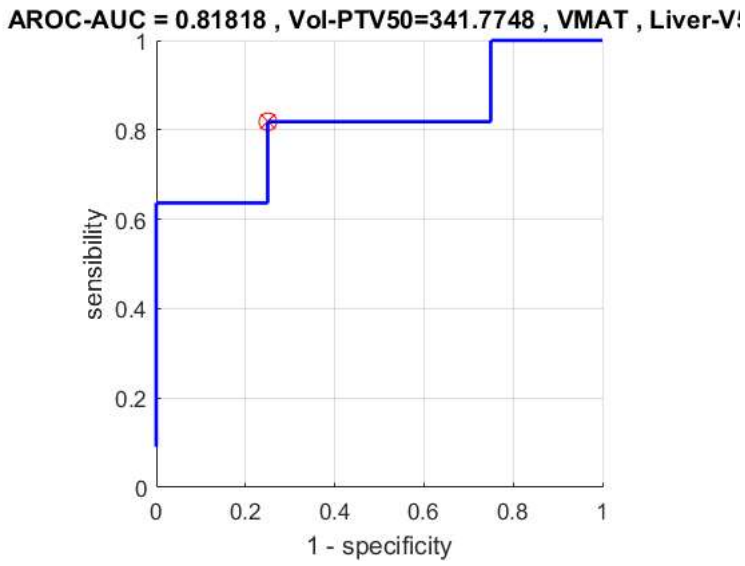

AROC-AUC = 0.90909 , BMI=20.3204 , Hybrid , Liver-V5
sensibility
1 - specificity
0
0.2
0.4
0.6
0.8
1

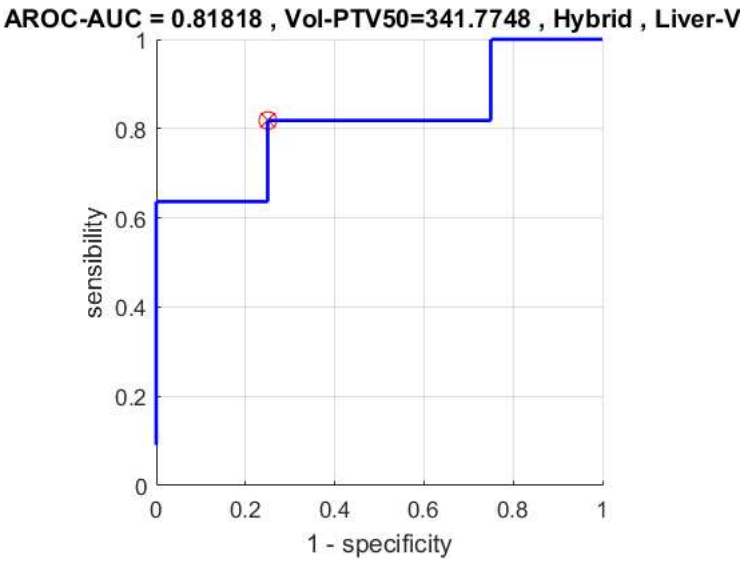

AROC-AUC = 0.74 , BMI=23.4732 , Hybrid , HH-Dmean
sensibility
1 - specificity
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
0.2
0.4
0.6
0.8
1


AROC-AUC = 0.84091 , Age=48.01 , VMAT , LungIL&CL-V5
sensibility
1 - specificity
0
0.2
0.4
0.6
0.8
1


AROC-AUC = 0.87037 , Vol-PTV50=672.2976 , 3DCRT , Liver-V
sensibility
1 - specificity
0
0.2
0.4
0.6
0.8
1


AROC-AUC = 0.75 , Vol-PTV50=354.0815 , VMAT , LungIL&CL-
sensibility
1 - specificity
0
0.2
0.4
0.6
0.8
1





ROC analyze Breast L

```
param(:,3)=VC(:,5);
for Input=1:3;   % 1=IMC 2=Age 3=VolPTV50-Eval
    Input_Name=["BMI","Age","Vol-PTV50"];
    for Mode=1:3;%1=3D 2=VMAT 3=Hybrid
        Mode_Name = ["3DCRT","VMAT","Hybrid"];
        for Output_OAR=1:15; % paramètres étudiés dans les OAR & Clinical  :
CG_OAR(1,1)=15;  %1 PoumonHomo_Dmean
CG_OAR(2,1)=30;  %2 PoumonHomo_V20
CG_OAR(3,1)=20;  %3 PoumonHomo_V30
CG_OAR(4,1)=5;   %4 PoumonHomo_NTCP
CG_OAR(5,1)=5;   %5 PoumonContro_Dmean
CG_OAR(6,1)=50;  %6 PoumonHomoContro_V5
CG_OAR(7,1)=5;   %7 Coeur_Dmean
CG_OAR(8,1)=10;  %8 Coeur_V25
CG_OAR(9,1)=30;  %9 IVA_V30
CG_OAR(10,1)=100;%10 Foie_V5
CG_OAR(11,1)=5;  %11 SeinContro_Dmean
CG_OAR(12,1)=20; %12 TH_Dmean
CG_OAR(13,1)=20; %13 PRVMoelle_Dmax
CG_OAR(14,1)=5;  %14 Oeso_V35
CG_OAR(15,1)=5;  %15 Trachee_V35

Sensitivity=ones(1000,1);Specificity=zeros(1000,1);distance=ones(1000,1);
FN=zeros(1000,1);

for i=16:30
    if OAR(i,Output_OAR+(Mode-1)*15)<CG_OAR(Output_OAR)
        diff(i,1)=0;
    else diff(i,1)=1;
    end
end
```

```
Threshold(1,1)=min(param(16:30,Input));
Delta_Threshold=(max(param(16:30,Input))-min(param(16:30,Input)))/1000;
for j=2:1000
    Threshold(j,1)=Delta_Threshold+Threshold(j-1,1);
    obj_pos=find(param(16:30,Input) >= Threshold(j,1));
    obj_neg=find(param(16:30,Input) < Threshold(j,1));
    TP(j,1)=sum(diff(obj_pos,1));
    FP(j,1)=length(obj_pos)-TP(j,1);
    FN(j,1)=sum(diff(obj_neg,1));
    TN(j,1)=length(obj_neg)-FN(j,1);
    Sensitivity(j,1)=TP(j,1)/(TP(j,1) + FN(j,1));
    Specificity(j,1)=TN(j,1)/(TN(j,1) + FP(j,1));
    distance(j,:)= sqrt((1-Sensitivity(j,1))^2+(Specificity(j,1)-1)^2);

end
        [~, opt] = min(distance);
        AUC=abs(trapz(1-Specificity,Sensitivity));
        if AUC > 0.7
        figure;
        hold on; plot(1-Specificity(opt,1), Sensitivity(opt,1), 'or', 'MarkerSize', 10);
        hold on; plot(1-Specificity(opt,1), Sensitivity(opt,1), 'xr', 'MarkerSize', 12);
        hold on; axis square; grid on; xlabel('1 - specificity'); ylabel('sensibility');
        plot(1-Specificity,Sensitivity, '-b', 'LineWidth', 2);
        set(gca, 'fontsize', 13)
        title(['AROC-AUC = ' num2str(AUC) ' , ' num2str(Input_Name(Input)) '='  num2str(Threshold(opt)) ' , ' num2str(Mode_Name(Mode)) ' , ' num2str(Param_OAR(Outpu
        clear diff obj_* TP FP FN TN Sensitivity Specificity distance;
        end
        end
    end
end
```

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