LIFEx v7.4.0

Announcement

— LIFEx —

C. Nioche, F. Orlhac, I. Buvat

What is new?

LIFEx version 7.4.0
Last update of document: 2022/11/28

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Statistics of the latest version

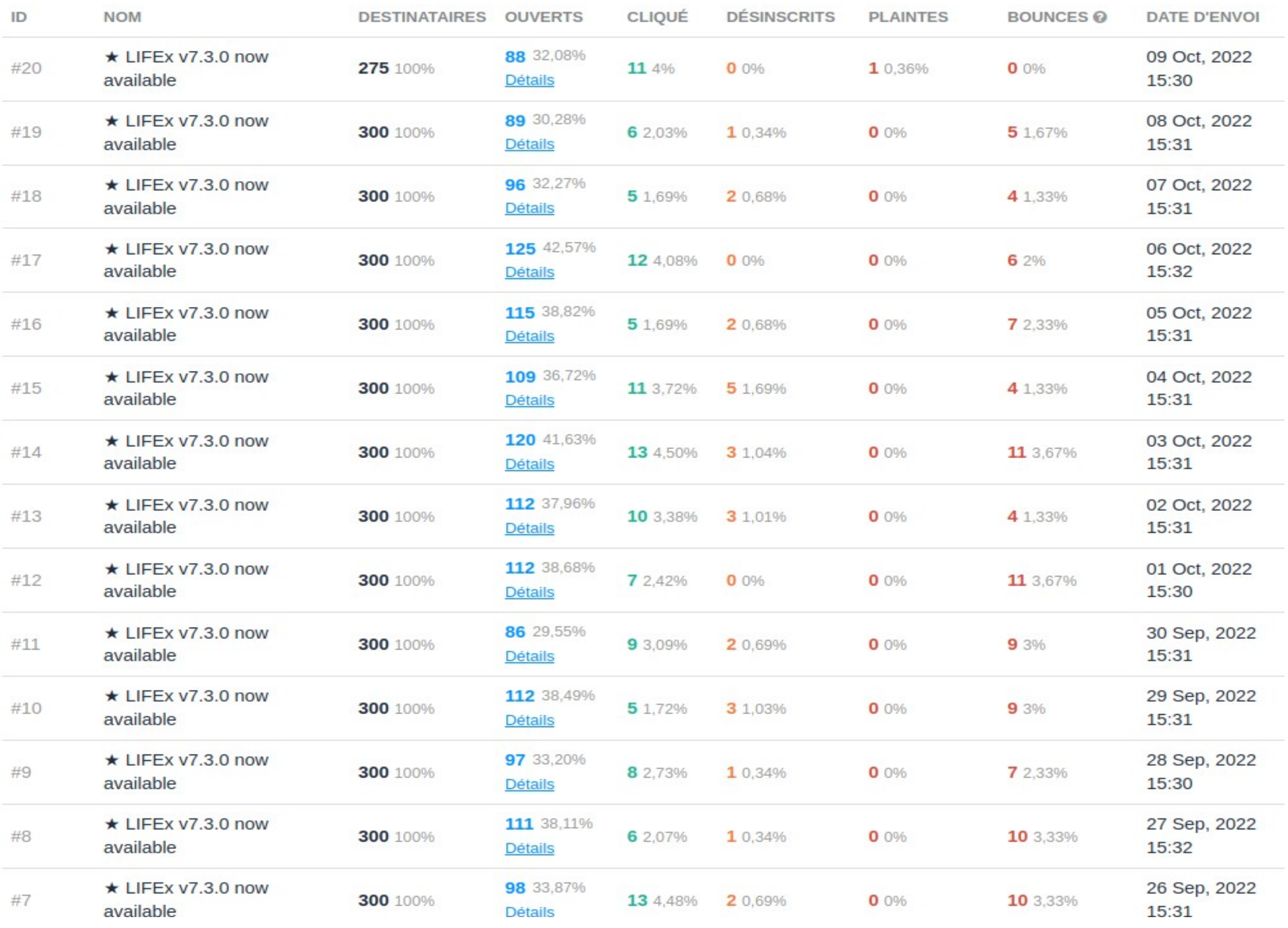
This part will be removed from the next new version campaign.

Compagnes Email

C. Nioche

sendinblue
https://fr.sendinblue.com/

Sending:
300 mails / 20 days

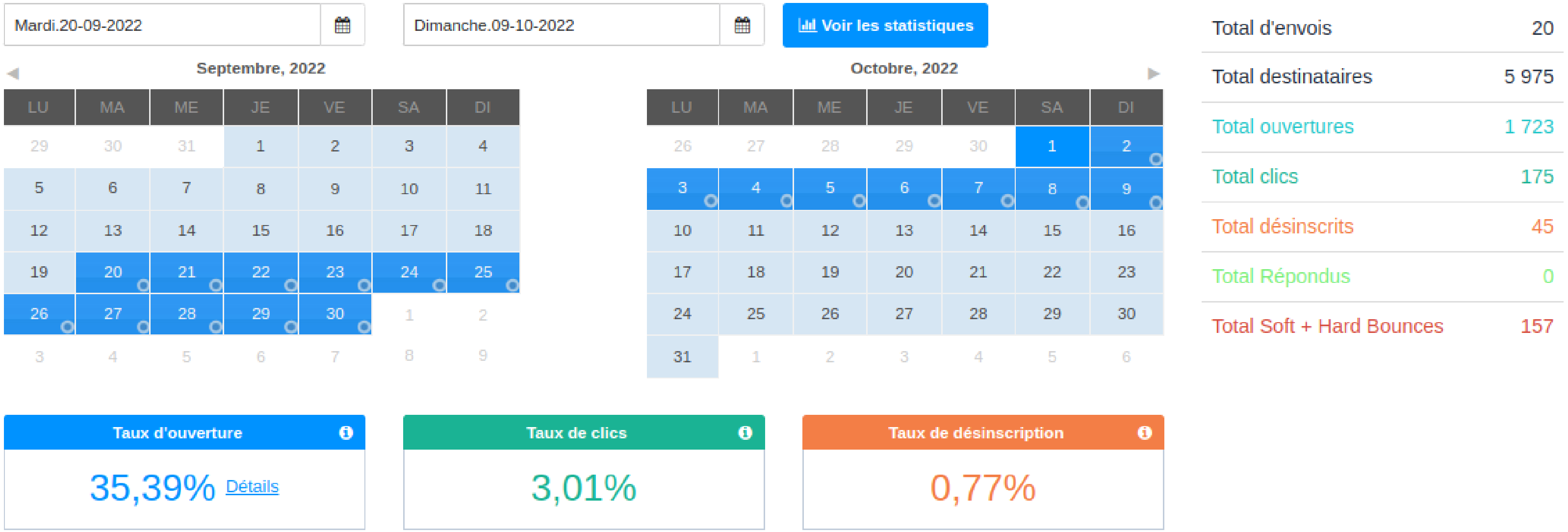


ID	NOM	DESTINATAIRES	OUVERTS	CLIQUÉ	DÉSINSCRITS	PLAINTES	BOUNCES	DATE D'ENVOI
#20	★ LIFEx v7.3.0 now available	275 100%	88 32,08% Détails	11 4%	0 0%	1 0,36%	0 0%	09 Oct, 2022 15:30
#19	★ LIFEx v7.3.0 now available	300 100%	89 30,28% Détails	6 2,03%	1 0,34%	0 0%	5 1,67%	08 Oct, 2022 15:31
#18	★ LIFEx v7.3.0 now available	300 100%	96 32,27% Détails	5 1,69%	2 0,68%	0 0%	4 1,33%	07 Oct, 2022 15:31
#17	★ LIFEx v7.3.0 now available	300 100%	125 42,57% Détails	12 4,08%	0 0%	0 0%	6 2%	06 Oct, 2022 15:32
#16	★ LIFEx v7.3.0 now available	300 100%	115 38,82% Détails	5 1,69%	2 0,68%	0 0%	7 2,33%	05 Oct, 2022 15:31
#15	★ LIFEx v7.3.0 now available	300 100%	109 36,72% Détails	11 3,72%	5 1,69%	0 0%	4 1,33%	04 Oct, 2022 15:31
#14	★ LIFEx v7.3.0 now available	300 100%	120 41,63% Détails	13 4,50%	3 1,04%	0 0%	11 3,67%	03 Oct, 2022 15:31
#13	★ LIFEx v7.3.0 now available	300 100%	112 37,96% Détails	10 3,38%	3 1,01%	0 0%	4 1,33%	02 Oct, 2022 15:31
#12	★ LIFEx v7.3.0 now available	300 100%	112 38,68% Détails	7 2,42%	0 0%	0 0%	11 3,67%	01 Oct, 2022 15:30
#11	★ LIFEx v7.3.0 now available	300 100%	86 29,55% Détails	9 3,09%	2 0,69%	0 0%	9 3%	30 Sep, 2022 15:31
#10	★ LIFEx v7.3.0 now available	300 100%	112 38,49% Détails	5 1,72%	3 1,03%	0 0%	9 3%	29 Sep, 2022 15:31
#9	★ LIFEx v7.3.0 now available	300 100%	97 33,20% Détails	8 2,73%	1 0,34%	0 0%	7 2,33%	28 Sep, 2022 15:30
#8	★ LIFEx v7.3.0 now available	300 100%	111 38,11% Détails	6 2,07%	1 0,34%	0 0%	10 3,33%	27 Sep, 2022 15:32
#7	★ LIFEx v7.3.0 now available	300 100%	98 33,87% Détails	13 4,48%	2 0,69%	0 0%	10 3,33%	26 Sep, 2022 15:31

Compagnes Email

C. Nioche

sendinblue
https://fr.sendinblue.com/



Mardi.20-09-2022

Dimanche.09-10-2022

Septembre, 2022

LU	MA	ME	JE	VE	SA	DI
29	30	31	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	29	30	1	2
3	4	5	6	7	8	9

Octobre, 2022

LU	MA	ME	JE	VE	SA	DI
26	27	28	29	30	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	29	30
31	1	2	3	4	5	6

Total d'envois	20
Total destinataires	5 975
Total ouvertures	1 723
Total clics	175
Total désinscrits	45
Total Répondus	0
Total Soft + Hard Bounces	157

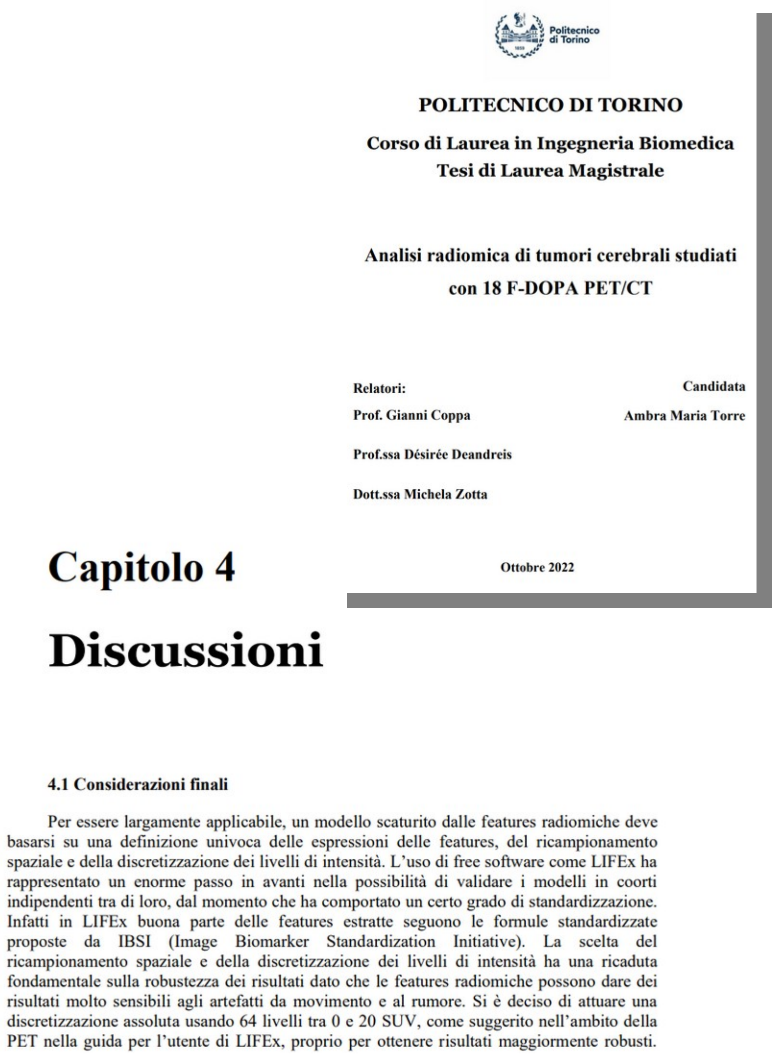
Taux d'ouverture: 35,39% Détails

Taux de clics: 3,01%

Taux de désinscription: 0,77%

Users testimonials

C. Nioche



Politecnico di Torino

POLITECNICO DI TORINO

Corso di Laurea in Ingegneria Biomedica
Tesi di Laurea Magistrale

Analisi radiomica di tumori cerebrali studiati
con 18 F-DOPA PET/CT

Relatori:	Candidata
Prof. Gianni Coppa	Ambra Maria Torre
Prof.ssa Désirée Deandreis	
Dott.ssa Michela Zotta	

Ottobre 2022

Capitolo 4

Discussioni

4.1 Considerazioni finali

Per essere largamente applicabile, un modello scaturito dalle features radiomiche deve basarsi su una definizione univoca delle espressioni delle features, del ricampionamento spaziale e della discretizzazione dei livelli di intensità. L'uso di free software come LIFEx ha rappresentato un enorme passo in avanti nella possibilità di validare i modelli in coorti indipendenti tra di loro, dal momento che ha comportato un certo grado di standardizzazione. Infatti in LIFEx buona parte delle features estratte seguono le formule standardizzate proposte da IBSI (Image Biomarker Standardization Initiative). La scelta del ricampionamento spaziale e della discretizzazione dei livelli di intensità ha una ricaduta fondamentale sulla robustezza dei risultati dato che le features radiomiche possono dare dei risultati molto sensibili agli artefatti da movimento e al rumore. Si è deciso di attuare una discretizzazione assoluta usando 64 livelli tra 0 e 20 SUV, come suggerito nell'ambito della PET nella guida per l'utente di LIFEx, proprio per ottenere risultati maggiormente robusti.

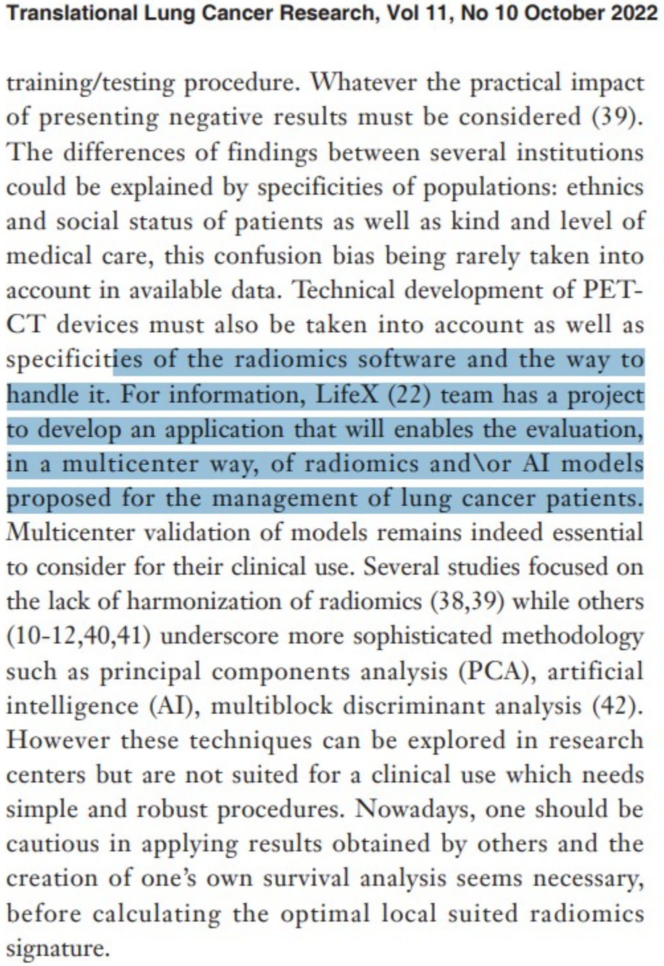
> AM Torre. **Analisi radiomica di tumori cerebrali studiati con 18F-DOPA PET/CT Radiomics analysis of brain tumor studied with 18F-DOPA PET/CT** – PhD 2022

In order to be widely applicable, a model derived from radiomic features must be based on an unambiguous definition of feature expressions, spatial resampling and discretization of intensity levels. The use of free software such as LIFEx represented a huge step forward in the possibility of validating models in independent cohorts, since it entailed a certain degree of standardisation.
In fact, in LIFEx most of the features extracted follow the standardised formulae proposed by IBSI (Image Biomarker Standardisation Initiative). The choice of spatial resampling and discretisation of intensity levels has a fundamental impact on the robustness of the results, given that radiomic features can be very sensitive to motion artefacts and noise. It was decided to implement absolute discretisation using 64 levels between 0 and 20 SUVs, as suggested in the PET user's guide of LIFEx, precisely to obtain more robust results.

Users testimonials

C. Nioche

Hannequin P, Decroisette C, Kermanach P, Berardi G, Bourbonne V. **FDG PET and CT radiomics in diagnosis and prognosis of non-small-cell lung cancer.** Transl Lung Cancer Res 2022;11(10):2051-2063. doi: 10.21037/tlcr-22- 158



Translational Lung Cancer Research, Vol 11, No 10 October 2022

training/testing procedure. Whatever the practical impact of presenting negative results must be considered (39). The differences of findings between several institutions could be explained by specificities of populations: ethnics and social status of patients as well as kind and level of medical care, this confusion bias being rarely taken into account in available data. Technical development of PET-CT devices must also be taken into account as well as specificities of the radiomics software and the way to handle it. For information, LifeX (22) team has a project to develop an application that will enables the evaluation, in a multicenter way, of radiomics and\or AI models proposed for the management of lung cancer patients. Multicenter validation of models remains indeed essential to consider for their clinical use. Several studies focused on the lack of harmonization of radiomics (38,39) while others (10-12,40,41) underscore more sophisticated methodology such as principal components analysis (PCA), artificial intelligence (AI), multiblock discriminant analysis (42). However these techniques can be explored in research centers but are not suited for a clinical use which needs simple and robust procedures. Nowadays, one should be cautious in applying results obtained by others and the creation of one's own survival analysis seems necessary, before calculating the optimal local suited radiomics signature.

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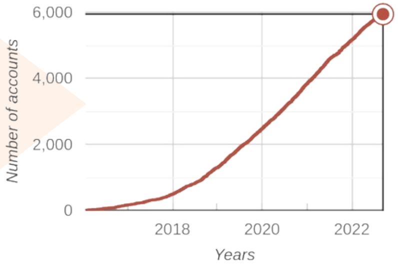
Acknowledgements

Dear LIFEx users,

We are pleased to announce the release of LIFEx v7.4.0

We would like to take this opportunity to thank all 6.700 LIFEx users for their feedback and relevant suggestions. We took into account your comments to enhance the software and produce this version.
We hope you will enjoy it.

Do not hesitate to download this new release and replace your old LIFEx version. Your feedback will always be welcome.

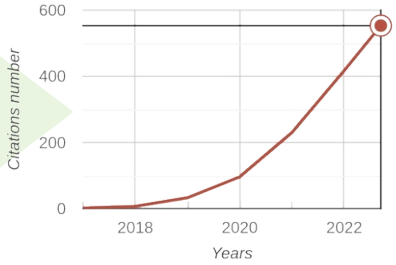


Evolution of the number of accounts (from our site web)

LIFEx is free of charge.

Please help us to keep it free by always quoting the LIFEx reference: (see below)

Please note that the correct reference to be cited is:
C Nioche, F Orlhac, S Boughdad, S Reuzé, J Goya-Outi, C Robert, C Pellot-Barakat, M Soussan, F Frouin, and I Buvat. LIFEx: a freeware for radiomic feature calculation in multimodality imaging to accelerate advances in the characterization of tumor heterogeneity. Cancer Research 2018; 78(16):4786-4789



Evolution of the number of citing LIFEx (from PubMed)

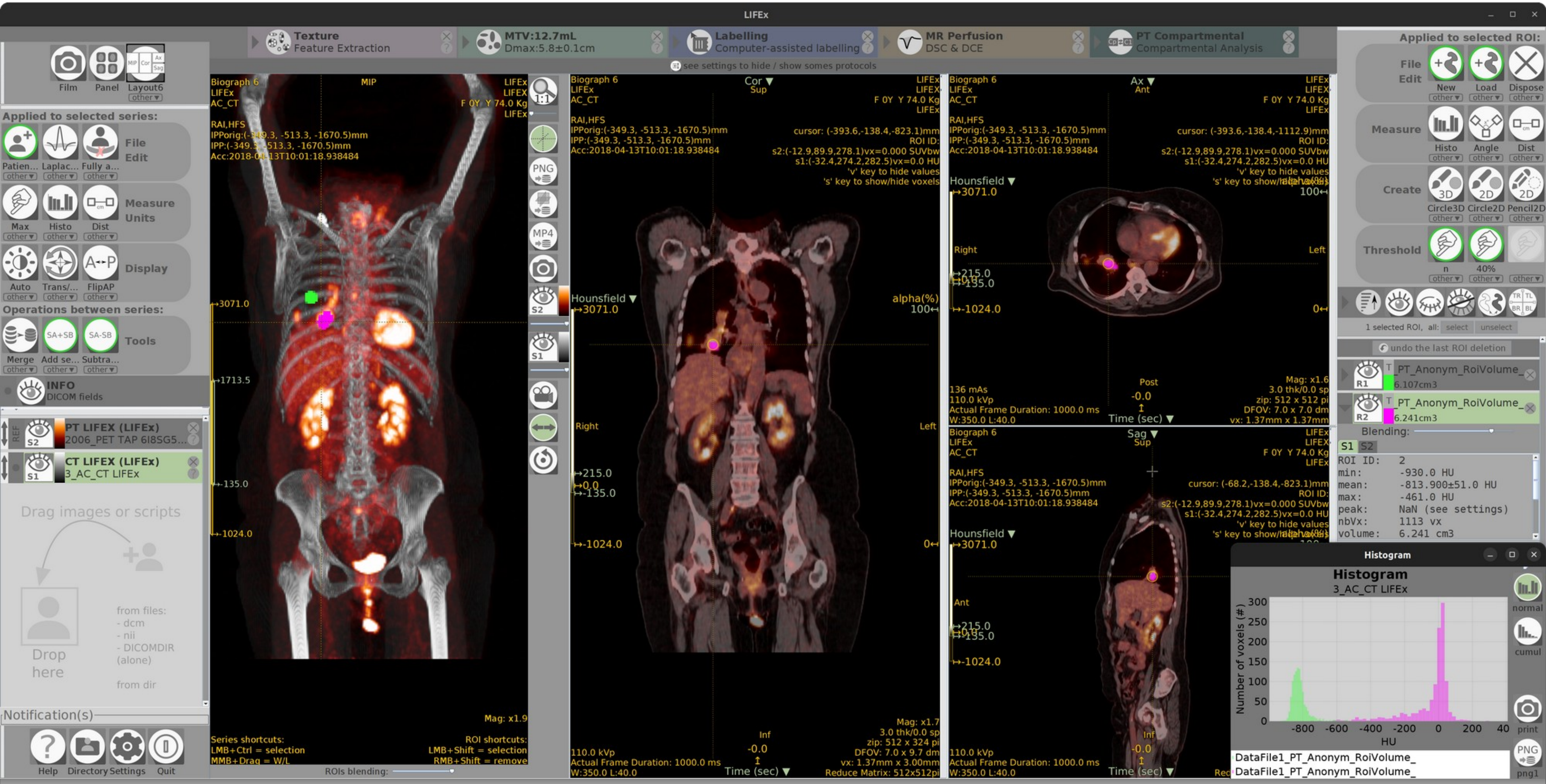
LIFEx v7.4.0

Annoucement

— LIFEx —

Interface screenshot

C. Nioche



```
ROI ID:    2
min:       -930.0 HU
mean:      -813.900±51.0 HU
max:       -461.0 HU
peak:      NaN (see settings)
nbVx:      1113 vx
volume:    6.241 cm3
```

RAI,HFS
IPPorig:(-349.3, -513.3, -1670.5)mm
IPP:(-349.3, -513.3, -1670.5)mm
Acc:2018-04-13T10:01:18.938484

cursor: (-393.6,-138.4,-823.1)mm
s2:(-12.9,89.9,278.1)vx=0.000 SUVbw
s1:(-32.4,274.2,282.5)vx=0.0 HU
'v' key to hide values
's' key to show/hide voxels

136 mAs
110.0 kVp
Actual Frame Duration: 1000.0 ms
W:350.0 L:40.0

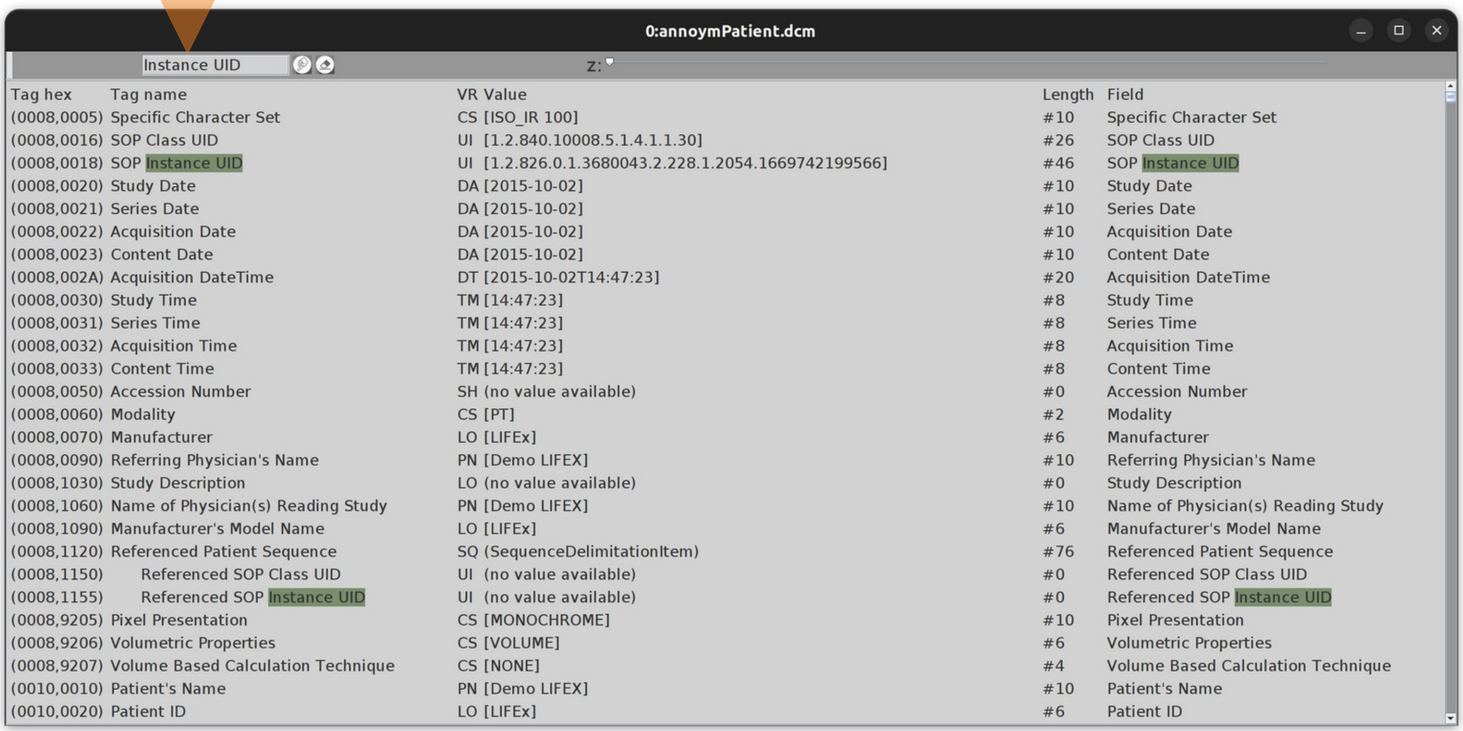
Mag: x1.6
3.0 thk/0.0 sp
zip: 512 x 512 pi
DFOV: 7.0 x 7.0 dm
vx: 1.37mm x 1.37mm
Reduce Matrix: 512x512pi

The Laboratory of Translational Imaging in Oncology is a mixed research unit supported by Inserm (=French NIH) and Institut Curie, the 1st cancer center in France.

CONTENTS

Main / Series updates

Main:
- added: search field in DICOM viewer
- fixed: (group, item) of DICOM tag in viewer DICOM



0:annoymPatient.dcm

Instance UID

```
Tag hex     Tag name                                    VR Value                                                 Length  Field
(0008,0005) Specific Character Set                      CS [ISO_IR 100]                                          #10     Specific Character Set
(0008,0016) SOP Class UID                               UI  [1.2.840.10008.5.1.4.1.1.30]                          #26     SOP Class UID
(0008,0018) SOP Instance UID                            UI  [1.2.826.0.1.3680043.2.228.1.2054.1669742199566]      #46     SOP Instance UID
(0008,0020) Study Date                                  DA [2015-10-02]                                          #10     Study Date
(0008,0021) Series Date                                 DA [2015-10-02]                                          #10     Series Date
(0008,0022) Acquisition Date                            DA [2015-10-02]                                          #10     Acquisition Date
(0008,0023) Content Date                                DA [2015-10-02]                                          #10     Content Date
(0008,002A) Acquisition DateTime                        DT [2015-10-02T14:47:23]                                 #20     Acquisition DateTime
(0008,0030) Study Time                                  TM [14:47:23]                                            #8      Study Time
(0008,0031) Series Time                                 TM [14:47:23]                                            #8      Series Time
(0008,0032) Acquisition Time                            TM [14:47:23]                                            #8      Acquisition Time
(0008,0033) Content Time                                TM [14:47:23]                                            #8      Content Time
(0008,0050) Accession Number                            SH (no value available)                                  #0      Accession Number
(0008,0060) Modality                                    CS [PT]                                                  #2      Modality
(0008,0070) Manufacturer                                LO [LIFEx]                                               #6      Manufacturer
(0008,0090) Referring Physician's Name                  PN [Demo LIFEX]                                          #10     Referring Physician's Name
(0008,1030) Study Description                           LO (no value available)                                  #0      Study Description
(0008,1060) Name of Physician(s) Reading Study          PN [Demo LIFEX]                                          #10     Name of Physician(s) Reading Study
(0008,1090) Manufacturer's Model Name                   LO [LIFEx]                                               #6      Manufacturer's Model Name
(0008,1120) Referenced Patient Sequence                 SQ (SequenceDelimitationItem)                            #76     Referenced Patient Sequence
(0008,1150)      Referenced SOP Class UID               UI  (no value available)                                 #0      Referenced SOP Class UID
(0008,1155)      Referenced SOP Instance UID            UI  (no value available)                                 #0      Referenced SOP Instance UID
(0008,9205) Pixel Presentation                          CS [MONOCHROME]                                          #10     Pixel Presentation
(0008,9206) Volumetric Properties                       CS [VOLUME]                                              #6      Volumetric Properties
(0008,9207) Volume Based Calculation Technique          CS [NONE]                                                #4      Volume Based Calculation Technique
(0010,0010) Patient's Name                              PN [Demo LIFEX]                                          #10     Patient's Name
(0010,0020) Patient ID                                  LO [LIFEx]                                               #6      Patient ID
```

Main / Series updates

C. Nioche

What has been added, changed or updated in this new release?
Here is a list of the most significant additions, changes or updates in LIFEx v7.4.0

Main:
- added: new layout (MIP Ax Cor Sag)

MIP:
- improved: window blocking under heavy use
- improved: increase default alpha blending of ROI on MIP frame
- fixed: mouse button operations are available on MacOS system
- improved: add "Click" and "Click40" tools on MIP frame with Shift+LMB
- improved: remove ROI on MIP frame with Shift+RMB

Series:
- added: shift of slice location with Ctrl+Mouse move (with takes into account the mouse displacement to calculate the shift location)
- fixed: ROIs don't disappear anymore after a screenshot of all view frames (.png)
- fixed: when binary file with orientation (ROI for example) is read to add a series,
  then the NEAREST_NEIGHBOR interpolation is chosen
  instead of the QUINTIC_LAGRANGIAN interpolation
- fixed: a bug prevented the series sorting from being done correctly

CONTENTS

Protocols updates

LIFEx v7.4.0

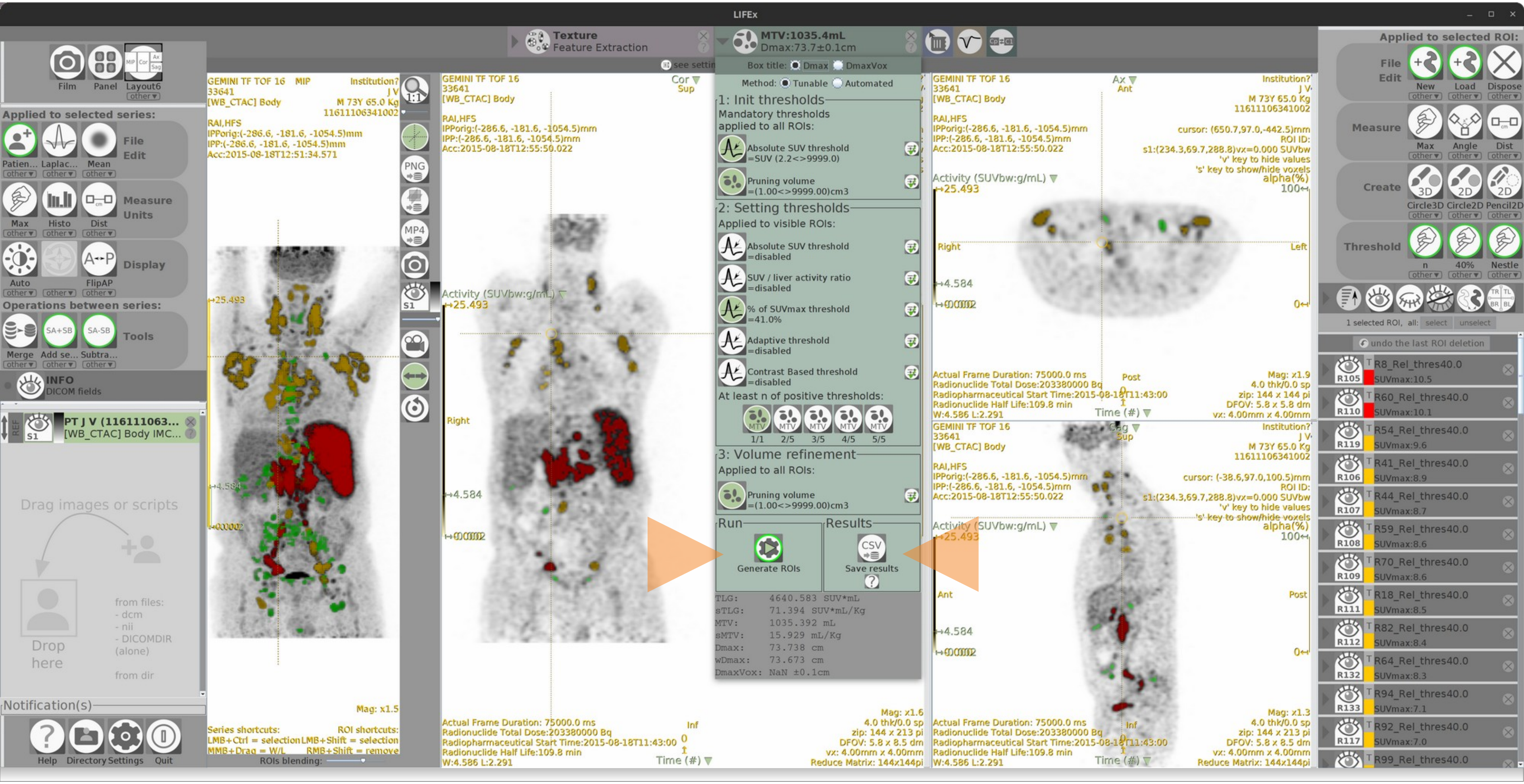
Annoucement

— LIFEx —

MTV updates

C. Nioche

The MTV results has become independent of the generation of ROIs
→ i.e. it can therefore now be saved with already existing ROIs



MTV:1035.4mL
Dmax:73.7±0.1cm

Box title: ● Dmax ○ DmaxVox

Method: ● Tunable ○ Automated

1: Init thresholds
Mandatory thresholds applied to all ROIs:
- Absolute SUV threshold =SUV (2.2<>9999.0)
- Pruning volume =(1.00<>9999.00)cm3

2: Setting thresholds
Applied to visible ROIs:
- Absolute SUV threshold =disabled
- SUV / liver activity ratio =disabled
- % of SUVmax threshold =41.0%
- Adaptive threshold =disabled
- Contrast Based threshold =disabled

At least n of positive thresholds: 1/1 2/5 3/5 4/5 5/5

3: Volume refinement
Applied to all ROIs:
- Pruning volume =(1.00<>9999.00)cm3

Run: Generate ROIs

Results: CSV Save results

```
TLG:      4640.583 SUV*mL
sTLG:     71.394 SUV*mL/Kg
MTV:      1035.392 mL
sMTV:     15.929 mL/Kg
Dmax:     73.738 cm
wDmax:    73.673 cm
DmaxVox:  NaN ±0.1cm
```

LITO

The Laboratory of Translational Imaging in Oncology is a mixed research unit supported by Inserm (=French NIH) and Institut Curie, the 1st cancer center in France.

LIFEx v7.4.0

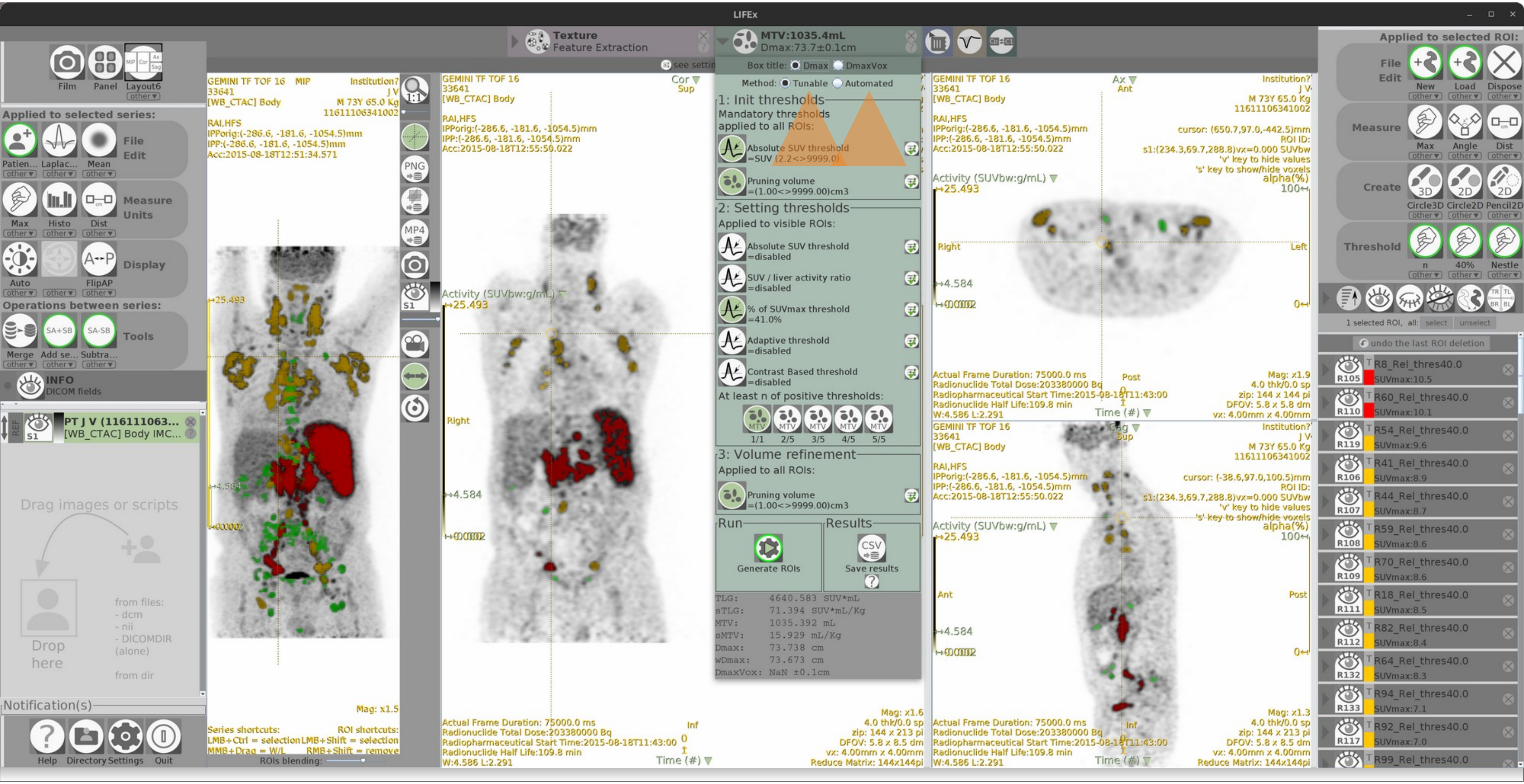
Annoucement

— LIFEx —

MTV updates

C. Nioche

New automated method (without input parameters) to generating ROIs



MTV:1035.4mL
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- Pruning volume =(1.00<>9999.00)cm3

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Applied to visible ROIs:

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- % of SUVmax threshold =41.0%
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At least n of positive thresholds: 1/1 2/5 3/5 4/5 5/5

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Applied to all ROIs:

- Pruning volume =(1.00<>9999.00)cm3

```
TLG:      4640.583 SUV*mL
sTLG:     71.394 SUV*mL/Kg
MTV:      1035.392 mL
sMTV:     15.929 mL/Kg
Dmax:     73.738 cm
wDmax:    73.673 cm
DmaxVox: NaN ±0.1cm
```

1 selected ROI, all: select unselect

undo the last ROI deletion

ROI	Name	SUVmax
R105	R8_Rel_thres40.0	SUVmax:10.5
R110	R60_Rel_thres40.0	SUVmax:10.1
R119	R54_Rel_thres40.0	SUVmax:9.6
R106	R41_Rel_thres40.0	SUVmax:8.9
R107	R44_Rel_thres40.0	SUVmax:8.7
R108	R59_Rel_thres40.0	SUVmax:8.6
R109	R70_Rel_thres40.0	SUVmax:8.6
R111	R18_Rel_thres40.0	SUVmax:8.5
R112	R82_Rel_thres40.0	SUVmax:8.4
R132	R64_Rel_thres40.0	SUVmax:8.3
R133	R94_Rel_thres40.0	SUVmax:7.1
R117	R92_Rel_thres40.0	SUVmax:7.0
	R99_Rel_thres40.0	

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LIFEx v7.4.0

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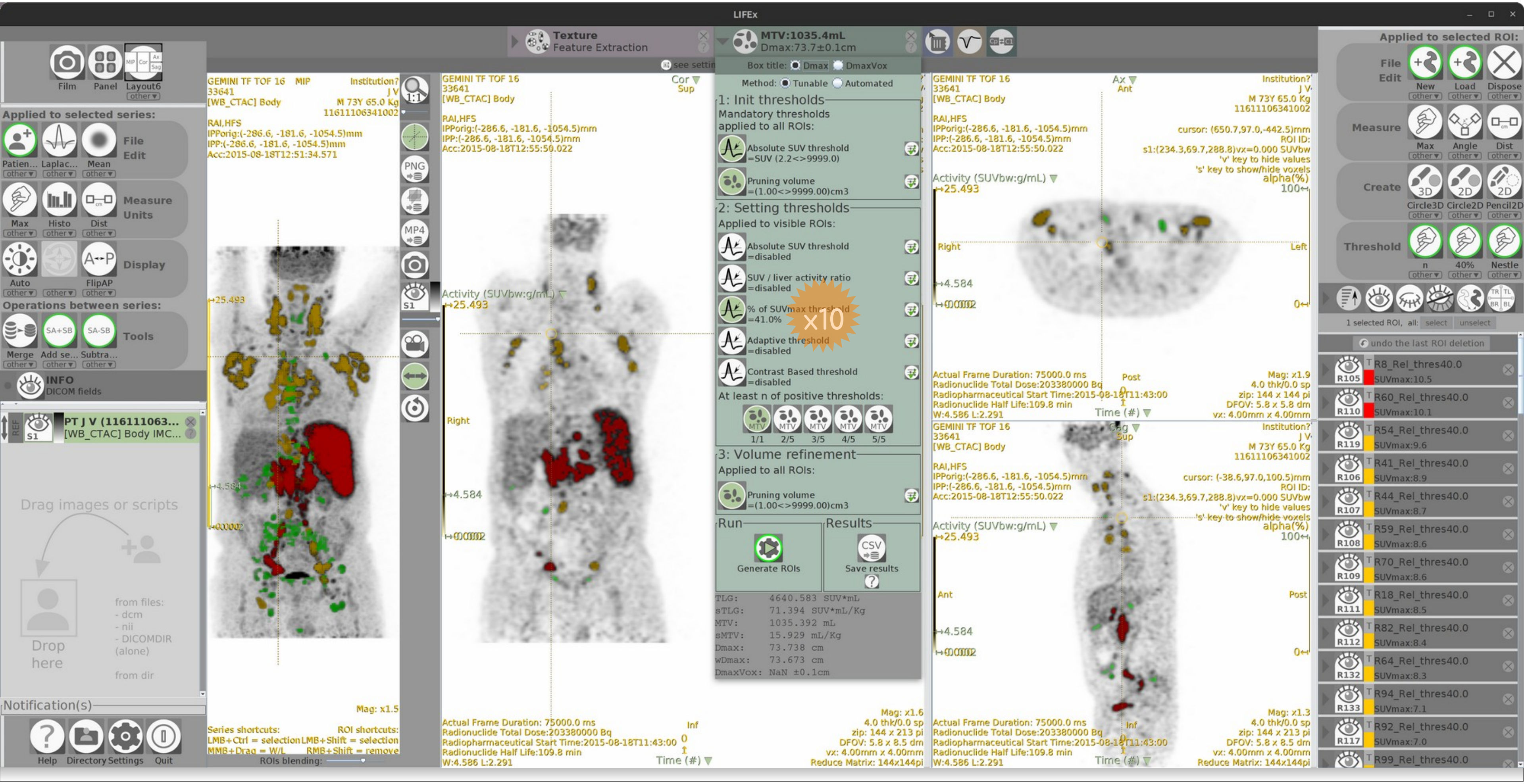
MTV updates

C. Nioche

Acceleration (x10) of the tunable segmentation process

x10



MTV:1035.4mL
Dmax:73.7±0.1cm

Box title: ● Dmax ○ DmaxVox

Method: ● Tunable ○ Automated

1: Init thresholds
Mandatory thresholds applied to all ROIs:
- Absolute SUV threshold =SUV (2.2<>9999.0)
- Pruning volume =(1.00<>9999.00)cm3

2: Setting thresholds
Applied to visible ROIs:
- Absolute SUV threshold =disabled
- SUV / liver activity ratio =disabled
- % of SUVmax threshold =41.0%
- Adaptive threshold =disabled
- Contrast Based threshold =disabled

At least n of positive thresholds: 1/1 2/5 3/5 4/5 5/5

3: Volume refinement
Applied to all ROIs:
- Pruning volume =(1.00<>9999.00)cm3

Run: Generate ROIs

Results: Save results

```
TLG:      4640.583 SUV*mL
sTLG:     71.394 SUV*mL/Kg
MTV:      1035.392 mL
sMTV:     15.929 mL/Kg
Dmax:     73.738 cm
wDmax:    73.673 cm
DmaxVox: NaN ±0.1cm
```

ROI	Name	SUVmax
R105	R8_Rel_thres40.0	SUVmax:10.5
R110	R60_Rel_thres40.0	SUVmax:10.1
R119	R54_Rel_thres40.0	SUVmax:9.6
R106	R41_Rel_thres40.0	SUVmax:8.9
R107	R44_Rel_thres40.0	SUVmax:8.7
R108	R59_Rel_thres40.0	SUVmax:8.6
R109	R70_Rel_thres40.0	SUVmax:8.6
R111	R18_Rel_thres40.0	SUVmax:8.5
R112	R82_Rel_thres40.0	SUVmax:8.4
R132	R64_Rel_thres40.0	SUVmax:8.3
R133	R94_Rel_thres40.0	SUVmax:7.1
R117	R92_Rel_thres40.0	SUVmax:7.0
	R99_Rel_thres40.0	

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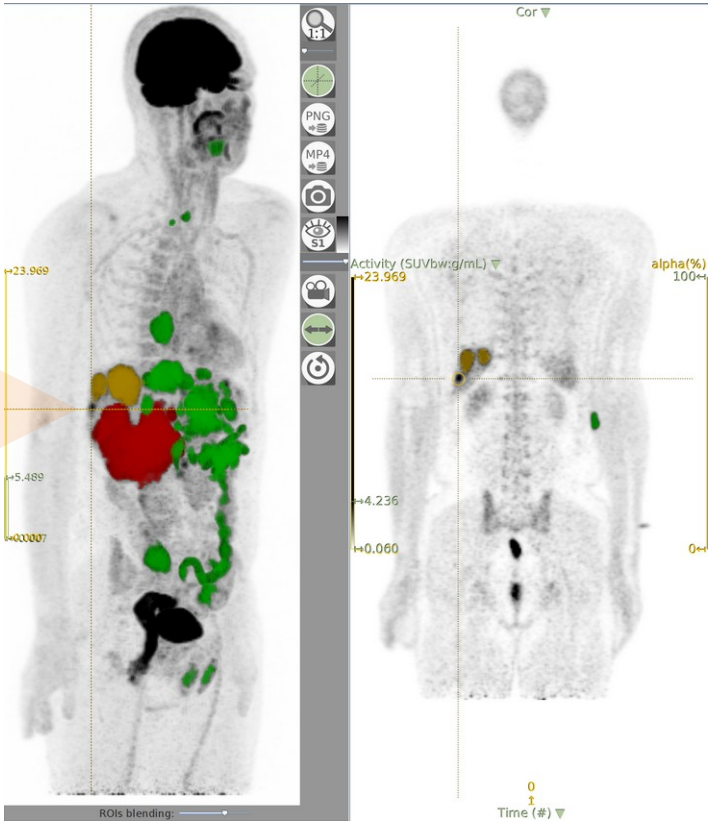
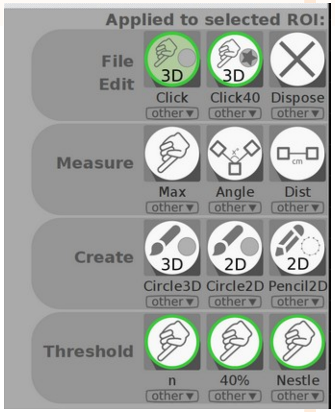
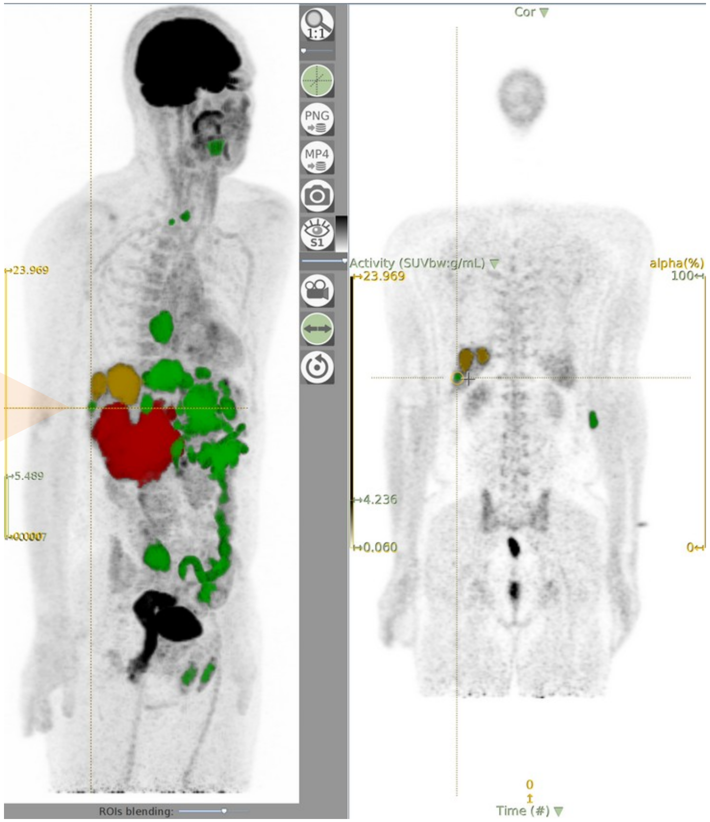
LIFEx v7.4.0
Annoucement
— LIFEx —

MTV updates
C. Nioche

MIP updates







MTV updates

C. Nioche

3D Click other▼

To remember the algorithm:
Click&Draw

3D Click40 other▼

To remember the algorithm:
Click40&Draw

Click&Draw

Creates a VOI using the following approach:

- reading of the intensity (I) of **the point the user clicked on**
- 3D flood filler algorithm stopped at I ∗ 70/100 = SegF
- if volume(SegF) > 500cm3 = error "Out of allowed size"
- Imax = maximum intensity in SegF
- Nestle threshold (with beta = 0.3 and Imax) = ThresN
- VOI = 3D flood filler algorithm from the user point and stopped at ThresN

The result might be similar to that obtained using 40% thresholding but will be more robust to the background signal surrounding the tumor area. This click and draw method is part of the adaptive threshold menu.

(specially designed for PET images)

Click40&Draw

The "click40" method is a variant tool.
The step SegF is made :
with I ∗ 40/100
instead of I ∗ 70/100.

(specially designed for PET images)

MTV updates

C. Nioche

MTV updates (summary)

Article definition	LIFEx <v7.3.1	LIFEx >= v7.3.4	LIFEx Legend
MTV	MTV(mL)	MTV(mL)	The tumor volume
TLG	TLG(SUV*mL)	TLG(SUV*mL)	MTV * SUVmean
SUVmean	SUVmean(SUV)	SUVmean(SUV)	The mean SUV value of the VOI
SUVmax	SUVmax(SUV)	SUVmax(SUV)	The SUV of the voxel with the highest SUV within the VOI
SUVpeak	no exist	MAX_peakmL(SUV)	The SUV of the 3mL with the highest SUV within the VOI (global peak)
Number of lesions	NumberOfROI	NumberOfROI	The number of separated lesion selections within the VOI
Dmax	Dmax	Dmax	The maximum distance between two lesions
DmaxBulk	MaxBindCOM(cm)	DmaxBulk(cm)	The maximum distance between the largest lesion and any other lesion
Spread	no exist	SUM_sumBindCOM(cm)	The sum of the distance between all lesions
SpreadBulk	sumBindCOM(cm)	BulkSumBindCOM(cm)	The sum of the distance between the largest lesion and all other lesions
Dvol	no exist	DiffVolBulkSmallest(mL)	The difference in volume between the largest and the smallest lesion
VolSpread	no exist	VolSpread	The sum of the differences in volume between all lesions
VolSpreadBulk	no exist	VolSpreadBulk	The sum of the differences in volume between the largest lesion and all other lesions
DSUVmax	no exist	DiffSUVmax	The difference in SUVmax between the lesion with the highest SUVmax and the lesion with the lowest SUVmax
DSUVmaxSum	no exist	DiffSUVmaxSum	The sum of the differences in SUVMax of all lesions
DSUVmaxBulk	no exist	DiffSUVmaxBulk	The difference in SUVmax between the largest lesion and the minimum of all SUVmax of other lesions
DSUVmaxSumBulk	no exist	DiffSUVmaxSumBulk	The sum of the differences in SUVmax between the largest lesion and all other lesions
DSUVmaxSumHot	no exist	DiffSUVmaxSumHot	The sum of the differences in SUVmax between the lesion with the highest SUVmax and all SUVmax of other lesions
DSUVpeak	no exist	DiffSUVpeak	The difference in SUVpeak between the lesion with the highest SUVpeak and the lesion with the lowest SUVpeak
DSUVpeakSum	no exist	DiffSUVpeakSum	The sum of the differences in SUVpeak of all lesions
DSUVpeakBulk	no exist	DiffSUVpeakBulk	The differences between the SUVpeak of the largest lesion and the SUVpeak of the lowest SUVpeak of all other lesions
DSUVpeakSumBulk	no exist	DiffSUVpeakSumBulk	The sum of the differences in SUVpeak between the largest lesion and all other lesions
DSUVpeakSumHot	no exist	DiffSUVpeakSumHot	The sum of the differences between the lesion with the highest SUVpeak and SUVpeak of all other lesions

Julia Driessen, Gerben JC Zwezerijnen, Heiko Schöder, Esther EE Drees, Marie José Kersten, Alison J Moskowitz, Craig H Moskowitz, Jakoba J Eertink, Henrica CW De Vet, Otto S Hoekstra, Joseé M Zijlstra, Ronald Boellaard. **The impact of semi-automatic segmentation methods on metabolic tumor volume, intensity and dissemination radiomics in 18F-FDG PET scans of patients with classical Hodgkin lymphoma.** Journal of Nuclear Medicine Jan 2022, jnumed.121.263067; DOI: 10.2967/jnumed.121.263067

MTV updates

C. Nioche

MTV protocol:

- added: legend of feature names on result file
- added: SUM_sumBindCOM(cm) feature (Spread feature -> The sum of the distances between all lesions)
- added: SUM_sumBindWCOM(cm) feature (sum of all bind WCOM of all ROI)
- added: SUVpeak0.5mL(SUV) feature
- added: SUVpeak1mL(SUV) feature
- added: NumberOfROI feature
- added: DiffVolBulkSmallest(mL) feature -> The difference in volume between the largest and the smallest lesions
- added: VolSpread feature -> The sum of the differences in volume between all lesions
- added: VolSpreadBulk feature -> The sum of the differences in volume between the largest lesion and all other lesions
- added: DiffSUVmax feature -> The difference in SUVmax between the lesion with the highest SUVmax and the lesion with the lowest SUVmax
- added: DiffSUVmaxSum feature -> The sum of the differences in SUVMax of all lesions
- added: DiffSUVmaxBulk feature -> The difference in SUVmax between the largest lesion and the minimum of all SUVmax of other lesions
- added: DSUVmaxSumBulk feature -> The sum of the differences in SUVmax between the largest lesion and all other lesions
- added: DiffSUVmaxSumHot feature -> The sum of the differences in SUVmax between the lesion with the highest SUVmax and all SUVmax of other lesions
- added: DiffSUVpeak feature -> The difference in SUVpeak between the lesion with the highest SUVpeak and the lesion with the lowest SUVpeak
- added: DiffSUVpeakSum feature -> The sum of the differences in SUVpeak of all lesions
- added: DiffSUVpeakBulk feature -> The differences between the SUVpeak of the largest lesion and the SUVpeak of the lowest SUVpeak of all other lesions
- added: DiffSUVpeakSumBulk feature -> The sum of the differences in SUVpeak between the largest lesion and all other lesions
- added: DiffSUVpeakSumHot feature -> The sum of the differences between the lesion with the highest SUVpeak and SUVpeak of all other lesions
- fixed: the minimum values are no longer zero.
- fixed: sum of all bind of COM is corrected
- changed: the MTV result has become independent of the automatic generation of ROIs: the MTV results can therefore now be saved with already existing ROIs
- changed: an extra digit after the decimal point of MTV (mL) feature
- changed: MTV script gives the same features as the "Save results" button of the protocol
- changed: COM**ofROI** feature is renamed into COM
- changed: **Weighted**COMOfROI feature is renamed into WCOM
- changed: sumBindCOM(cm) feature is renamed into **Bulk**SumBindCOM (sum of the distance between the largest lesion and all other lesions=SpreadBulk feature)
- changed: avBindCOM(cm) feature is renamed into **BulkMean**BindCOM(cm)
- changed: stdBindCOM(cm) feature is renamed into **Bulk**StdBindCOM(cm)
- changed: minBindCOM(cm) feature is renamed into **Bulk**MinBindCOM(cm)
- changed: maxBindCOM(cm) feature is renamed into **Bulk**MaxBindCOM(cm)
- changed: avTotBindCOM(cm) feature is renamed into **BulkMean**BindCOM(cm)
- changed: COM(vx) feature is renamed into **Bulk**COM(vx)
- changed: wCOM(vx) feature is renamed into **Bulk**WCOM(vx)
- changed: sumBindWeightedCOM(cm) feature is renamed into **Bulk**SumBindWCOM(cm)
- changed: avBindWeightedCOM feature is renamed into **BulkMean**BindWCOM(cm)
- changed: stdBindWeightedCOM feature is renamed into **Bulk**StdBindWCOM(cm)
- changed: minBindWeightedCOM feature is renamed into **Bulk**MinBindWCOM(cm)
- changed: avTotBindWeightedCOM feature is renamed into **BulkMean**BindWCOM(cm)

Texture updates

C. Nioche

Texture protocol:
- added: areaUnderCurveCsh feature is now calculated on CT with negative intensities
- changed: AreaUnderCurveCsh renamed into AreaUnderCurveCIVH (Cumulative Intensity Volume Histogram)
- changed: in AreaUnderCurveCsh, binsize is (maximumGreyLevel - minimumGreyLevel) / 1000
  → IBSI, Intensity-volume histogram features / Arbitrary intensity units
- changed: Range feature is renamed into **Intensity**Range
- changed: Mean feature is renamed into Mean**Intensity**
- changed: Variance feature is renamed into **Intensity**Variance
- changed: Skewness feature is renamed into **Intensity**Skewness
- changed: Kurtosis feature is renamed into **Intensity**Kurtosis
- changed: Median feature is renamed into Median**Intensity**
- changed: MinimumGreyLevel feature is renamed into Minimum**Intensity**
- changed: MaximumGreyLevel feature is renamed into Maximum**Intensity**
- changed: 10thPercentile feature is renamed into 10th**Intensity**Percentile
- changed: 25thPercentile feature is renamed into 25th**Intensity**Percentile
- changed: 50thPercentile feature is renamed into 50th**Intensity**Percentile
- changed: 75thPercentile feature is renamed into 75th**Intensity**Percentile
- changed: 90thPercentile feature is renamed into 90th**Intensity**Percentile
- changed: InterquartileRange feature is renamed into **Intensity**InterquartileRange
- changed: MeanAbsoluteDeviation feature is renamed into **IntensityBased**MeanAbsoluteDeviation
- changed: RobustMeanAbsoluteDeviation feature is renamed into **IntensityBased**RobustMeanAbsoluteDeviation
- changed: MedianAbsoluteDeviation feature is renamed into **IntensityBased**MedianAbsoluteDeviation
- changed: CoefficientOfVariation feature is renamed into **IntensityBased**CoefficientOfVariation
- changed: QuartileCoefficientOfDispersion feature is renamed into **IntensityBased**QuartileCoefficientOfDispersion
- changed: Energy feature is renamed into **IntensityBased**Energy
- changed: RootMeanSquare is renamed into RootMeanSquare**Intensity**

CONTENTS

ROI updates

C. Nioche

Quick editing
with predefined organ names

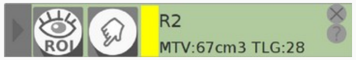
Quick edition

Recent items
- Mediastinum X
- Pancreas X
- Skin X
- Spine X

Predefined Organ
- Adrenal-glands
- Aorta
- Bone
- Bone-marrow
- Brain
- Breast
- Bronchi
- Esophagus
- Ear
- Eye
- Gallbladder
- Heart
- Kidneys
- Interstitium
- Large bowel
- Larynx
- Liver
- Lungs
- Mediastinum
- Muscular
- Nasal-cavity
- Oesphageal
- Osteo-medullary
- Pancreas
- Paramedullary
- Parathyroid-glands
- Pelvis
- Peritoneum
- Pineal-gland
- Pituitary-gland
- Pharynx
- Pleural
- Prostate
- Rectum
- Retroperitoneum
- Skin
- Small-bowel
- Soft-tissue
- Spine
- Spleen
- Sternum
- Stomach
- Subcutaneous
- Trachea
- Thyroid-gland
- Thymus
- Urinary-Bladder
- Urethra
- Ureter
- Uterus

Predefined Lymph Node
- Abdomen-LN
- Axillary-LN
- Cervical-LN
- Common-iliac-LN
- Internal-iliac-LN
- External-iliac-LN
- Deep-cervical-LN
- Deep-inguinal-LN
- Chest-LN
- Head-LN
- Hilaire-liver-LN
- Liver-hilus-LN
- Inguinal-LN
- Inferior-deep-cervical-LN
- Mediastinal-LN
- Mastoid-LN
- Neck-LN
- Occipital-LN
- Pelvic-LN
- Parotid-LN
- Periaortic-LN
- Popliteal-LN
- Preaortic-LN
- Retro-aortic-LN
- Retro-peritoneal-LN
- Retro-clavicular-LN
- Retro-crural-LN
- Sacral-LN
- Superficial-inguinal-LN
- Supraclavicular-LN

ROI:
Old display options (v7.3.0)

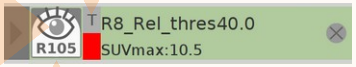


R2
MTV:67cm3 TLG:28

ROI:
New display options (v7.4.0)

one-click:
Localize max value

double-clicks:
On/Off display



R8_Rel_thres40.0
SUVmax:10.5

Display ID on icon

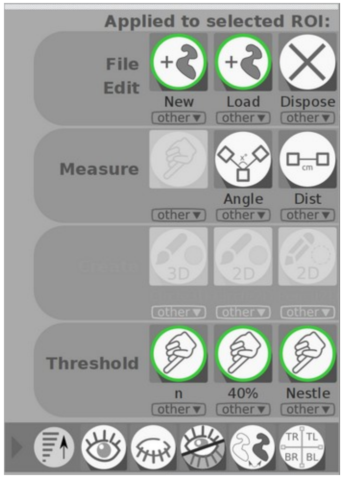
LIFEx v7.4.0

Annoucement

— LIFEx —

ROI multi-selection

C. Nioche



new display tool bar

2 new buttons for un/select all

R105 R8_Rel_thres40.0 SUVmax:10.5
R110 R60_Rel_thres40.0 SUVmax:10.1
R119 R54_Rel_thres40.0 SUVmax:9.6
R106 R41_Rel_thres40.0 SUVmax:8.9
R107 R44_Rel_thres40.0 SUVmax:8.7
R108 R59_Rel_thres40.0 SUVmax:8.6
R109 R70_Rel_thres40.0 SUVmax:8.6
R111 R18_Rel_thres40.0 SUVmax:8.5
R112 R82_Rel_thres40.0 SUVmax:8.4
R132 R64_Rel_thres40.0 SUVmax:8.3
R133 R94_Rel_thres40.0 SUVmax:7.1
R117 R92_Rel_thres40.0 SUVmax:7.0

have a multi selection to make grouped action

R105 R8_Rel_thres40.0 SUVmax:10.5
R110 R60_Rel_thres40.0 SUVmax:10.1
R119 R54_Rel_thres40.0 SUVmax:9.6
R106 R41_Rel_thres40.0 SUVmax:8.9
R107 R44_Rel_thres40.0 SUVmax:8.7
R108 R59_Rel_thres40.0 SUVmax:8.6
R109 R70_Rel_thres40.0 SUVmax:8.6
R111 R18_Rel_thres40.0 SUVmax:8.5
R112 R82_Rel_thres40.0 SUVmax:8.4
R132 R64_Rel_thres40.0 SUVmax:8.3
R133 R94_Rel_thres40.0 SUVmax:7.1
R117 R92_Rel_thres40.0 SUVmax:7.0

quick shortcut
Crtl+A: un/selection all

ROI updates

C. Nioche

ROI:
- deleted: all uint8 of nifti format (keep only uint16 to have more than 16 ROI with Save-M menu)
- added: quick labelling with predefined organ names
- added: remove ROI with click on ROI on image with combined right button mouse and shift (=Shit+RMB)
- changed: All delete actions delete the file (as before) but also unload it from the application.
- improved: creating a new ROI no longer disables the Nii save button
- improved: the volume of SUVpeak1mL is closer to the real desired volume 1mL (the result is not much changed)
- improved: the volume of SUVpeak0.5mL is closer to the real desired volume 0.5mL (the result is not much changed)
- improved: ROIpeak is integrated by default in the basic ROI statistics calculations
- fixed: issue when drawing segmentation with absolute filter threshold activated
- fixed: issue on translate ROI
- fixed: issue on dispose all ROI
- fixed: freeze of union ROI when number of ROI to be merged is greater than 10
- fixed: series not found in ROI comparison tool
- fixed: new alert message if the 3D crosshairs are not in the area to be filled, or the filling is in an open structure.

End of the announcement

don't forget

LIFEx is still evolving

C. Nioche

> Other functionalities are being added every week.
> Stay tuned !
> We hope you go on enjoying LIFEx !

LIFEx is free of charge.

> **Please help us to keep it free** by always quoting the LIFEx reference: (see below)

> Please note that the correct reference to be cited is:
> C Nioche, F Orlhac, S Boughdad, S Reuzé, J Goya-Outi, C Robert, C Pellot-Barakat, M Soussan, F Frouin, and I Buvat. **LIFEx: a freeware for radiomic feature calculation in multimodality imaging to accelerate advances in the characterization of tumor heterogeneity.** Cancer Research 2018; 78(16):4786-4789