



## LIFEx v7.7.0: a software with enhanced functionalities to support reproducible radiomic and AI studies in multimodal imaging

C. Nioche<sup>1</sup>, F. Orhac<sup>1</sup>, N. Hovhannisyani<sup>1</sup>, AS. Cottureau<sup>2</sup>, E Woff<sup>3</sup>, I. Buvat<sup>1</sup>

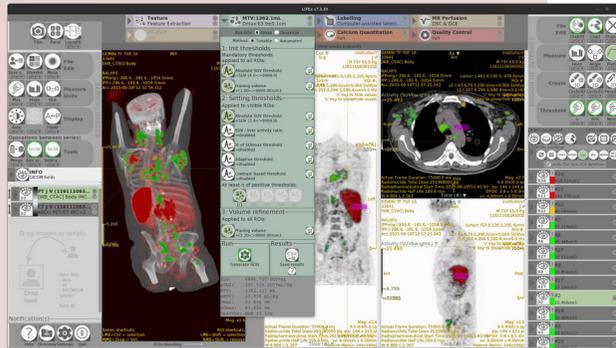
- 1- Institut Curie, Université PSL, Inserm U1288, Laboratory of Translational Imaging in Oncology (LITO), 91440 Orsay, France
- 2- Department of Nuclear Medicine, Cochin Hospital, AP-HP, Université Paris Cité, 75005 Paris, France
- 3- Department of Nuclear Medicine, Institut Jules Bordet, H.U.B, Université libre de Bruxelles (ULB), Brussels, Belgium

## What is LIFEX?

### Local Image Feature Extraction

LIFEx is a **free and well documented software** for automatic measurement of a large number of features characterizing tissue properties from medical images.

LIFEx has been especially designed for **radiologists, nuclear medicine physicians, oncologists, and scientists** involved in *in vivo* medical imaging (no programming skills required).



Download the software



lifexsoft.org



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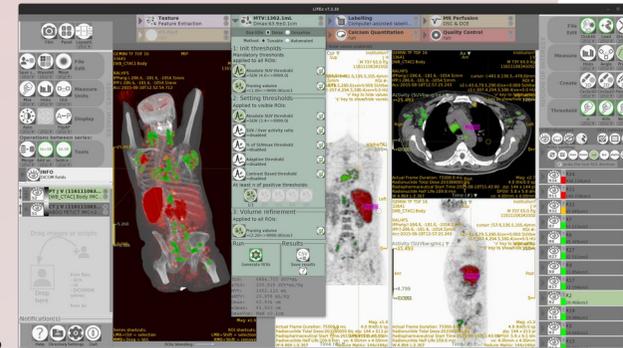
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## Purpose

LIFEx graphical user interface (see below) in which a sample of protocols can be seen on the top (Radiomic feature extraction protocol, Metabolic Tumor Volume (MTV) protocol, Labelling protocol, Calcium quantification protocol, etc).

VOIs automatically segmented using the MTV protocol are shown in color.

The display includes a Maximum Intensity Projection view (left) as well as the axial, coronal and sagittal slices.

LIFEX: a freeware for radiomic feature calculation in multimodality imaging to accelerate advances in the characterization of tumor heterogeneity.

C Nioche, F Orhac, S Boughdad, S Reuzé, J Goya-Outi, C Robert, C Pellot-Barakat, M Soussan, F Frouin, and I Buvat.

Cancer Research 2018; 78(16):4786-4789

## Development strategy

LIFEx complies with the Image Biomarker Standardisation Initiative (IBSI) guidelines by **providing access to 306 histogram, textural and shape indices**. The correct implementation of radiomic feature calculation has been thoroughly checked using IBSI benchmarks. Novel experimental and validated radiomic features have also been implemented.

A careful follow-up of advances in the field and fruitful interactions with users guide LIFEX developments.

A practical annotation module has been developed (Labeling Tool) to meet new needs in image annotation for supervised machine learning.

Image Biomarker Standardisation Initiative. Zwanenburg A et al. Radiology 2020 and Whybro et al. Radiology 2024

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## New biomarkers

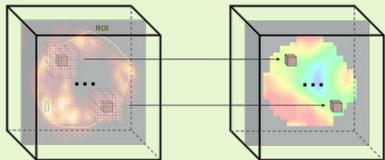
Recently introduced biomarkers, such as the normalized distance from hotspot to centroid (NHOC) reflecting tumor aggressiveness, are now available in LIFEx. Total Metabolic Tumor Volume (MTV) and Dmax from PET/CT images can be easily calculated using a dedicated protocol, including a practical one-click interactive tool to add or remove any high-uptake region from the Maximum Intensity Projection views. When multiple lesions are present, various disease dissemination biomarkers can be automatically calculated.

Hovhannisyani-Baghdasarian N, Luporsi M, Captier N, Nioche C, Cuplov V, Woff E, Hegarat N, Livartowski A, Girard N, Buvat I, Orhac F. Promising Candidate Prognostic Biomarkers in [18F]FDG PET Images: Evaluation in Independent Cohorts of Non-Small Cell Lung Cancer Patients. J Nucl Med. 2024 1;65(4):635-642.

## Radiomic maps

Feature maps are computed using a 3x3x3 voxels kernel and the result is assigned to the central voxel in the resulting 3D feature map.

This process is repeated for all features and all voxels inside the ROI.



Voxel-wise supervised analysis of tumors with multimodal engineered features to highlight interpretable biological patterns. T Escobar, P Pineau, S Vauclin, F Orhac, C Nioche, L Champion, H Brisse, I Buvat. Med Phys 2022

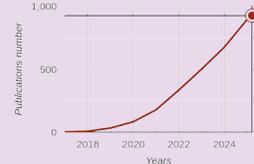
## Training session

We are offering a training session on Radiomics and the use of LIFEx April 23-25, 2025, either on-site in Paris (France) or online. Please follow the QRCode link for information and registration.



## Time line

2025



Publications referencing LIFEx

Newly created website user accounts: 9 400 users

2020



2018

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A COLLECTION OF THE HIGHLIGHTED RESEARCH ARTICLES

2016

First release

## New biomarkers

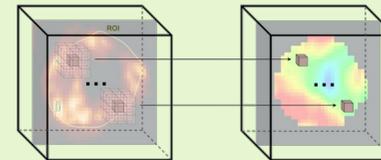
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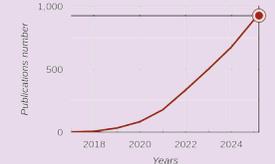
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