UNIVERSIDAD DE MÁLAGA

USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

The SimPET project

A web-based platform for the realistic simulation of brain PET studies based on SimSET and STIR libraries

Powered by QUBIO tech

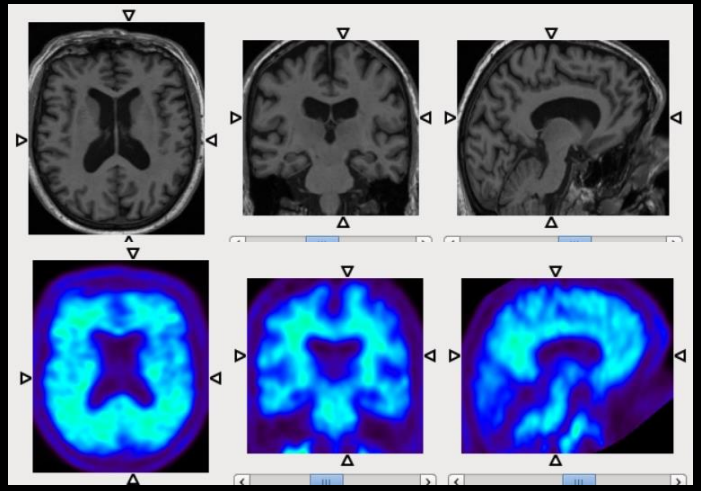
J. Paredes-Pacheco, J. Silva-Rodriguez, A. Ninerola-Baizan, F. J. Lopez-Gonzalez, E. Alonso- Albella, R. Sala-Llonch, D. Ros, N. Roe-Vellve, P. Aguiar

CIMES

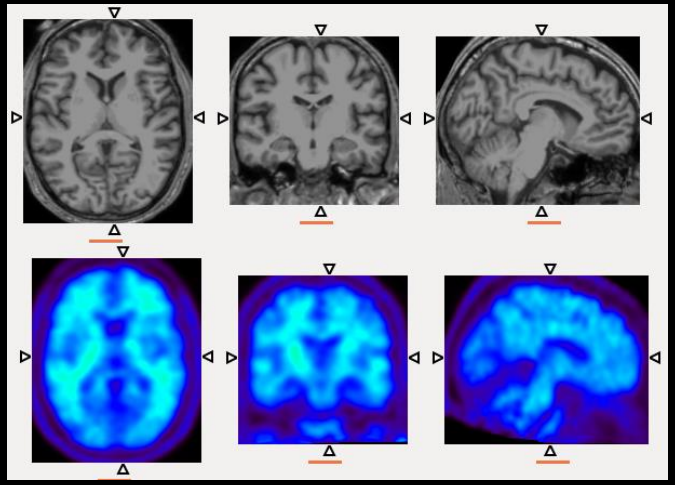
Need for quantification and simulation

Visual analysis is not sufficient:

Poster M-07-356, Moscoso et al.



MCI, non-AD converter (5y)
Positive amyloid PET + hippocampal atrophy



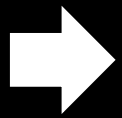
MCI, AD-converter.
Positive amyloid PET, no hippocampal atrophy.

But a 3-parameter model correctly classified them

Need for quantification and simulation

Visual analysis is not sufficient:

- Initial stages of the disease
- Small longitudinal changes
- Texture analysis
- Inputs for automatic classification



Quantification

Simulation: test PET quantification methods

Current simulation softwares

Most of them require:

- Programming expertise
- Validation for each scanner
- Simplified phantoms
- Either Monte Carlo (MC) or deterministic simulation

Aim: SimPET-WEB

- Web platform for the simulation of PET studies
- Free
- Easy-to-use
- Various pre-validated scanners
- Automatic generation of realistic phantoms
- MC and deterministic simulations
- Tomographic reconstruction

Methods: SimSET & STIR

SimSET

- MC tracking (object)
  - Attenuation
  - Scattering
- Simplified detector
- Simulation time: ~10 h

STIR projector

- Analytical simulation
  - Attenuation
  - Scattering (SSS)
- Simplified detector
- Simulation time: ~1 h

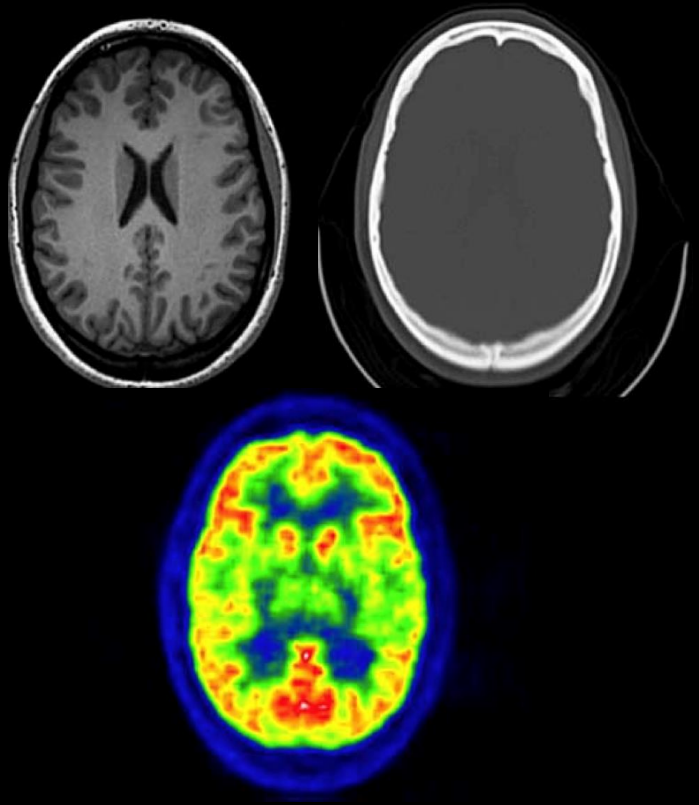
STIR reconstruction

NEMA-validated

- GE Advance
- GE Discovery
- SIEMENS mCT*

Methods: *Brain-VISET*

Input



MRI + CT

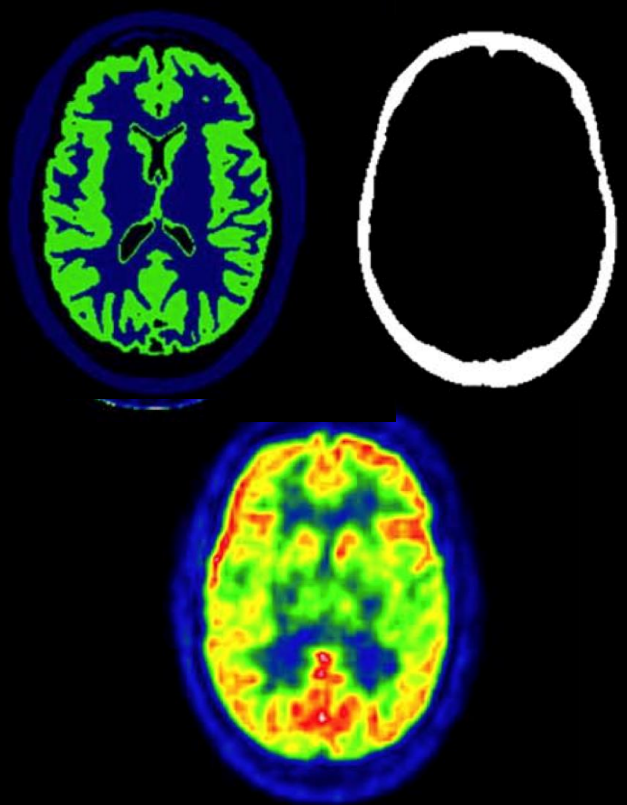
Model

Sinograms
(not shown)

Reconstructed
PET

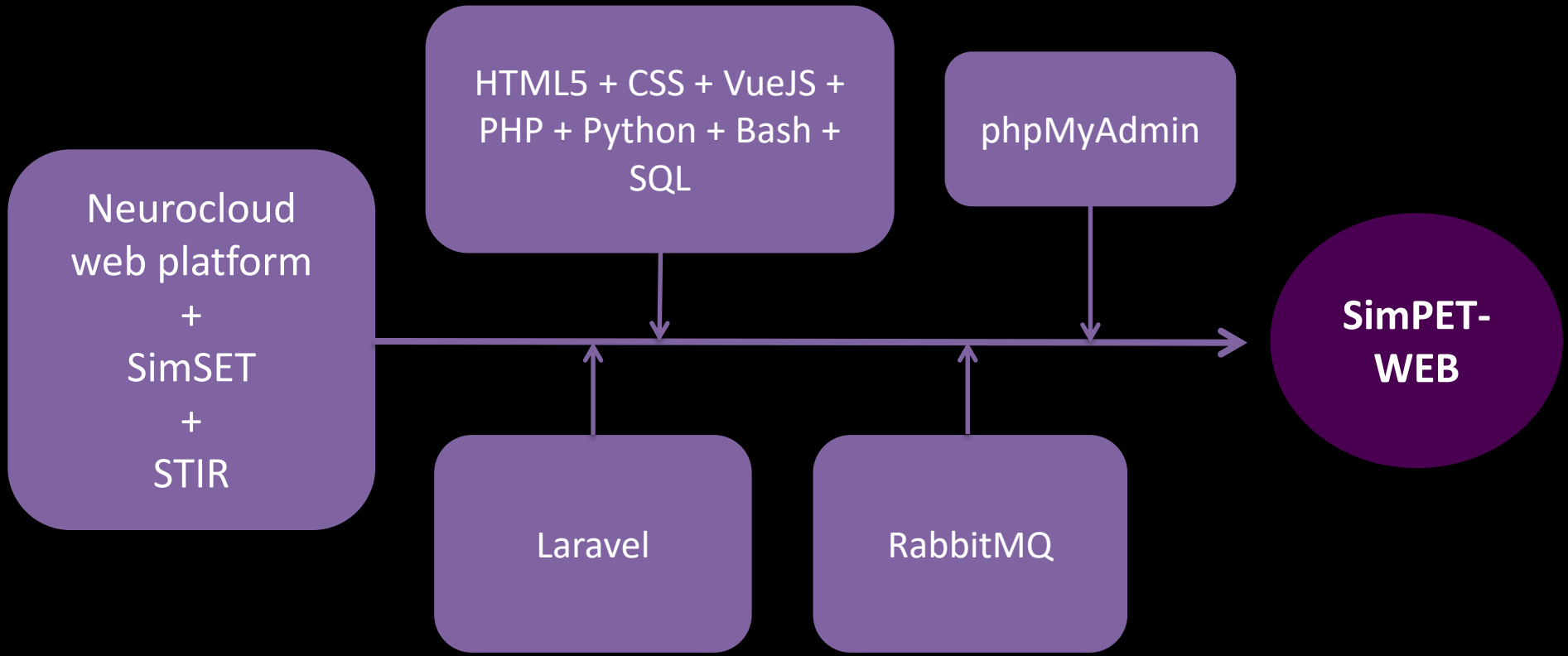
PET

Output

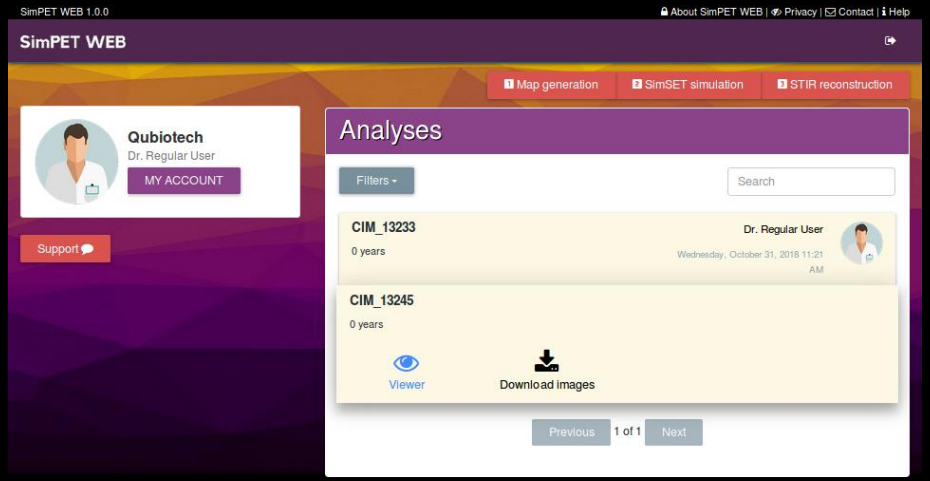


Marti-Fuster et al. IEEE TMI 33(10), 1931:38 (2014)

Methods: Web platform software



Results: SimPET-WEB



Powered by QUBIO

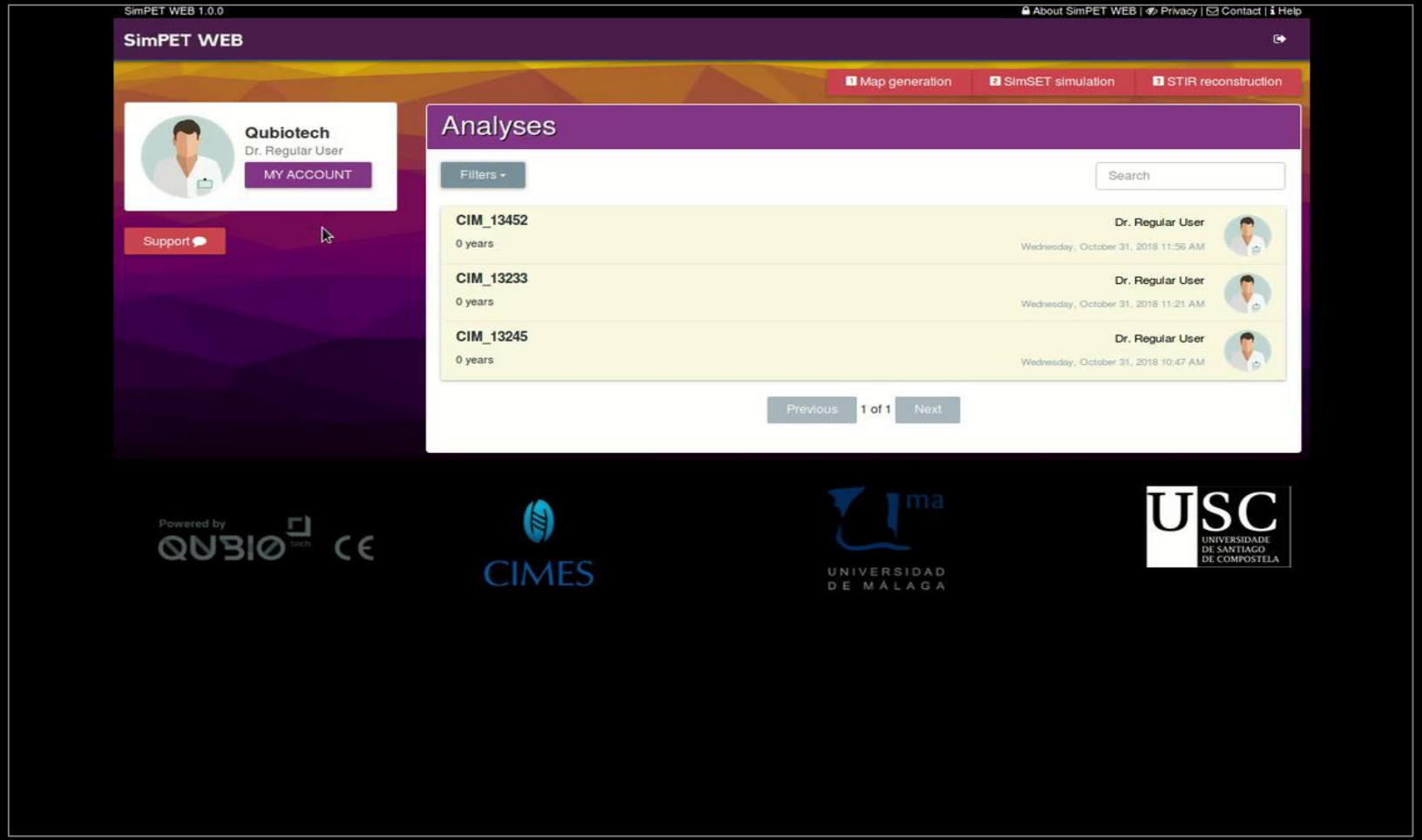
CIMES

UNIVERSIDAD DE MÁLAGA

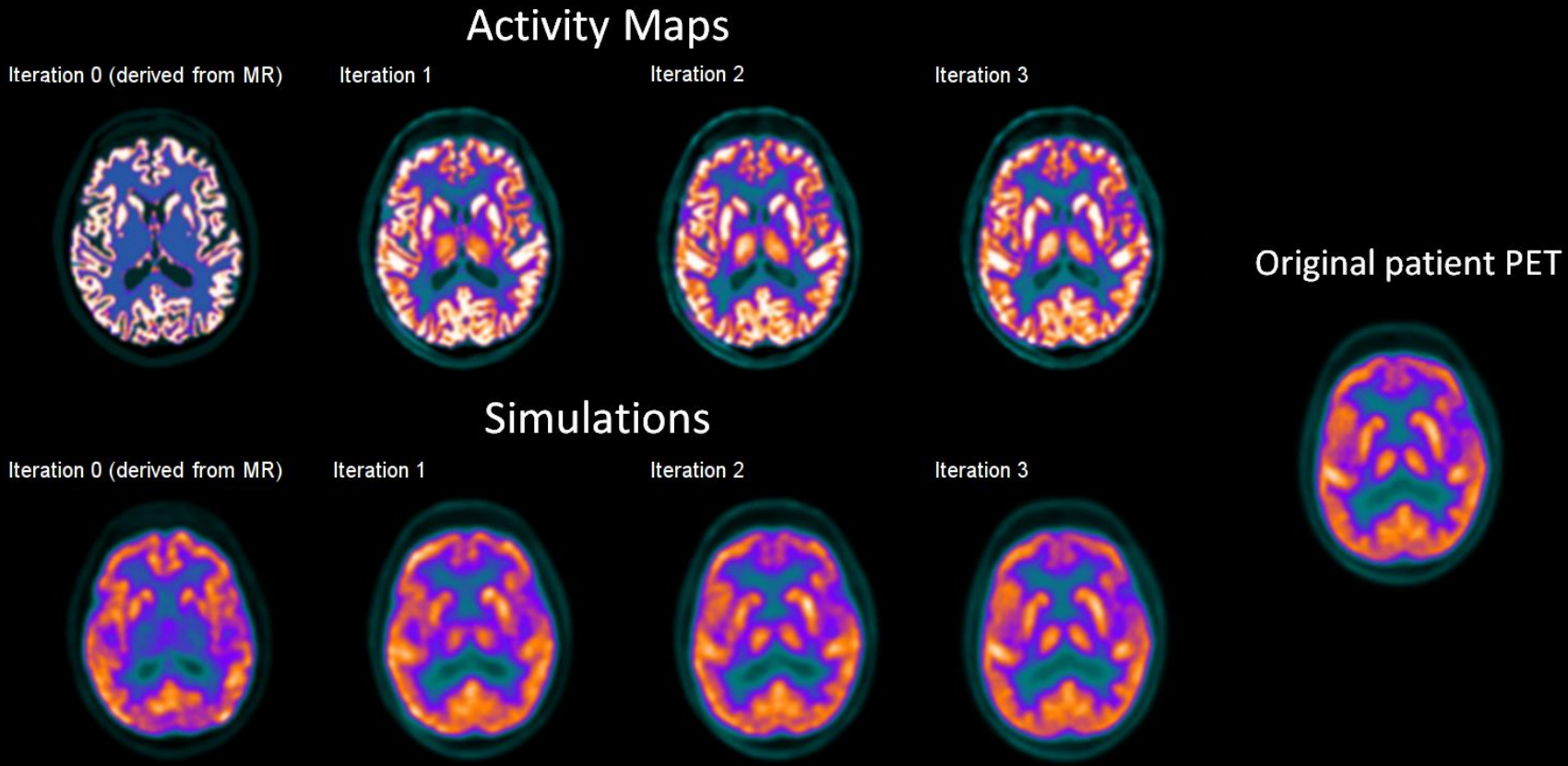
USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

- Attenuation/Activity map generation
- Simulation
- Reconstruction
- Viewer
- Image download

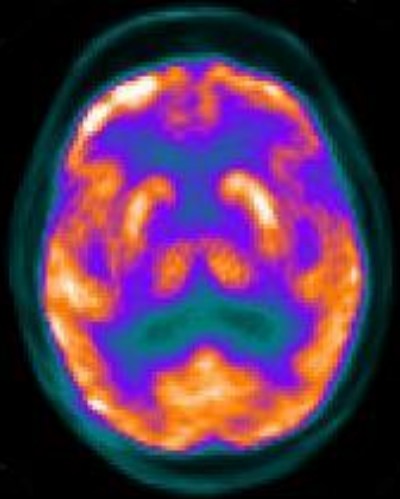
Results: Demonstration video



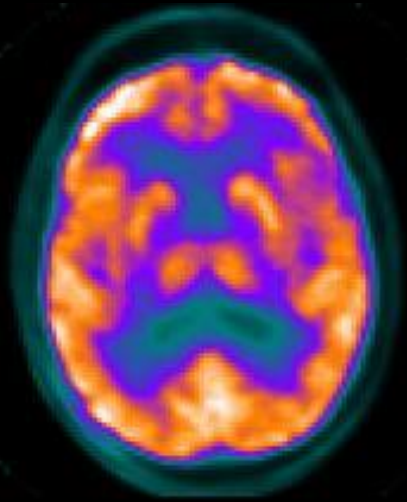
Results: activity map generation



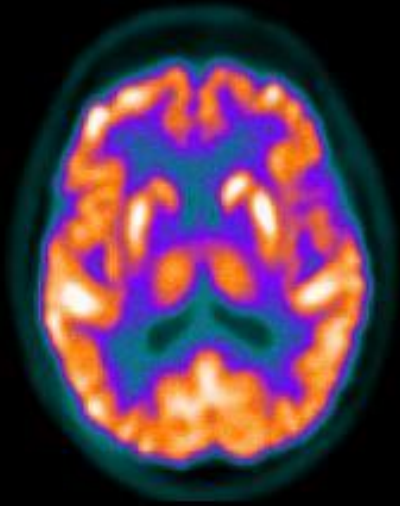
Results: simulated PET studies



GE Advance NXi



GE Discovery STE4



SIEMENS mCT

Conclusions

SimPET-WEB:

- Free & user-friendly web platform for the simulation of PET studies
- Automatic generation of realistic phantoms
- MC and deterministic simulations
- Tomographic reconstruction
- Various validated scanners

Thank you