# Automated Change Detection of Hot-Spots in Intro-Subject

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## 1. Aims of the Project

- Developing a schema for a computer-aided diagnosis system, and via the system the doctors can read the PET-CT images faster.
- Digging out the information about the tumour metastasis between multiple PET-CT scans of a same patients, and quantitatively describe the hot spots.

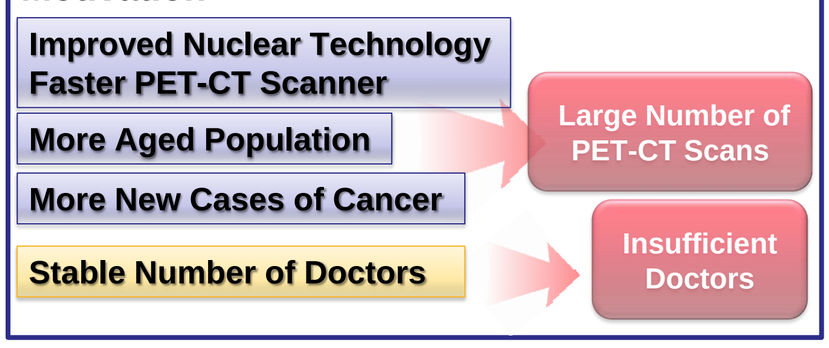
## 2. Introduction

[18F]-fluoro-2-deoxy-D-glucose (FDG)Prosition emission tomography (PET) provide the functional information and the co-registered Computed Tomography (CT) images displays the corresponded anatomical information.

For example, in Australia, 1/4 males and 1/3 females may be diagnosed with cancer before their 75 years old. The cancer is an age-related disease, and the developed countries and some of developing countries are aging.

The medical resources in Australia and all over the world are always insufficient. The lack of radiologists reading the PET/CT images leads the long waiting period before patients get their diagnostic reports. Therefore, the motivation of the project is:

**Motivation**




## 3. Contribution

| | |
|---|---|
| **An idea** | • Comparing and visualizing the metastasis of tumours between different PET-CT **scans** |
| **A schema** | • Using different algorithms and parameters in different tissues and organs |
| **Properties of Hot Spots** | • position, volume, maximum standardized uptake value |

Contribution to Society (National Research Priority)

Help aged people by earlier and faster diagnosing the Cancers, and Promoting their Life Quality.

- Ageing well, ageing productively (Promoting and Maintaining Good Health)

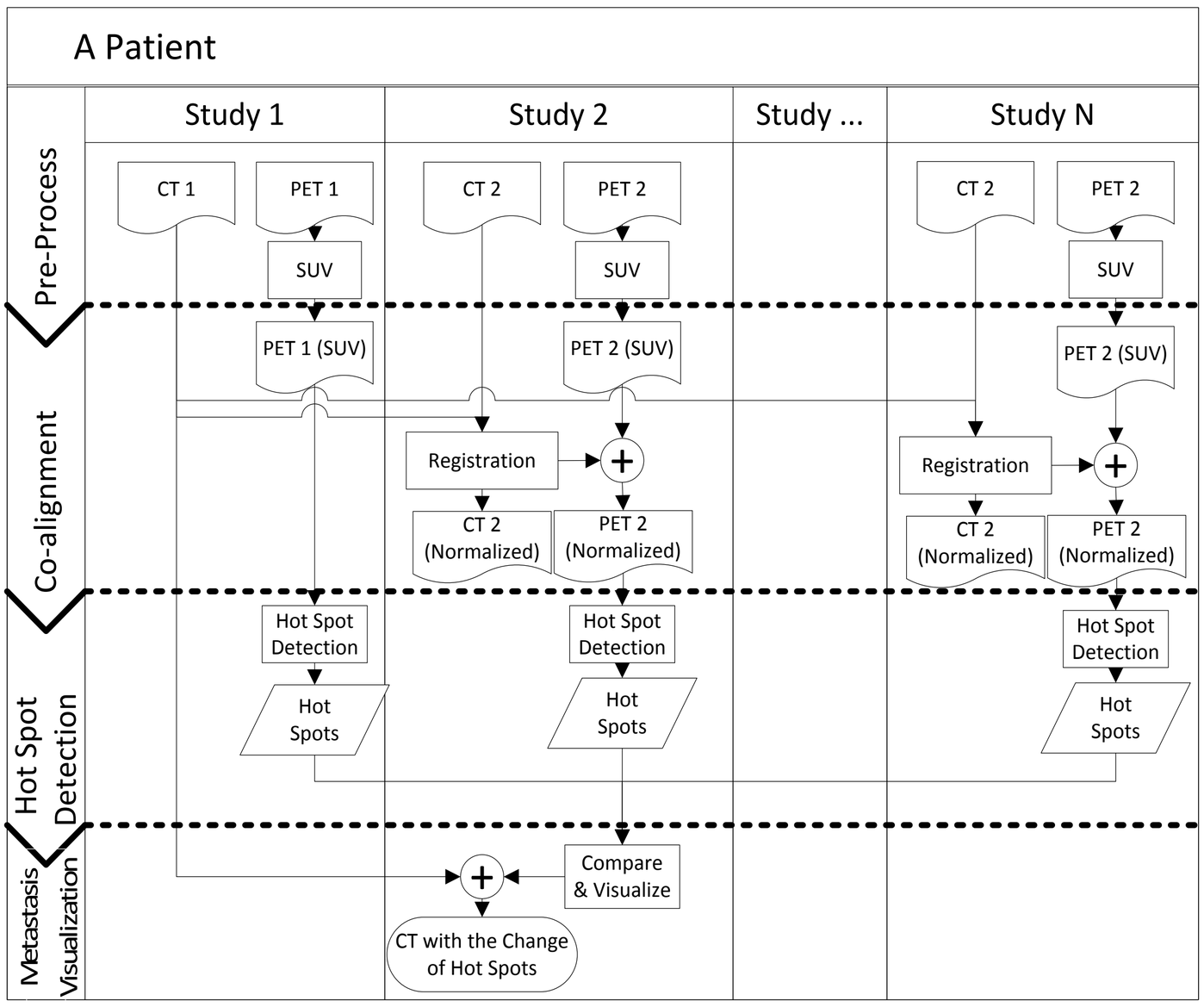
## 4. Methodology

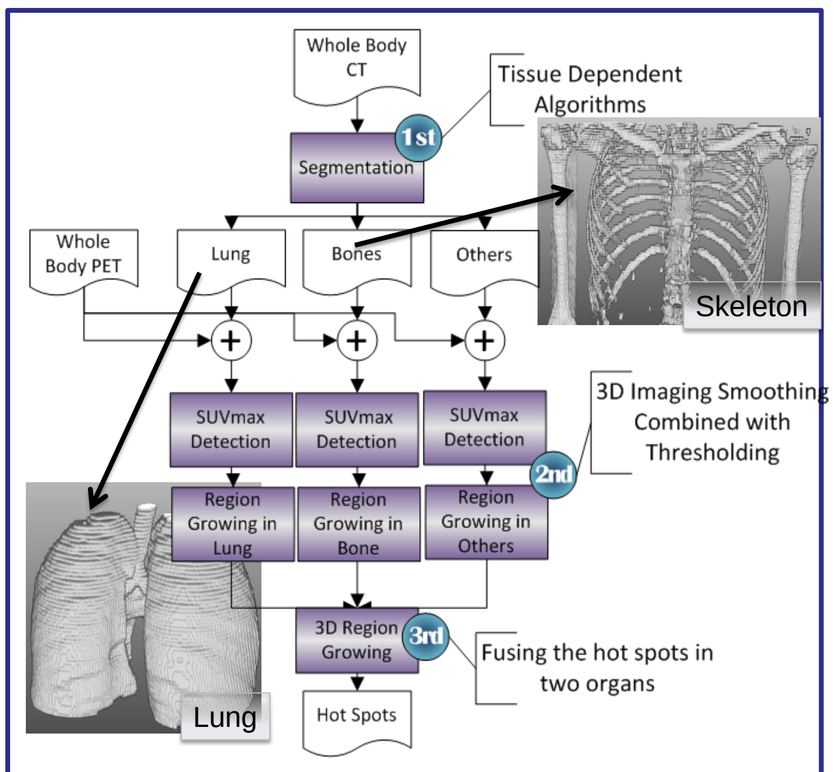
The system schema has four parts – Pre-process, co-alignment, hot spot detection, and metastasis analysis.

First, the sizes of PET images are different from of CT images, so we enlarged the PET images to match the size of CT. After that, the value in PET images is affected by the patient weight, injected dose of radiotracer, so the standardized uptake value (SUV) is applied to normalized the value.

Second, a patient took multiple PET-CT scans, but the positions of patients in PET-CT images differs from each other, so the registration technology is employed to normalize the multiple PET-CT scans.

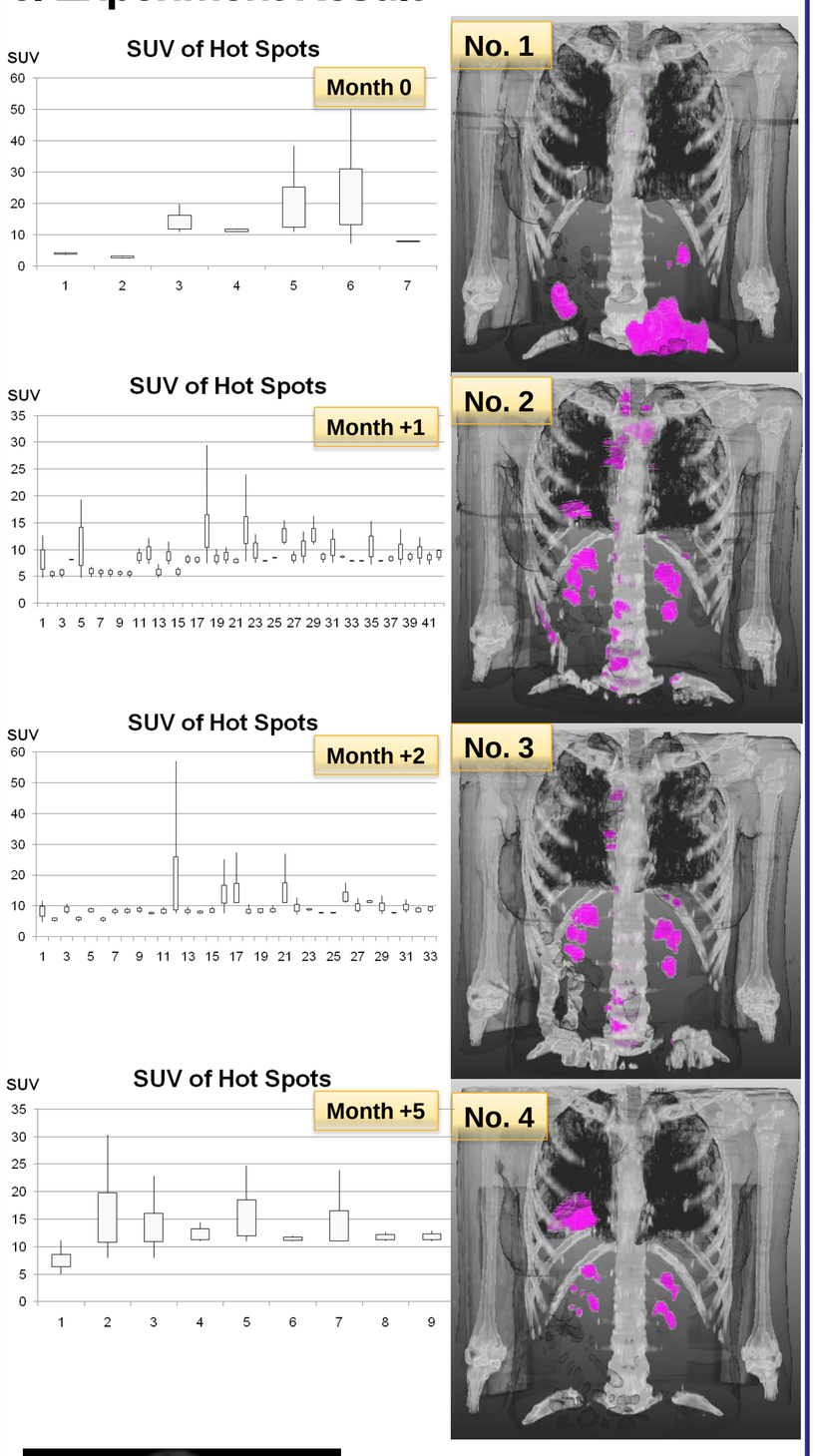
Third, the level of glucose metabolism is variable in different tissues and organs, so we originally innovate a tissue dependence algorithm to detect the hot spot in separated organs. The below figures shows the structures of the algorithm of hot spot detection.

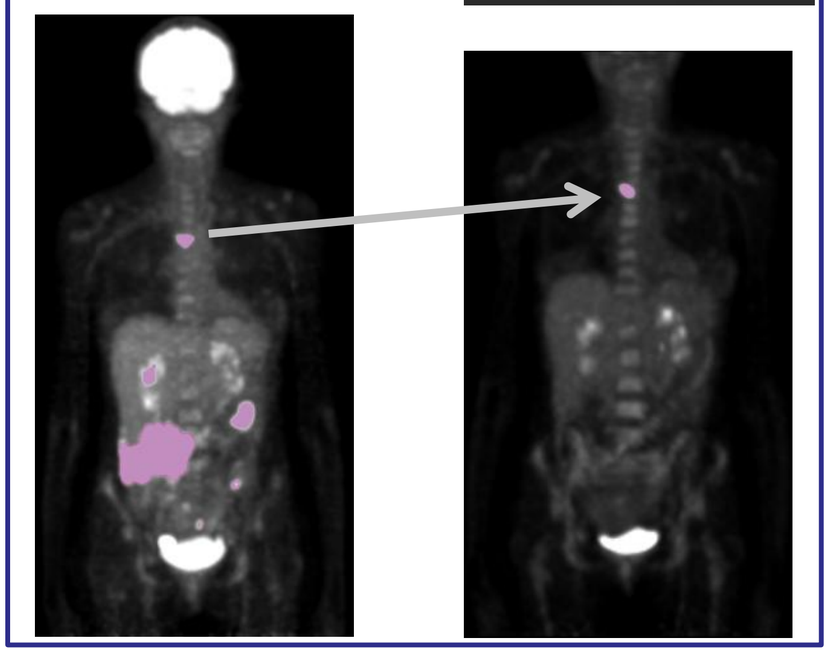



At last, we employ the MeVisLab to visualize the detected hot spots in 3D CT images, and quantitatively describe the properties of hot spots by a group of variables such as the SUVmax, SUVmin, Mean of SUV in a hot spot, standard deviation of SUV in a hot spot, the position in subject body, and the volume.

## 6. Experiment Result



Biomedical & Multimedia Information Technology (BMIT)

Reference:
Wang, J., Feng, D., & Xia, Y. (2010). *Automated Detection of the Occurrence and Changes of Hot-Spots in Intro-Subject FDG-PET Images from Combined PET-CT Scanners. Paper presented at the International Conference on Digital Image Computing: Techniques and Applications (DICTA) Sydney, Australia.*

Huang, S.-C. (2000). Anatomy of SUV. [doi: DOI: 10.1016/S0969-8051(00)00155-4]. Nuclear Medicine and Biology, 27(7), 643-646.