Gabriele Piantadosi

Tutor: Prof. Carlo Sansone

Co-Tutor: Prof. Mario Sansone

XXIX Cycle - I year presentation

Breast Cancer Analysis

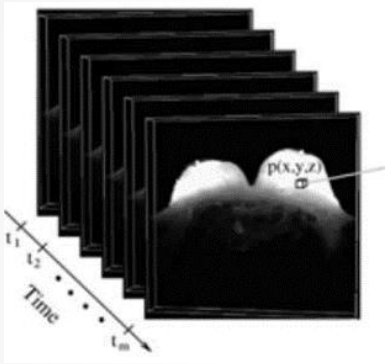
Università degli Studi di Napoli
Federico II

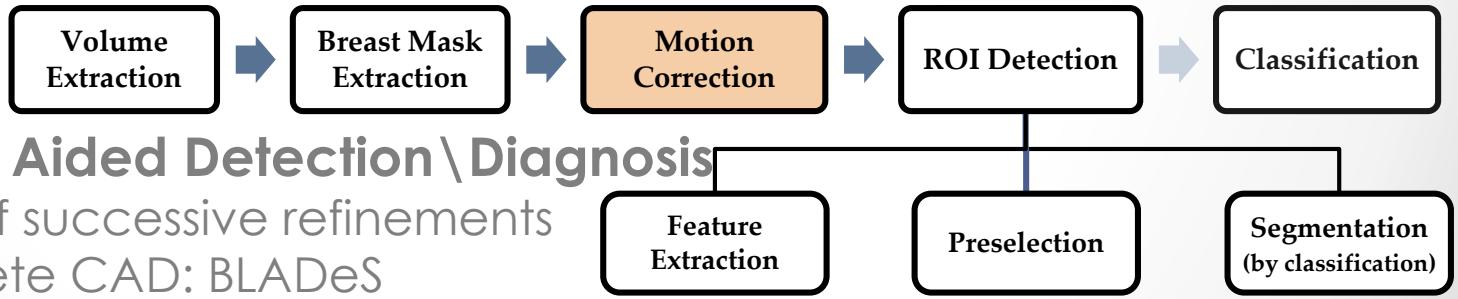
PhD candidate

- **Graduation:** MSc in Computer Engineering
- **Group:** PRIAMUS
- **Fellowship:** MIUR research grant
- **Research Field:** Breast Cancer Analysis

DCE-MRI in Breast Cancer Analysis

- **Dynamic contrast-enhanced MRI (DCE-MRI):**
  - By using of a contrast agent provides functional information high spatial resolution (about 1mm)
  - Makes use of electromagnetic fields (non-ionizing)
  - High sensitivity (>95%)
  - 4D volume (3 spatial dimension + 1 temporal dimension)
  - Fourth dimension of the DCE- MRI volume: Trend of the contrast agent absorption in the tissue

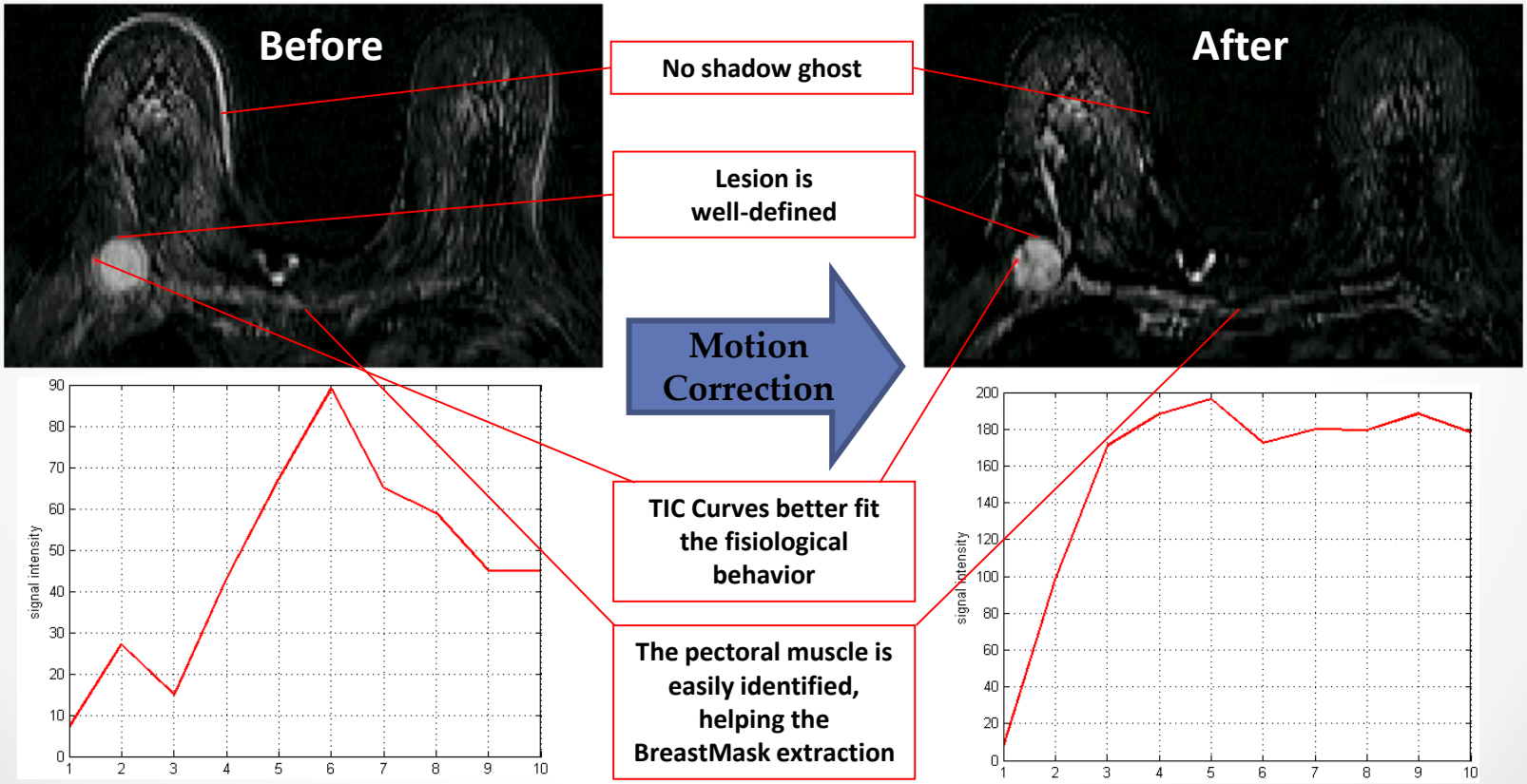




- **Computer Aided Detection\Diagnosis**
  - Series of successive refinements
  - Complete CAD: BLADeS (deployed before PhD starts)
  - I focalize on Motion Correction problem

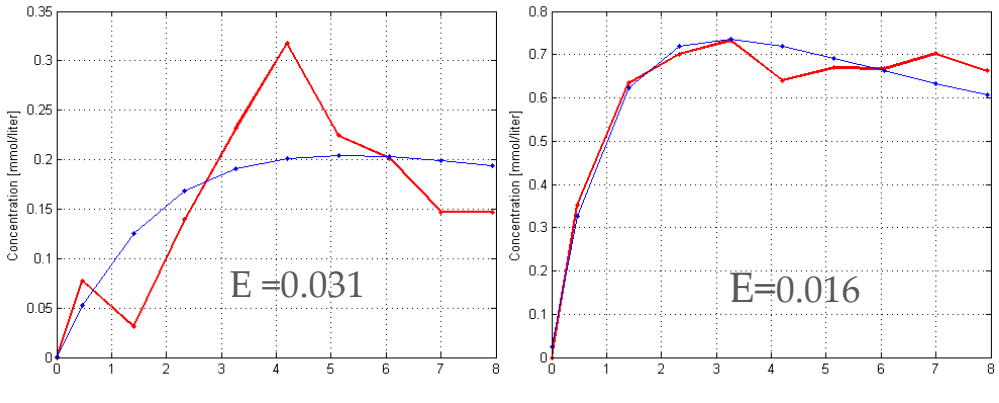
Motion Correction

- Dynamic characteristics of soft tissues DCE-MRI examinations make hard to detect suspicious ROI (Patient movements, Breathing, Involuntary movements, etc…)



Quality Evaluation of Motion Correction

- After registration, the DCE-MRI data were fitted to different kinetics model solving a non-linear curve-fitting problem in the least-squares sense



- It is possible to obtain a goodness-of-fit (GOF) indicator by calculating squared 2-norm of the residual
- Kinetics models:
  - Tofts-Kermode (TK) model
  - Extended Tofts-Kermode (ETK) model
  - Hatyon-Brady (HB) model

Algorithm 1 GOODNESSOFFIT

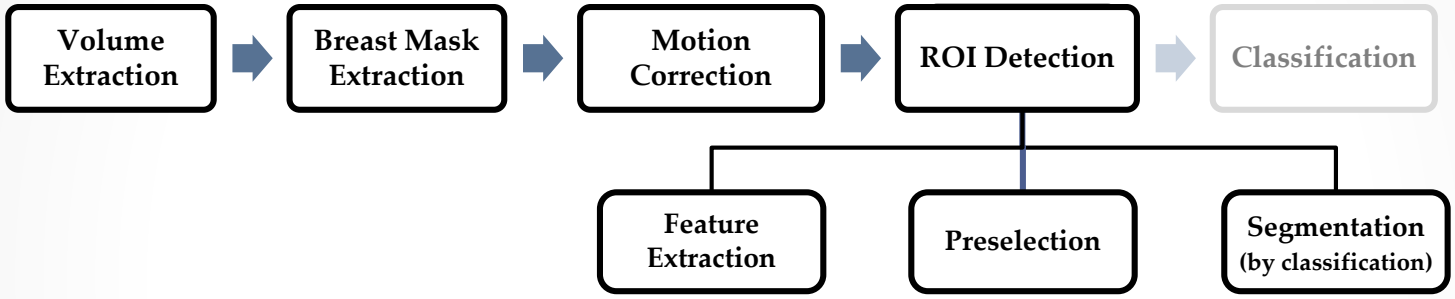
```
function GOODNESSOFFIT(volume,m-roi)
    for each voxel v ∈ m-roi do
        tic_v ← extract TIC for v from volume
        fitted_v ← fitting(tic_v)
        residuals(v) ← sqrt(sum((fitted_v-tic_v)^2)
    end for
     return median(residuals)
end function
```

Products

- S. Marrone, G. Piantadosi, R. Fusco, A. Petrillo, M. Sansone, and C. Sansone, "A novel model-based measure for quality evaluation of image registration techniques in DCE-MRI" in IEEE 27th International Symposium on Computer-Based Medical Systems (CBMS), pp. 209-214, 27-29 May 2014, New York, IEEE, 2014.
- G. Piantadosi, S. Marrone, R. Fusco, A. Petrillo, M. Sansone, and C. Sansone, "Data-driven selection of motion correction techniques in breast DCE-MRI" in IEEE International Symposium on Medical Measurements and Applications (MeMeA 2015), IEEE, 2015. [UNDER REVIEW]

Next Years

- Topics



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	Credits year 1										
	Est.	Bimonth						Tot.	Est. 2° year	Est. 3° Year	Grand Tot.	Check
		1	2	3	4	5	6					
Modules	26	0	3	0	3	3	11	20	15	0	35	30-70
Seminars	13	2,4	1	4,8	1	1,5	2,3	13	12	0	25	10-30
Research	21	7,6	6	5,2	6	5,5	0	30,3	33	60	123,3	80-140
	60	10	10	10	10	10	13,3	63,3	60	60	186,3	180


Thanks for your attention…