Automatic classification of intensity-vs-time curves in breast DCE-MRI by K-means clustering and Dynamic Time Warping curve matching.

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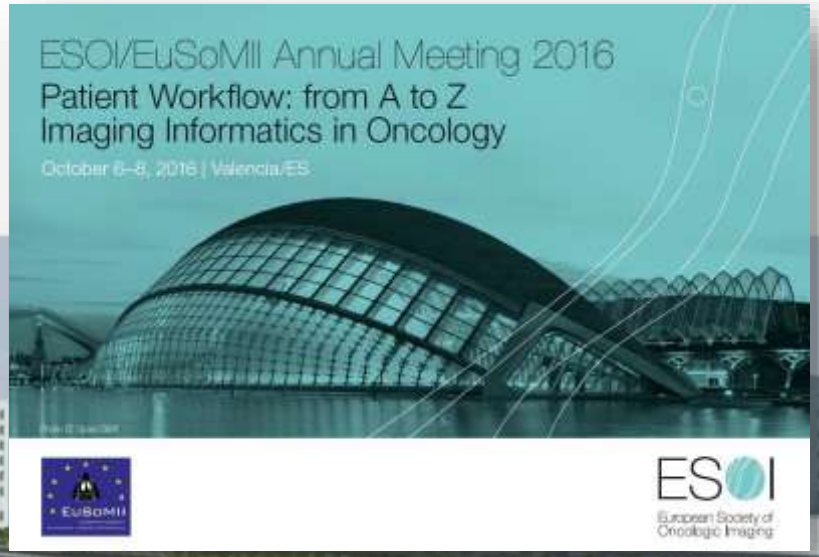

Outline

- Introduction
- Purpose
- Materials and methods
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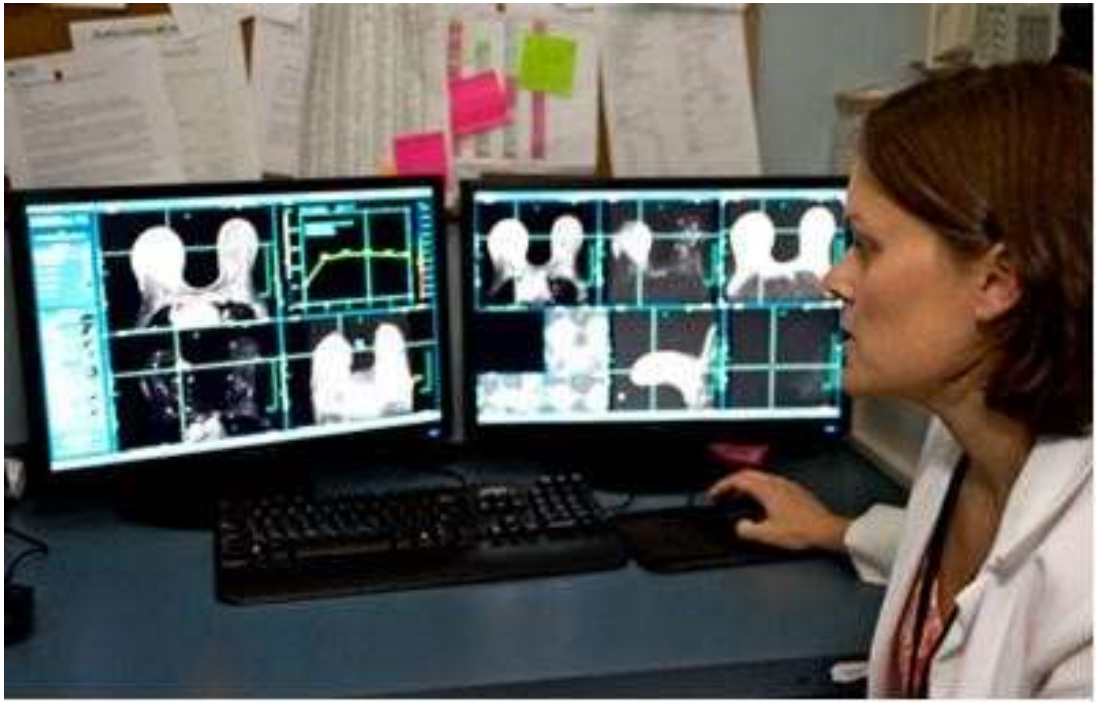
  - Dynamic Time Warping
- Results
- Conclusion

Introduction



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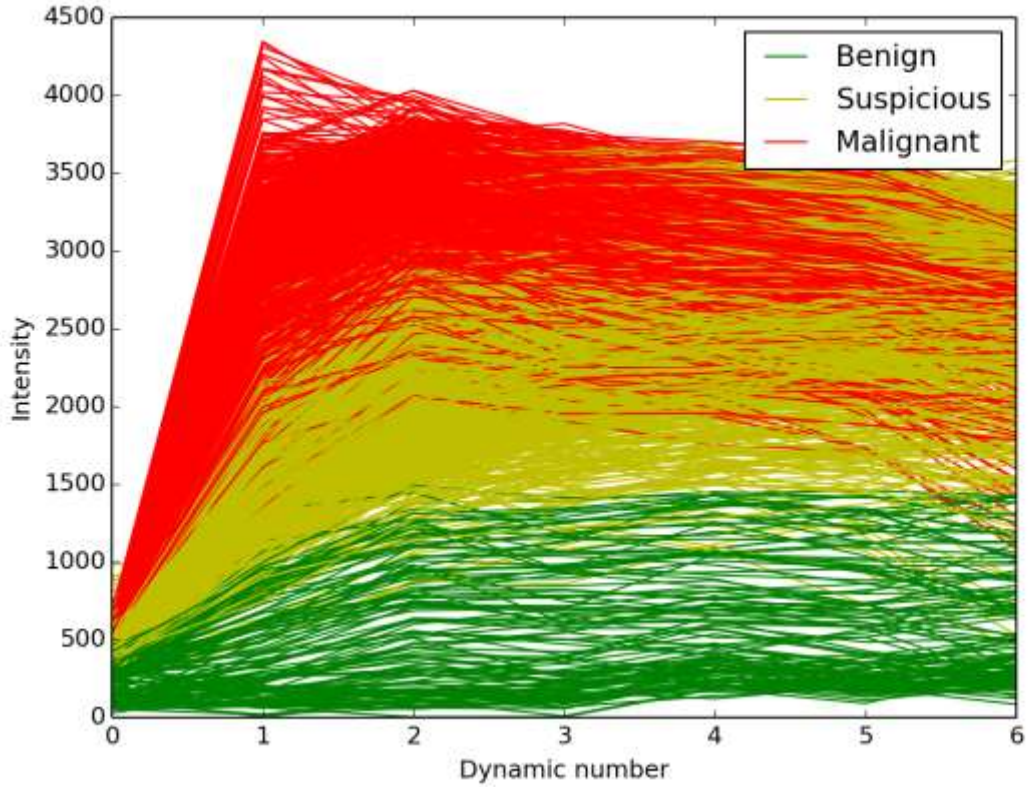
Introduction



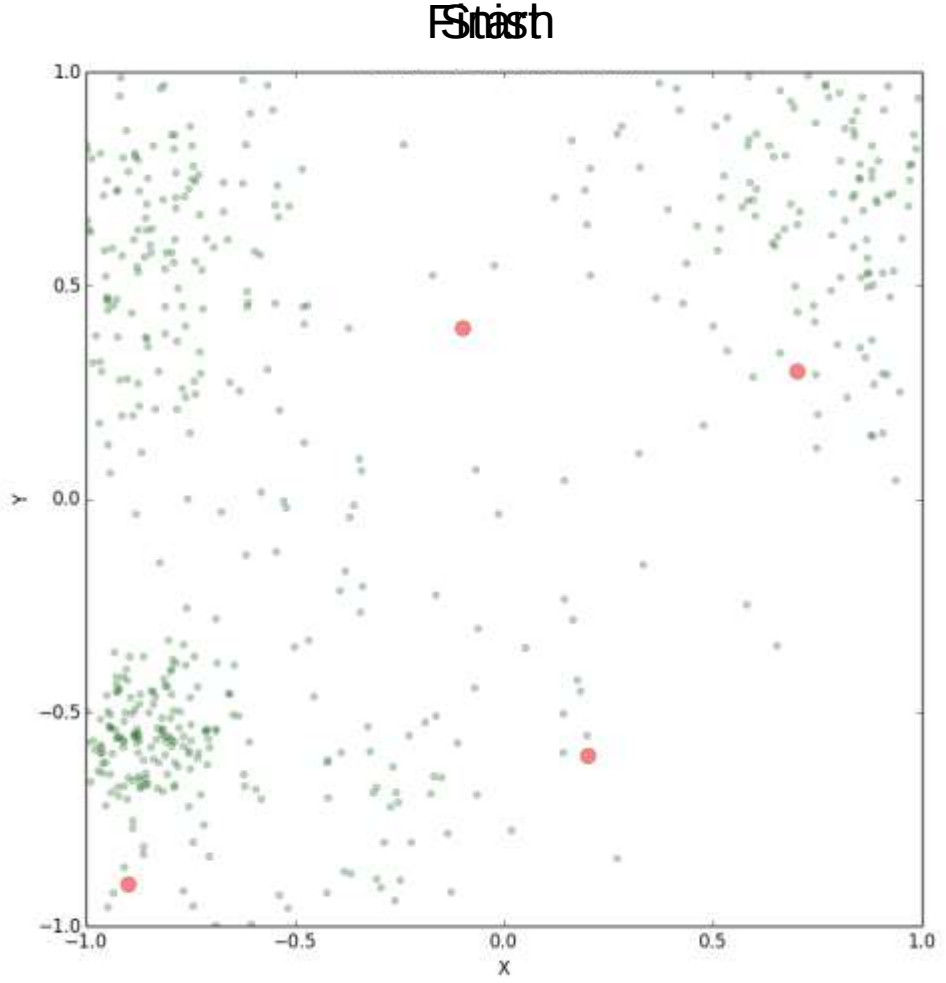
Purpose

- Develop an automatic lesion detection algorithm for breast DCE-MRI.
- Imaging biomarker extraction: volume and eccentricity.
- Automatic generation of a quantitative structured report.

Materials and Methods

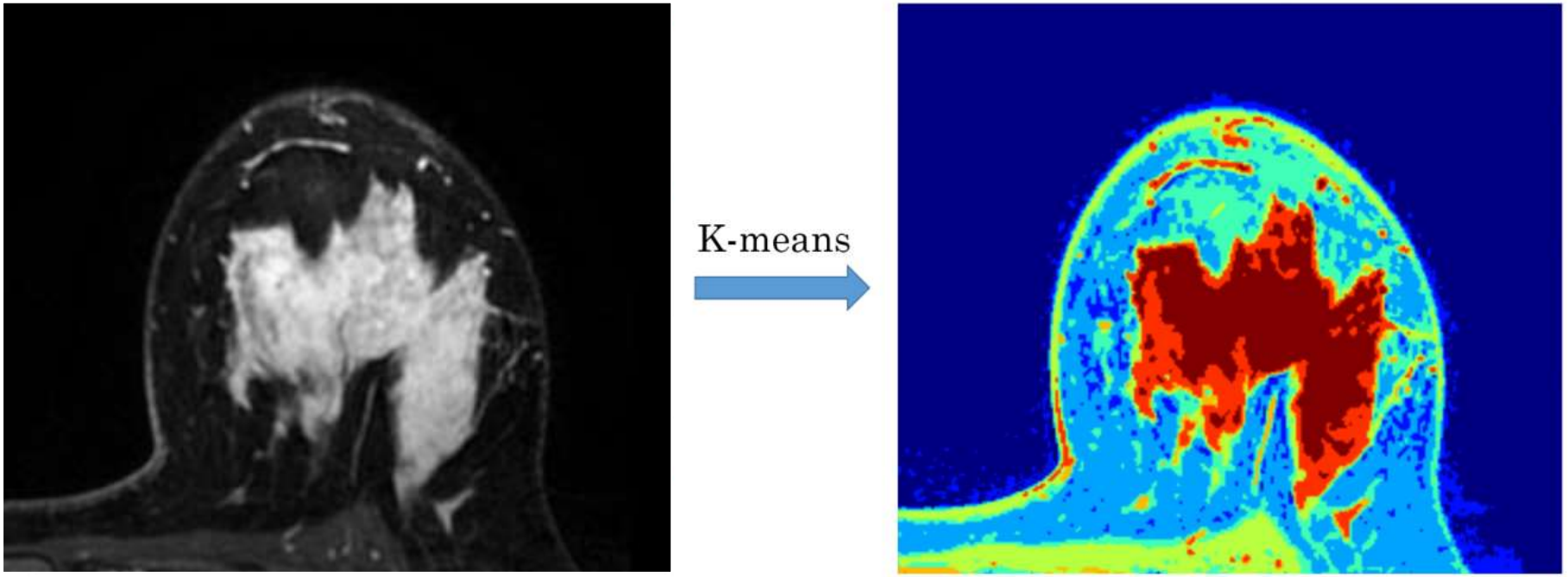
- K-means
  - Iterative clustering algorithm.
  - Reduce the set of intensity-vs-time curves.

$$\mathcal{L} = \sum_{j=1}^{k} \sum_{i=1}^{n} \left\| x_i^{(j)} - \mu_j \right\|^2$$



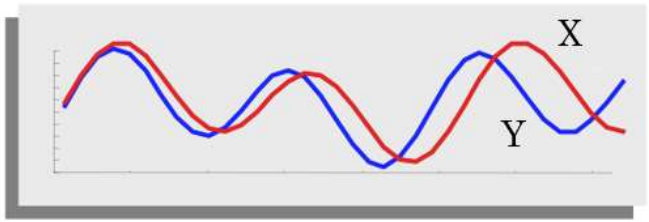
Materials and Methods

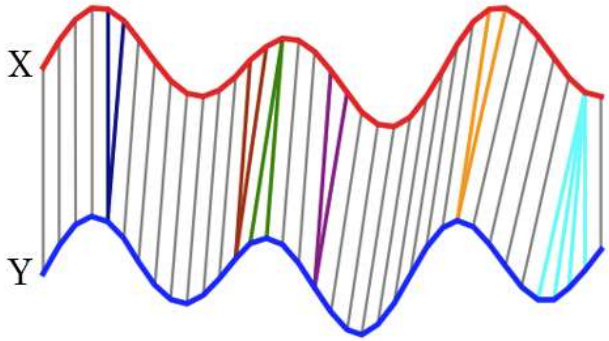
- K-means pre-clustering



Materials and Methods

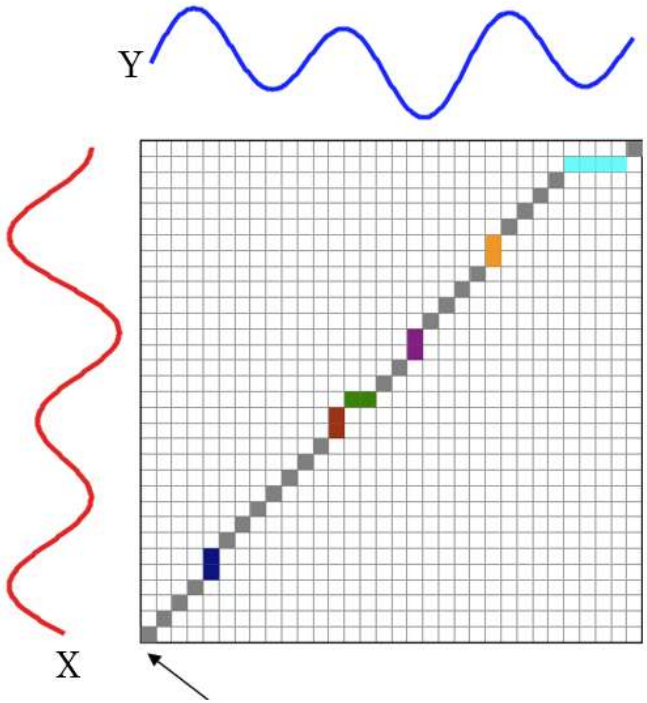
- Dynamic Time Warping





$X = (x_1, \dots, x_N), x_i \in \Phi$

$Y = (y_1, \dots, y_M), y_j \in \Phi$



Optimum alignment path P*

Minimize: $d: \Phi \times \Phi \rightarrow \mathbb{R} \geq 0$

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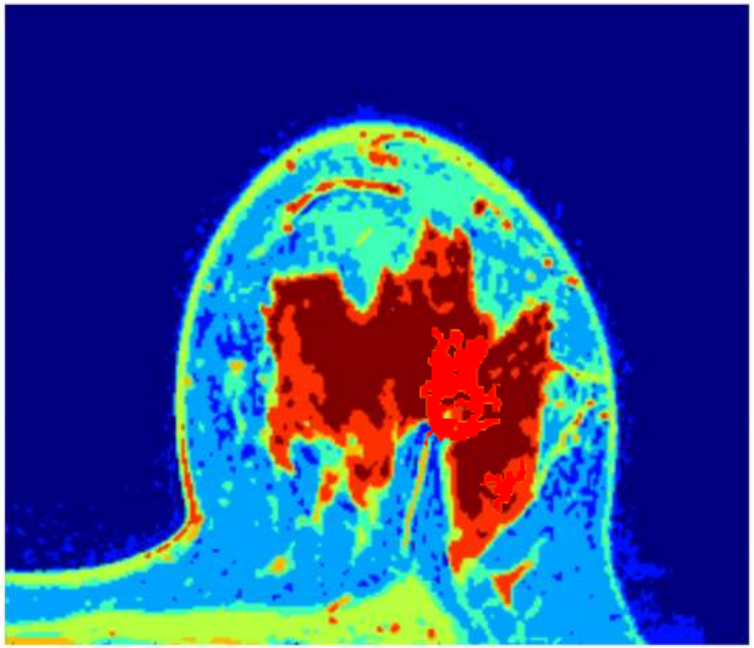
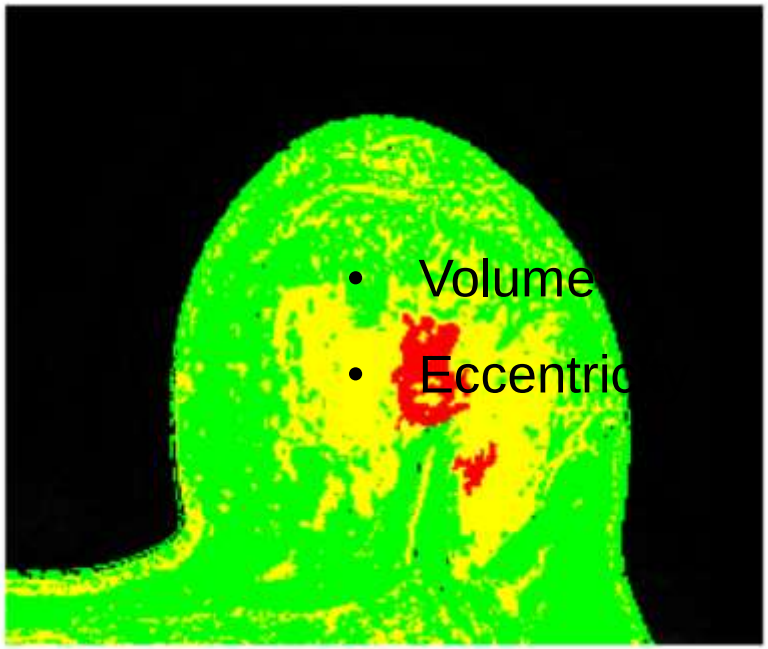
Materials and Methods

- DTW voxelwise classification



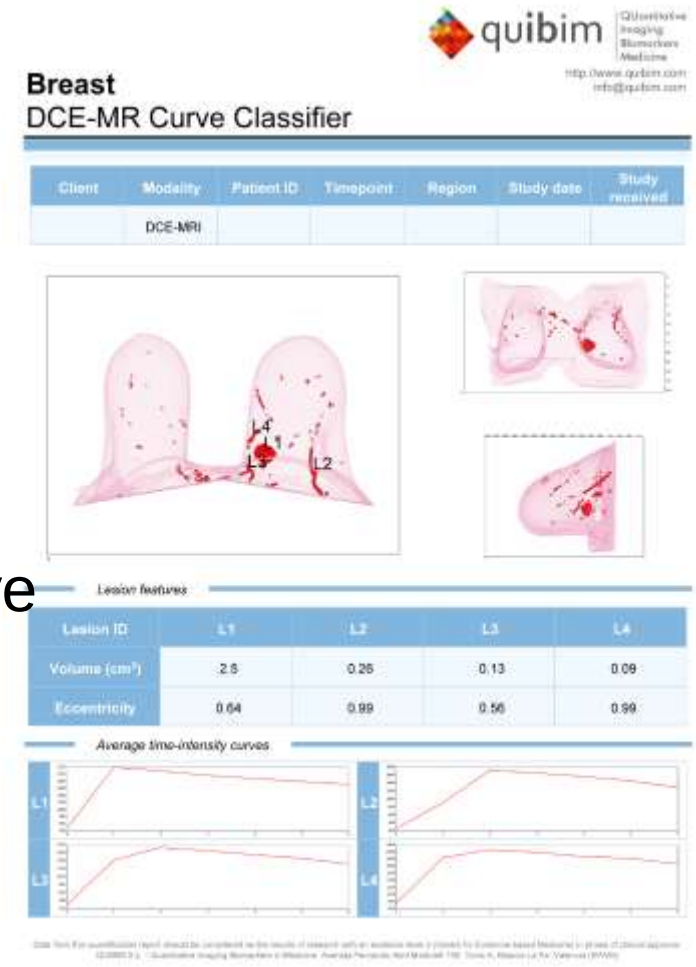
DTW



Results

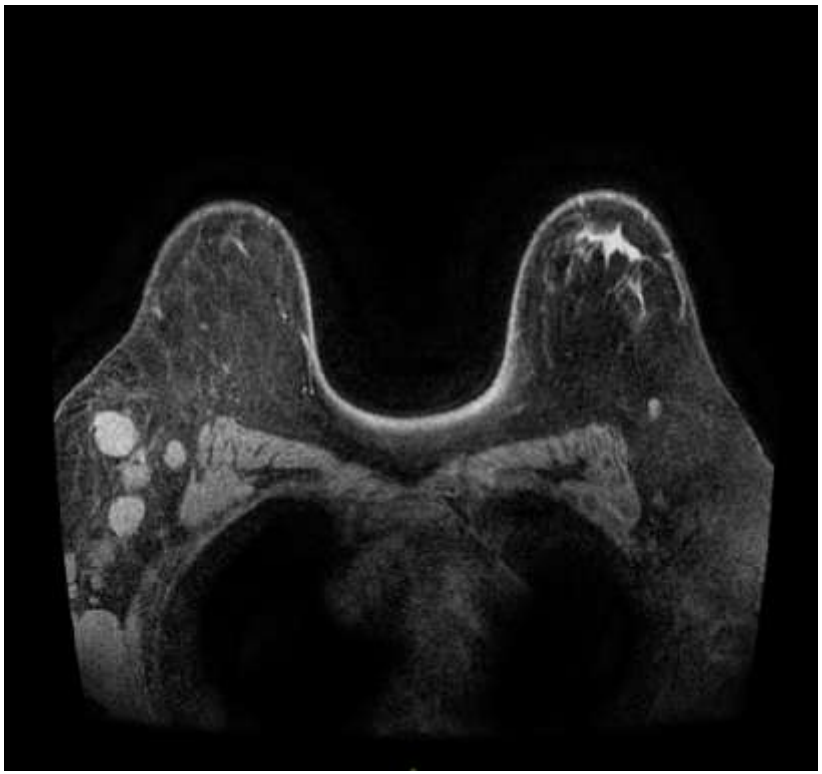
Report

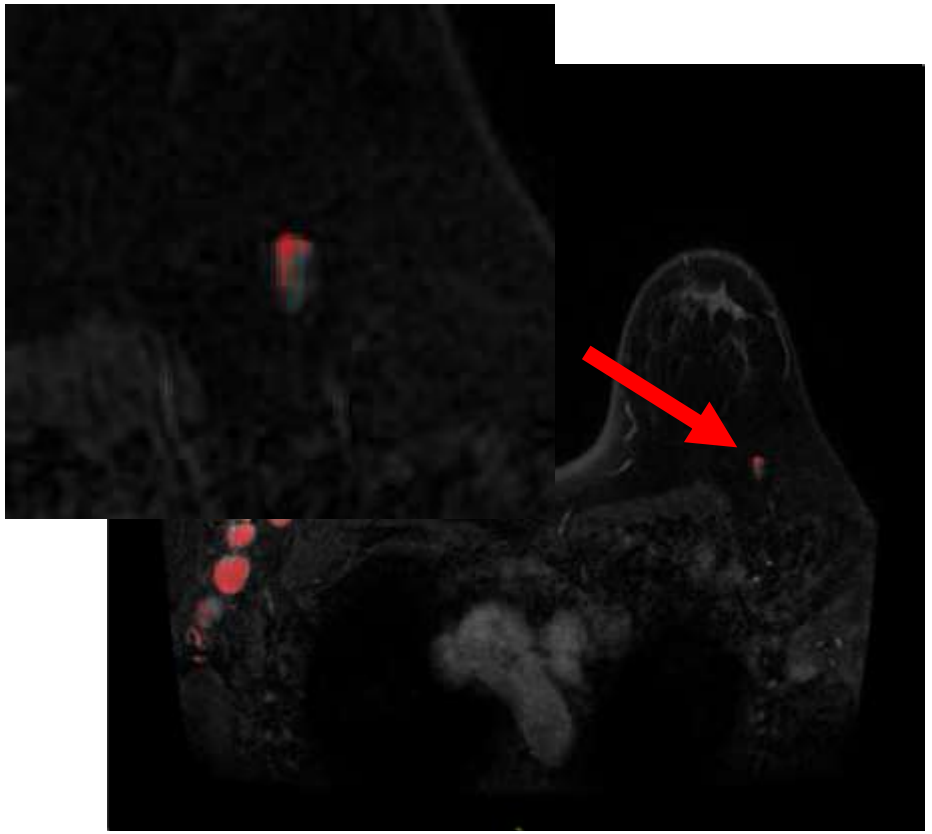
- Patient data
- 3D Views
- Volume
- Eccentricity
- Average curve



Results

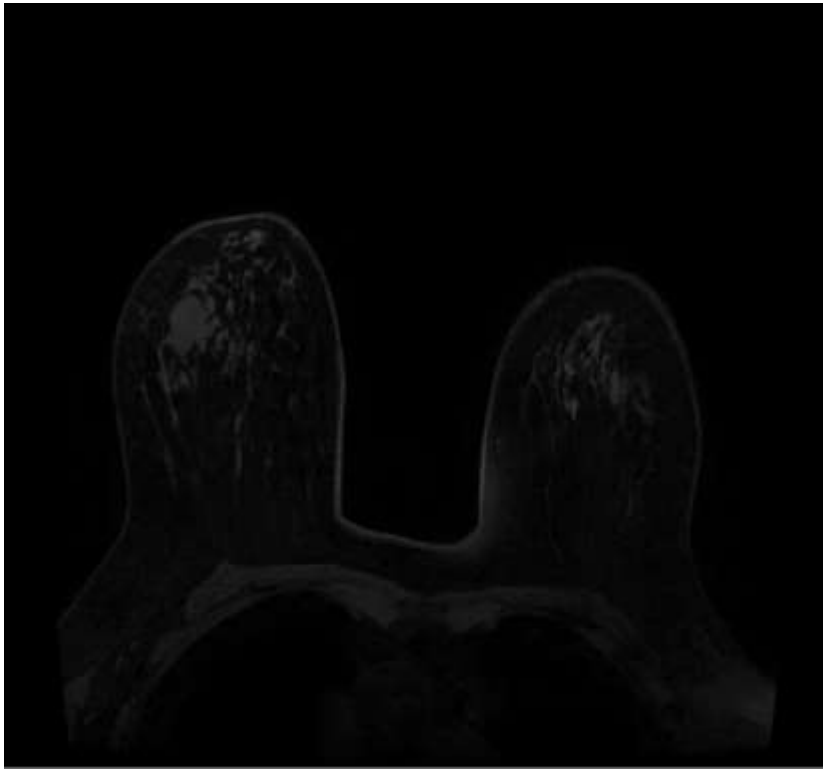
Case 1

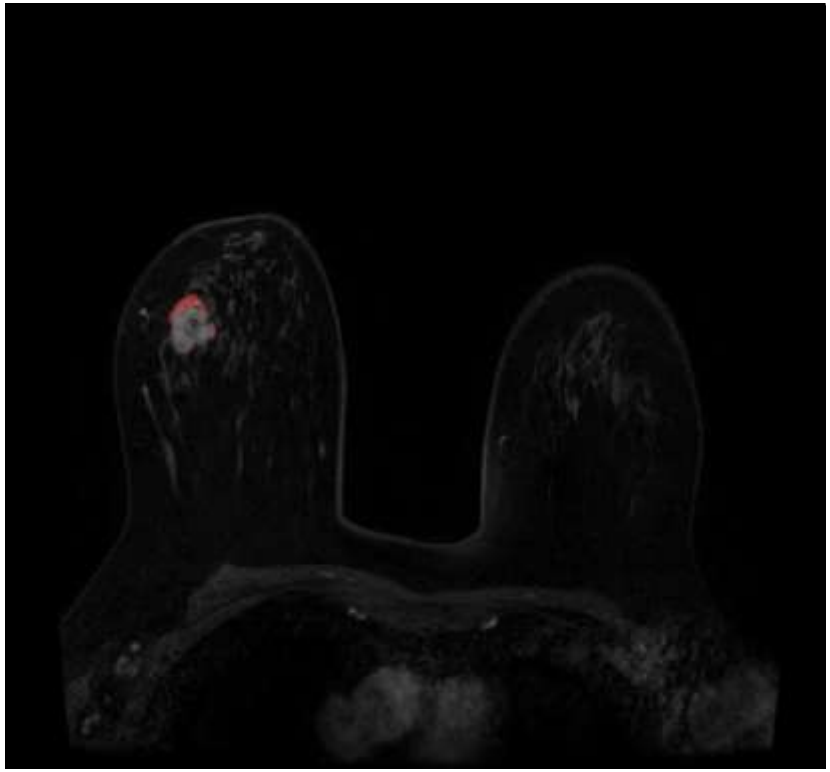




Results

Case 2





Conclusions

- Dynamic Time Warping is a very convenient algorithm for curve matching tasks.
- Automatic detection tools can improve time efficiency in radiology workflows.
- Quantitative structured reporting offers a needed help for radiologists in their diagnostics.

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