

# Breast Ultrasound Image Segmentation: an optimization approach based on super-pixels and high-level descriptors

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Quality Control by Artificial Vision  
4<sup>th</sup> June 2015



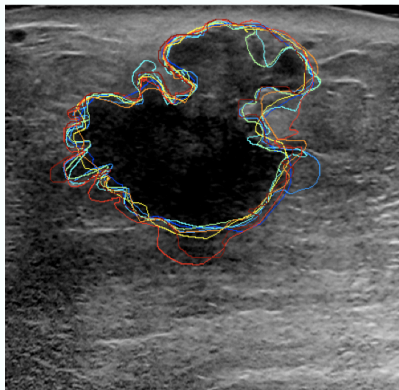
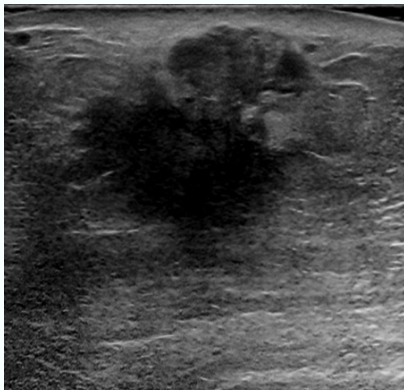
Features Training CostFunction  
Data 12CVB ComputerAidedDiagnosisCAD Lesion  
InterIntraObserver ModelLearning SearchSpace Segmentation  
OpenResearch Modeling SuperPixel AreaOverlap Imaging  
Optimization Stochastic  
Minimization BIRADS Cancer GraphCuts  
Ultrasound Breast MachineLearning

A word cloud on a dark blue background featuring various terms related to medical imaging and machine learning. The words are arranged in a dense, overlapping manner. The most prominent words, shown in a larger font size, include 'Optimization', 'Segmentation', 'Lesion', 'Breast', 'CostFunction', 'Data', '2CVB', 'Imaging', 'Stochastic', 'Ultrasound', 'BIRADs', 'MachineLearning', 'Minimization', 'Features', 'Training', 'OpenResearch', 'Modeling', 'SuperPixel', 'AreaOverlap', 'GraphCuts', 'Cancer', 'MachineLearning', 'InterIntraObserver', 'SearchSpace', 'ModelLearning', 'ComputerAidedDiagnosisCAD', and 'MachineLearning'. The words 'Segmentation' and 'Lesion' are highlighted in a bright orange color, while all other words are in a dark blue color matching the background.

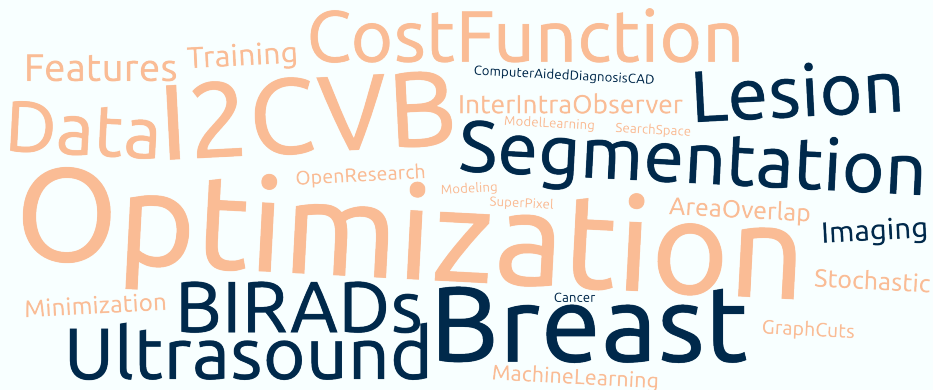
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Modeling SuperPixel AreaOverlap Imaging  
Minimization BIRADs Stochastic  
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MachineLearning



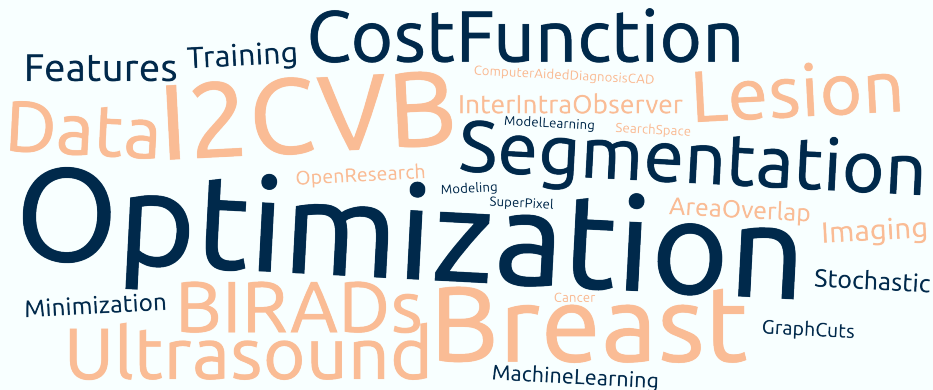
## Breast Lesion Segmentation in US images



Features Training CostFunction Lesion  
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Ultrasound Breast GraphCuts  
MachineLearning

A word cloud centered on the page, with words in various sizes and colors (orange and dark blue). The words are related to medical image analysis and machine learning. The most prominent words are 'Optimization', 'Segmentation', 'Breast', 'Lesion', 'CostFunction', 'Data', '2CVB', 'Ultrasound', 'BIRADs', 'Imaging', 'Stochastic', 'GraphCuts', 'MachineLearning', 'Cancer', 'Minimization', 'OpenResearch', 'Modeling', 'SuperPixel', 'AreaOverlap', 'InterIntraObserver', 'ModelLearning', 'SearchSpace', 'ComputerAidedDiagnosisCAD', 'Features', 'Training', and 'MachineLearning'.

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GraphCuts  
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A word cloud centered on the page, with words in various sizes and colors (dark blue, orange, and light blue). The most prominent word is 'Optimization' in large dark blue letters. Other large words include 'Segmentation', 'Breast', 'Lesion', 'CostFunction', 'Data', '2CVB', 'Imaging', 'Ultrasound', 'BIRADs', 'Features', 'Training', 'Minimization', 'MachineLearning', 'Stochastic', 'AreaOverlap', 'InterIntraObserver', 'ModelLearning', 'SearchSpace', 'OpenResearch', 'Modeling', 'SuperPixel', 'Cancer', 'GraphCuts', 'ComputerAidedDiagnosisCAD', and 'B'. The words are arranged in a way that they overlap and fill the central area of the slide.

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Ultrasound MachineLearning GraphCuts  
ComputerAidedDiagnosisCAD

A word cloud featuring various terms related to computer vision, medical imaging, and machine learning. The words are arranged in a dense, overlapping manner. The most prominent words, shown in larger fonts, include 'Optimization', 'Segmentation', 'Breast', 'Data', 'CostFunction', 'Lesion', 'Imaging', 'Stochastic', 'AreaOverlap', 'OpenResearch', 'Modeling', 'SuperPixel', 'Cancer', 'MachineLearning', 'GraphCuts', 'BIRADs', 'Ultrasound', 'Minimization', 'Features', 'Training', 'InterIntraObserver', 'ModelLearning', 'SearchSpace', 'ComputerAidedDiagnosisCAD', and 'Leakage'. The words are primarily in shades of orange and blue, with some in white. The background is a light blue gradient.

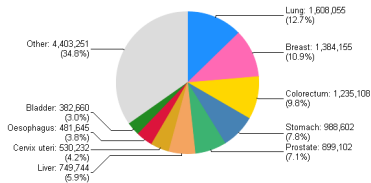
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Stochastic  
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Ultrasound Breast



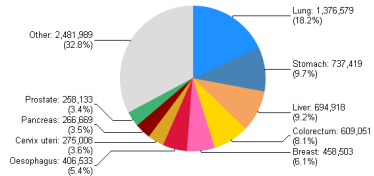


# Motivations

# Statistics



(a) # of cancer cases



(b) # of cancer deaths

## Implications

- ▶ 1.4 million cases per year
- ▶ 10.9% of diagnosed cancers
- ▶ 5<sup>th</sup> cause of cancer death
- ▶ 1<sup>th</sup> cause of cancer death (females)