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

Quality Control by Artificial Vision
4th June 2015

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CostFunction
ComputerAidedDiagnosisCAD
Data
I2CVB
InterIntraObserver
Lesion
ModelLearning
SearchSpace
Segmentation
OpenResearch
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SuperPixel
AreaOverlap
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Cancer
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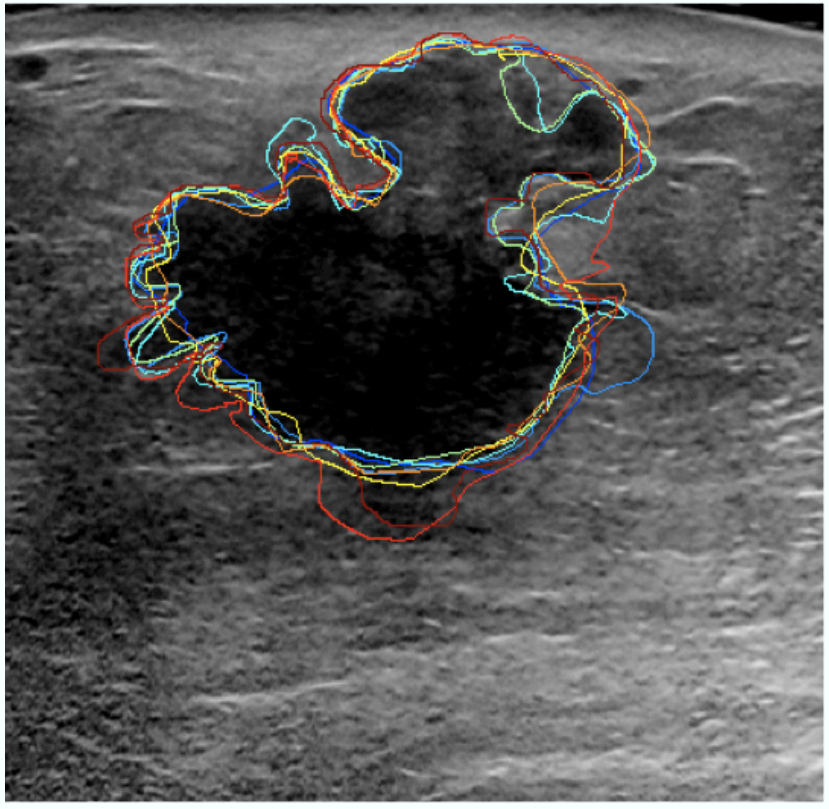
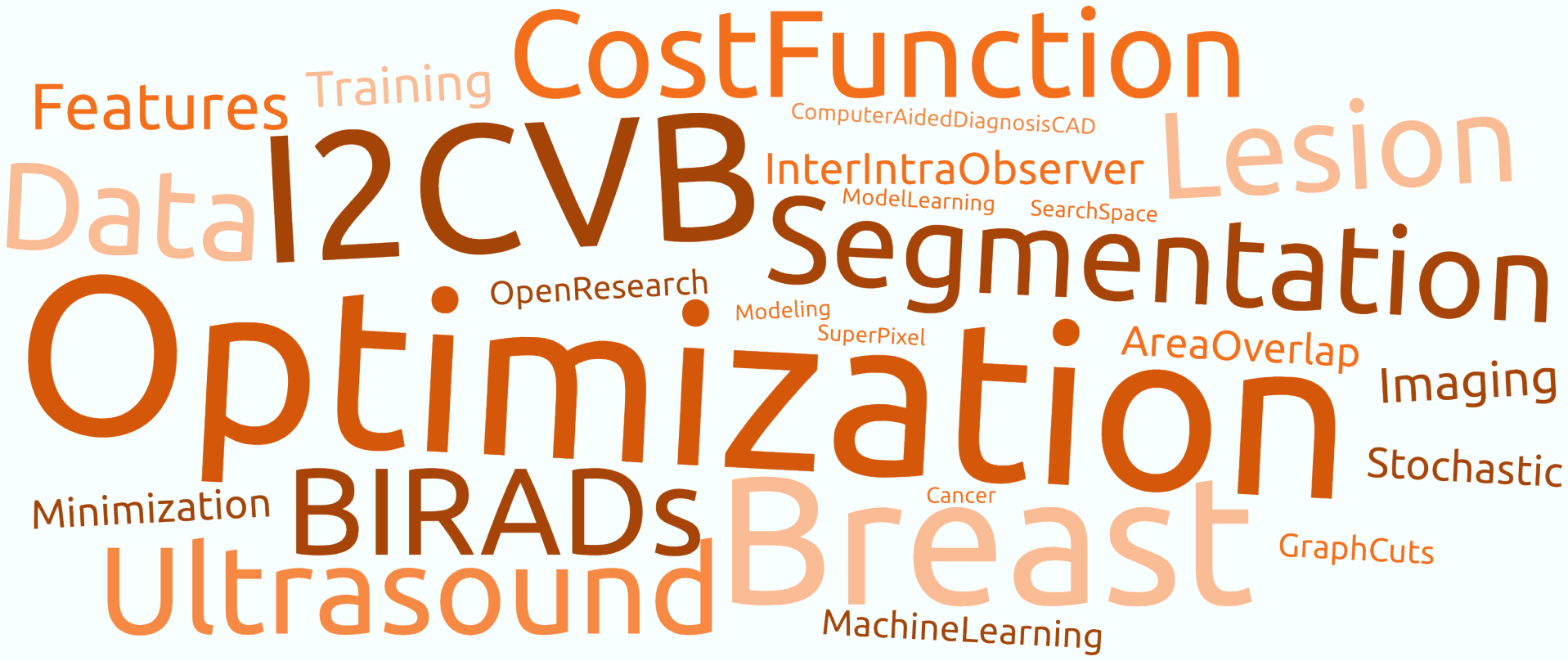
Breast Lesion Segmentation in US images

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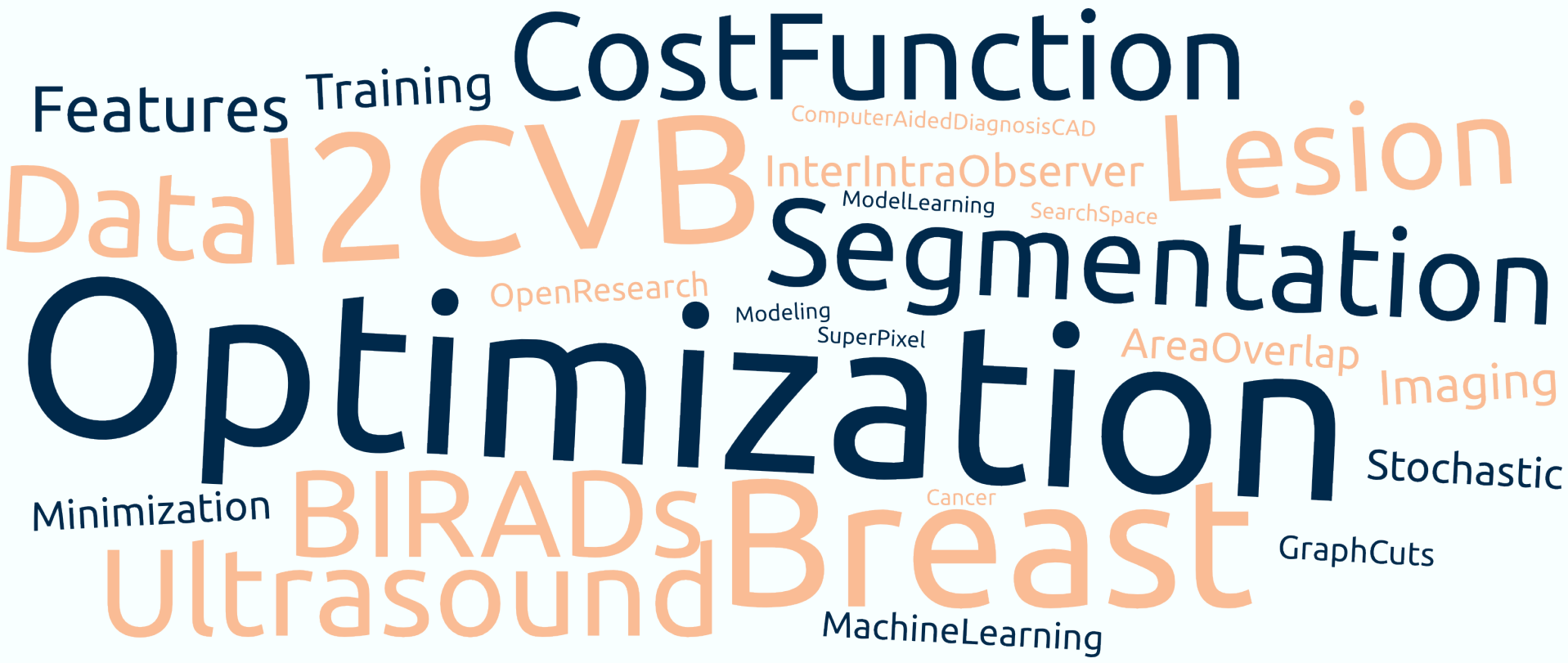
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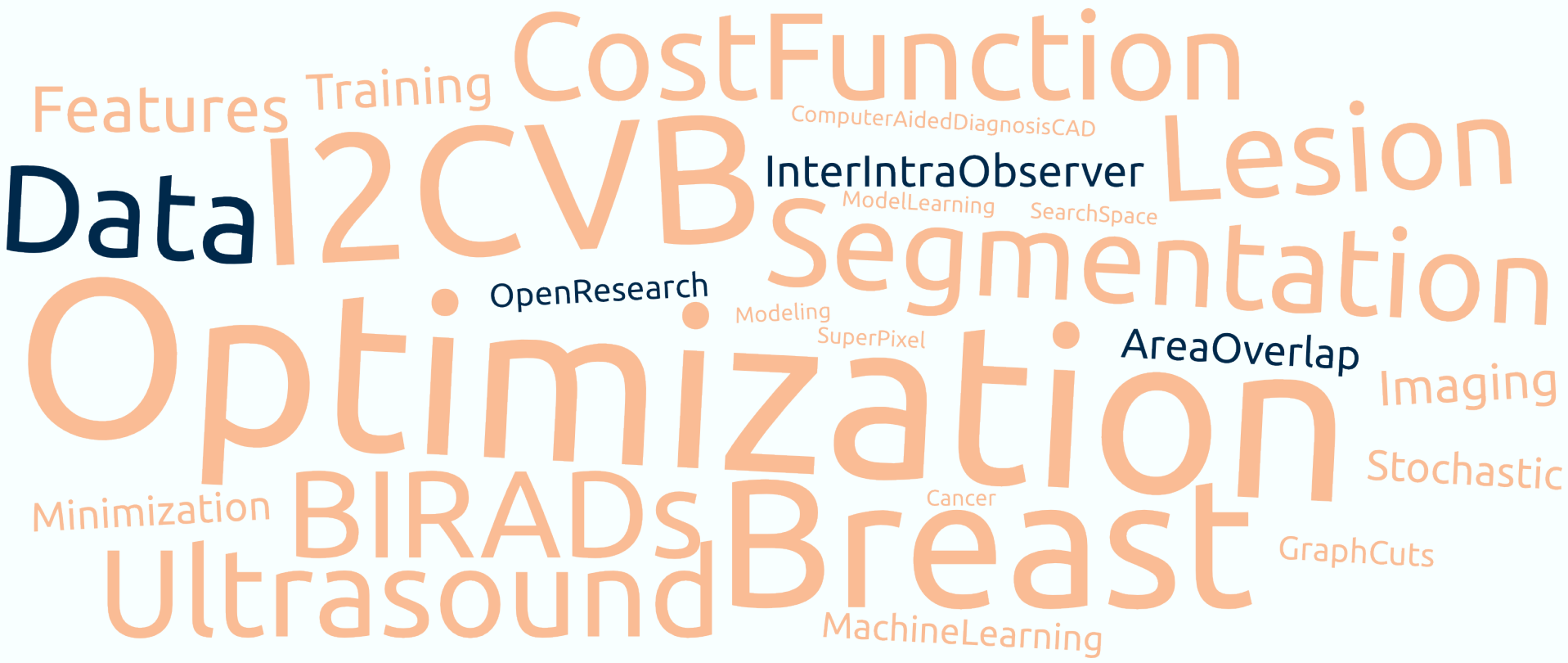
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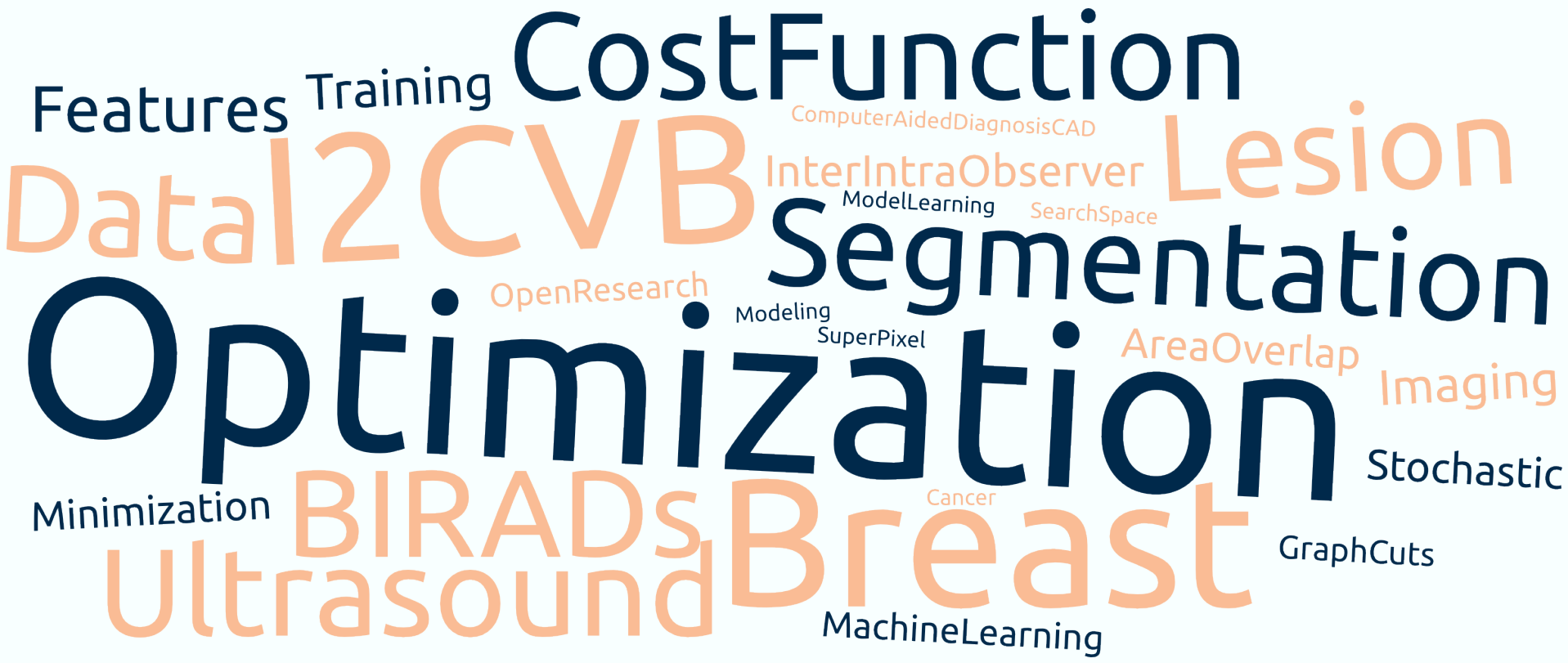
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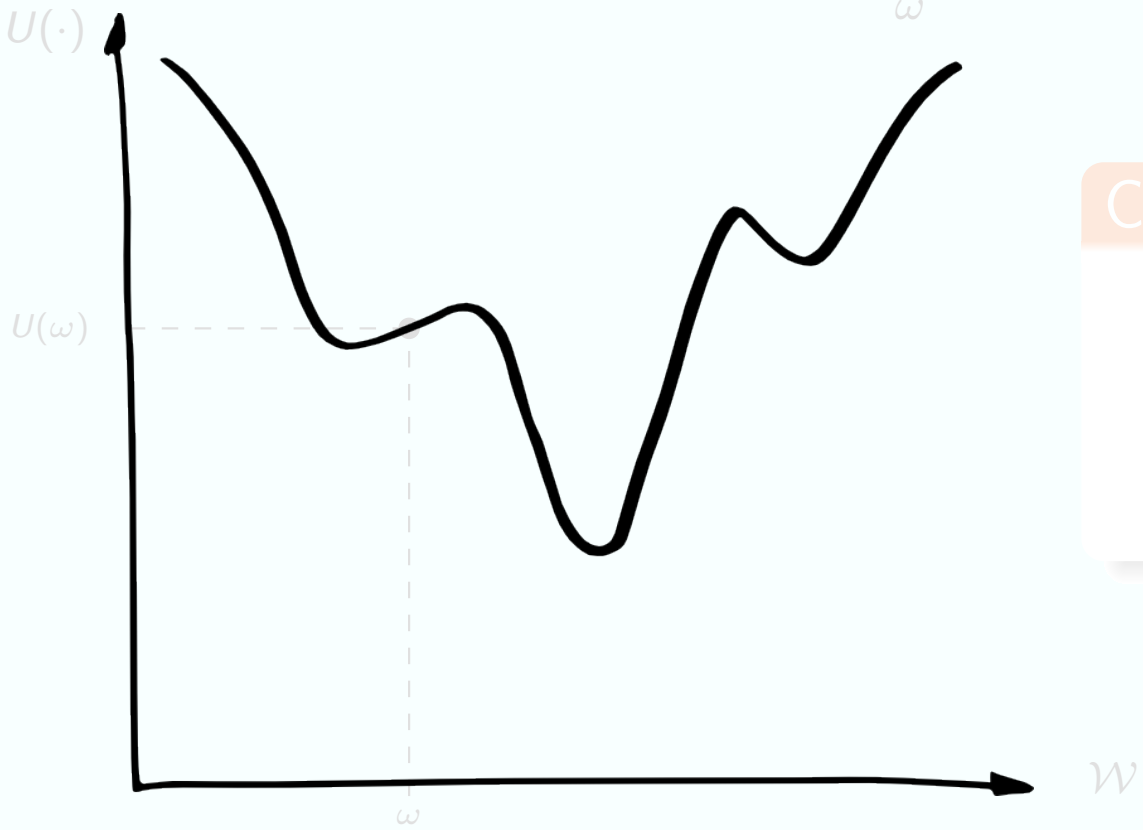
Optimization
For image segmentation

$$\hat{\omega} = \arg\min_{\omega} U(\omega)$$

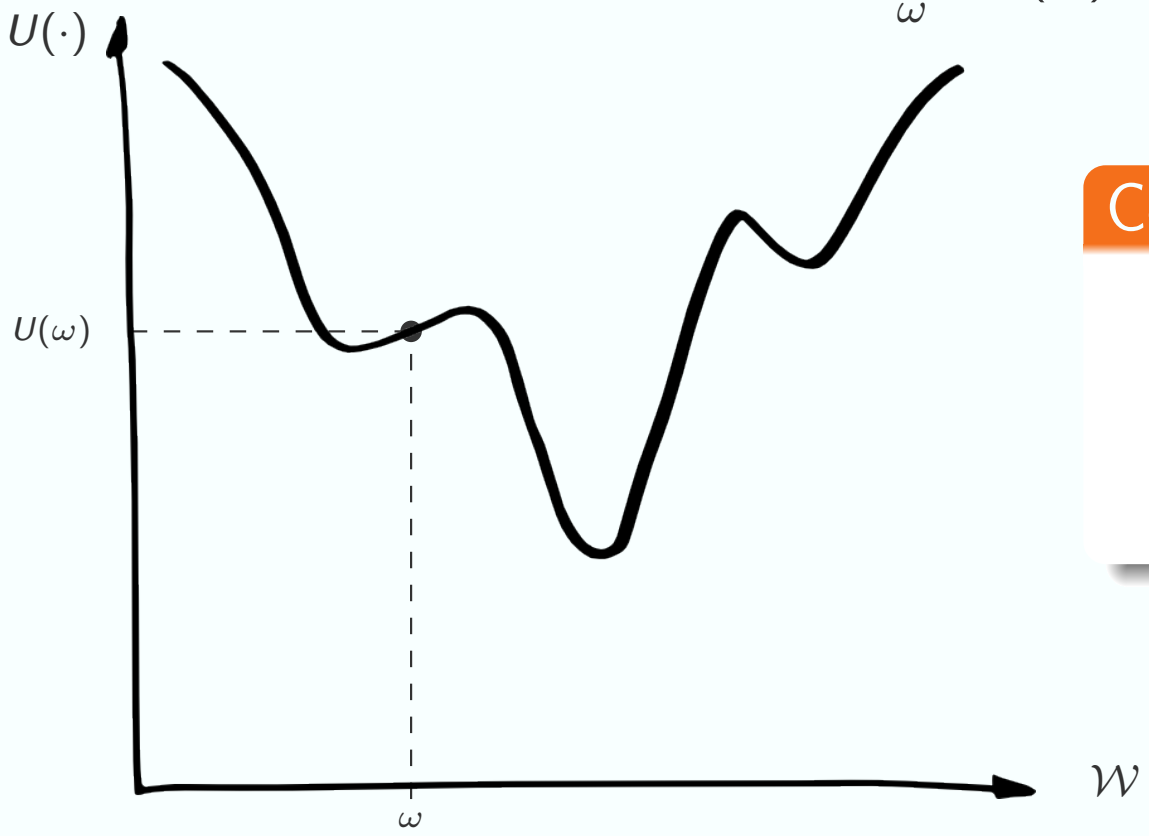


Considerations

- Search Space $\mathcal{W}$
- Cost Function $U(\cdot)$
- Minimization Strategy

Optimization
For image segmentation

$$\hat{\omega} = \arg\min_{\omega} U(\omega)$$

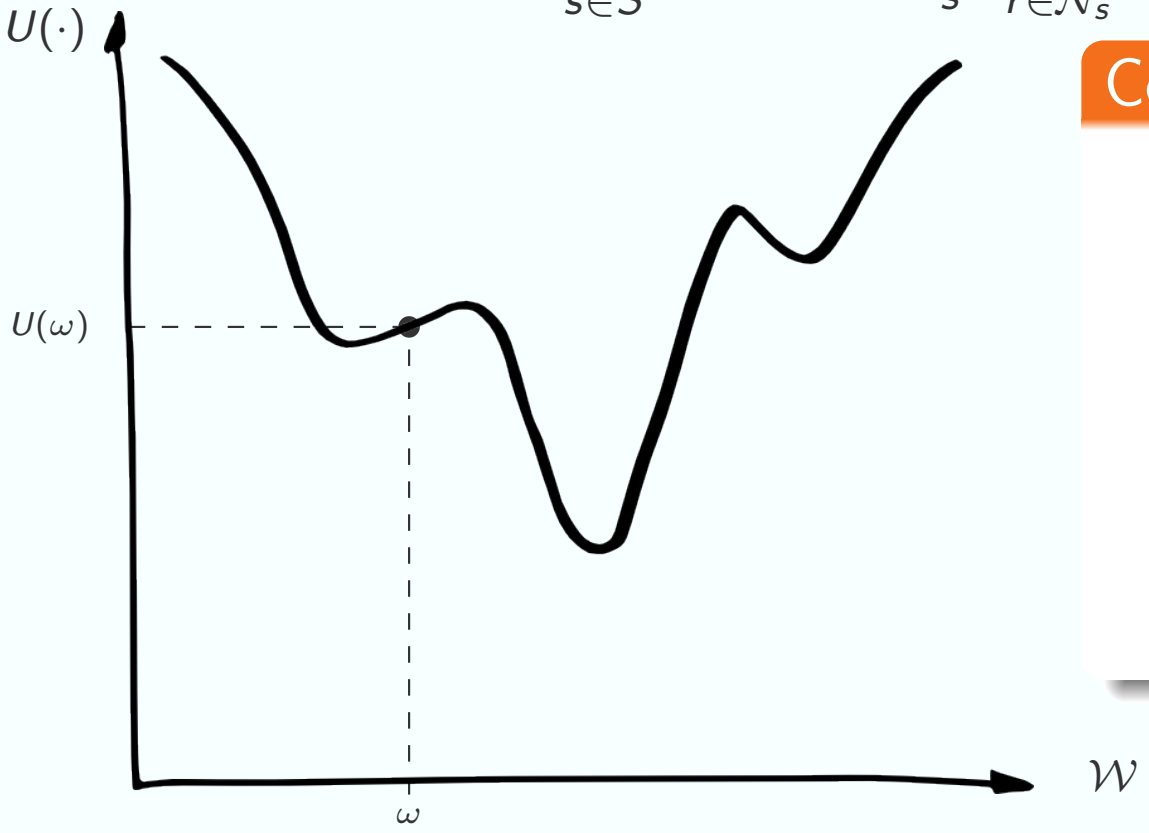


Considerations

- Search Space $\mathcal{W}$
- Cost Function $U(\cdot)$
- Minimization Strategy

Image Segmentation by Optimization
The Metric Labeling Problem

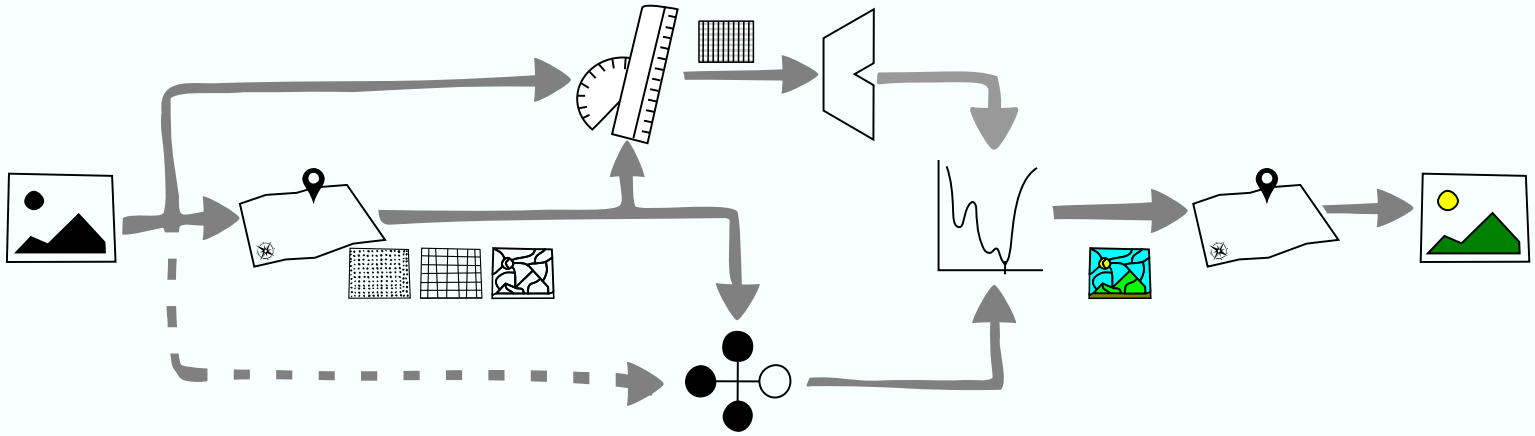
$$U(\omega) = \sum_{s \in S} D_s(\omega_s) + \sum_{s} \sum_{r \in \mathcal{N}_s} V_{s,r}(\omega_s, \omega_r)$$



Considerations

- Image as a discrete set $\mathcal{S}$
- Search Space $\mathcal{W}$ $(\omega_s = l)$, $l \in \mathcal{L}$, $\forall s \in \mathcal{S}$
- Cost Function
- Minimization Strategy

The Metric Labeling Problem
Conceptual schema



$$U(\omega) = \sum_{s \in S} D_s(\omega_s) + \sum_s \sum_{r \in \mathcal{N}_s} V_{s,r}(\omega_s, \omega_r)$$

- $D_s(\omega_s = l_{\checkmark}) << D_s(\omega_s = l_{\times})$
- $$V_{s,r}(\omega_s, \omega_r) = \begin{cases} \beta, & \text{if } \omega_s \neq \omega_r \\ 0, & \text{otherwise} \end{cases}$$
- $|\mathcal{W}| = |\mathcal{L}|^{|S|}$