Full or Weak annotations? An adaptive strategy for budget-constrained annotation campaigns

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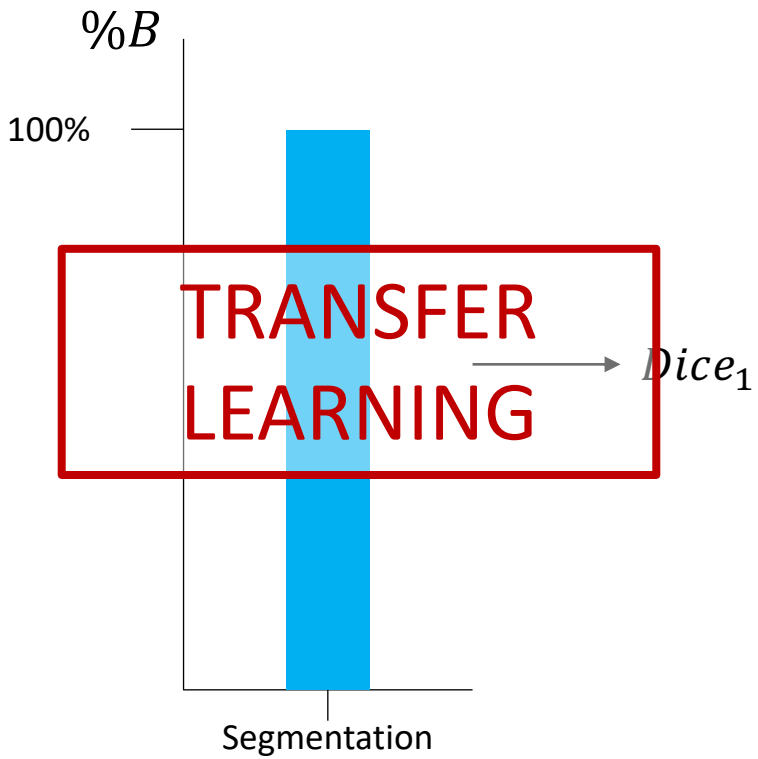
Full or weak annotations: Problem statement



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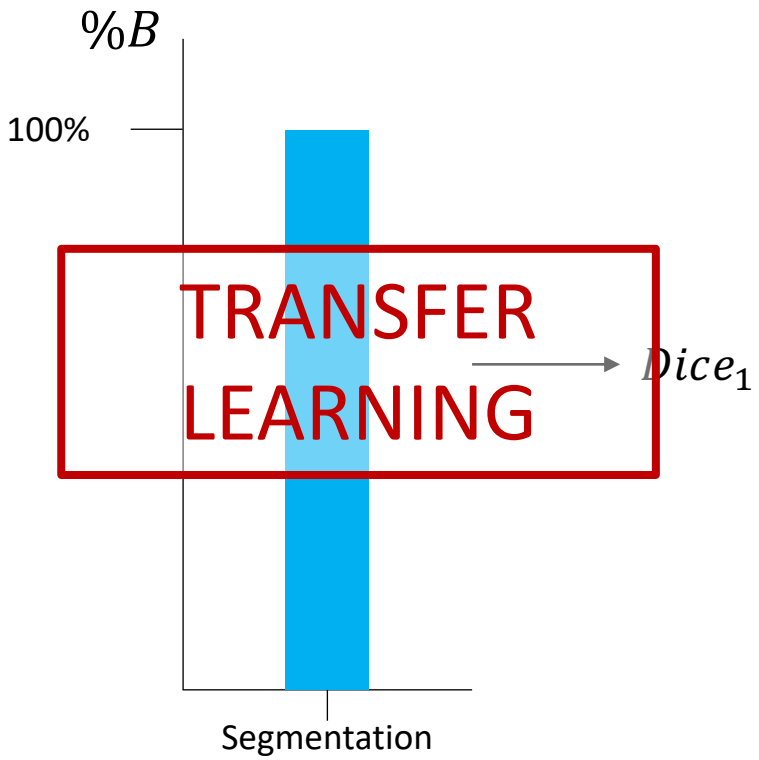
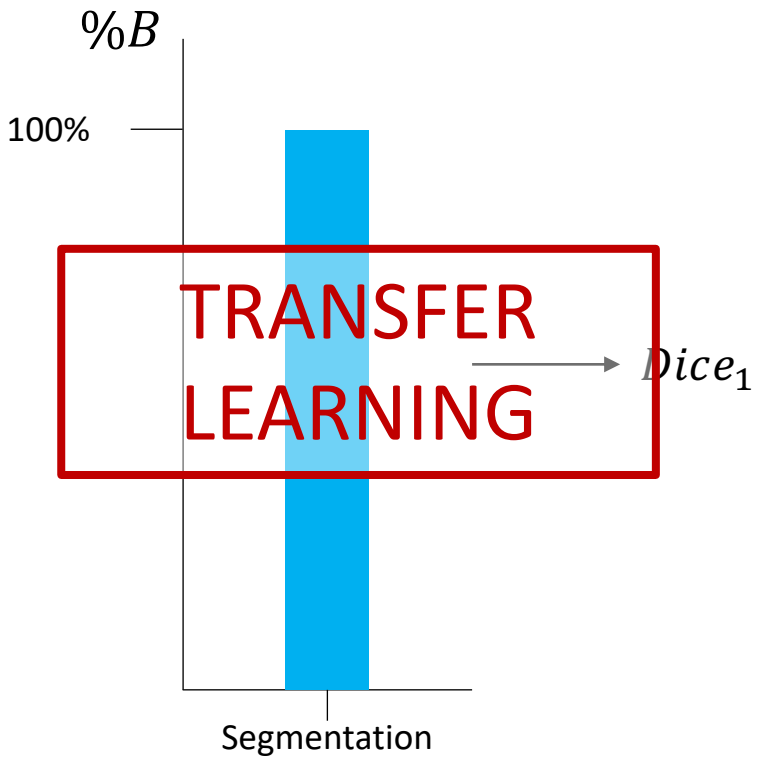
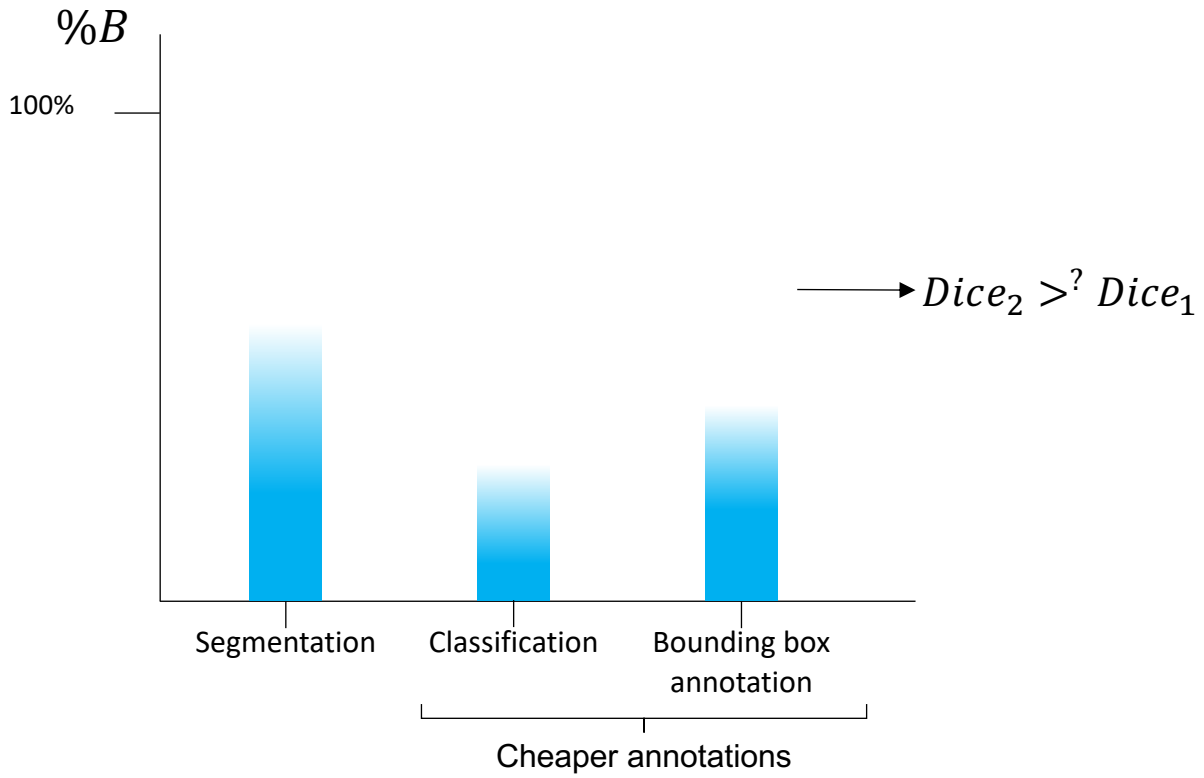


- CNNs benefit from exposition to same domain data and different tasks
- Classification annotation is 12 times* cheaper than segmentation

*Amy Bearman, et al. What's the point: Semantic segmentation with point supervision. ECCV 2016

Full or weak annotations: Problem statement





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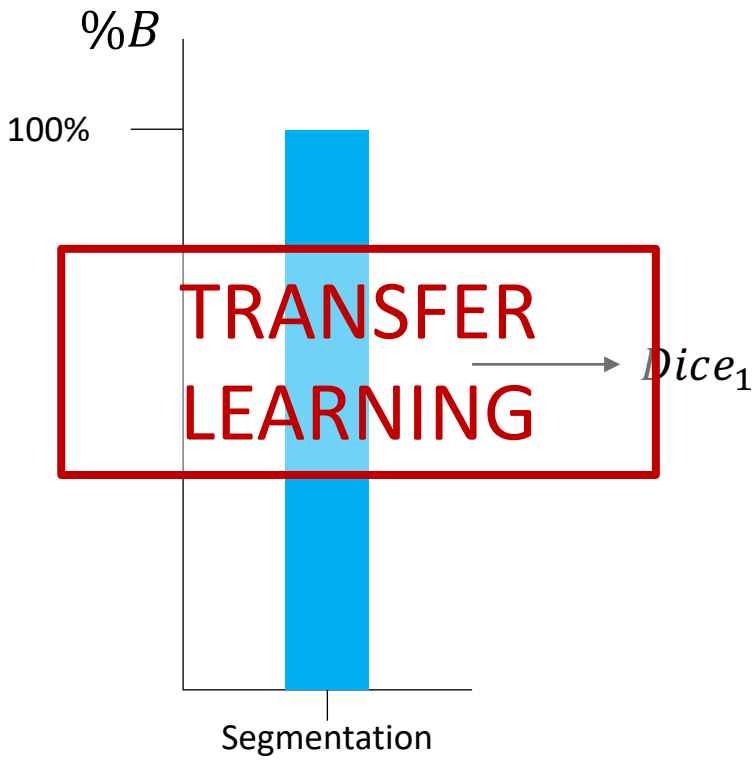
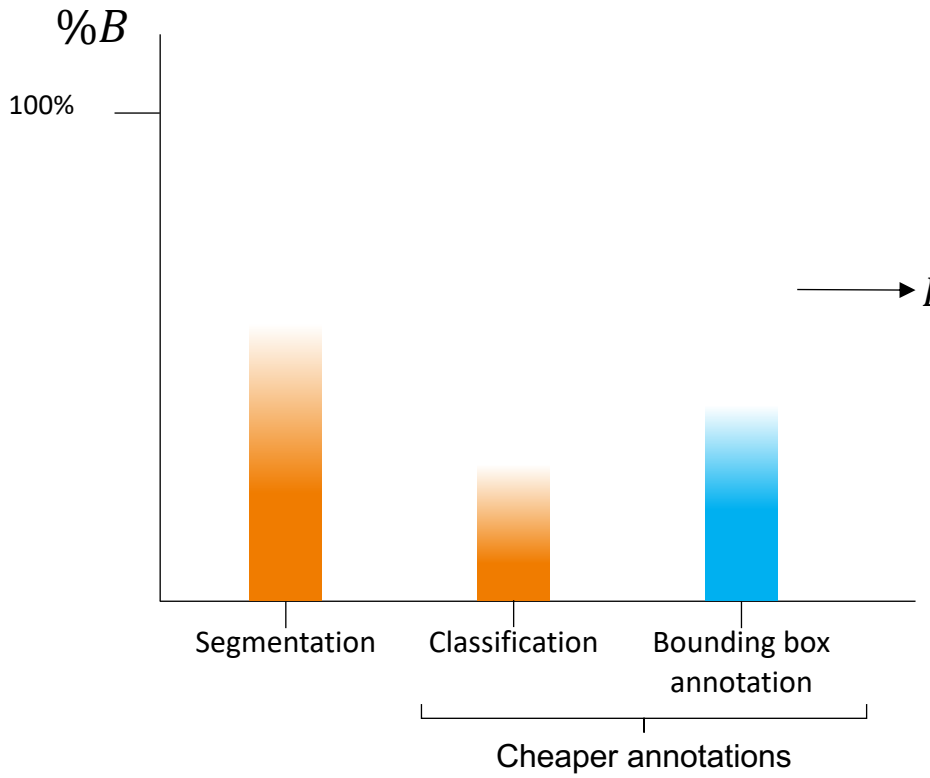




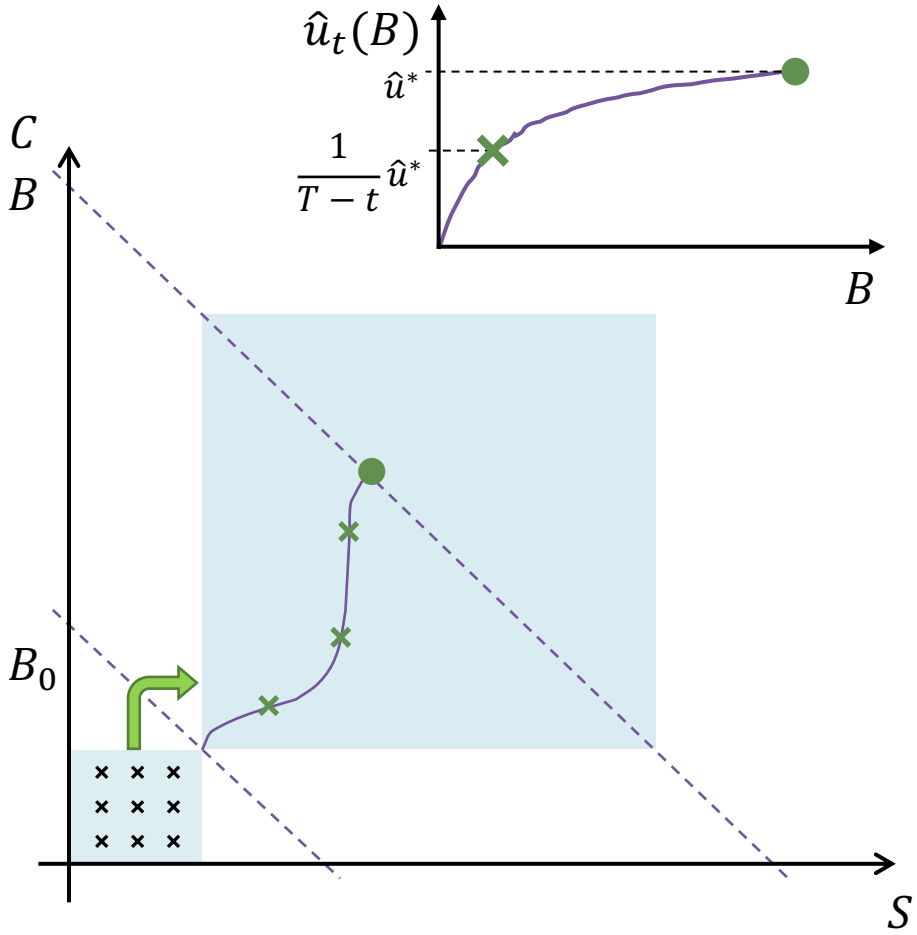
$$B = \alpha_c C + \alpha_s S$$

Full or weak annotations: Method

- How do we find the best combination of c and s?
- The process must be iterative
- We need a surrogate model: Gaussian Processes

Algorithm:

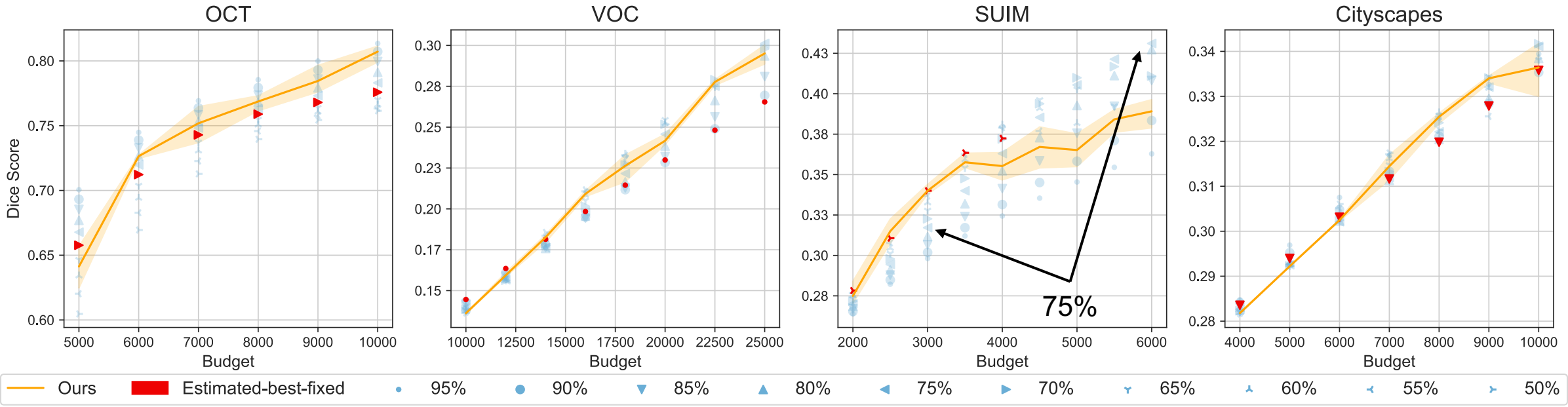
1. Initial conditions $B_0 = \alpha_c C_0 + \alpha_s S_0$, number of steps T and final budget B.
2. Sample the space under (C, S) → Train a segmentation model on each combination. The result is a surface $(c_i, s_i, \text{dice}_i)$.
3. Fit $GP(\mu, k)$ and predict the region to the budget goal (B).
4. Find a trajectory with ever-increasing expected improvement over the new region
5. Select new (C, S) that is T steps away in terms of expected improvement.



$$B = \alpha_c C + \alpha_s S$$

Full or weak annotations: Results

We tested the ability of our method to reach the best performance on four datasets.
Comparison was done against fixed strategies.

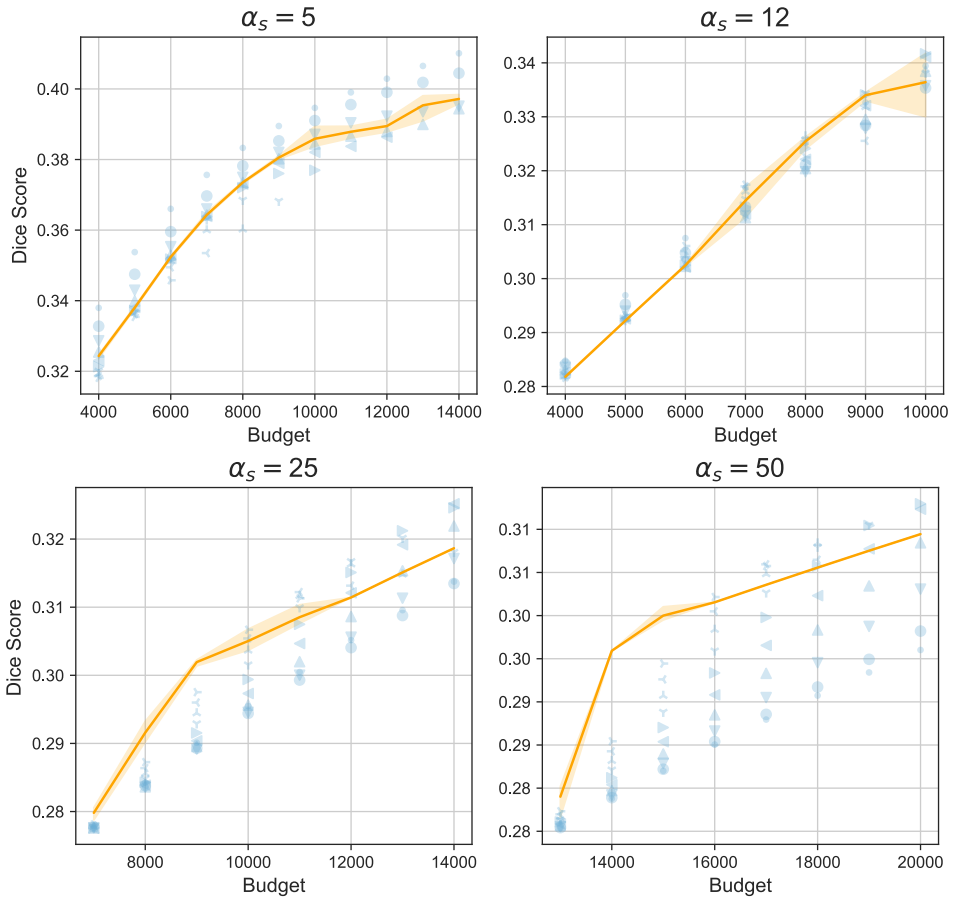


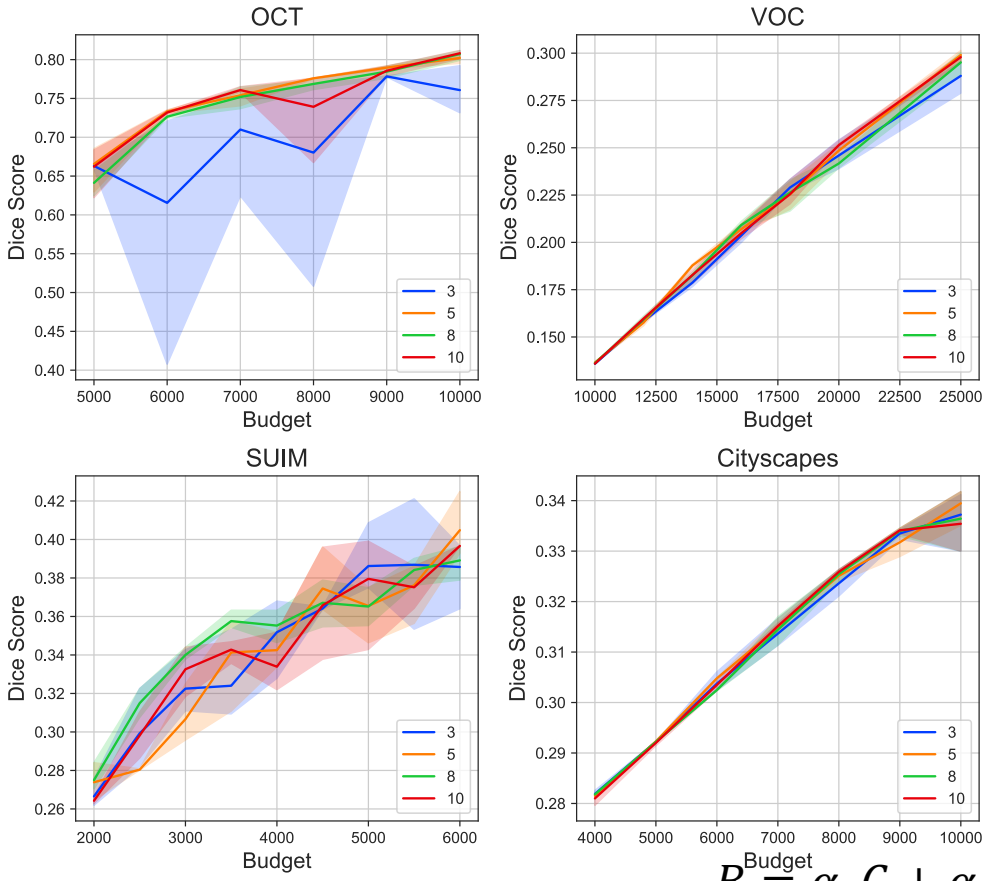
Fixed strategies in blue. Red points show the *estimated-best-fixed* strategy with B_0. Labels expressed as percentage of the budget allocated to segmentation.

$$B = \alpha_c C + \alpha_s S$$

Full or weak annotations: Ablation studies

Sensitivity of the model to α_s and T.





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