

Endoscopic Vision Challenge 2019

-Robust Medical Instrument Segmentation (ROBUST-MIS)

13th of October
Shenzen, China

Team Uniandes



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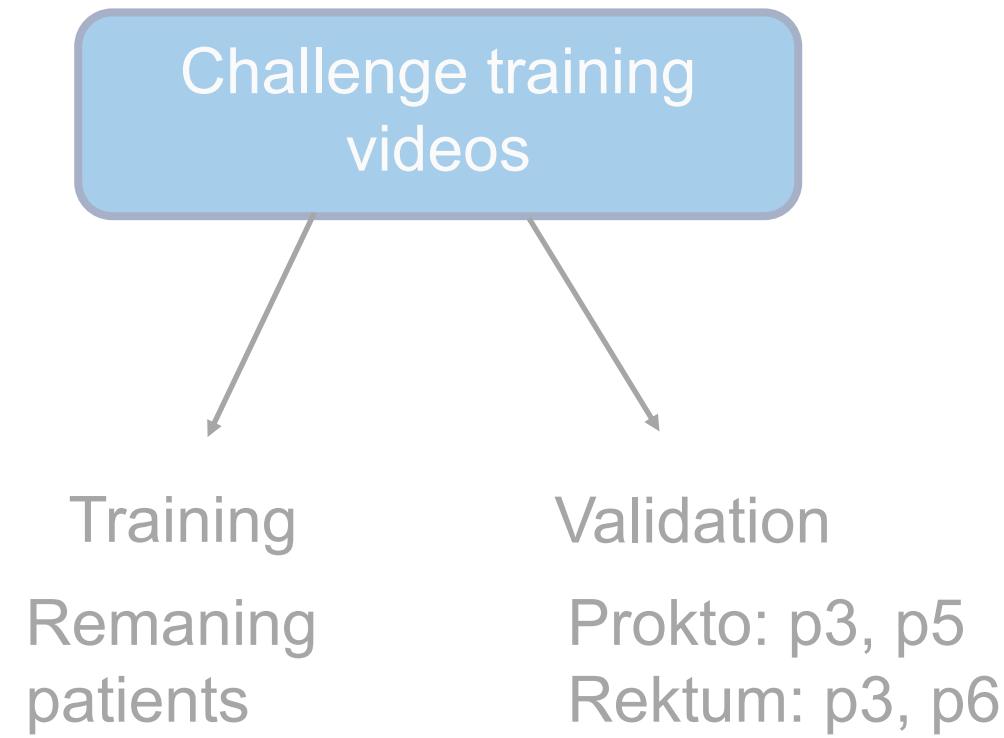


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Concept Overview

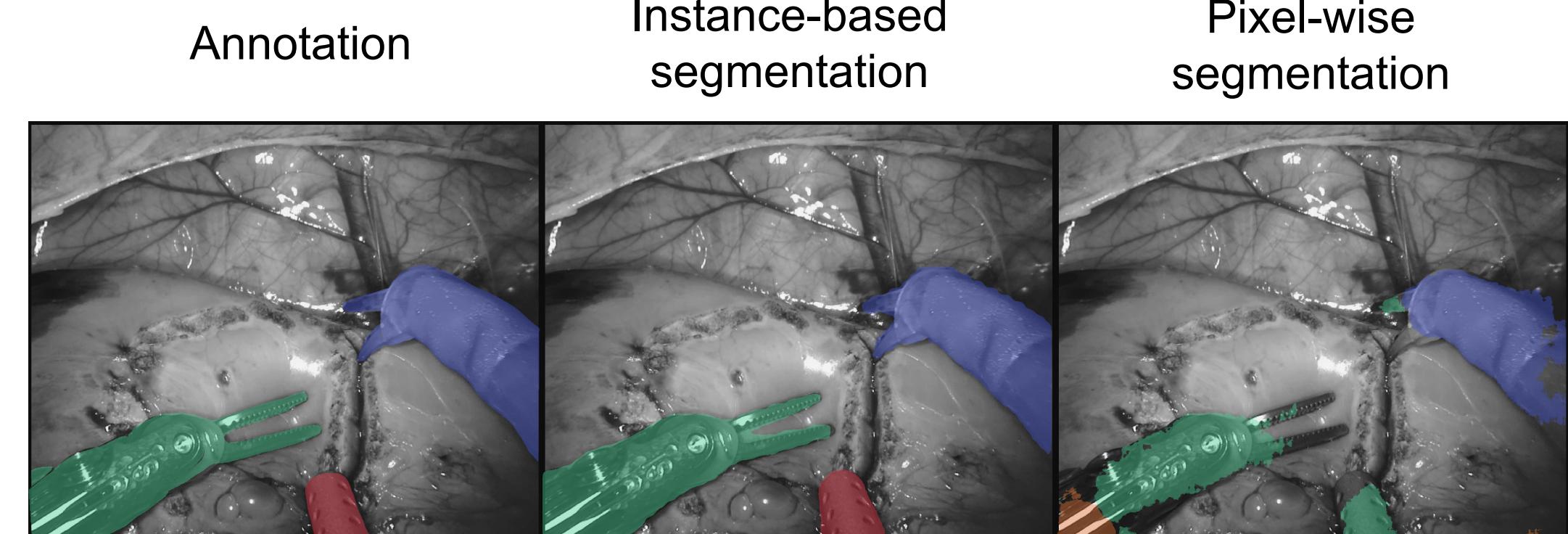
Experimental setup



- ✓ Each patient is in only one split.
- ✓ ~ same number of videos from prokto and rektum in the splits.

Our quantitative evaluation is based on multiple metrics (Dice, mIoU, cloU, Precision, Recall)

Instance-based segmentation



Instance-based segmentation



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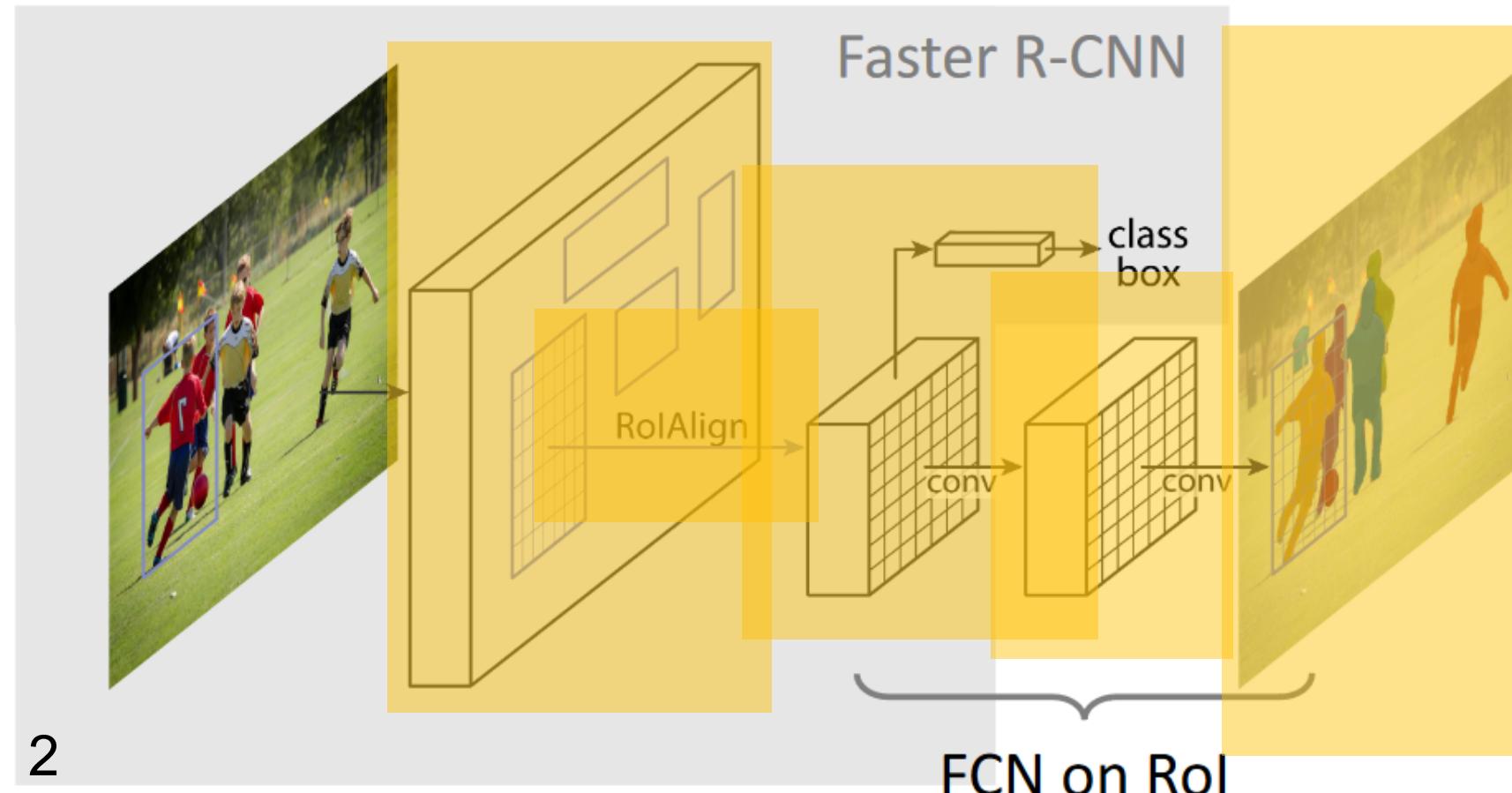
Pixel-wise
segmentation

- Spatial consistency in label prediction:
- ✓ Reduce instrument fragmentation.
 - ✓ Reduce instrument merging.

Concept Overview

Instance-based segmentation

Mask R-CNN¹



1. Candidate proposals.
2. Feature extraction.
3. Ensure same size RoIs.
4. Predict object class and BBox coordinates.
5. Predict the object's mask.
6. Final segmentation: keep masks with score ≥ 0.5

We validated all our design choices with the experimental framework.

Model	Avg. Dice	mAP	Avg. Recall	mIoU	cIoU
Ours	81.5	67.2	49.6	84.7	61.3

Table 1. Results of our method on our validation set.

1. Kaiming He, Georgia Gkioxari, Piotr Dollar, and Ross Girshick. Mask R-CNN. In The IEEE International Conference on Computer Vision (ICCV), Oct 2017.

2. Image taken from: http://kaiminghe.com/iccv17tutorial/maskrcnn_iccv2017Tutorial_kaiminghe.pdf

Key design choices

Temporal information

How do we take advantage of unlabeled frames in videos?

Information redundancy

Data augmentation



1

Propagate annotations backwards in time

Video with annotated frame

2

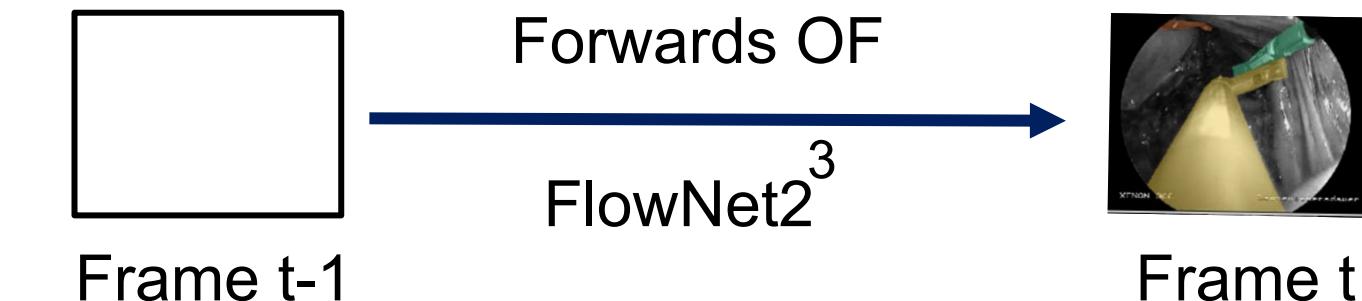
Train Mask R-CNN with more data.

Instance-based segmentation

Spatial consistency in label prediction

1 Propagate annotations

Calculate optical flow between consecutive frames



Warp annotations from t to t-1

