



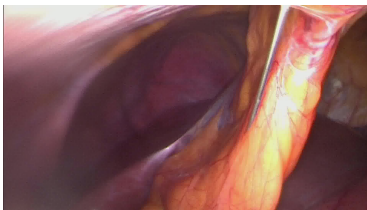
M2CAI WORKFLOW CHALLENGE 2016

Fine tuning CNN with HMM smoothing

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Videos resolution is 1920×1080 , shot at 25 frames per second at the IRCAD research center in Strasbourg, France.

- 27 training videos
- 15 test videos

1 of 8 classes for each frames :

- TrocarPlacement
- Preparation
- CalotTriangleDissection
- ClippingCutting
- GallbladderDissection
- GallbladderPackaging
- CleaningCoagulation
- GallbladderRetraction

Online prediction : $P(y|x_i, x_{i-1}, x_{i-2}, \dots)$

x_i := frame i , and y := classes

Useful to :

- monitor surgeons
- trigger automatic actions

Measures : - Jaccard similarity coefficient :

$$J(A, B) = \frac{|A \cap B|}{|A \cup B|} = \frac{|A \cap B|}{|A| + |B| - |A \cap B|}$$

- Accuracy top1 : nb frames well classified / nb total frames

Training models to classify from images (frames)

Extract features from CNN Fine tuning CNN

Smoothing the predictions of our model

1. averaging 2. HMM

1. Extracting images

Train

Val

2. Training a frame classifier

Features extraction

2. Training a frame classifier

Fine tuning CNN

2. Training a frame classifier

Fine tuning CNN with Weldon

3. Smoothing the predictions

Averaging

3. Smoothing the predictions

HMM online

3. Smoothing the predictions

HMM offline

Validation set

by classes

hmm A

hmm mus

Conclusion

lolz