IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

UE Computer Vision 2024

Optical flow based tracking using CNN's

Group 4:
Santiago Quinteros
Sofia Pistone
Álvaro Scarramberg

Index

IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

1. Baseline Method

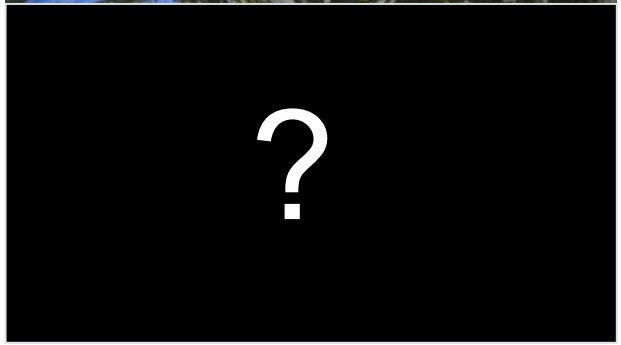
IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

1.Baseline Method:

1.1 Objective

FRAME 1

FRAME 2

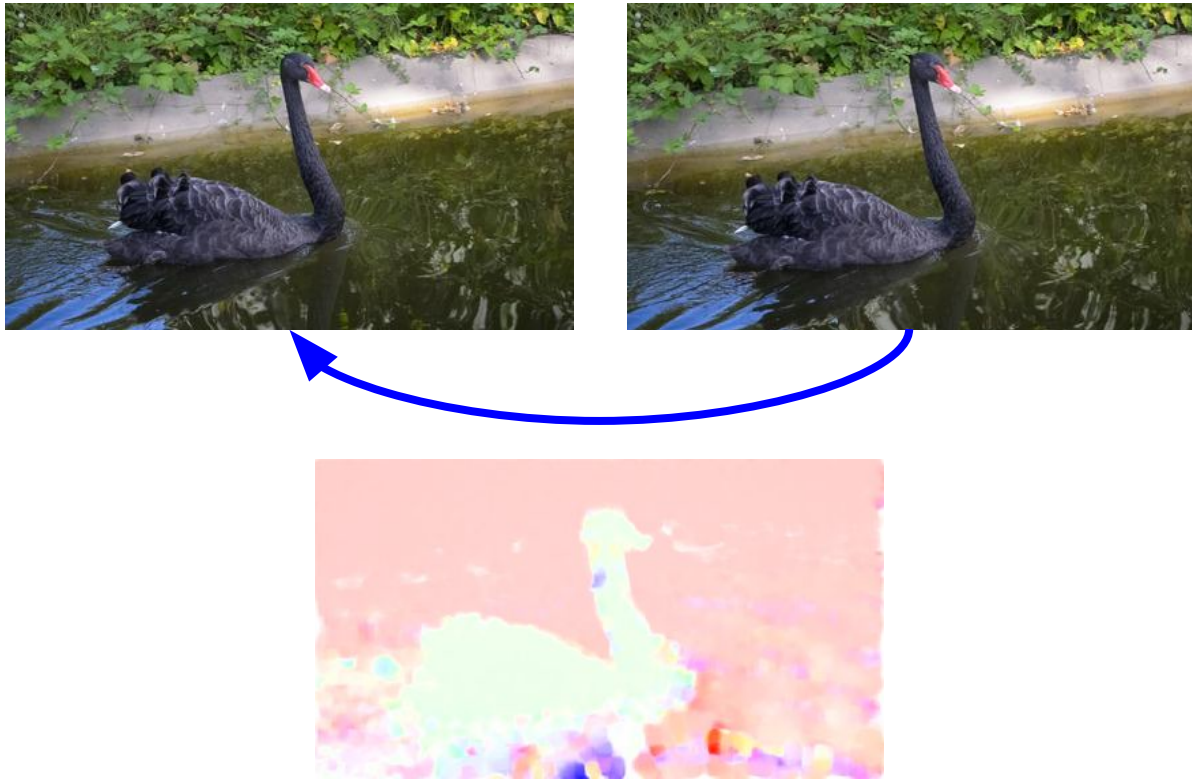


How to obtain the segmentation of the next frame?

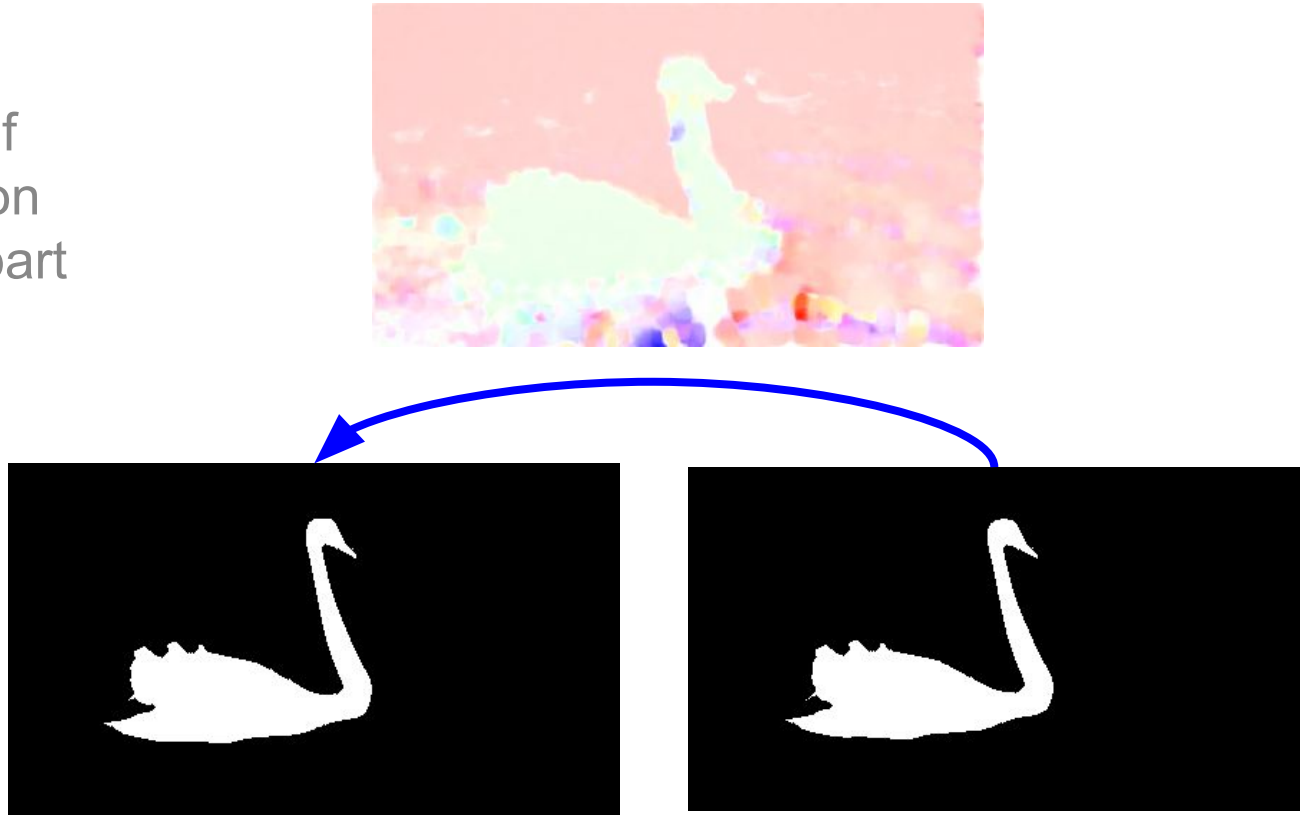
1.Baseline Method:

1.2 Operation

1) We compute the inverse sense optical flow (Frame 1 to 2)



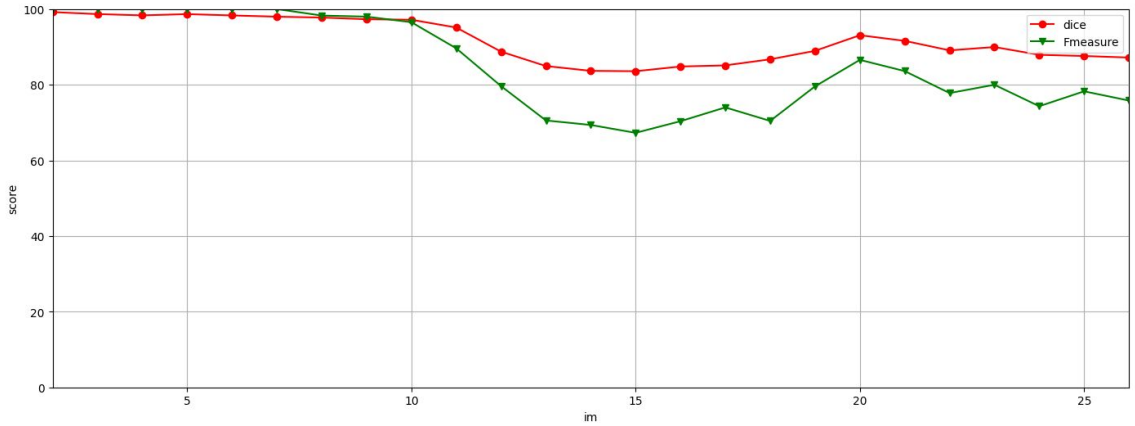
2) We propagate the mask by checking if the previous position of each pixel was part of the mask

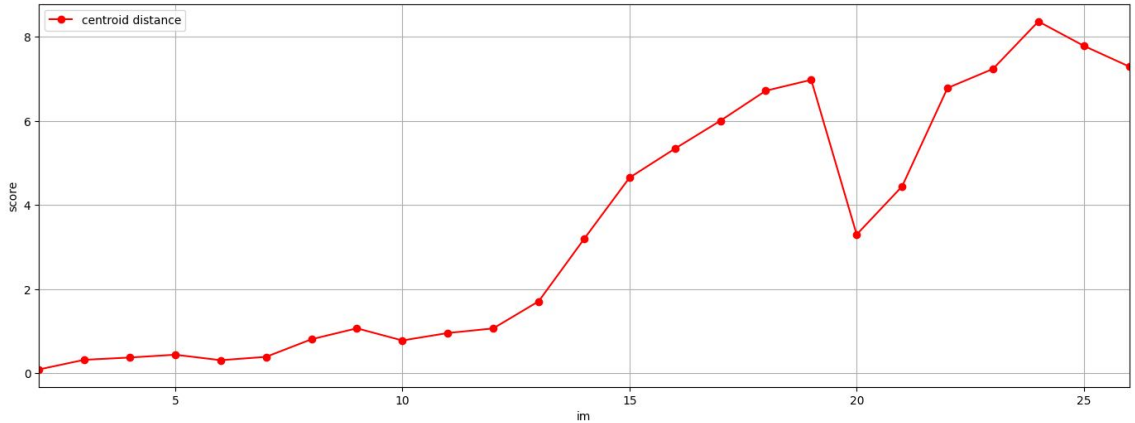


1.Baseline Method:

1.3 Performance

This method has a great performance for frames that are close but it degrades with higher time differences.





1.Baseline Method:

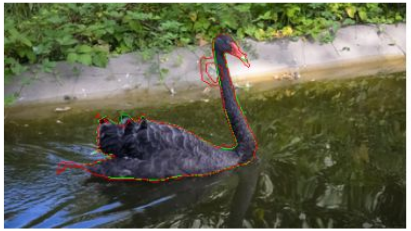
1.3 Performance

1

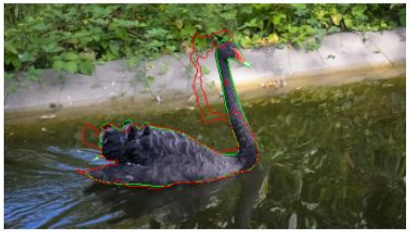
4

7

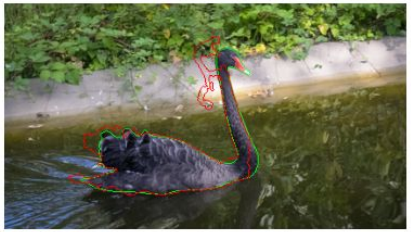
10



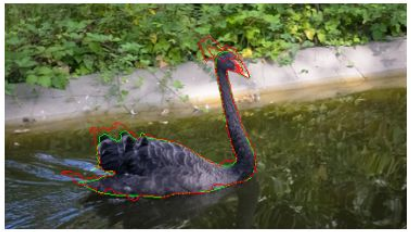
14



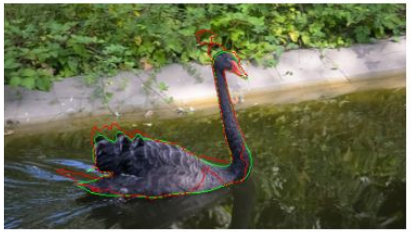
17



20



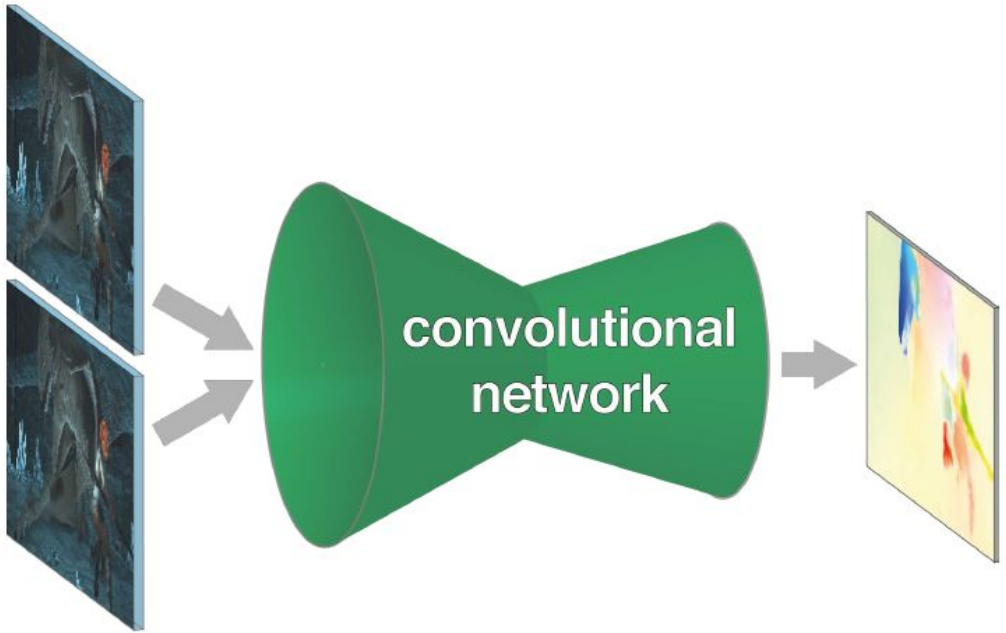
23



2. Optical flow estimation with CNN's

IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

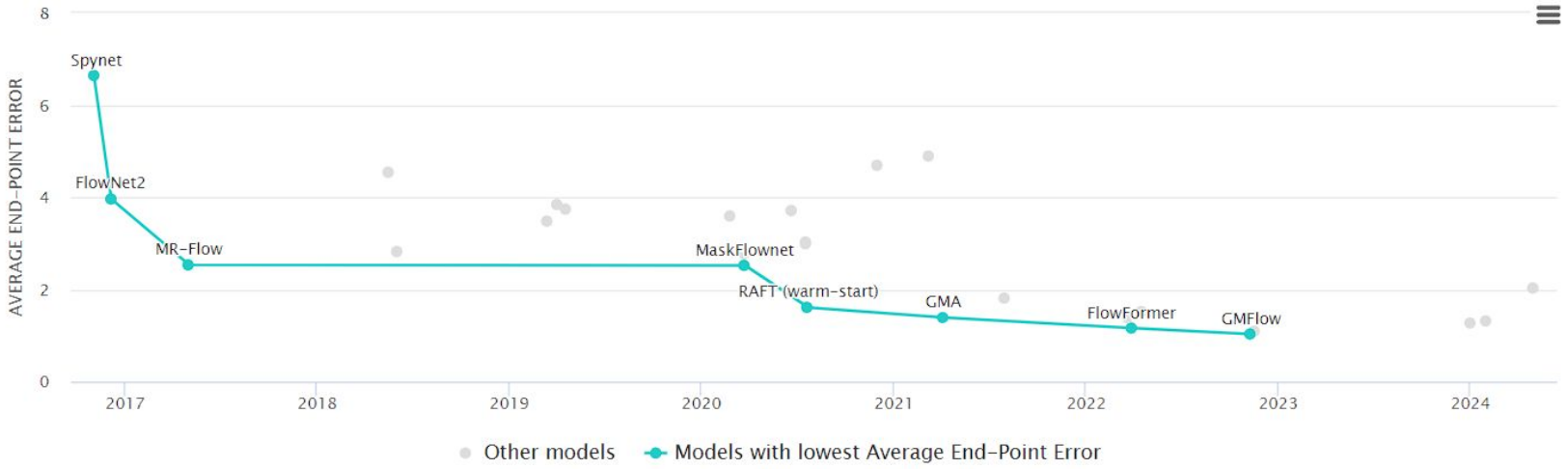
FlowNet consists of a encoder-decoder CNN architecture which is trained to estimate optical flow



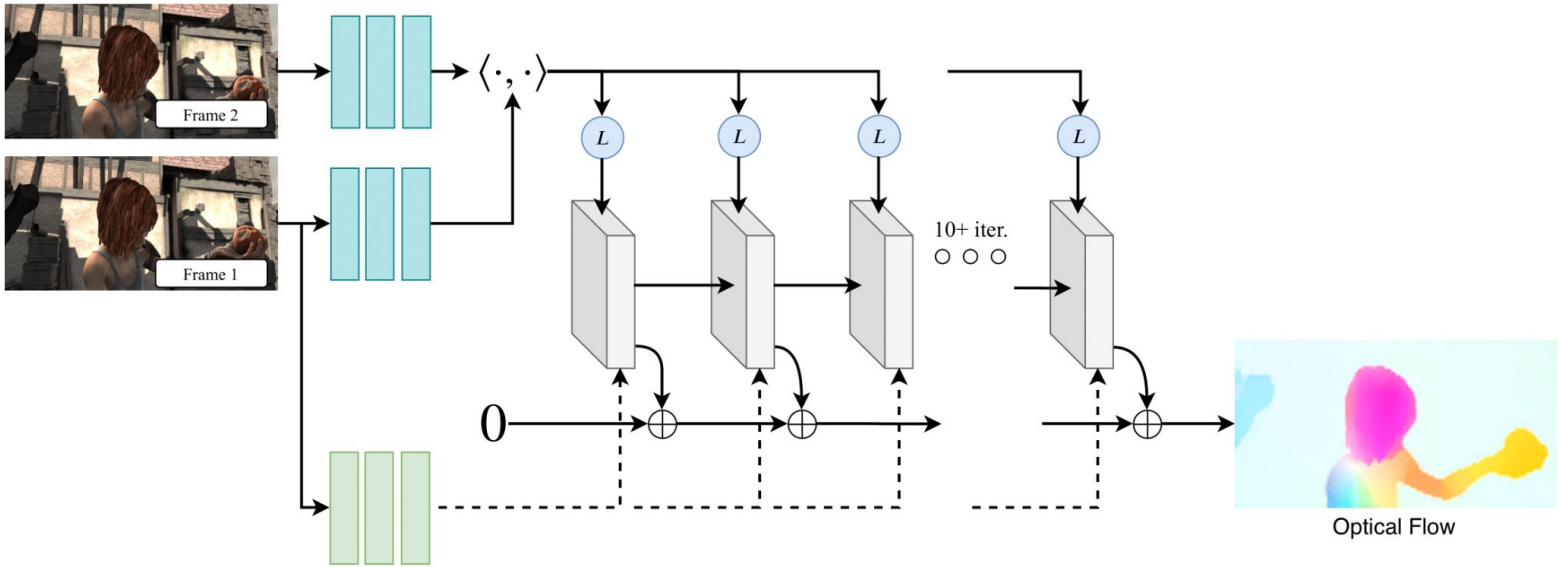
Optical Flow Estimation on Sintel-clean

Leaderboard Dataset

View Average End-Point Error by Date



RAFT is a modern CNN based OF model which acts in a recurrent manner.



The output is refined through a certain number of iterations.

2. Optical flow estimation with CNN's

2.4 RAFT vs Farneback

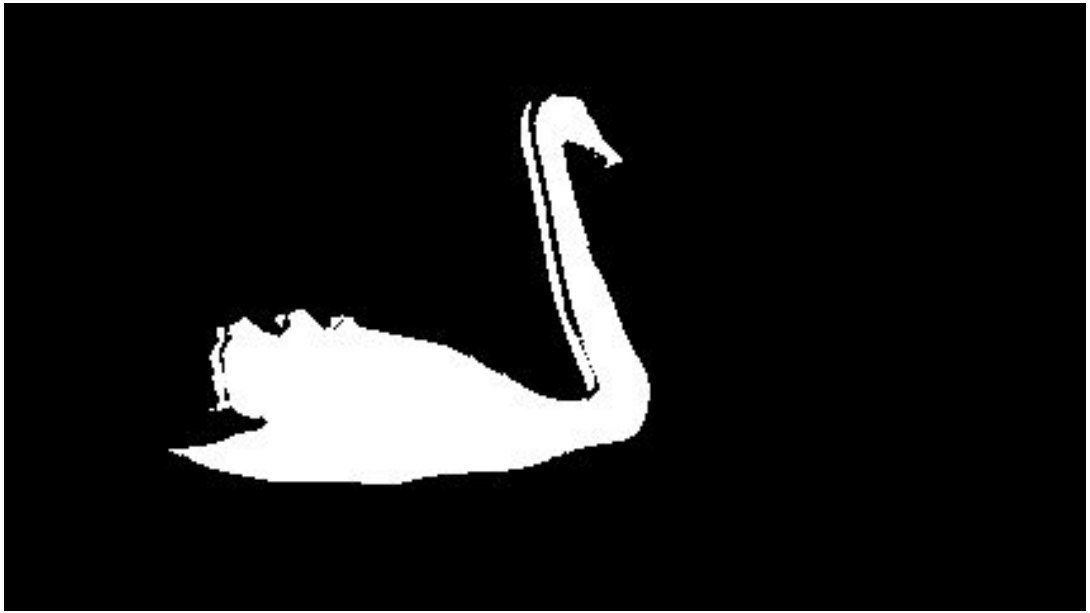
RAFT's solutions:

- Are smoother
- Don't degrade with higher time steps

3.The Ghost Duck

IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

Our initial results were not encouraging…



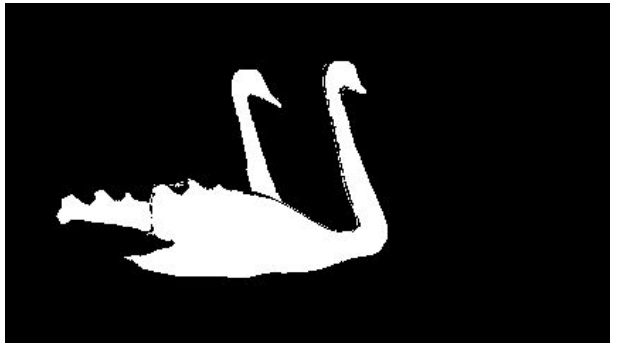
(GIF)

3. Ghost duck

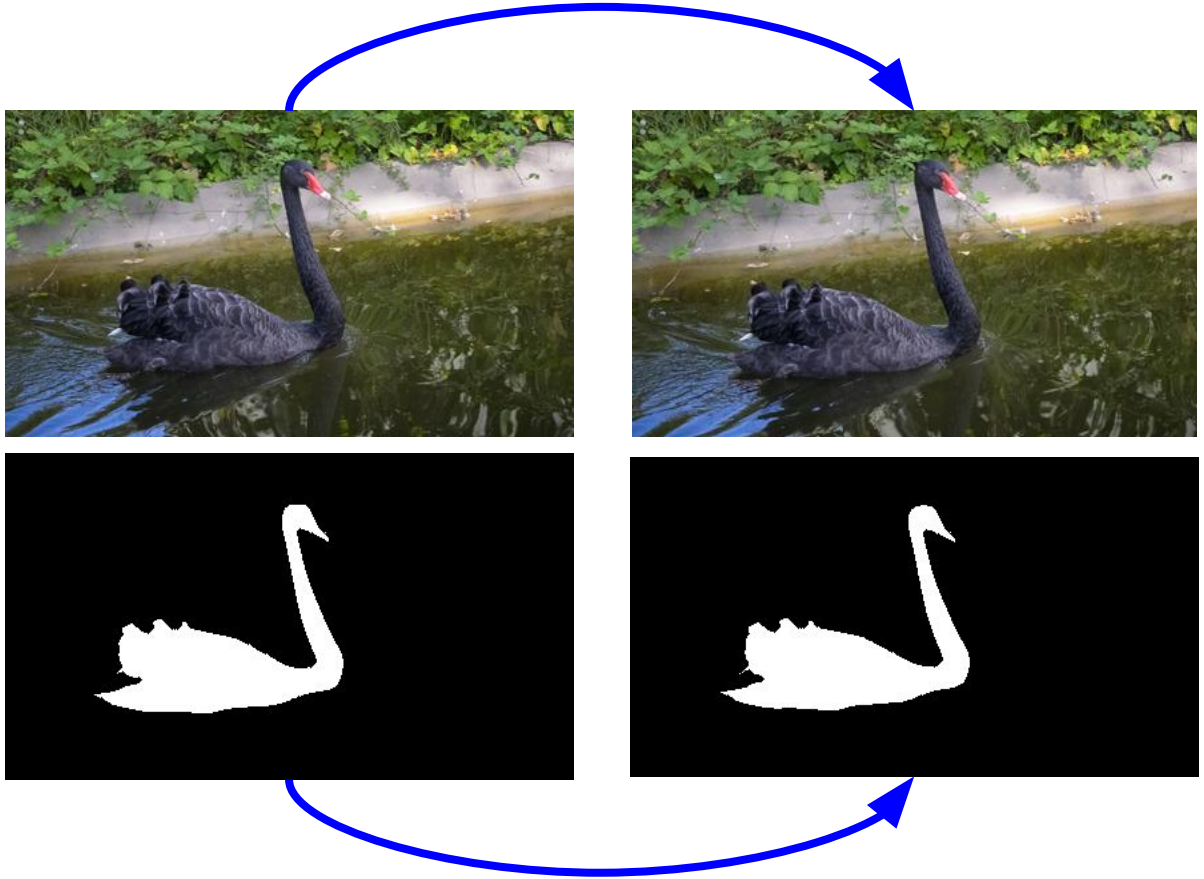
3.1 RAFT segmentation propagation

The segmentation propagation method is not suited for RAFT.

The occluded background is assigned as part of the segmentation



We solved it by using the forward sense OF and propagating the position of each pixel of the mask.



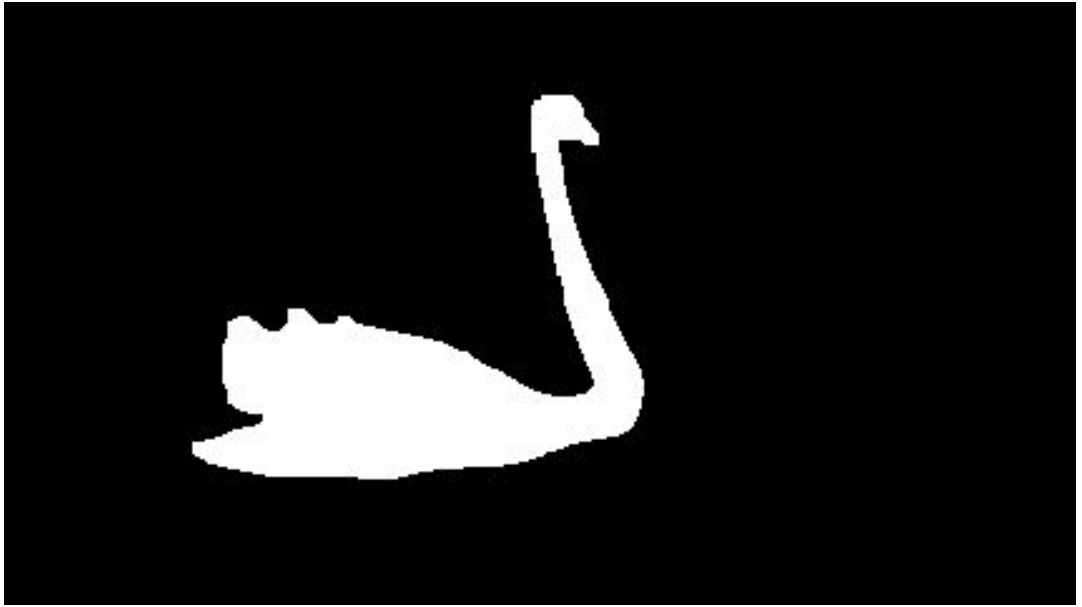
Now the ghost is gone, but we need to use some post-processing to correct some issues:

- Cracks
- Small objects

(GIF)

With morphological operations we remove small objects and fill in the cracks:

- Dilatation
- Erosion
- Remove small object
- Fill

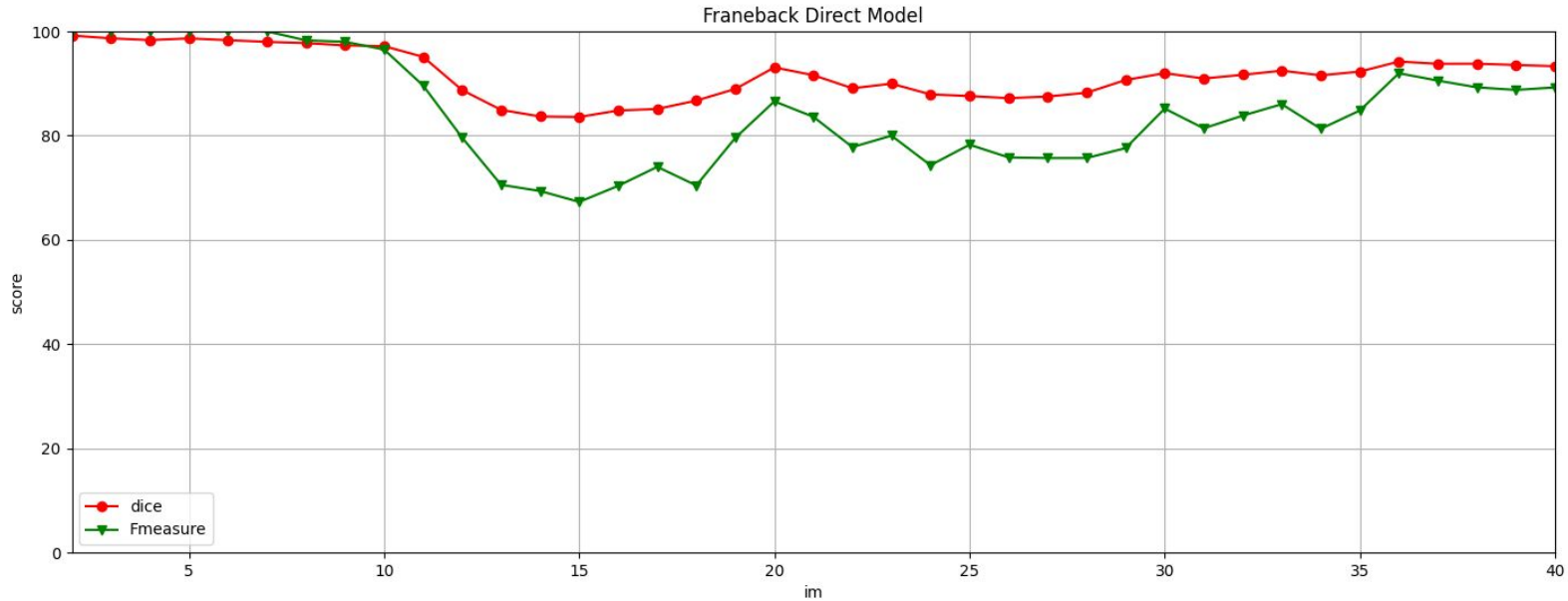


(GIF)

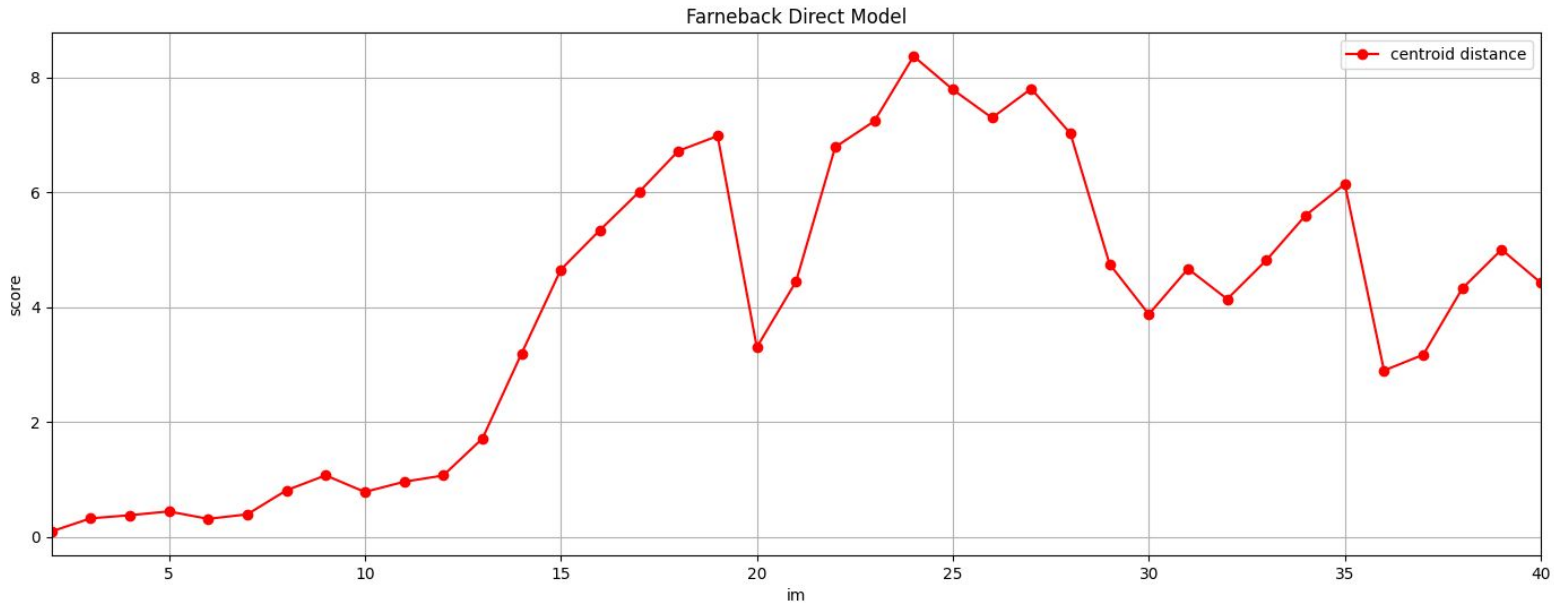
4.Results

IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

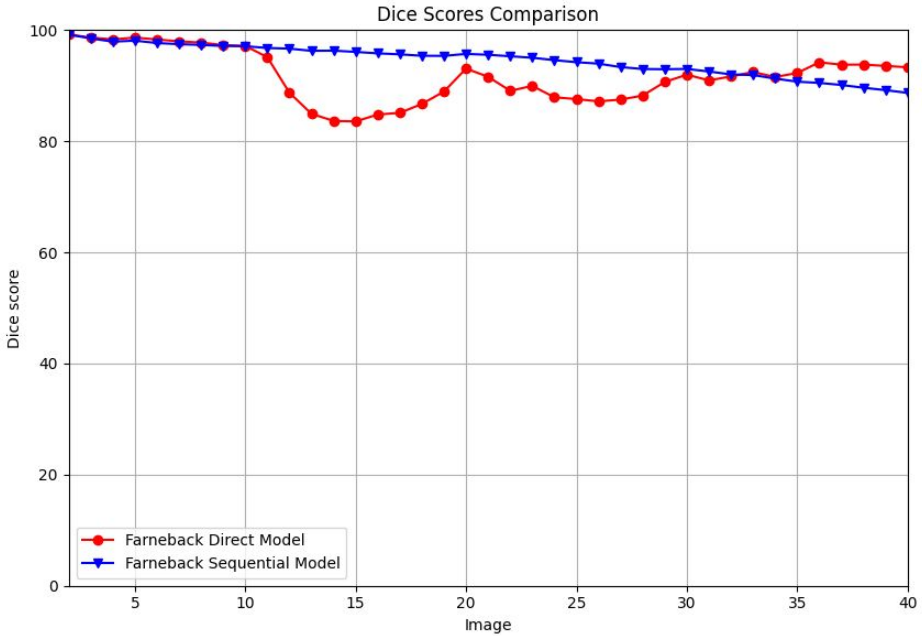
Farneback Direct Model

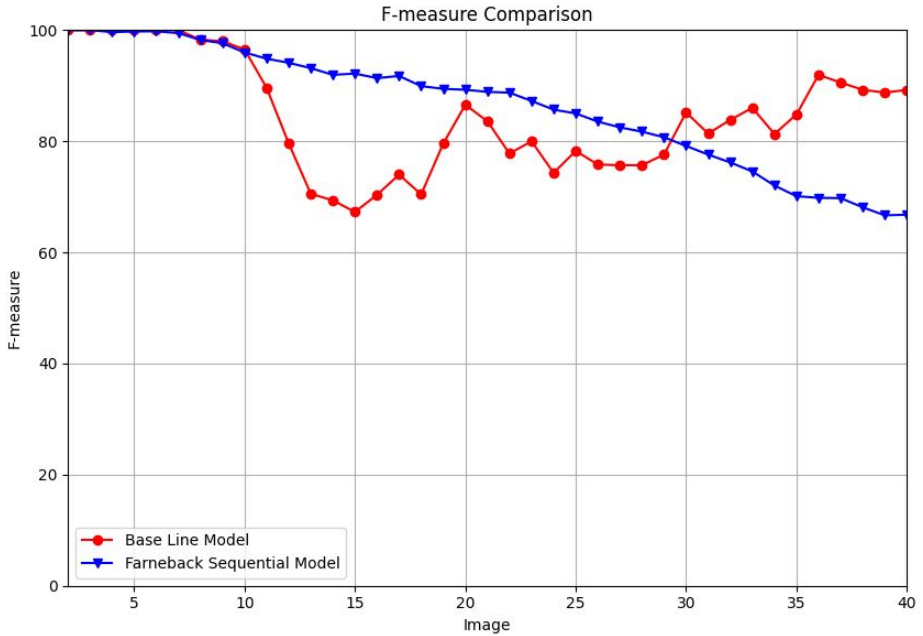


Farneback Direct Model

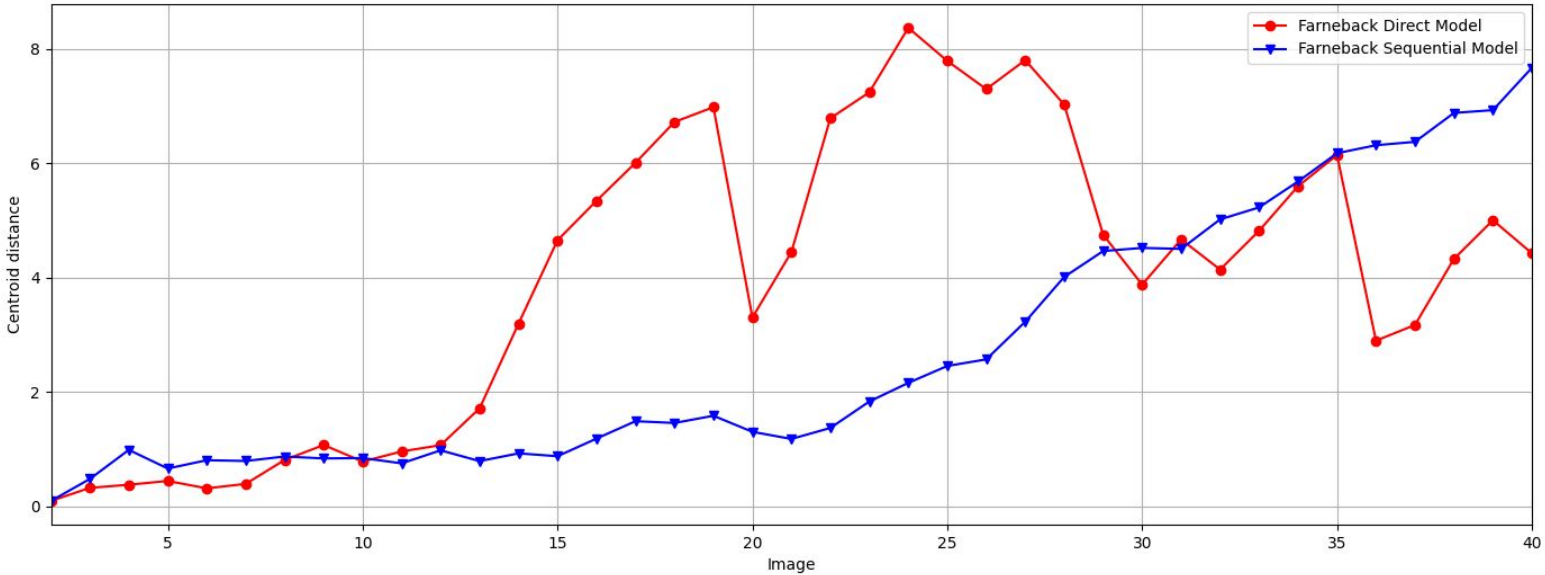


Farneback Sequential model

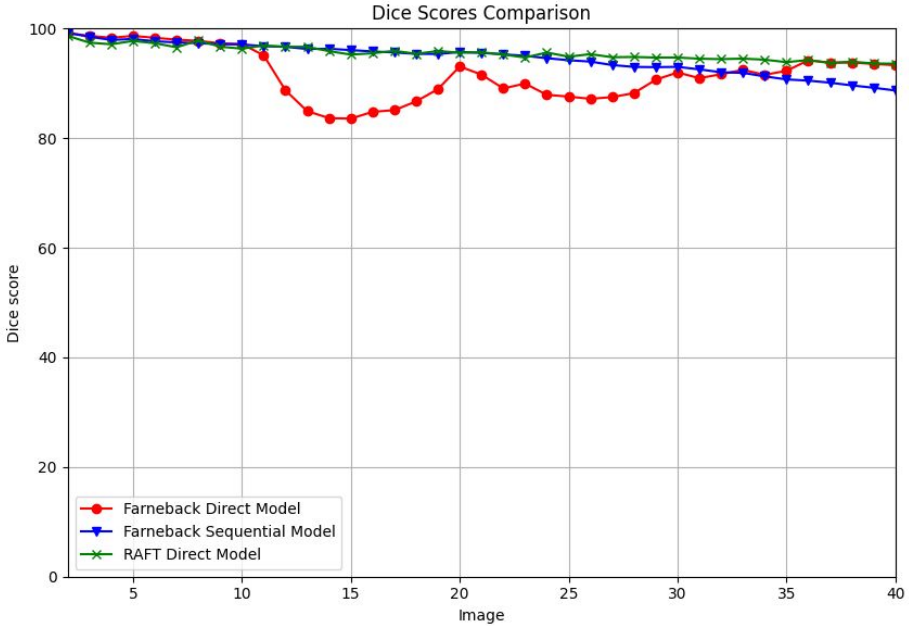


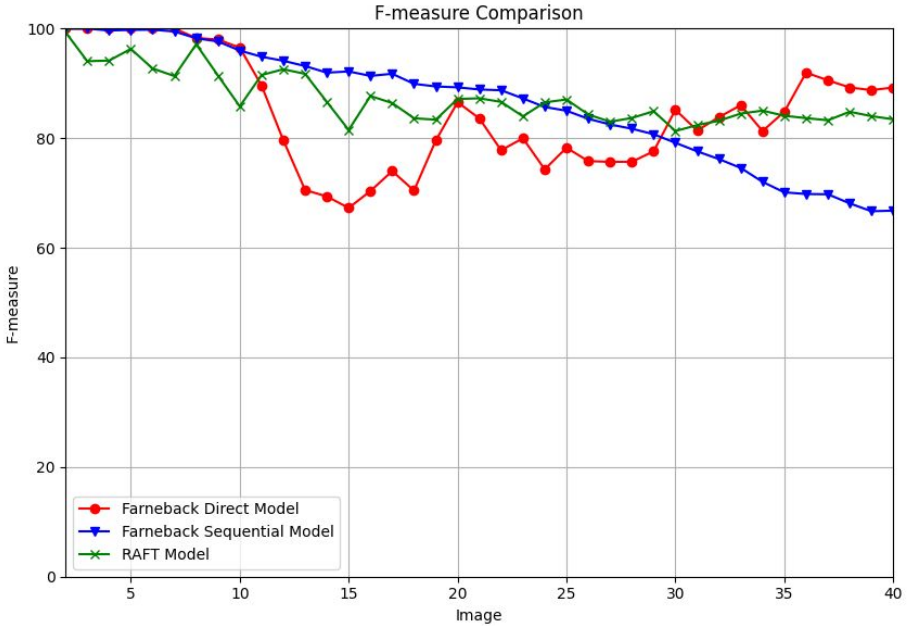


Farneback Sequential model

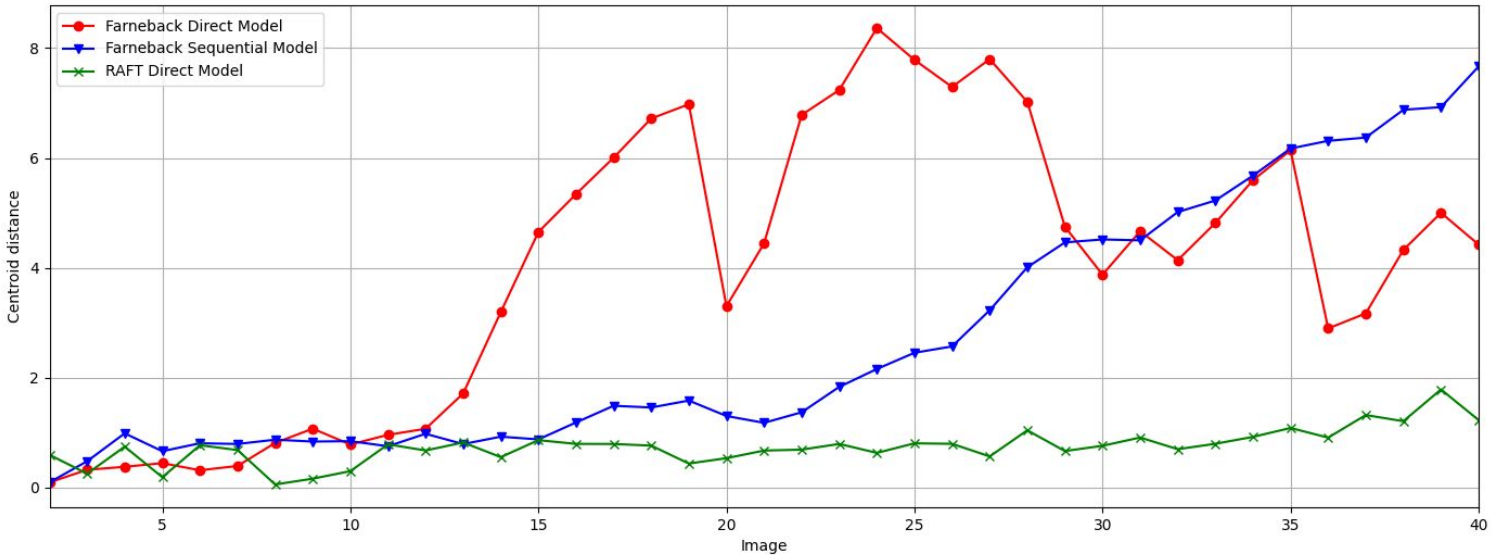


RAFT Direct Model

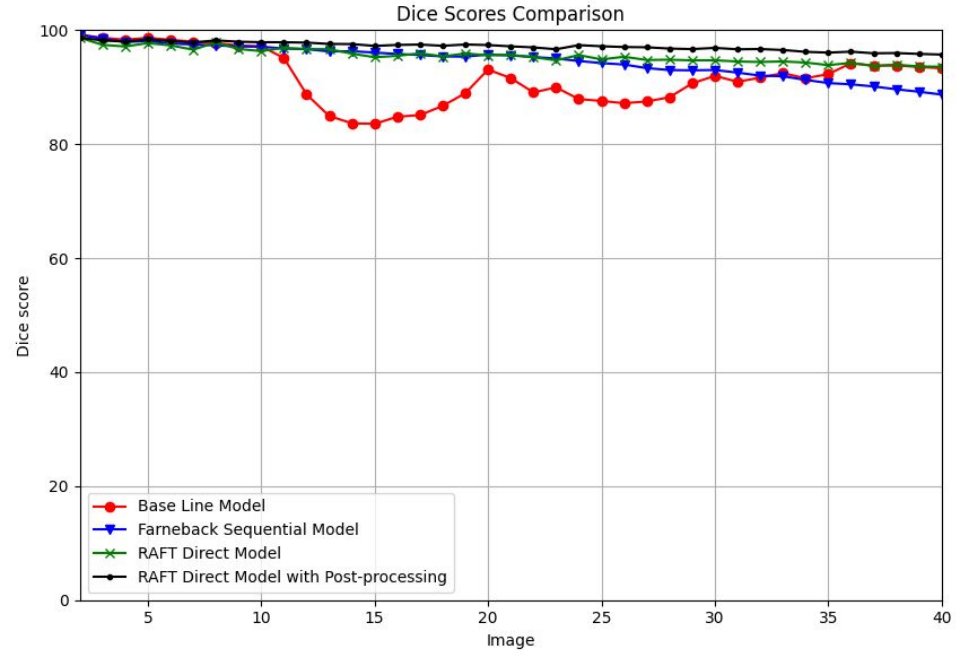


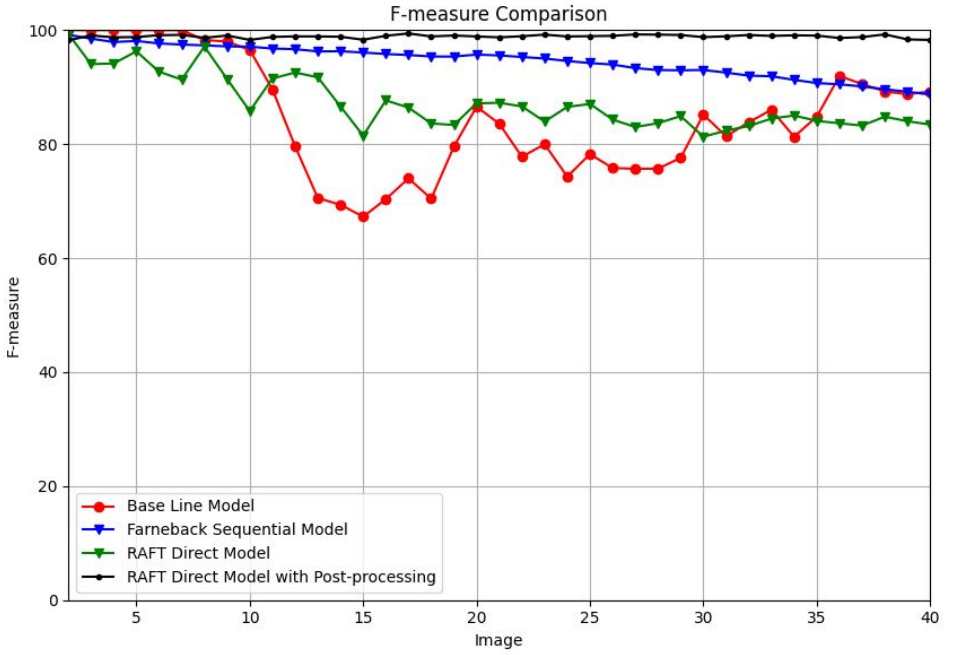


RAFT Direct Model

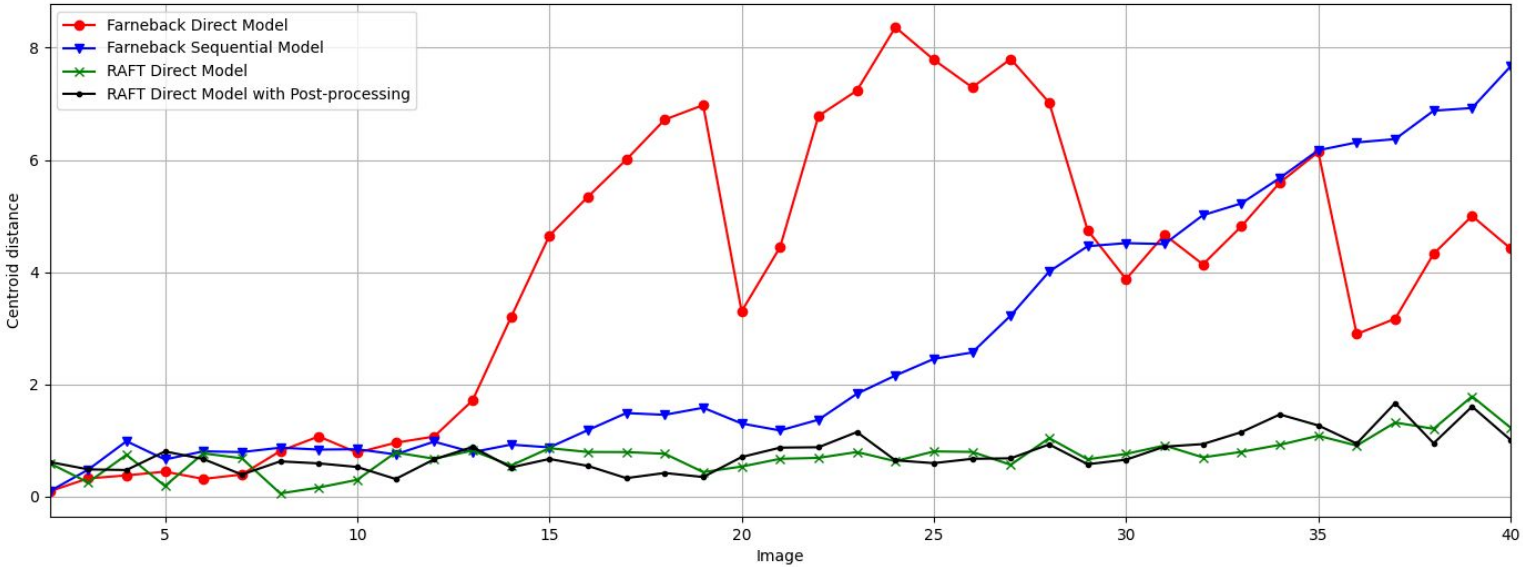


RAFT Direct Model with Post-processing





RAFT Direct Model with Post-processing

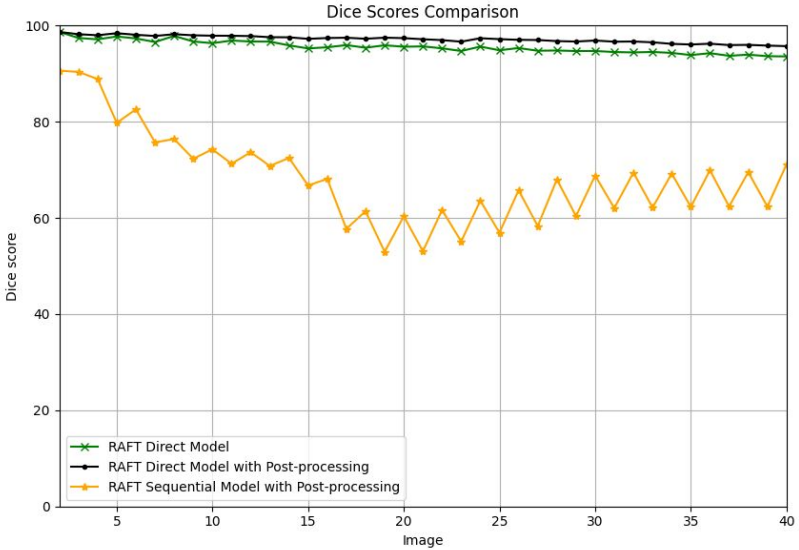


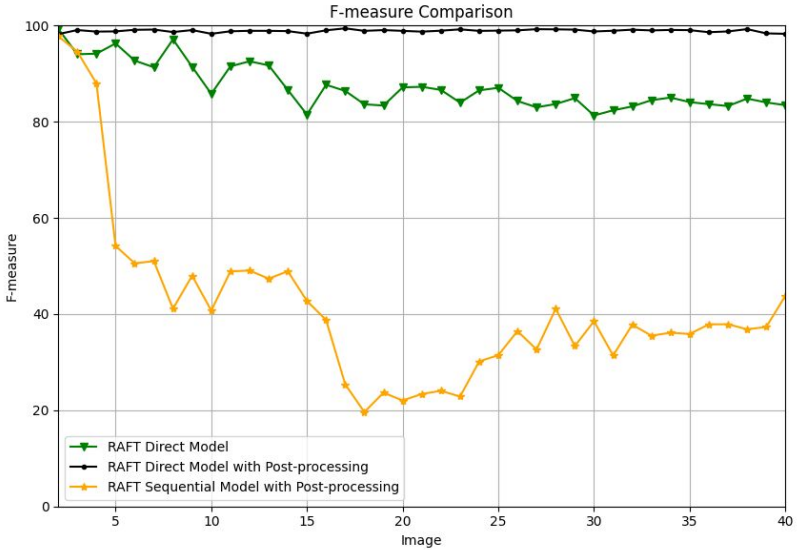
4. Future Improvements

IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

RAFT Sequential Model with Post-processing

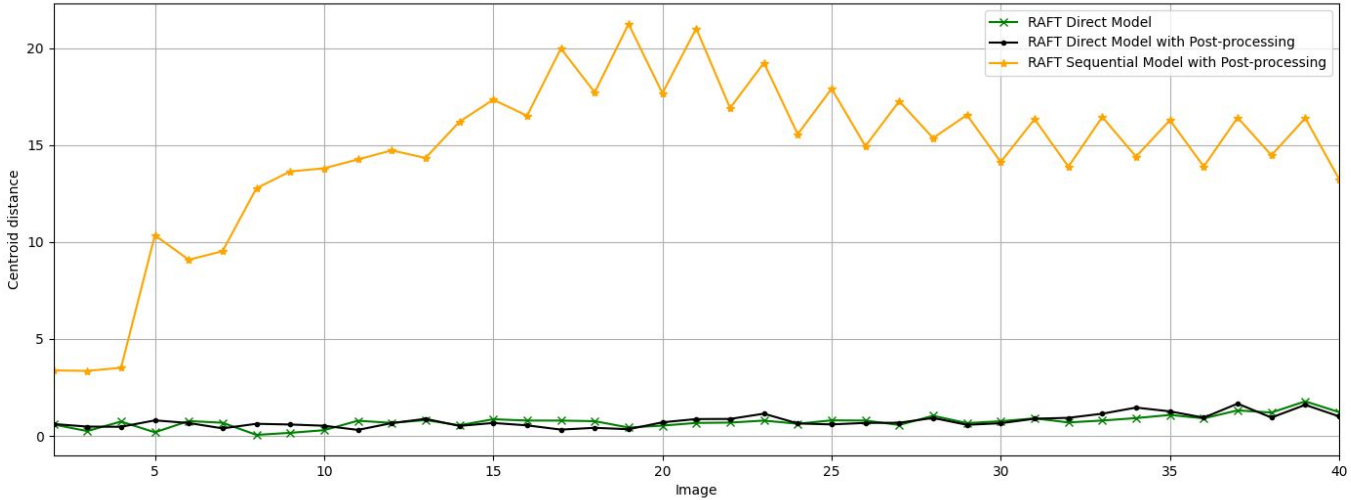
Do to a lack of time, we could not make it work correctly





RAFT Sequential Model with Post-processing

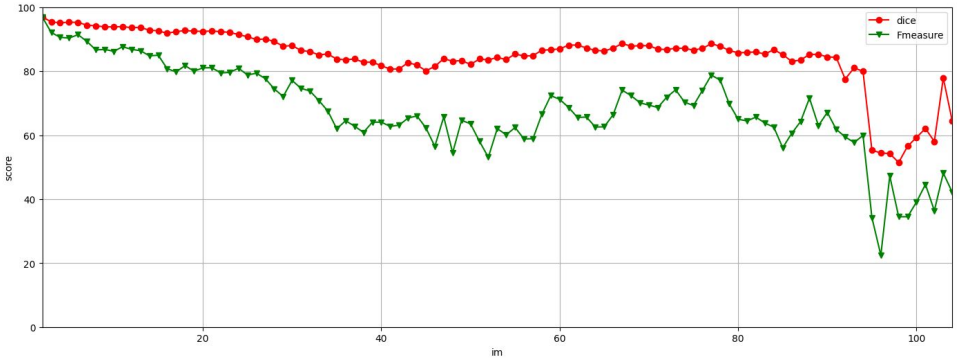
Do to a lack of time, we could not make it work correctly

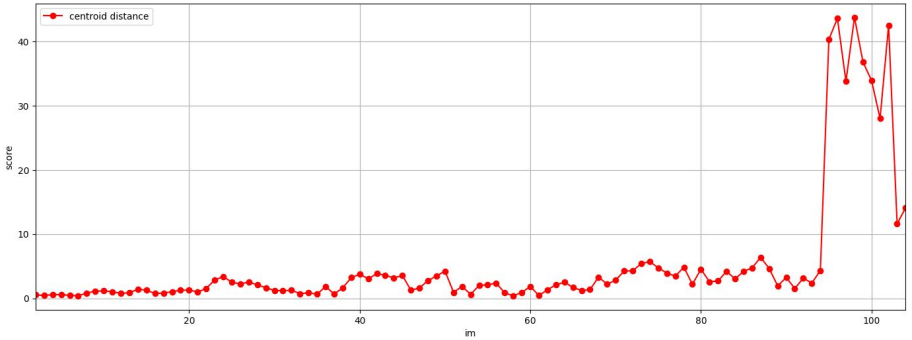


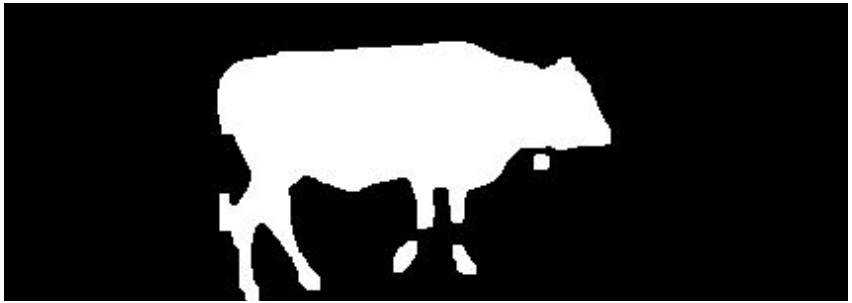
5. Challenge Results

IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

4. Results







(GIF)

Thank you for your attention

IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom