MICCAI2022 Singapore

Endoscopic Vision Challenge

SimCol-to-3D 2022

3D Reconstruction During Colonoscopy

18th September 2022

ENDOSCOPIC VISION CHALLENGE

MICCAI2022 Singapore

Intro

Challenge

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Intro

Challenge

Results

SimCol Organizers

Anita Rau

Sophia Bano

Yueming Jin

Danail Stoyanov

UCL

wellcome EPSRC centre interventional + surgical sciences

SURGICAL ROBOT VISION research group

Clinical Partners and affiliated project:

EndoMapper

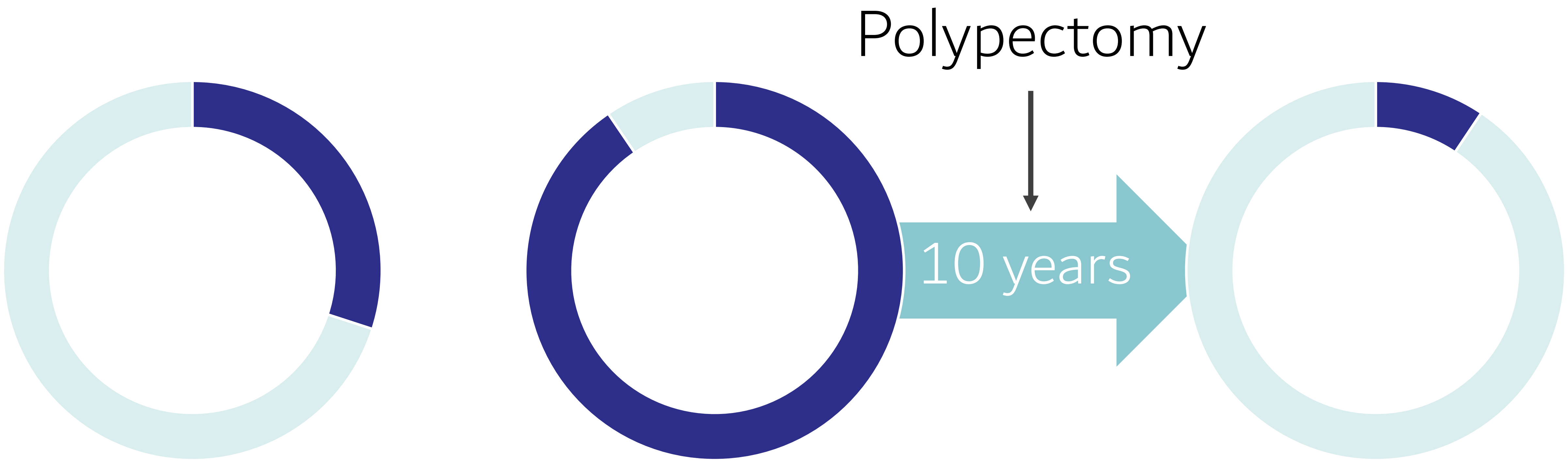
Universidad Zaragoza 1542

Sponsors:

Digital Surgery™

Medtronic

Clinical Background



People > 60 y. with polyps

Localized stage CRC patients surviving 5 years

Metastatic CRC patients surviving 5 years

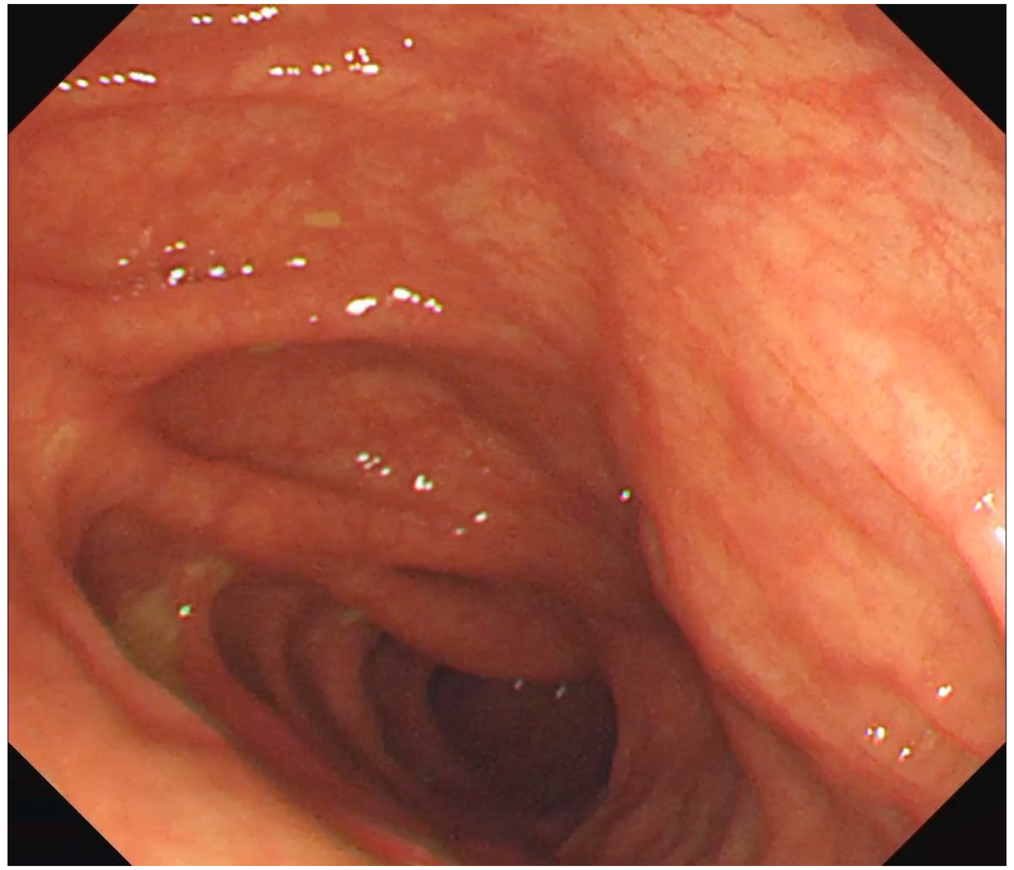
Polyp detection rates highly depend on skill!

Han, A., 2017. Butyrate, A Major Bacterial-derived Metabolite: Understanding of Butyrate Metabolism in Cancerous Colonocytes.
Hailes, S., 2007, Screening for colorectal cancer in Contemporary Issues in Cancer Imaging.

Clinical Background

Standard Colonoscope

Colonoscopy video



3D model

Olympus Medical Systems https://www.youtube.com/watch?v=IG6H-VhRiek
Pablo Azagra et al. Endomapper dataset of complete calibrated endoscopy procedures. arXiv preprint arXiv:2204.14240, 2022

Intro

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Results

SimCol Challenge Tasks

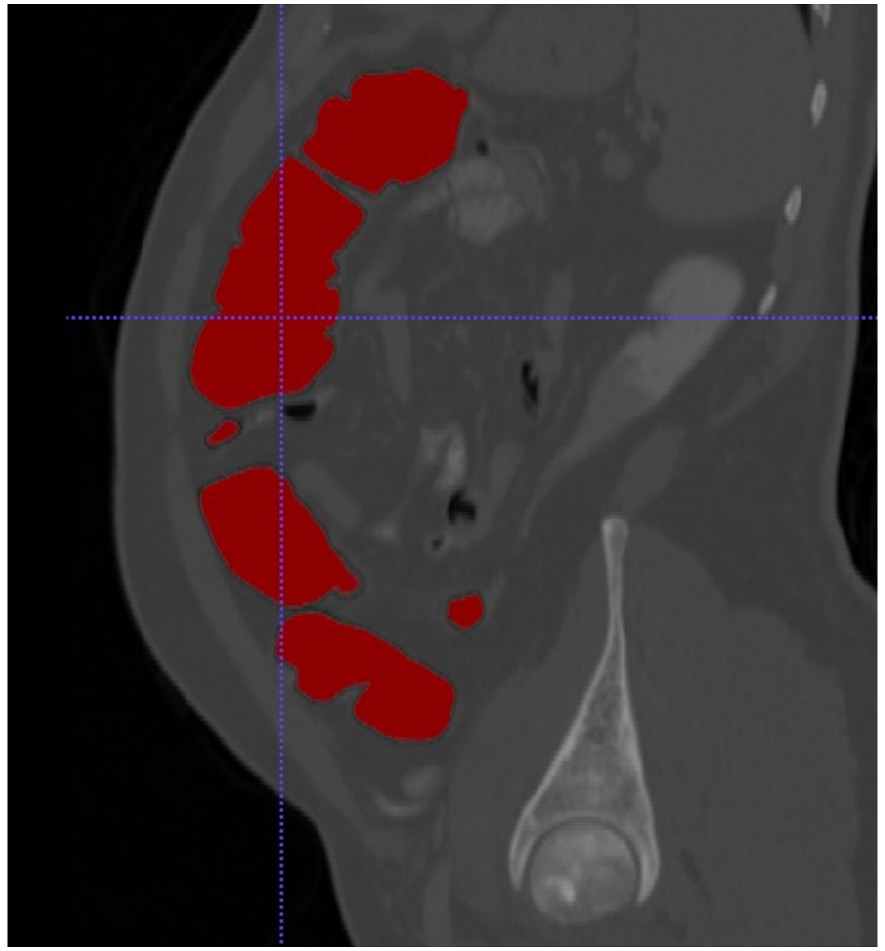
Aims at designing generalized algorithms to solve:

Task 1: Depth prediction in simulated colonoscopy

Task 2: Camera pose estimation in simulated colonoscopy

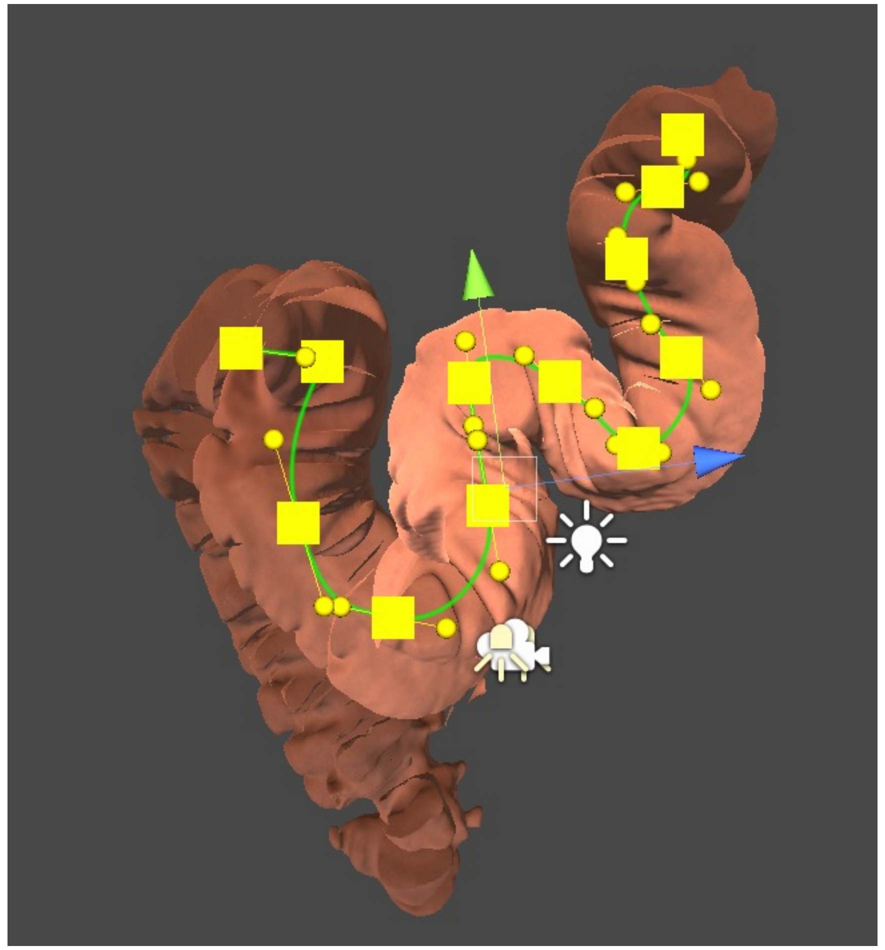
Task 3: Camera pose estimation in real procedures

SimCol Data Generation



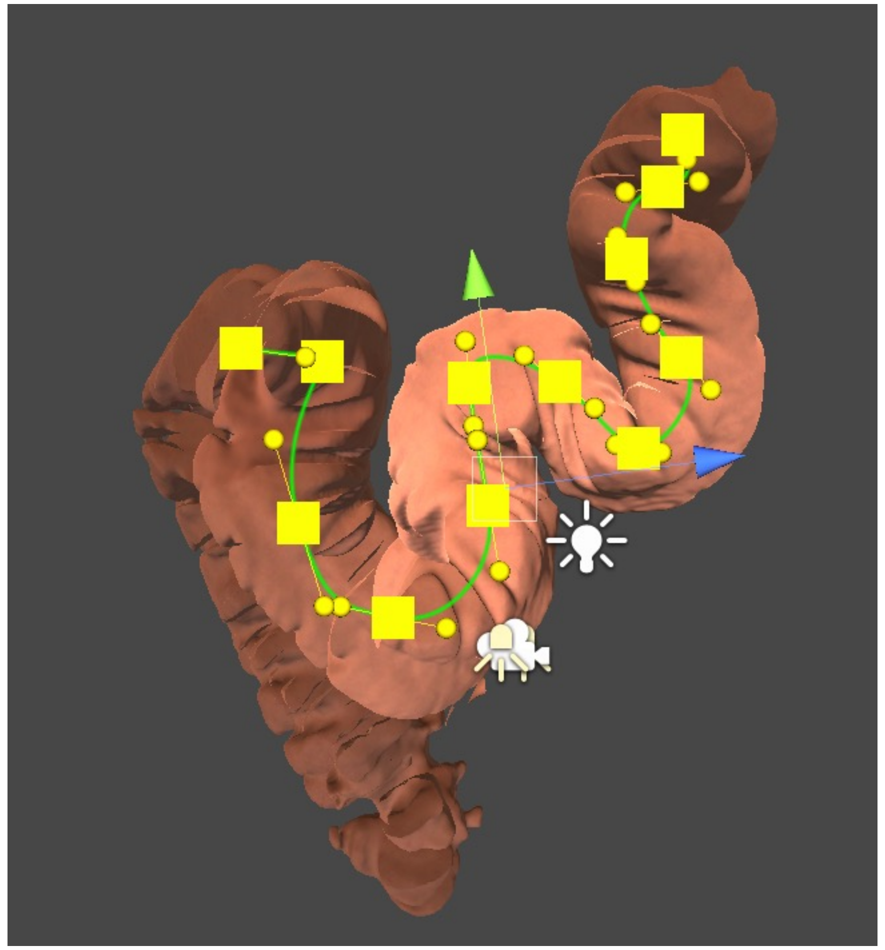
Segmentation

3D mesh

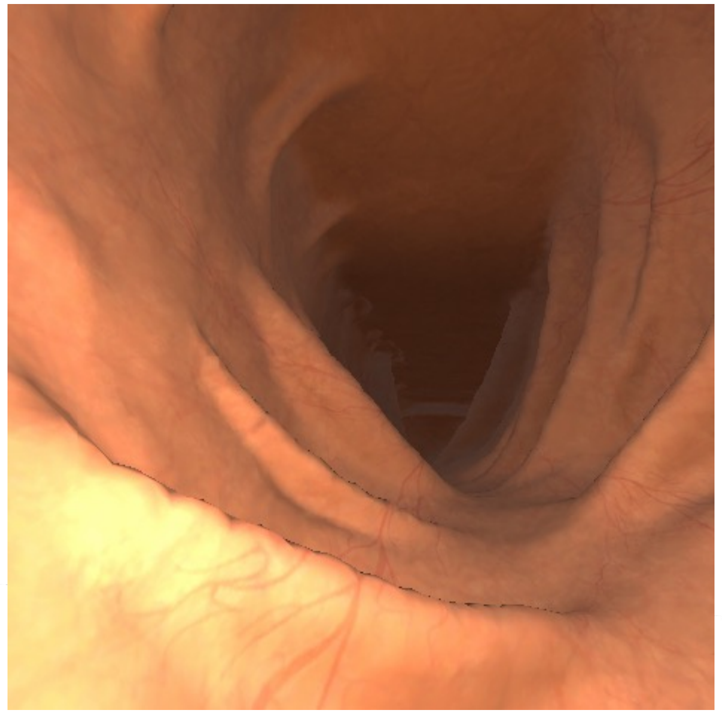


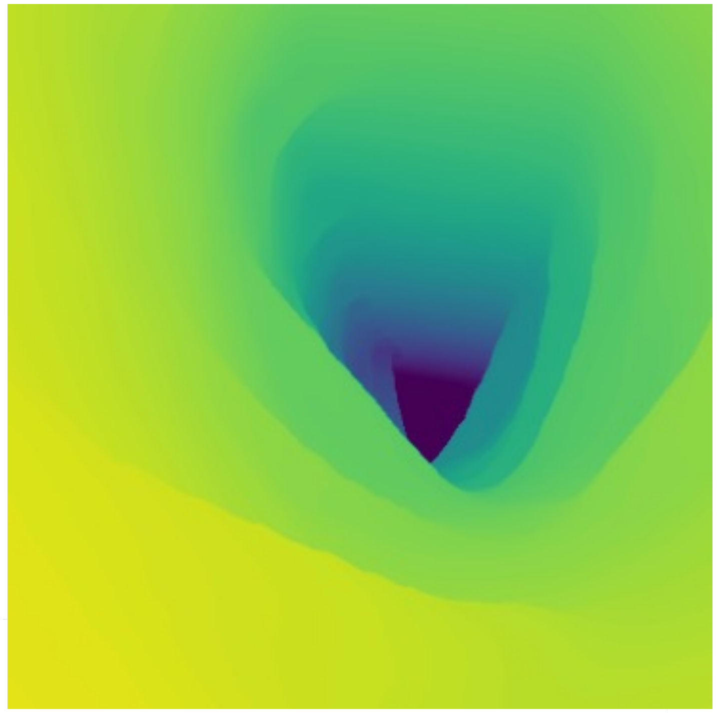
Camera path in Unity

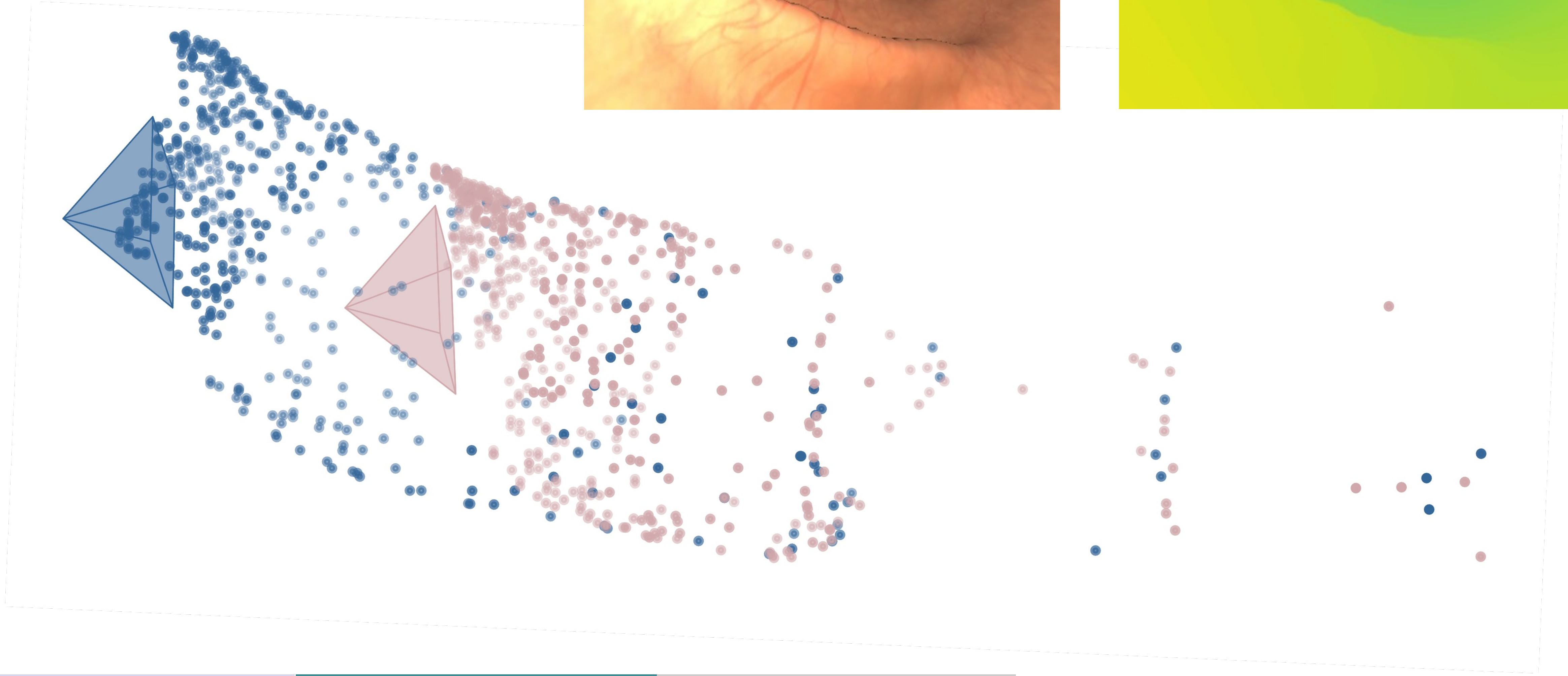
SimCol Data Generation



Camera path in Unity



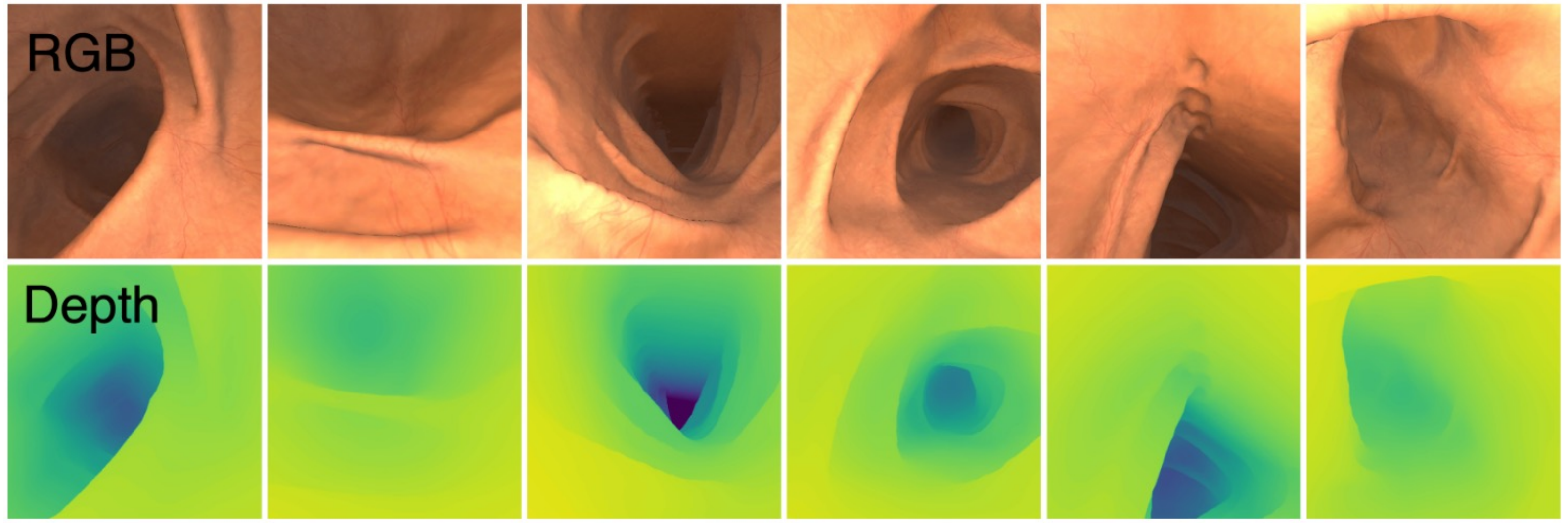




Training Data

Tasks 1&2: Depth and camera pose estimation in simulated colonoscopy

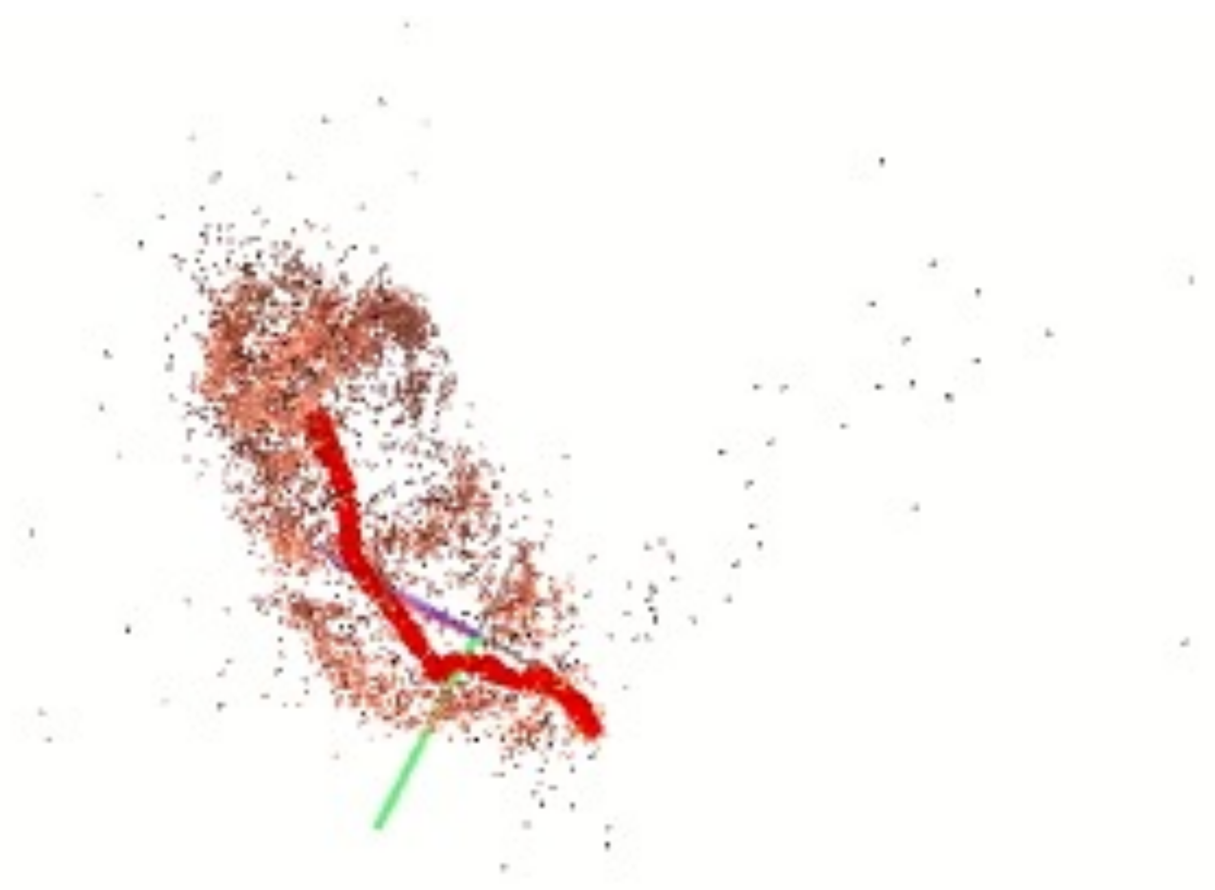
- 2 simulated patient's anatomies → 2 subsets
- In each subset, we generate 12 trajectories with >1,000 images each
- Ground truth for each image:
  - depth map
  - camera pose
  - camera intrinsics

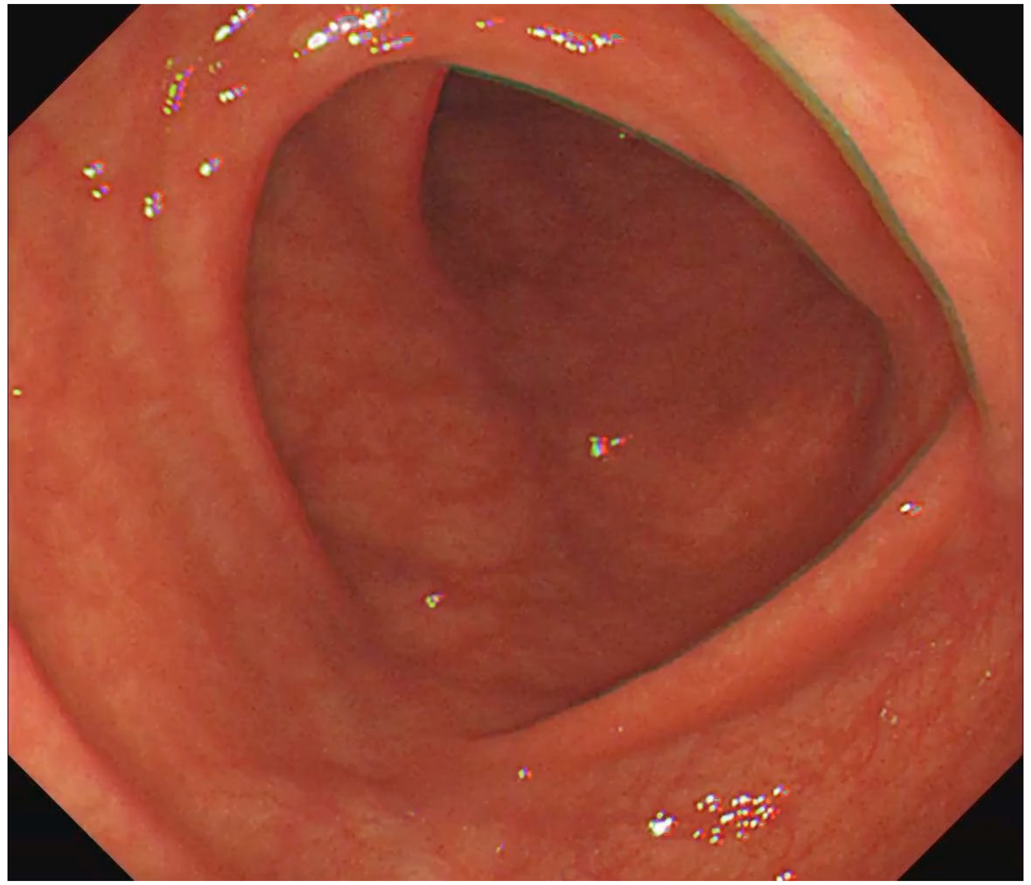


Training Data

Task 3: Camera pose estimation in real procedures

- 96 procedures
- 2 with COLMAP pseudo ground truth (camera poses, intrinsics & sparse depth)





Testing Data

Tasks 1&2: Depth and camera pose estimation in simulated colonoscopy

- 2 anatomies from training & 1 unseen anatomy
- 3 trajectories from each anatomy with 601 or 1,201 images each

Task 3: Camera pose estimation in real procedures

- 3 anatomies
- 1-3 sub-trajectories from each anatomy (7 total)

Evaluation Metrics

Task 1: Synthetic depth

$$L_1 = \frac{1}{D}\sum_d ||Y(d) - Y'(d)||_1$$

$$L_{\text{rel}} = \mu_d(||\frac{Y(d)-Y'(d)}{Y(d)}||_1)$$

$$L_{\text{RMSE}} = \sqrt{\frac{1}{D}\sum_d (Y(d) - Y'(d))^2}$$

Y : ground truth depth, Y' : predicted depth, D : number of pixels in Y, μ : median

Evaluation Metrics

Tasks 2 & 3: Synthetic / real pose

$$RTE = \mu_\tau(||trans({\Omega_\tau}^{-1}{\Omega'}_\tau)||)$$

$$ATE = \mu_\tau(||trans(P_\tau) - trans(P'_\tau)||)$$

$$ROT = \mu_\tau(\frac{trace(Rot(\Omega_\tau^{-1}{\Omega'}_\tau))-1}{2} \cdot \frac{180}{\pi})$$

Ω : relative pose, P : absolute pose, $'$: prediction, μ : median

Challenge Setup

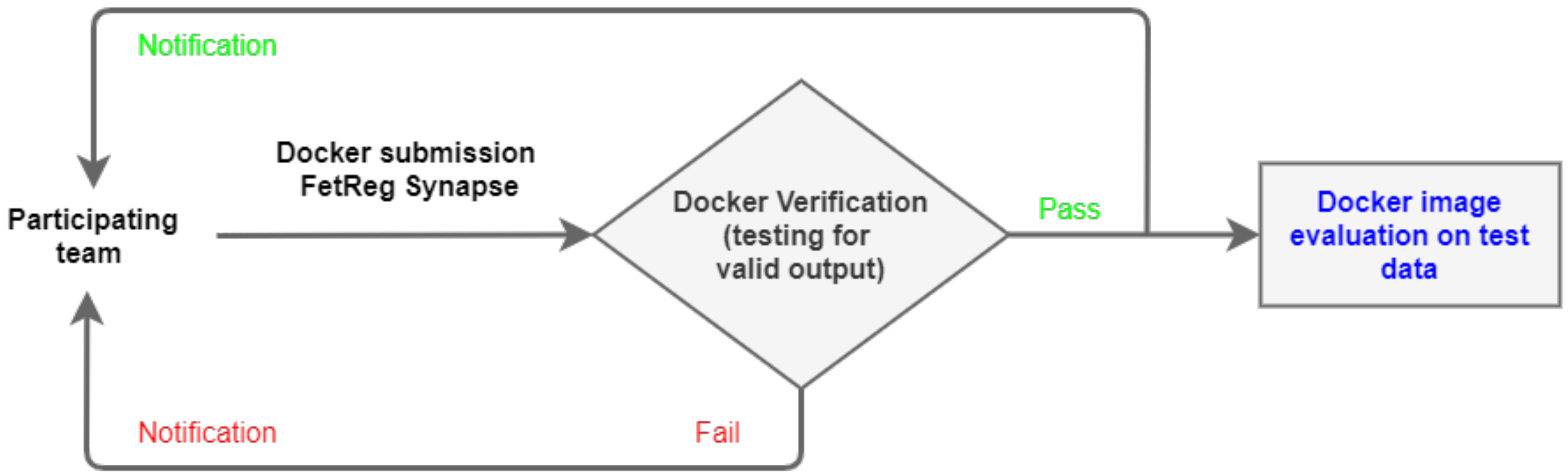
- 15th Apr – Training data - I (Synthetic Colon I) released
- 1st Jun – Training data - II (Synthetic Colon II) released
- 10th Aug – Team Registration Open
- 15th Aug – Slack launched & Instruction released
- 15th Aug – Test data released & Submission opened
- 2nd Sept – Submission deadline

- 51 challenge registration requests
- 13 Team registrations with 31 Team members

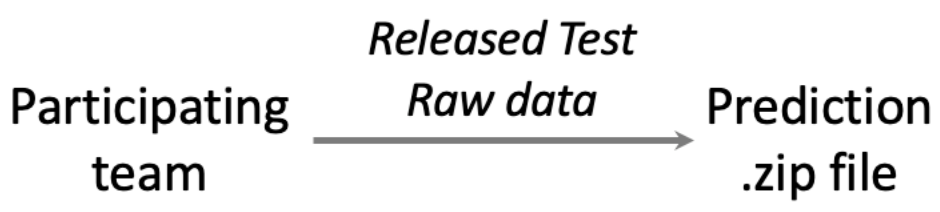
- 6 Team submissions
- 6 submissions – Task 1
- 3 submissions – Task 2
- 2 submissions – Task 3

Submission Setup

#1 Docker Submission



#2 Prediction Submission



Test raw dataset

Released

Submission

Synapse platform

Provided

Docker examples (Three tasks)

Submission guidelines

Slack support forum

https://github.com/anitarau/simcol

Participating Teams

CVML

Edward Sanderson and Bogdan J. Matuszewski
Computer Vision and Machine Learning (CVML) Group,
University of Central Lancashire, Preston, UK

EndoAI

Jiwoon Jeon[1], Jae Young Lee[2], Dong Jae Lee[2], Woonghyun Ka[2]
[1] EndoAI, Korea
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IntuitiveIL

Erez Posner, Netanel Frank, Moshe Bouhnik
Intuitive Surgical

KLIV

Sista Raviteja, Varshini Elangovan, Rachana Sathish, Debdoot Sheet
Indian Institute of Technology, Kharagpur

MIVA

Zhengwen Li, Yichen Zhu, Yihe Chen, Yutong Hu, Xiaoyan Zhang
ZheJiang University, China

MMLAB-NUS-SimCol

Lalithkumar Seenivasan[1], Mobarakol Islam[2], Hongliang Ren[1,3]
[1] National University of Singapore, Singapore
[2] Imperial College London, UK
[3] Chinese University of Hong Kong, HK, China

PARTICIPATING TEAMS

PRESENTATIONS

TEAM - CVML

PRESENTATION

ENDOSCOPIC VISION CHALLENGE

Team CVML Group

MICCAI2022 Singapore

Edward Sanderson and Bogdan J. Matuszewski

Computer Vision and Machine Learning (CVML) Group, University of Central Lancashire, Preston, UK

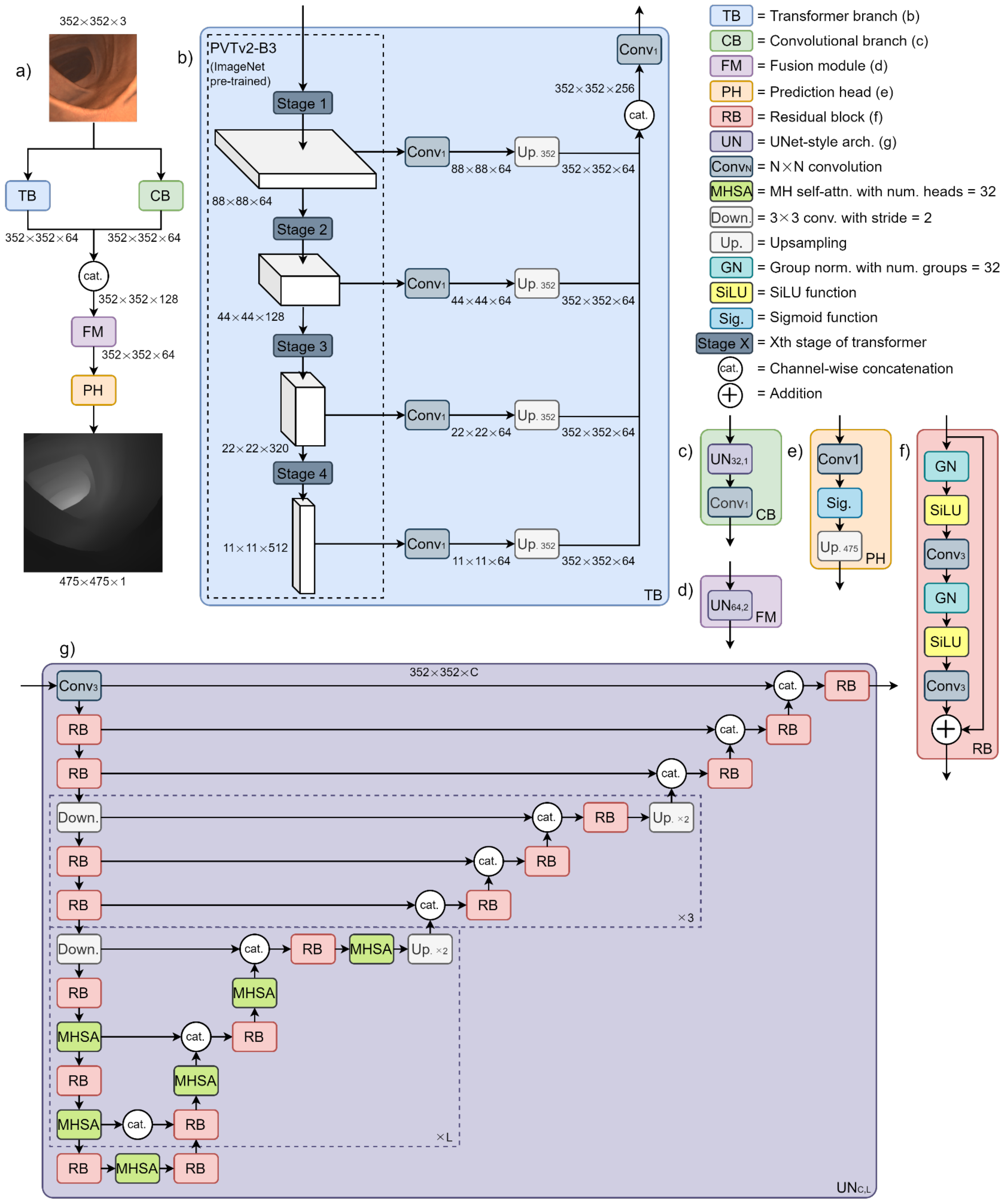
This work was supported by the Science and Technology Facilities Council [grant number ST/S005404/1]

Method for Task 1

Main components:

1. Two parallel branches:
   a) Transformer branch (TB) – PVTv2 encoder with lightweight decoder
   b) Convolutional branch (CB) – Updated UNet-style architecture
2. Fusion module (FM) – similar to CB but larger
3. Prediction head (PH) – simple architecture for mapping features to depth map of original size

Training performed in supervised manner with MSE loss



Sanderson, E., Matuszewski, B.J.: Fcn-transformer feature fusion for polyp segmentation. In: Annual Conference on Medical Image Understanding and Analysis. pp. 892–907. Springer (2022)
Wang, W. et al., Pvtv2: Improved baselines with pyramid vision transformer. Computational Visual Media 8(3), 1–10 (2022)

Results

Our method reduced the MSE of a standard UNet by 70%

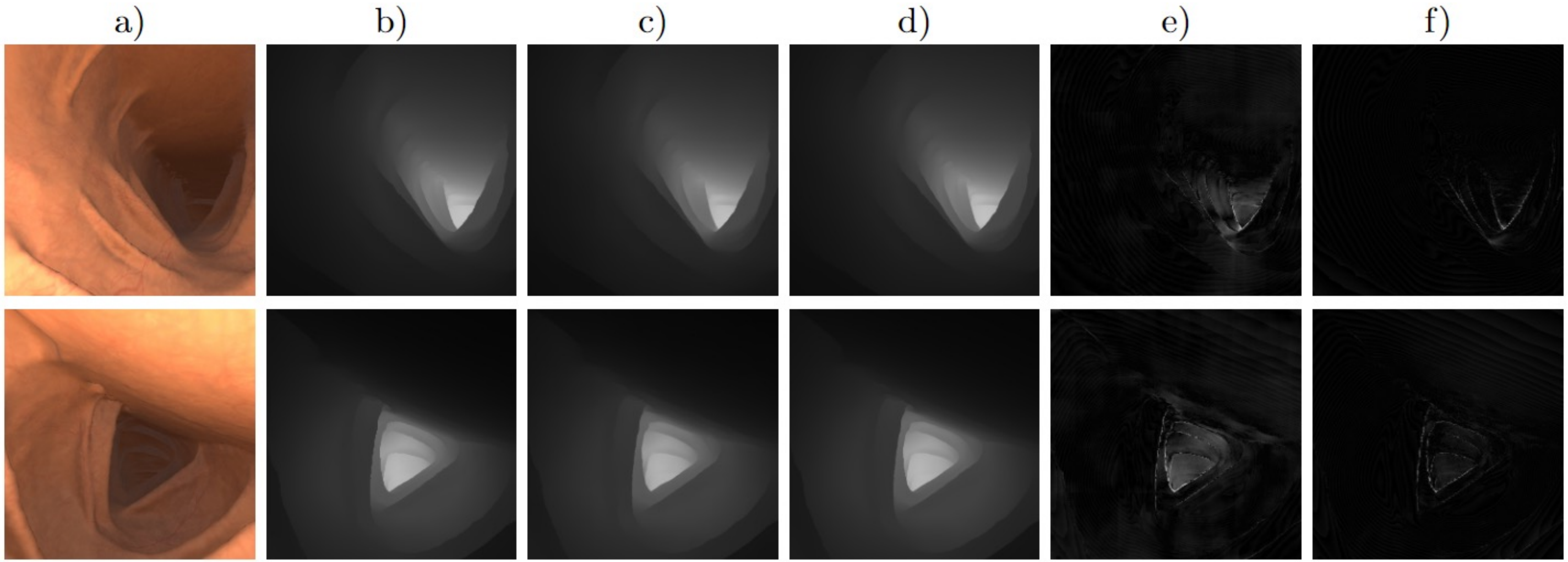


Figure: a) Input RGB, b) ground truth, c) UNet prediction, d) prediction from our method, e) absolute error of UNet (log-scale), f) absolute error of our method (same scale as e))

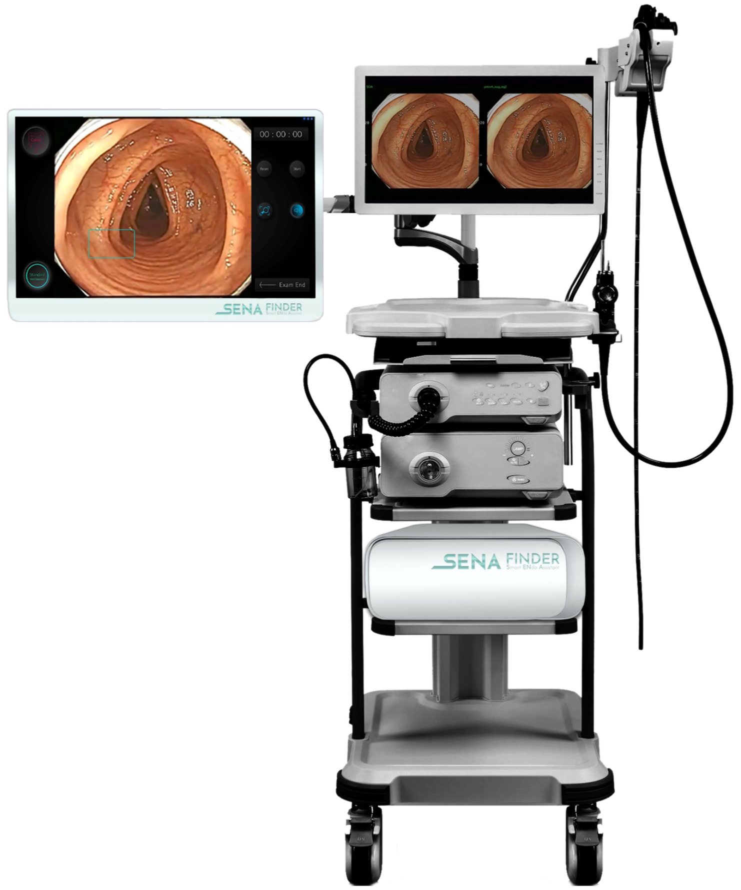
TEAM - EndoAI

PRESENTATION

Team

Endo AI

AI solution provider for Gastroenterology



- ✓ Real-time Polyp Detection AI Service
- ✓ Diagnosis Software
- ✓ Raw Data Based Report

→ Actual test operation is in progress and is expected to be commercialized soon.

Jiwoon Jeon
Senior researcher at EndoAI
Research interest
Image generation, Image detection

Jae Young Lee
Ph.D Student at KAIST
Research interest
Light field, Depth estimation, Image generation

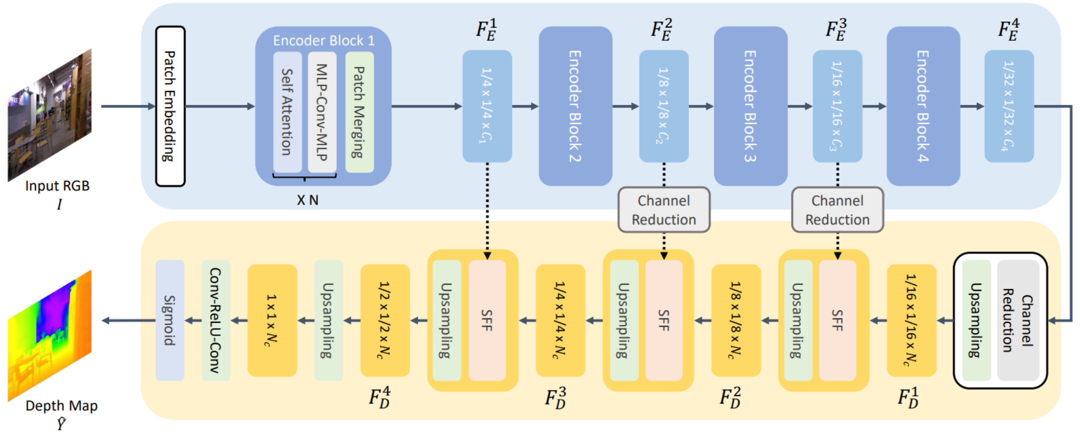
Dong-Jae Lee
Master Student at KAIST
Research interest
Depth estimation, Transformer

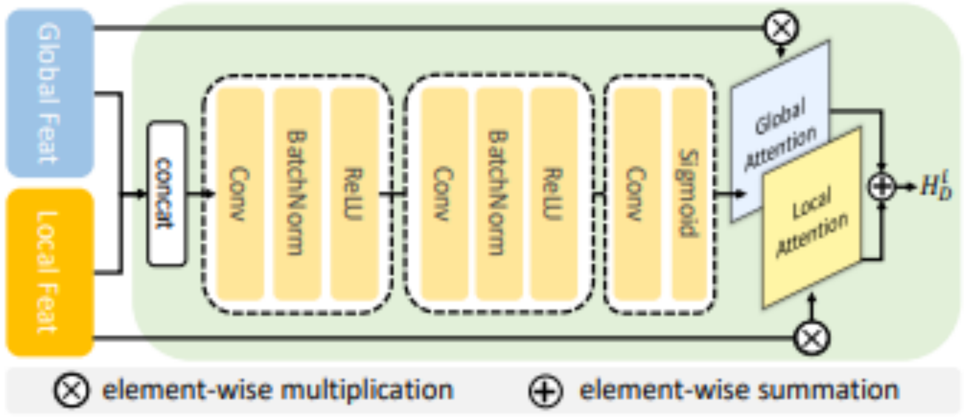
Woonghyun Ka
Master Student at KAIST
Research interest
Computer vision related to Autonomous driving

Method (1/2)

Task1 : dealing with global and local information simultaneously

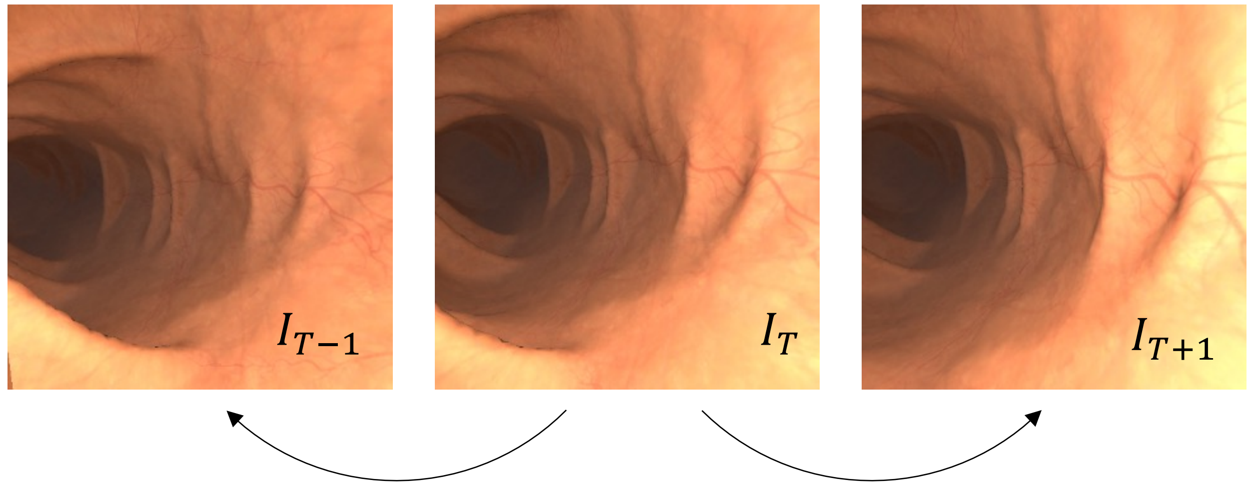
- **GLPDepth [1]: Transformer-based monocular depth estimation**
  - Backbone: B4 model
  - Loss: SiLog loss
  - Hyper-parameter tuning





Task2 : dealing with depth and pose information simultaneously

- **MonoDepth2 [2]: Self-supervised monocular depth estimation**
  - Depth model: replaced to the model used in Task1
  - Pose model: resnet encoder + pose decoder
  - Warp direction in training time: forward and backward

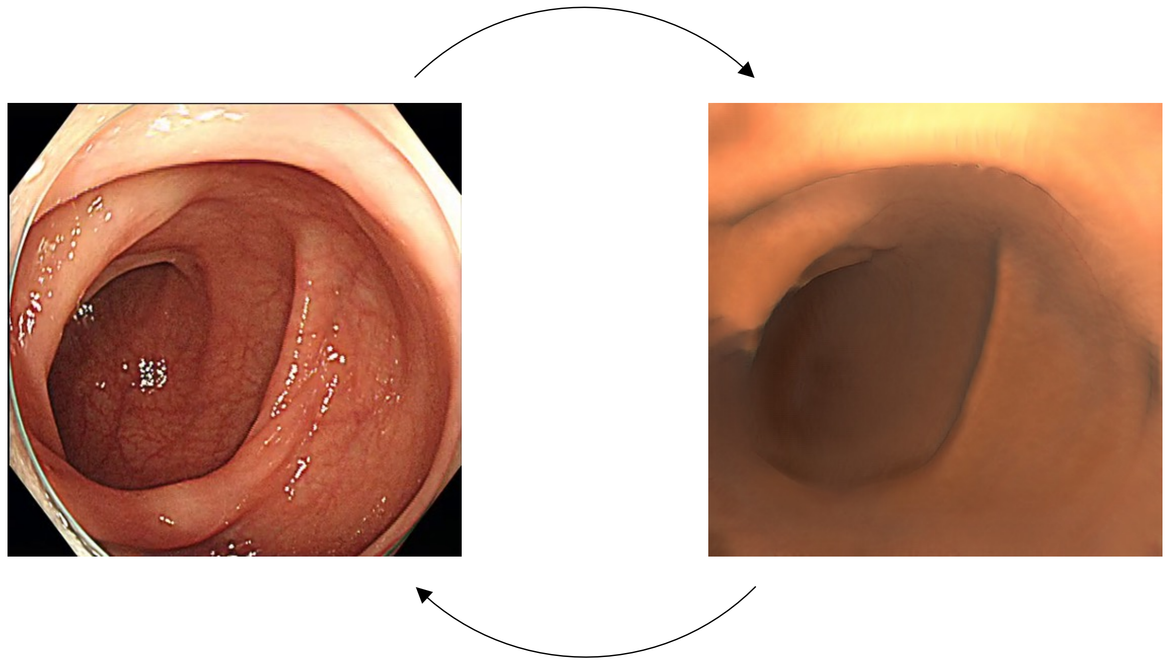


[1] D. Kim, W. Ka, P. Ahn, D. Joo, S. Chun, and J. Kim, "Global-Local Path Networks for Monocular Depth Estimation with Vertical CutDepth," arXiv, 2021.
[2] C. Godard, O. M. Aodha, M. Firman, G. J. Brostow, "Digging into Self-Supervised Monocular Depth Prediction," ICCV, 2019.

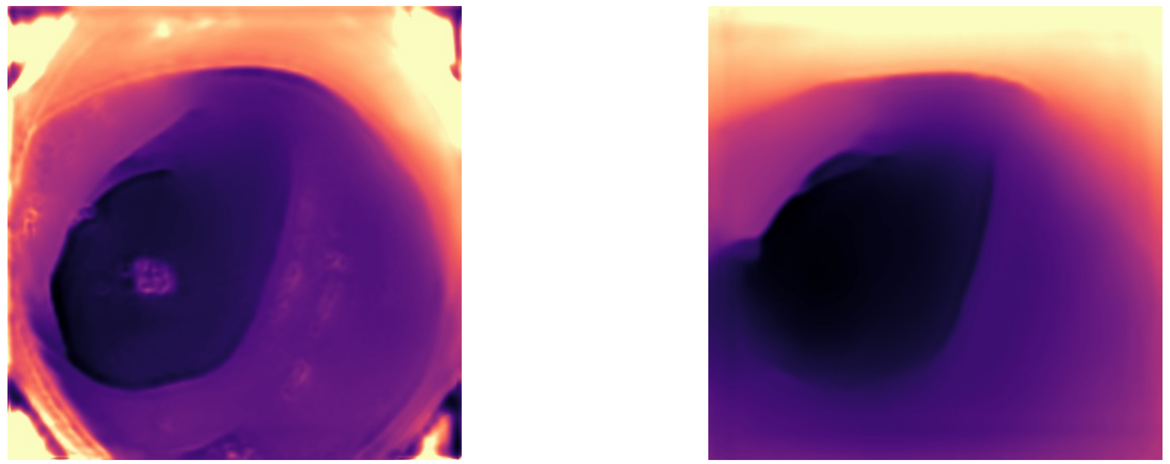
Method (2/2)

Task3 : Change the domain to the same image as the previously trained image domain

- **MonoDepth2**
  - Use the same model as Task2
- **Cyclegan [3]: Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks**
  - Generator architecture : resnet_9blocks



Depth estimation result (for reference)



[3] J.-Y. Zhu, T. Park, P. Isola, and A. A. Efros, "Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks," ICCV, 2017.

TEAM - IntuitiveIL

PRESENTATION

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IntuitiveIL - Intuitive Surgical Israel

MICCAI2022 Singapore

Deluminator

Illumination Invariant Augmentation For Colonoscopy

Erez Posner

INTUITIVE

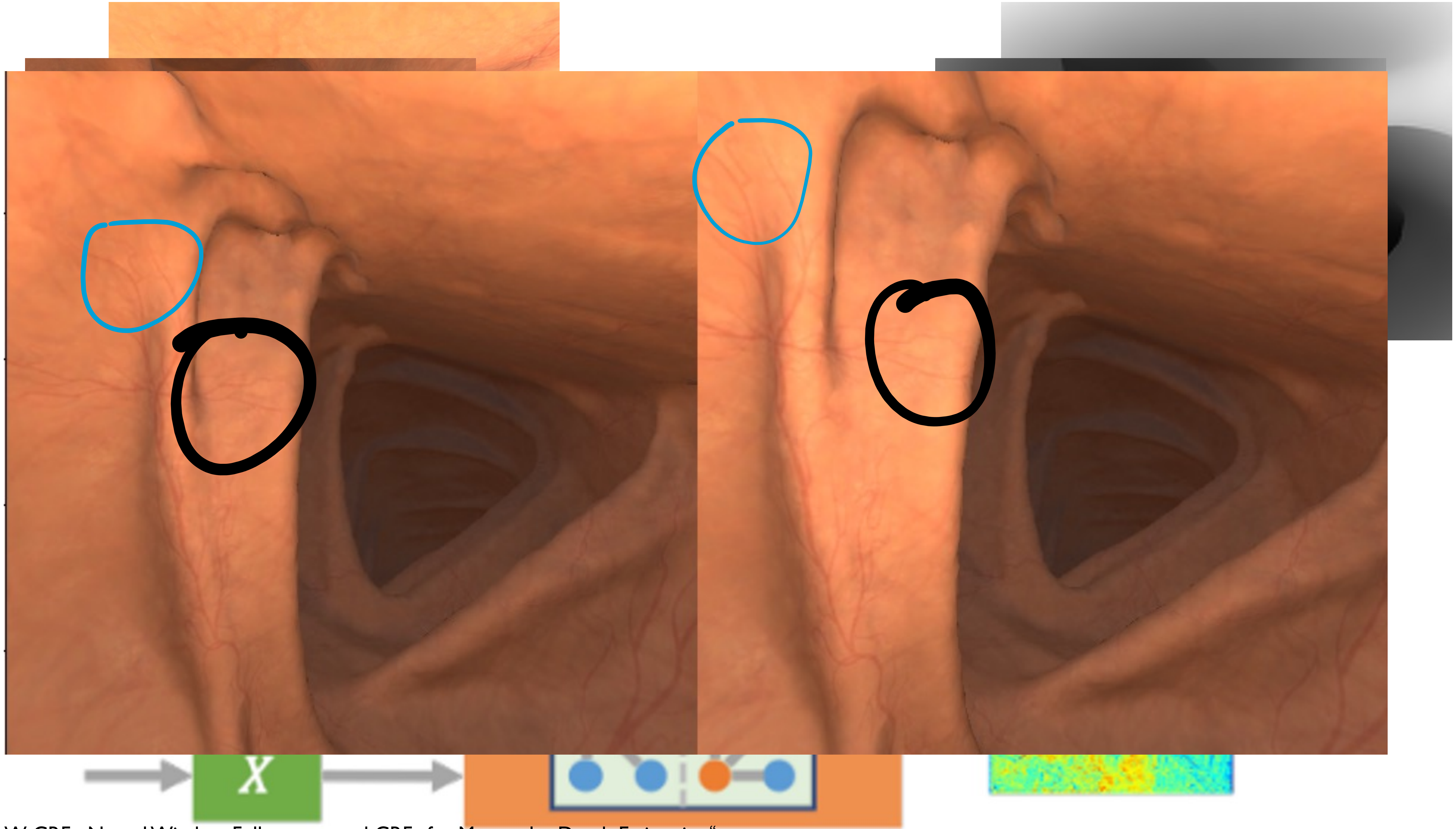
Netanel Frank

INTUITIVE

Moshe Bouhnik

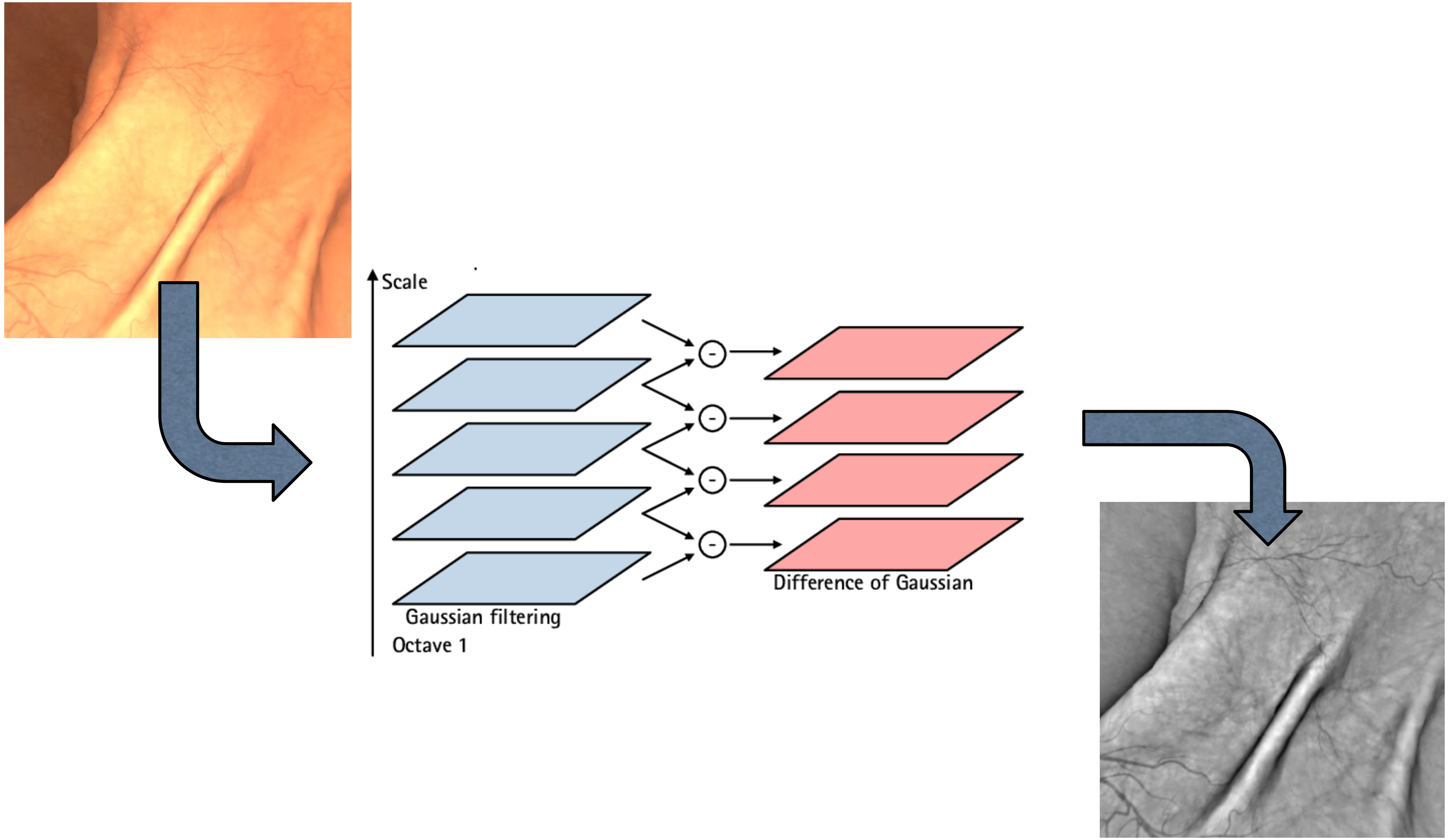
INTUITIVE

Method



{*}. Y. Weihao et al."NeW CRFs: Neural Window Fully-connected CRFs for Monocular Depth Estimation"

Colon Deluminator Augmentation



{*} X. Tan and B. Triggs, "Enhanced Local Texture Feature Sets for Face Recognition Under Difficult Lighting Conditions," in IEEE Transactions on Image Processing

Colon Deluminator Augmentation

{*} X. Tan and B. Triggs, "Enhanced Local Texture Feature Sets for Face Recognition Under Difficult Lighting Conditions," in IEEE Transactions on Image Processing

Windowed Conditional Random Fields Model(*)

SimCol2022	AbsRel (%) Train	AbsRel (%) Val
Baseline Training	2.0	2.5
+ DeluminatorAug	1.7	1.8

TEAM - KLIV

PRESENTATION

Team

#iitKLIV
Kharagpur Learning, Imaging and Visualization Research Group
www.iitkliv.github.io

Depth Estimation in Synthetic Colonoscopy Images using SUMNet

Varshini Elangovan

Sista Raviteja

Rachana Sathish

Dr. Debdoot Sheet

Method

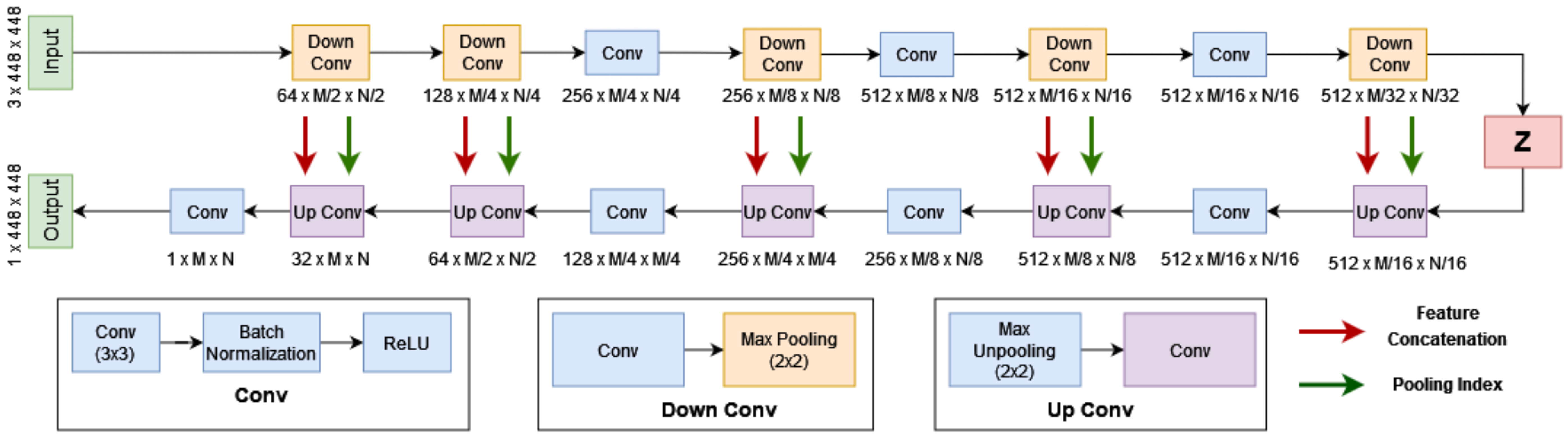


Figure 1: SUMNet Architecture

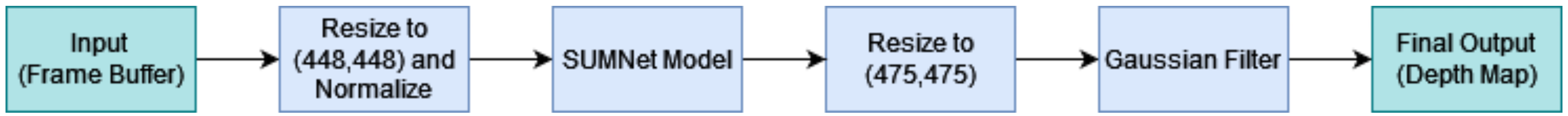


Figure 2: Block Diagram

Results

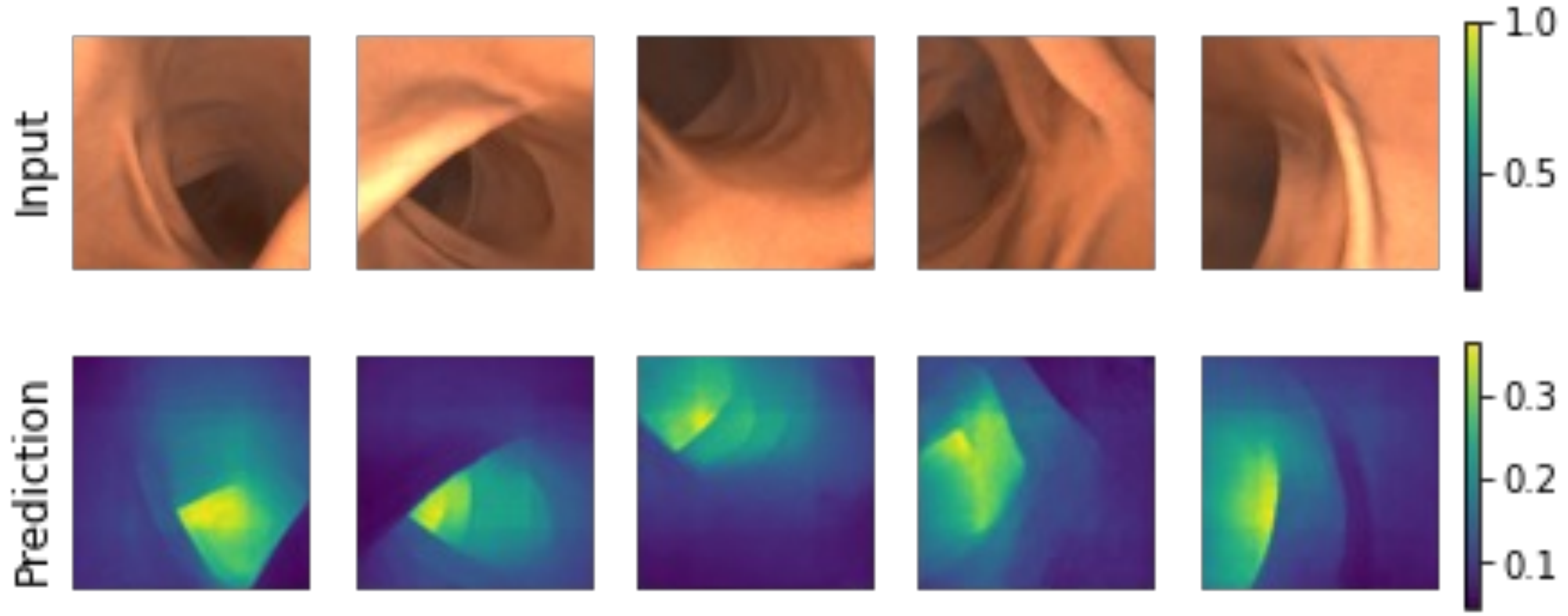


Figure 3: Sample Predictions on Test Data

Table 1: RMSE values for the proposed approach

Dataset	Mean RMSE (in cm)
Training	0.227 ± 0.076
Validation	0.23 ± 0.113

TEAM - MIVA

PRESENTATION

Team

Our Team: MIVA (Medical Image Visual Analysis)

Lab of Biomedical Informatics, College of Biomedical Engineering & Instument Science,

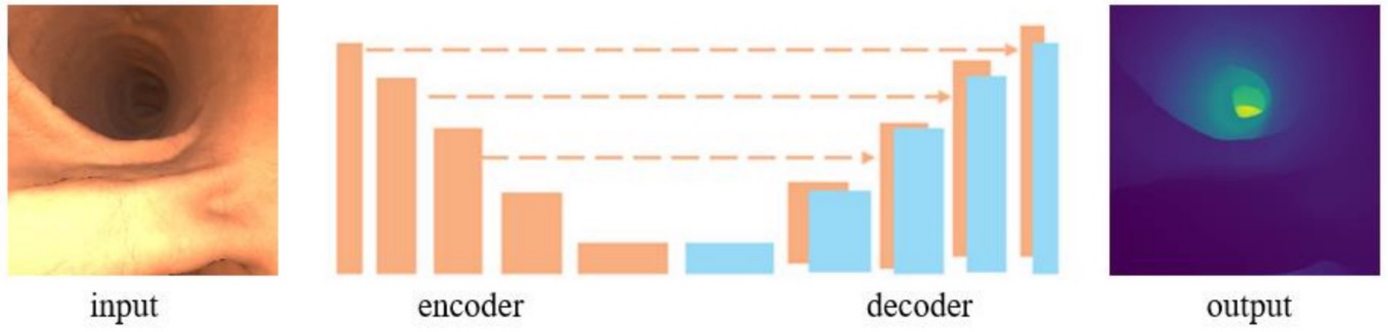
Zhejiang University, Hangzhou, China

Participants: Zhengwen Li, Yichen Zhu   Presenter: Zhengwen Li

Advisor: Jiquan Liu PhD

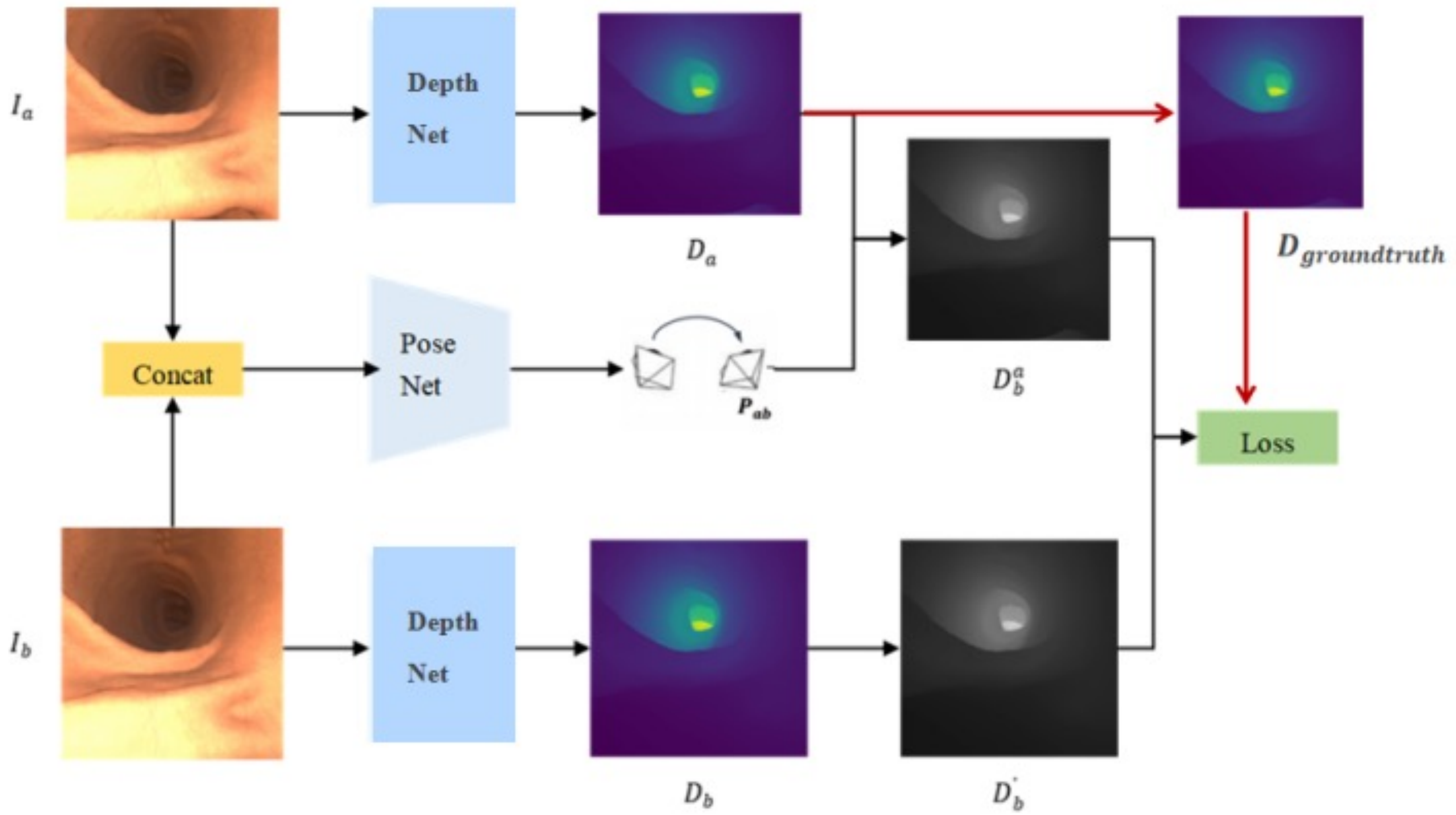
Method

1. subtask 1 DenseDepth



$$L(y,\hat{y}) = 0.1L_{depth}(y,\hat{y}) + L_{SSIM}(y,\hat{y})$$

2. subtask 2 SC-SfmLearner + DenseDepth

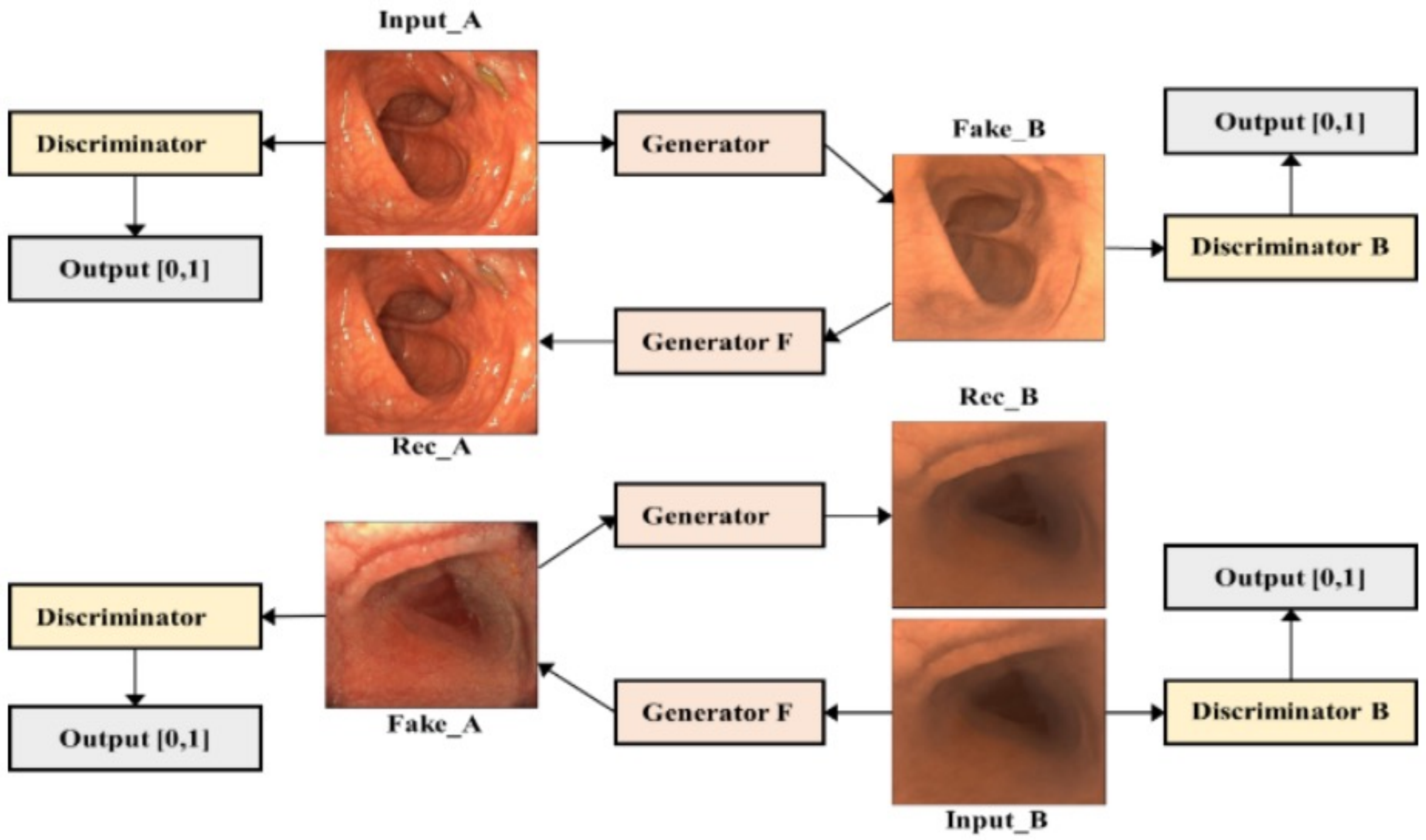


$$\begin{aligned} L &= L_{SC-Sfmlearner} + \omega L_{DenseDepth} \\ &= L_P^M + 0.1L_S + 0.5L_{GC} + L_{DenseDepth} \end{aligned}$$

dataset: SimCol, Endomapper

data augmentation: horizontal flipping, normalization

3. subtask 3 CycleGAN + subtask2



Results

1. subtask 1 DenseDepth

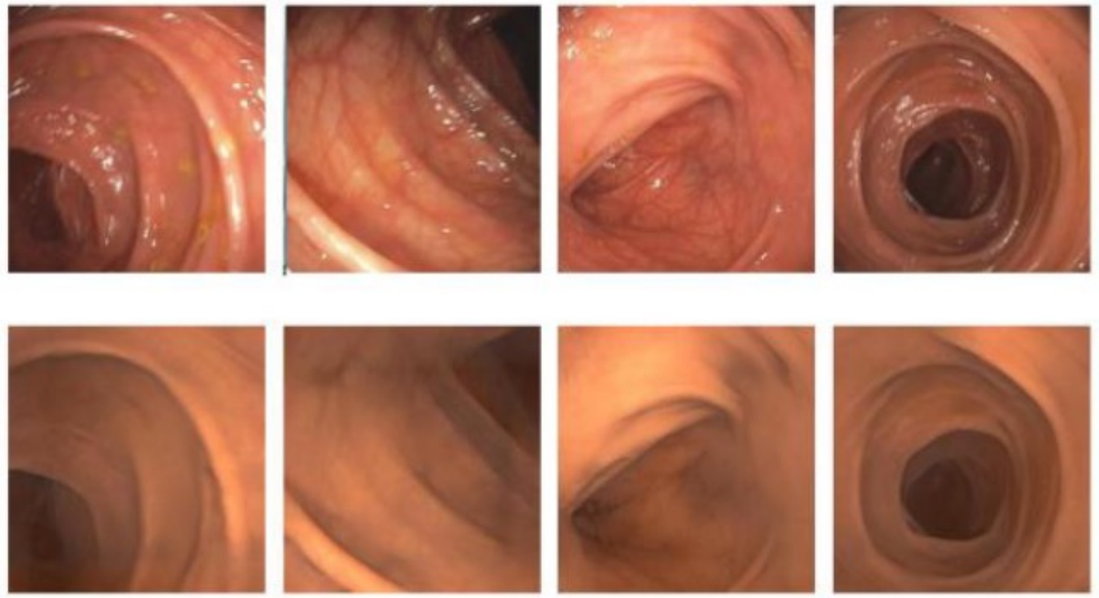
Frames_S4, Frames_S9, Frames_S14,Frames_B4, Frames_B9, Frames_B14

Method	L_1(cm)	L_{RMSE}(cm)	L_{rel}(%)
DenthDepth	0.038	0.066	1.22

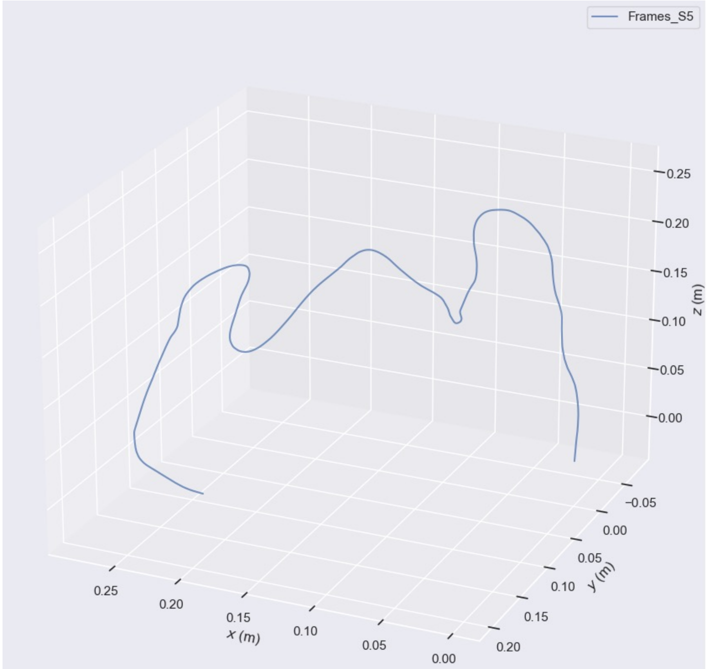
2. subtask 2 SC-SfmLearner + DenseDepth

Trajectory	Scale	ATE(cm)	RTE(mm)	ROT(°)
Frames_S9	1.03	3.34	0.12	0.14
Frames_B9	1.04	2.72	0.14	0.21
Frames_S4	1.01	6.16	0.15	0.15
Frames_B4	1.05	5.10	0.15	0.21
Frames_S14	1.00	7.99	0.15	0.16
Frames_B14	1.05	3.37	0.16	0.21
Average	1.03	4.78	0.145	0.18

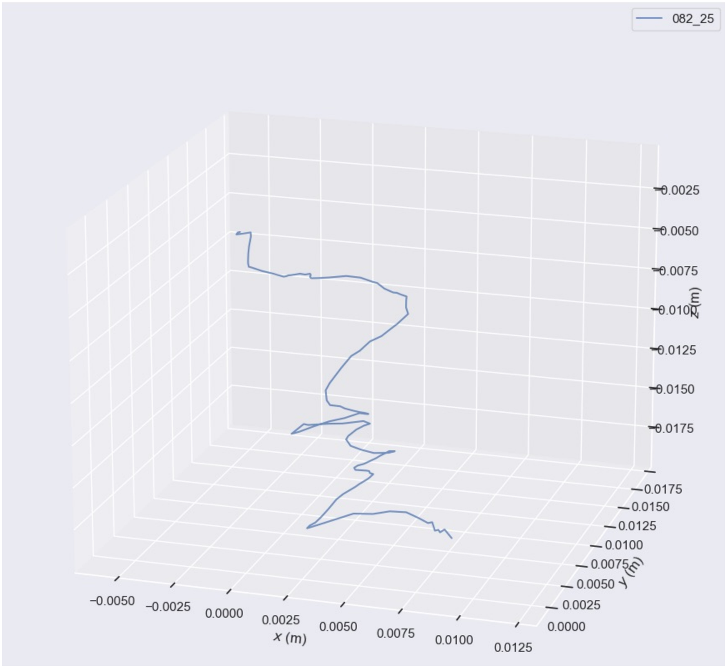
3. subtask 3 CycleGAN + subtask2



Style transfer



subtask 2: Frames_S5 trajectory



subtask 3: ims_082_25 trajectory

TEAM - MMLAB-NUS-SimCol

PRESENTATION – In person

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MMLAB-NUS-SimCol

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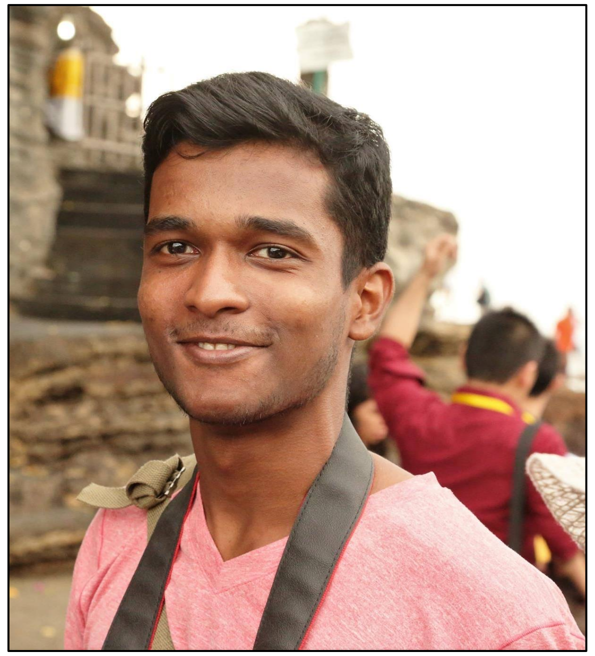

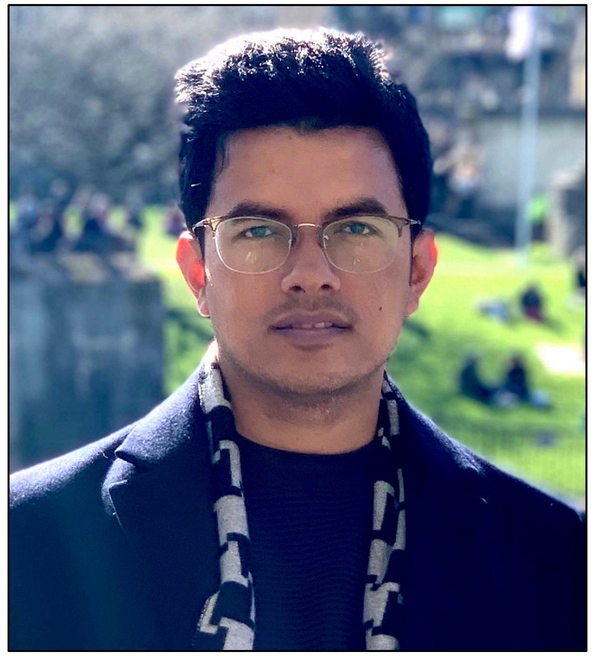

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& Electronic Engineering Department,
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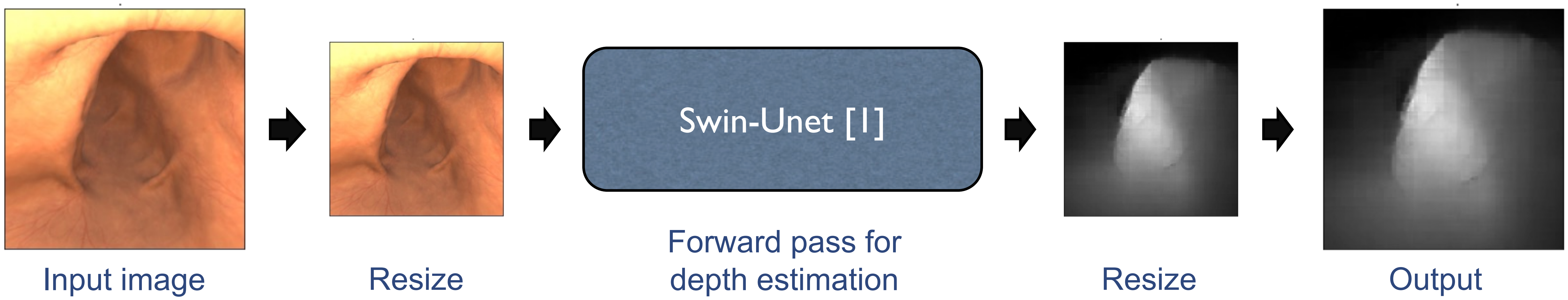
NUS National University of Singapore

Imperial College London

香港中文大學 The Chinese University of Hong Kong

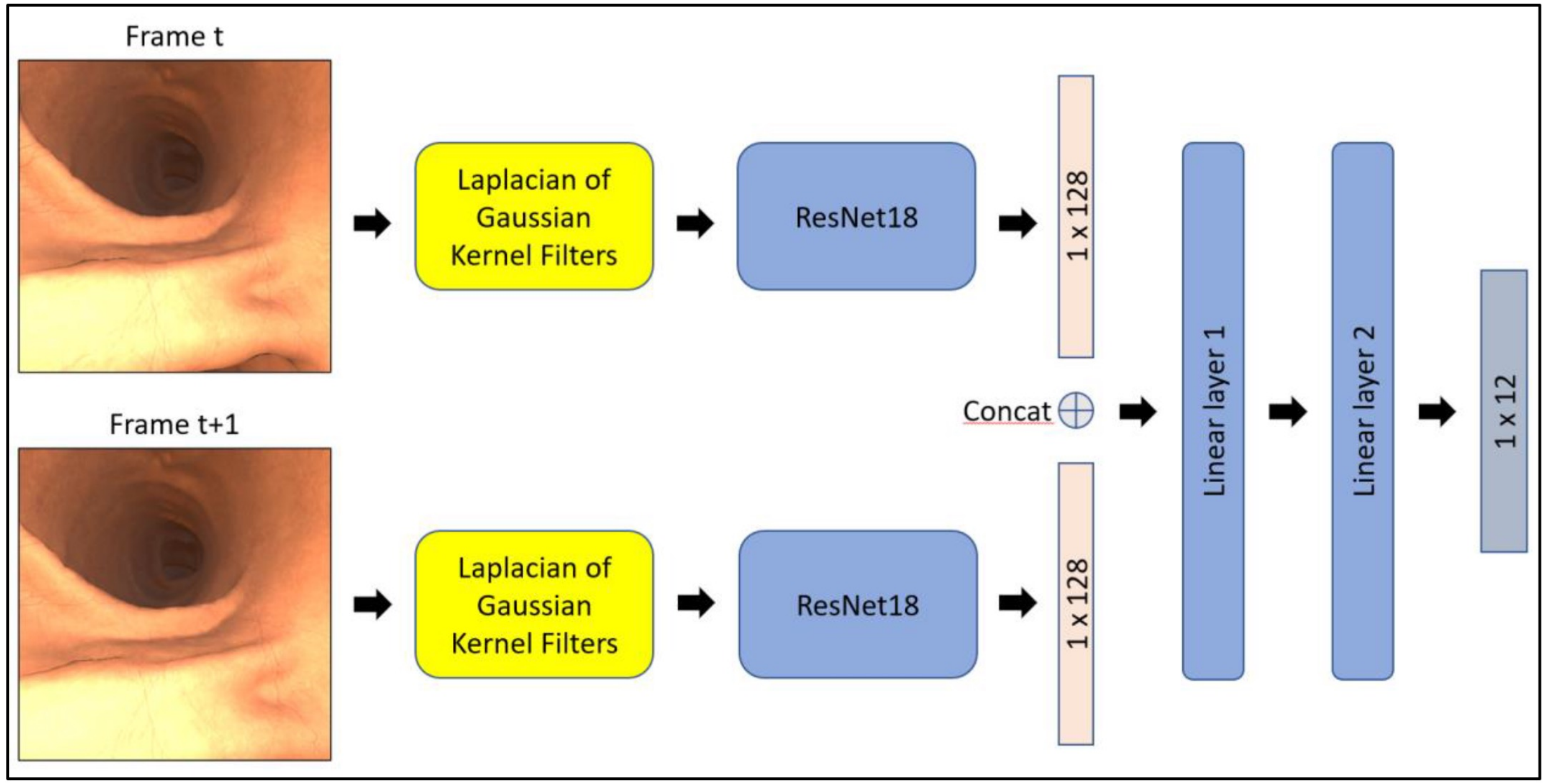
Task 1: Depth Prediction in Simulated Colonoscopy



- Unet-like Swin-Transformer (Swin-Unet) [1] is used for the Depth estimation.
  - Three blocks of encoder and corresponding decoder
- The model trains on L1 loss and SGD optimizer with a learning rate of 0.01, a decay factor of 1e-4, and a momentum of 0.9.
- The input images are resized to 224x224 during training and the predicted depth map is upsampled.
- Different loss functions such as L1, mean square error (MSE), structural similarity index (SSIM), and binary cross entropy (BCE) are used to observe the model performance where L1 outperforms other loss functions with the MSE of 0.000115 and SSIM of 0.984670.

1. Cao, H., Wang, Y., Chen, J., Jiang, D., Zhang, X., Tian, Q., & Wang, M. (2021). Swin-unet: Unet-like pure transformer for medical image segmentation. arXiv preprint arXiv:2105.05537

Task 2: Pose Estimation in Simulated Colonoscopy



- We employ ResNet18 [1] and a series of linear layers.
- While the relative ground truth pose has 16 values, the module regresses 12 values as the last four values are constant [0.0, 0.0, 0.0, 1.0].
- Furthermore, we employ Laplacian of Gaussian (LoG) kernel-based filters [2] to enforce attention to contours and perform curriculum (by smoothing) learning [3].
- Initially, the ResNet module is loaded with the PyTorch ImageNet pre-trained weights.
- Then the whole model is trained based on mean-square-error (MSE) loss using adam optimizer with a learning rate of 7.5 x 10-6.
- During training, the values of the LOG kernel (with a kernel size = 3) are updated with a factor of 0.9 to allow more features to pass through the model as the learning progresses and to enforce attention to contours.

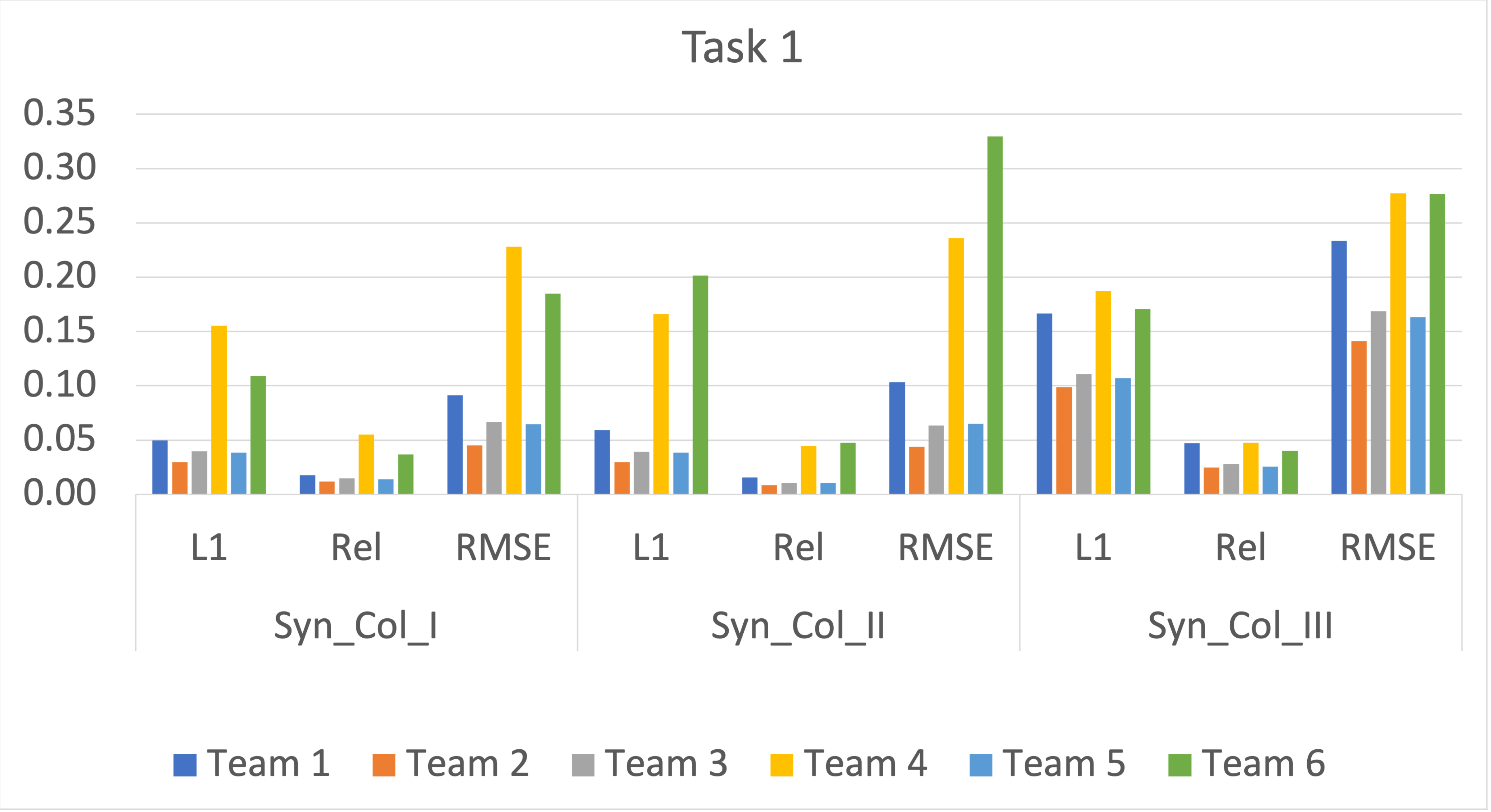
1. He, K., Zhang, X., Ren, S., & Sun, J. (2016). Deep residual learning for image recognition. In Proceedings of the IEEE conference on computer vision and pattern recognition (pp. 770-778).
2. Seenivasan, L., Islam, M., Ng, C. F., Lim, C. M., & Ren, H. (2022). Biomimetic Incremental Domain Generalization with a Graph Network for Surgical Scene Understanding. Biomimetics, 7(2), 68.
3. Sinha, S., Garg, A., & Larochelle, H. (2020). Curriculum by smoothing. Advances in Neural Information Processing Systems, 33, 21653-21664.

Intro

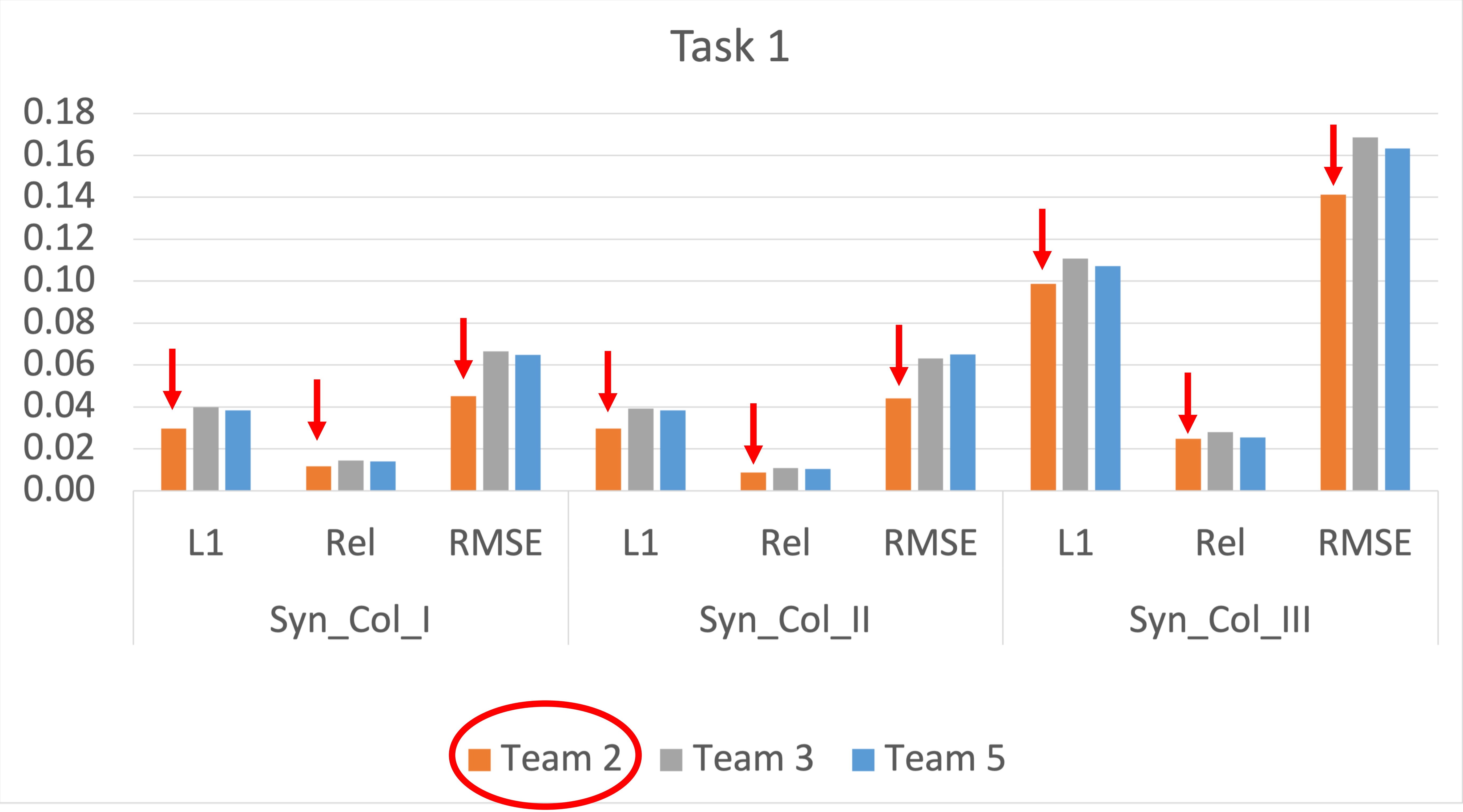
Challenge

Results

Results: Synthetic Depth



Results: Synthetic Depth – TOP 3



Results: Synthetic Depth – Ranks

	Syn_Col_I			Syn_Col_II			Syn_Col_III		
	L1	Rel	RMSE	L1	Rel	RMSE	L1	Rel	RMSE
Winner	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2
Runner-up	Team 5	Team 5	Team 5	Team 5	Team 5	Team 3	Team 5	Team 5	Team 5
Third	Team 3	Team 3	Team 3	Team 3	Team 3	Team 5	Team 3	Team 3	Team 3
Fourth	Team 1	Team 1	Team 1	Team 1	Team 1	Team 1	Team 1	Team 6	Team 1
Fifth	Team 6	Team 6	Team 6	Team 4	Team 4	Team 4	Team 6	Team 1	Team 6
Sixth	Team 4	Team 4	Team 4	Team 6	Team 6	Team 6	Team 4	Team 4	Team 4

ENDOSCOPIC VISION CHALLENGE

Results: Synthetic Depth – Ranks

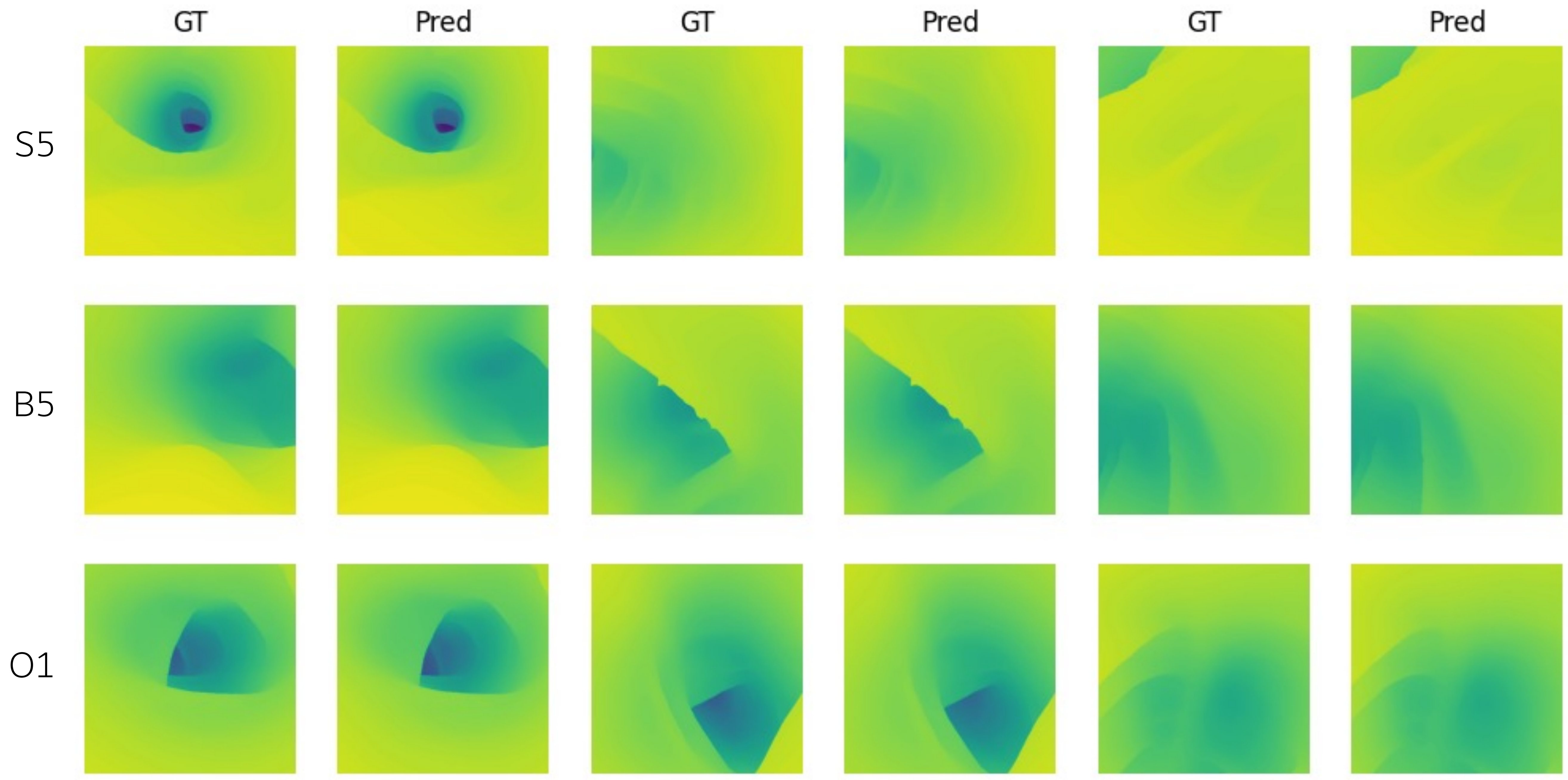
MICCAI2022 Singapore

	Syn_Col_I			Syn_Col_II			Syn_Col_III		
	L1	Rel	RMSE	L1	Rel	RMSE	L1	Rel	RMSE
Winner	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2
Runner-up	Team 5	Team 5	Team 5	Team 5	Team 5	Team 3	Team 5	Team 5	Team 5
Third	Team 3	Team 3	Team 3	Team 3	Team 3	Team 5	Team 3	Team 3	Team 3
Fourth	Team 1	Team 1	Team 1	Team 1	Team 1	Team 1	Team 1	Team 6	Team 1
Fifth	Team 6	Team 6	Team 6	Team 4	Team 4	Team 4	Team 6	Team 1	Team 6
Sixth	Team 4	Team 4	Team 4	Team 6	Team 6	Team 6	Team 4	Team 4	Team 4

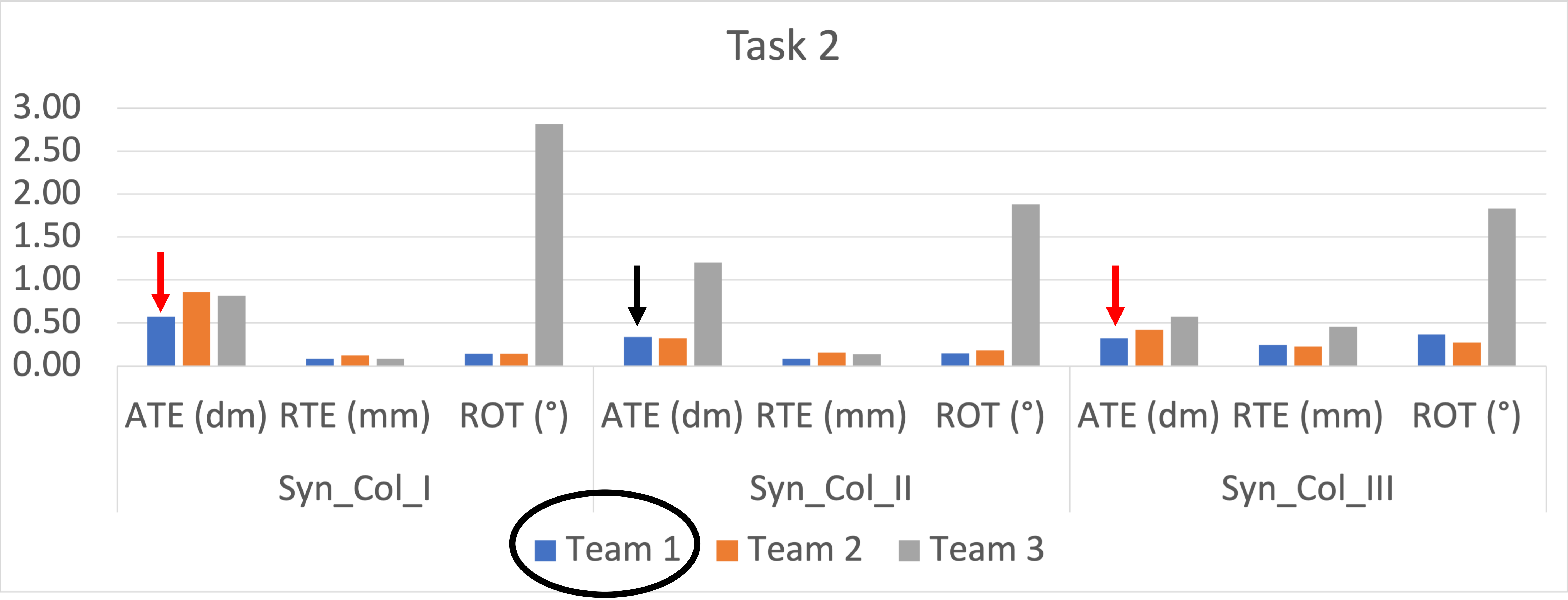
Results: Synthetic Depth – Ranks

	Syn_Col_I			Syn_Col_II			Syn_Col_III		
	L1	Rel	RMSE	L1	Rel	RMSE	L1	Rel	RMSE
Winner	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2	Team 2
Runner-up	Team 5	Team 5	Team 5	Team 5	Team 5	Team 3	Team 5	Team 5	Team 5
Third	Team 3	Team 3	Team 3	Team 3	Team 3	Team 5	Team 3	Team 3	Team 3
Fourth	Team 1	Team 1	Team 1	Team 1	Team 1	Team 1	Team 1	Team 6	Team 1
Fifth	Team 6	Team 6	Team 6	Team 4	Team 4	Team 4	Team 6	Team 1	Team 6
Sixth	Team 4	Team 4	Team 4	Team 6	Team 6	Team 6	Team 4	Team 4	Team 4

Winning Team's results

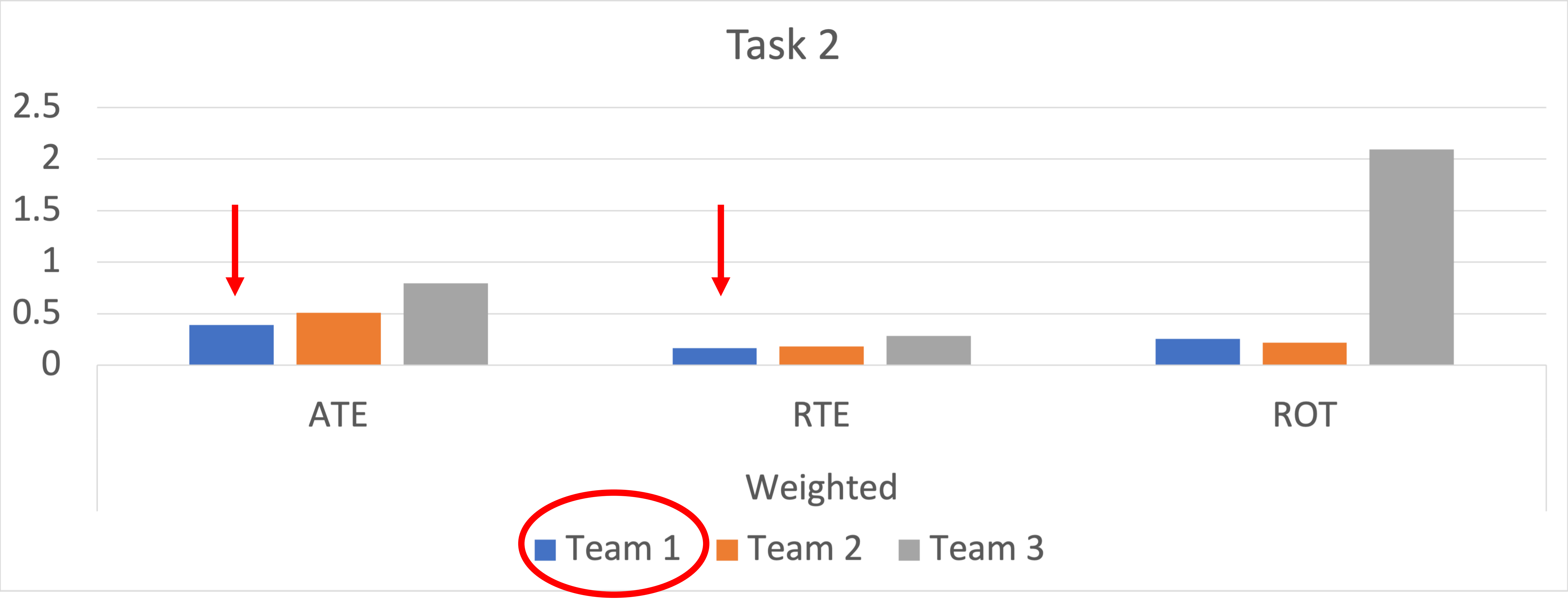


Results: Synthetic Pose



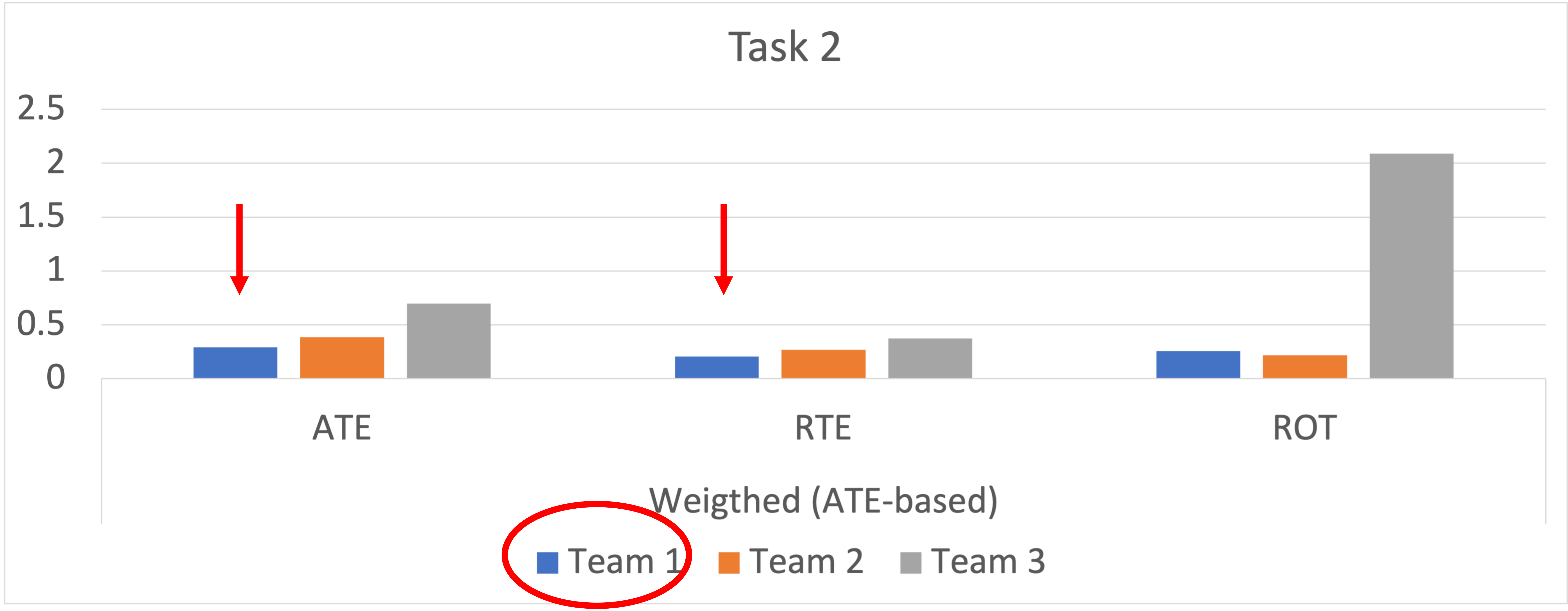
Results: Synthetic Pose

Give double weight to Synthetic_Colon_III



Results: Synthetic Pose

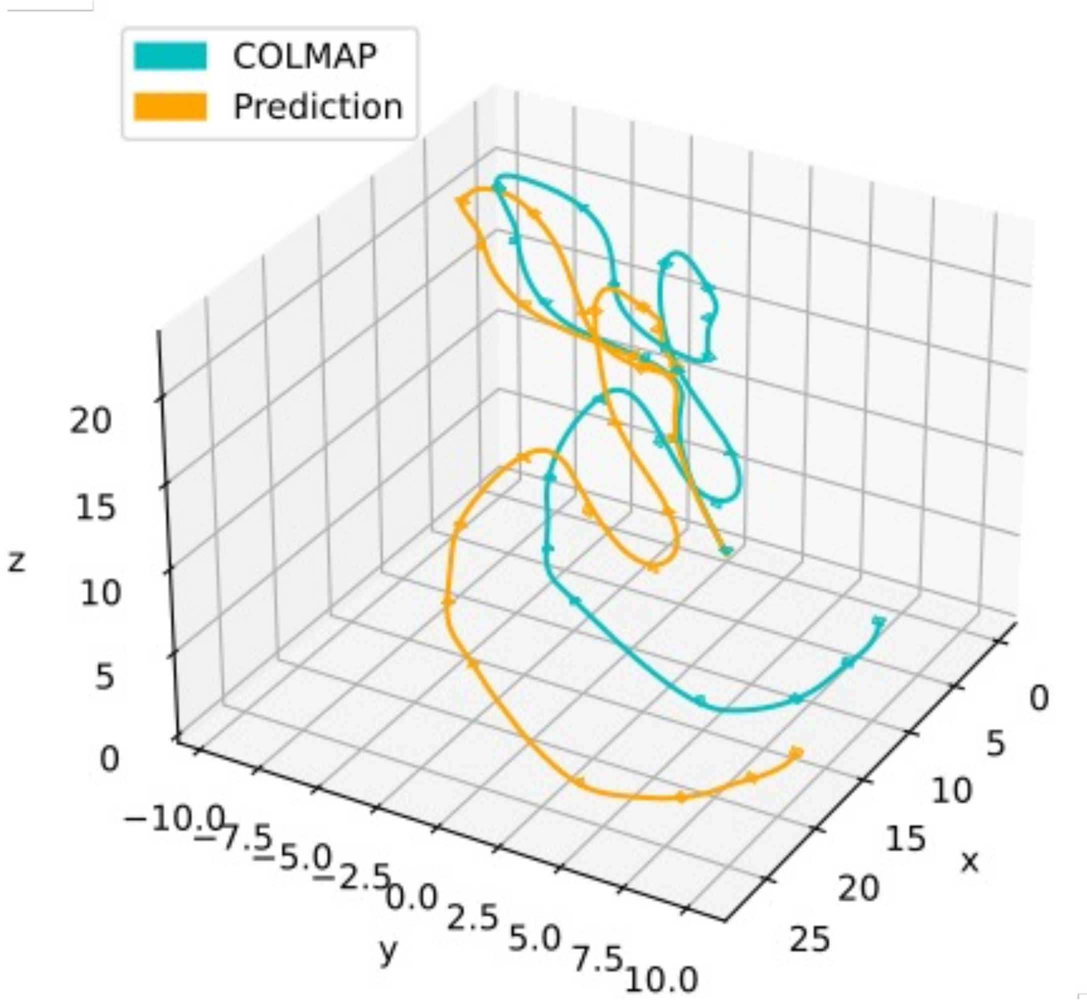
Consistent result using a different scaling:



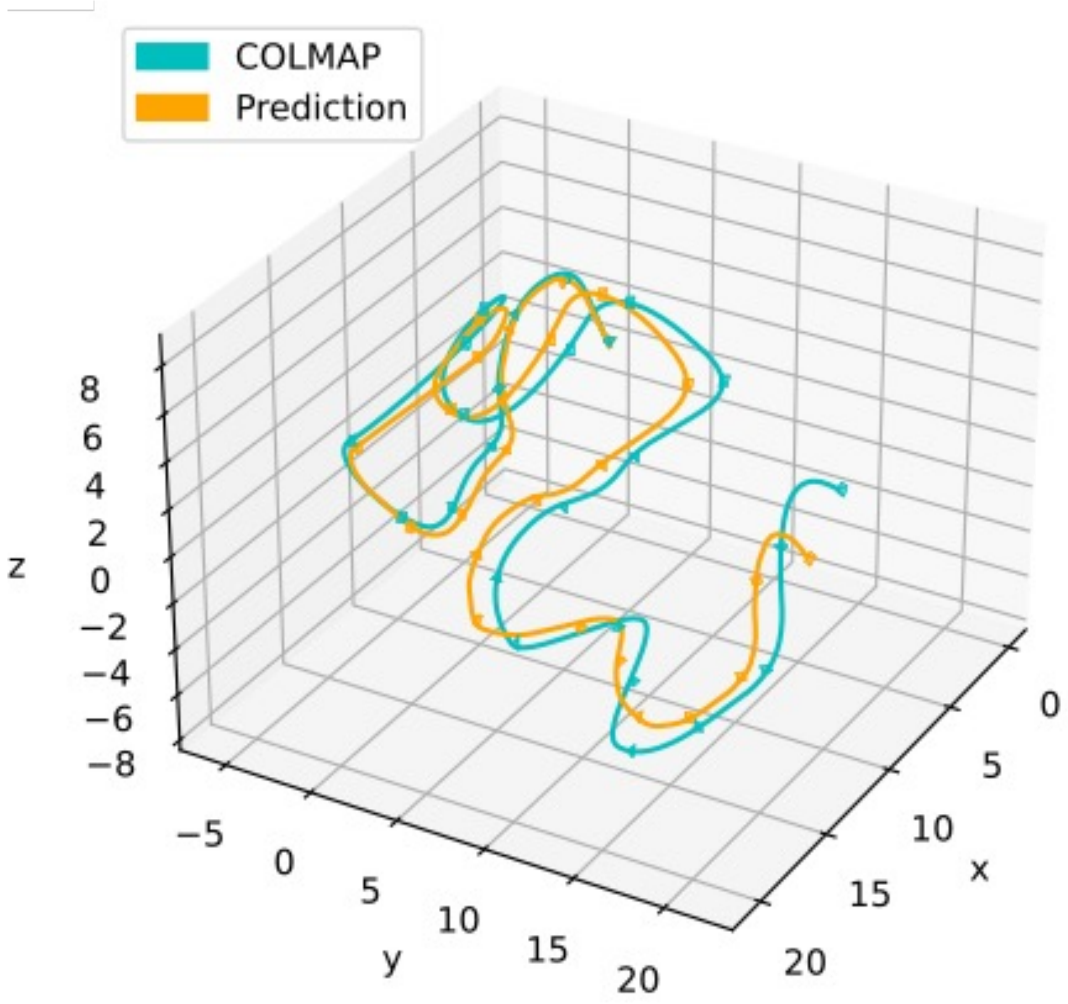
Results: Synthetic Pose – Ranks

	Syn_Col_I			Syn_Col_II			Syn_Col_III		
	ATE (dm)	RTE (mm)	ROT (°)	ATE (dm)	RTE (mm)	ROT (°)	ATE (dm)	RTE (mm)	ROT (°)
Winner	Team 1	Team 1	Team 2	Team 2	Team 1	Team 1	Team 1	Team 2	Team 2
Runner-up	Team 3	Team 3	Team 1	Team 1	Team 3	Team 2	Team 2	Team 1	Team 1
Third	Team 2	Team 2	Team 3	Team 3	Team 2	Team 3	Team 3	Team 3	Team 3

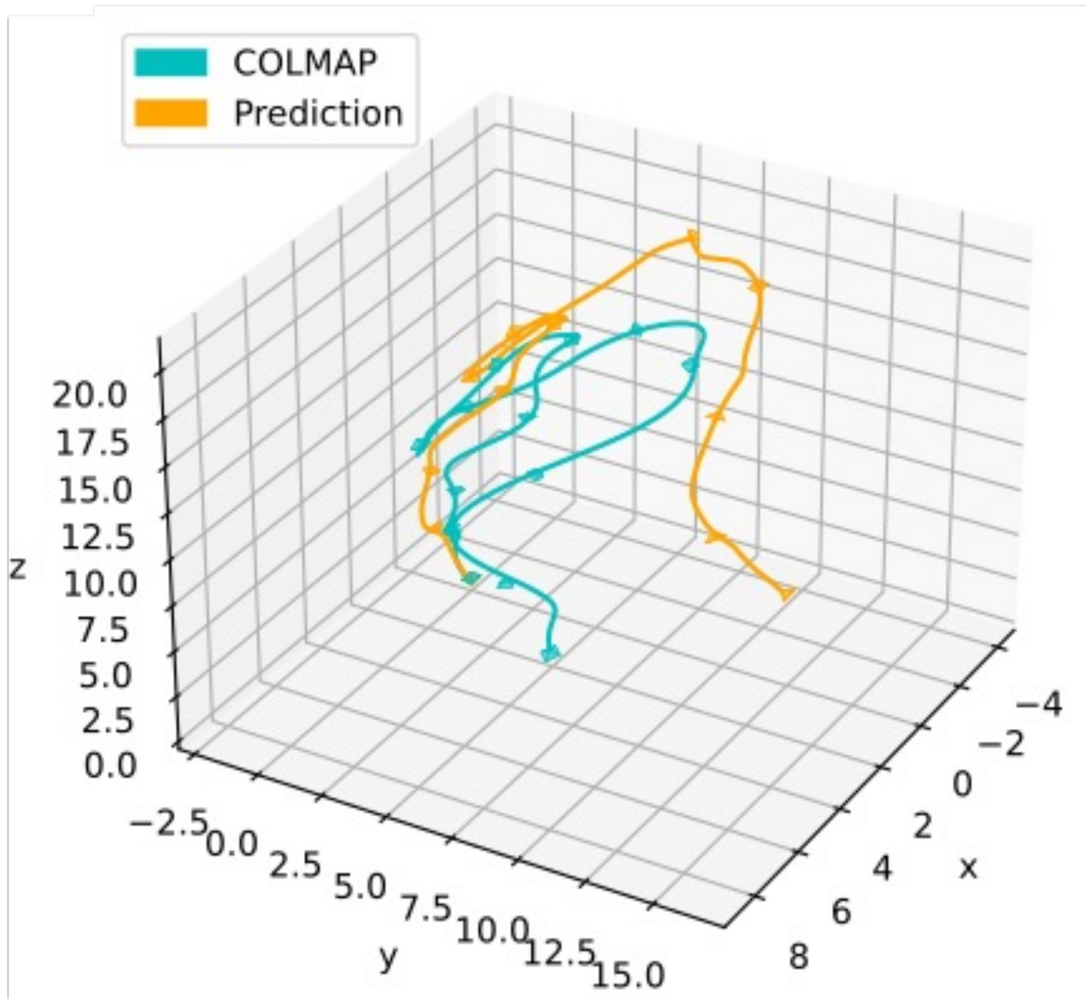
Winning Team‘s results



S5

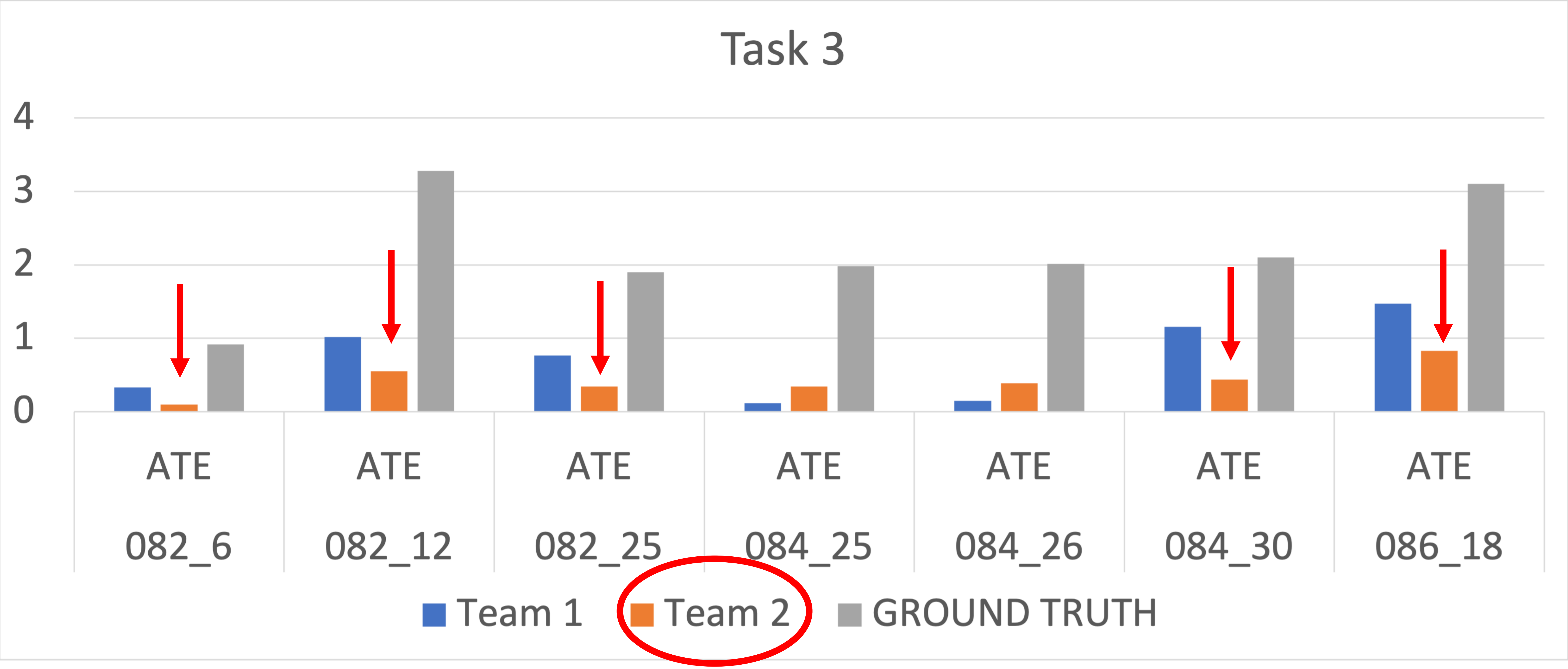


B5

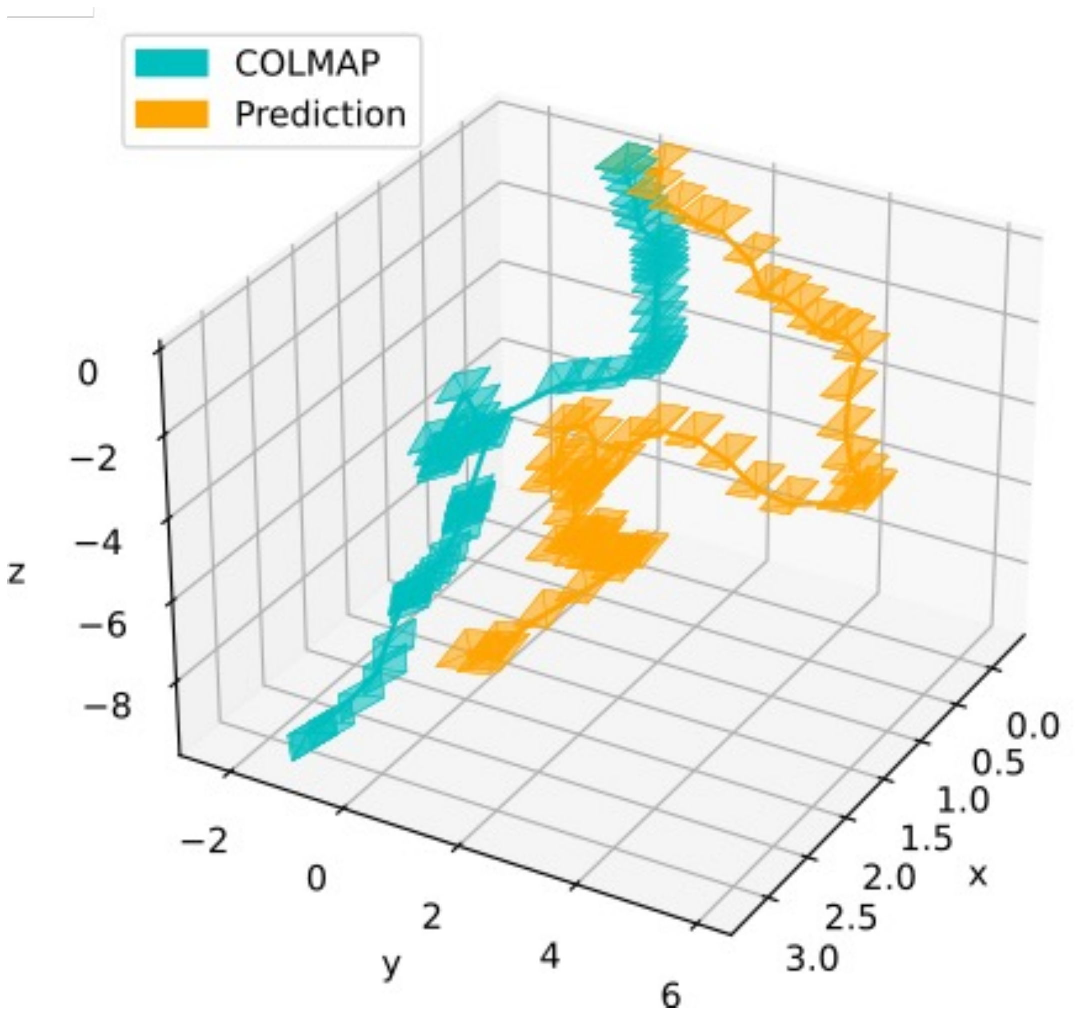


O1

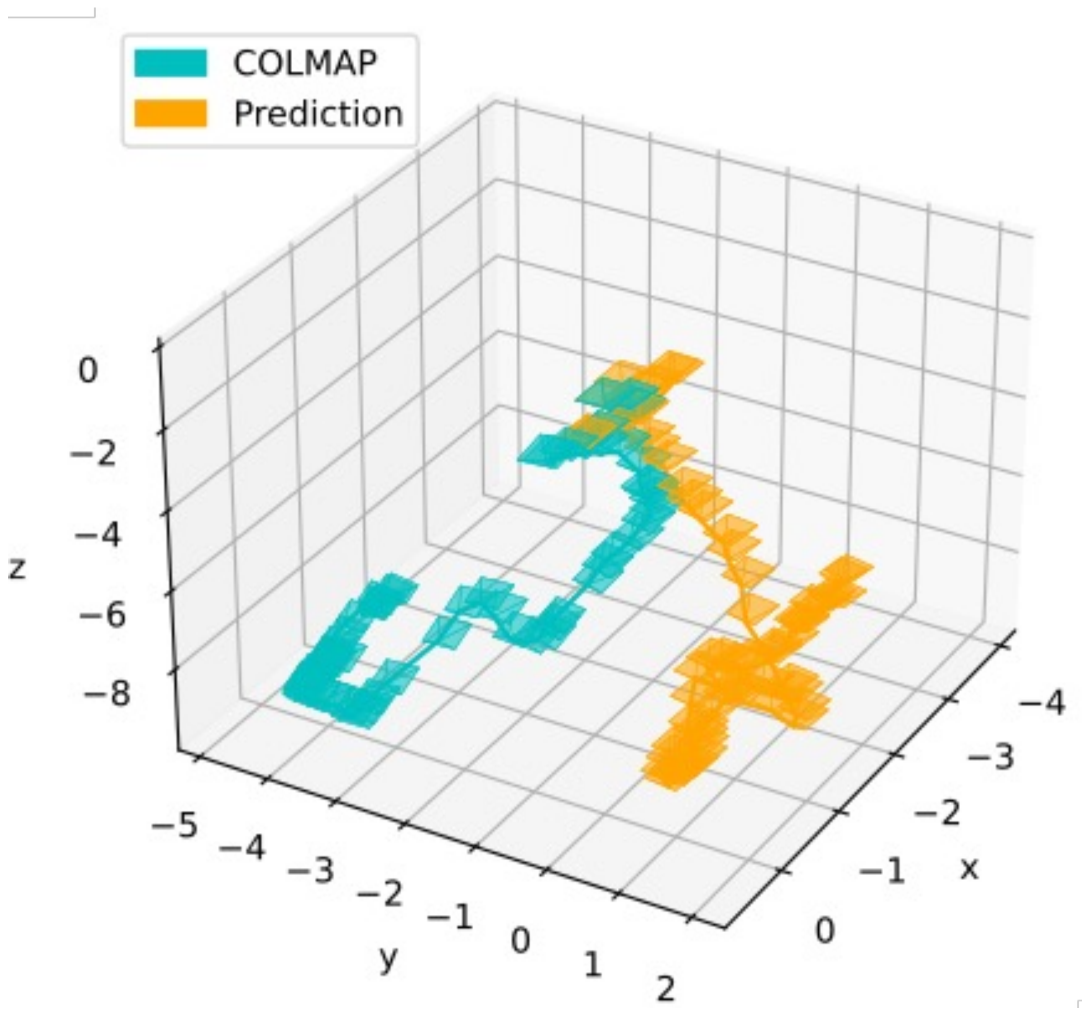
Results: Real Pose



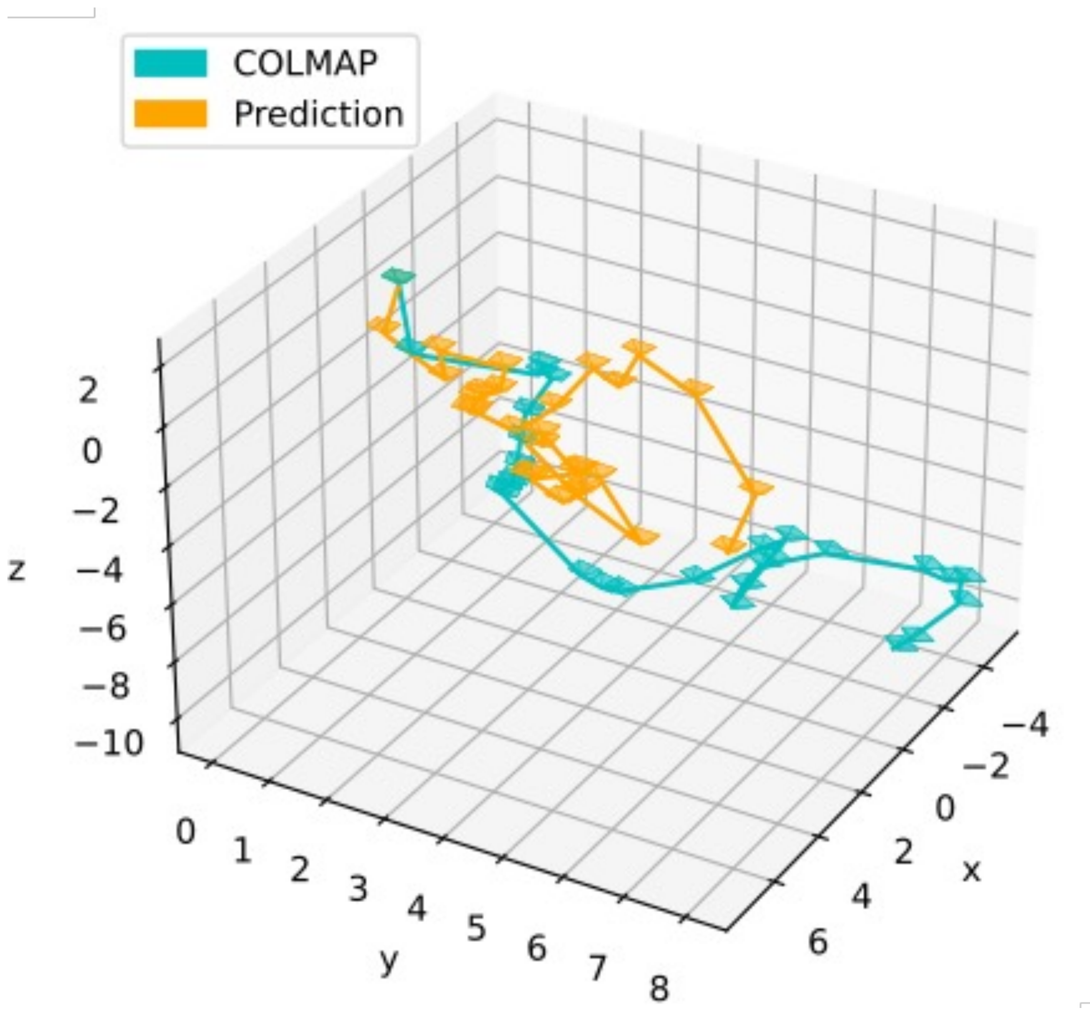
Winning Team‘s results



082_25

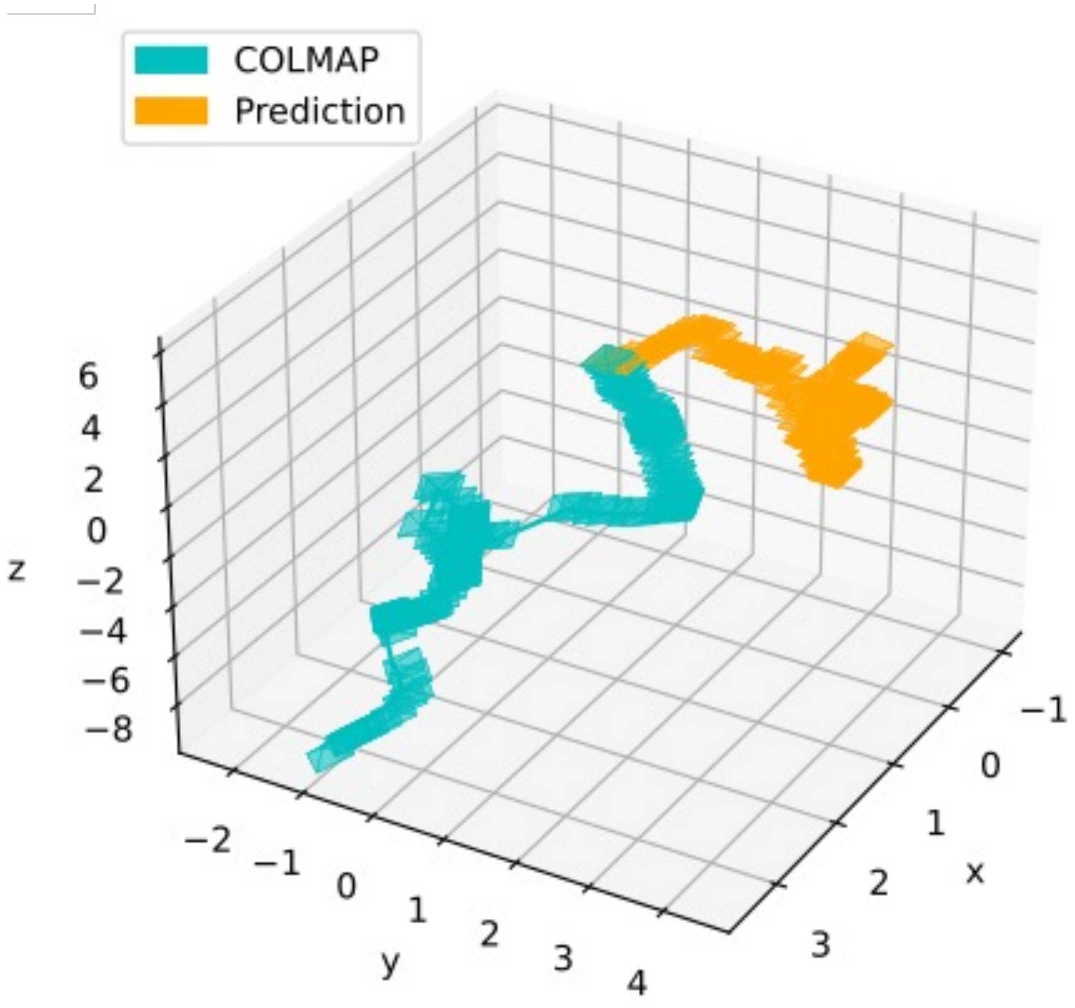


084_26

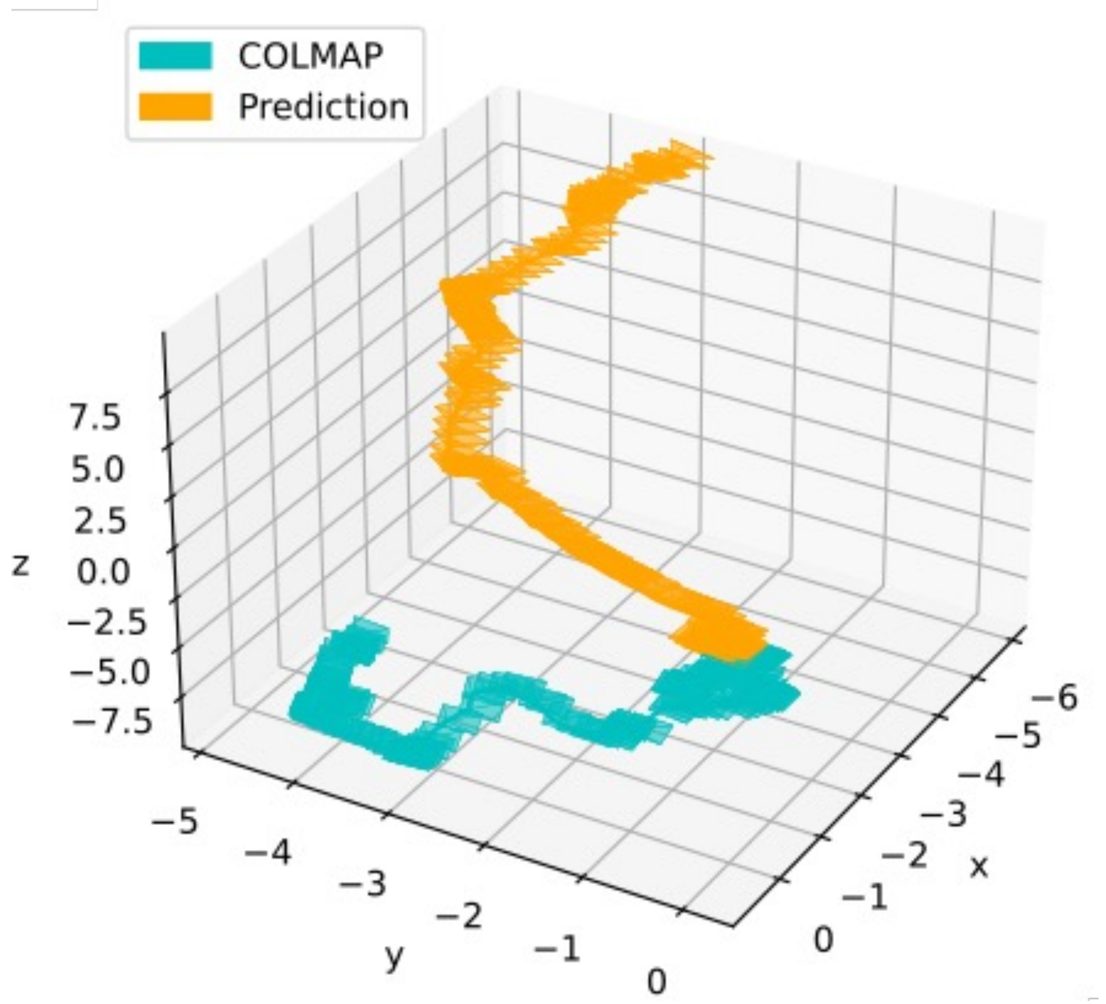


086_18

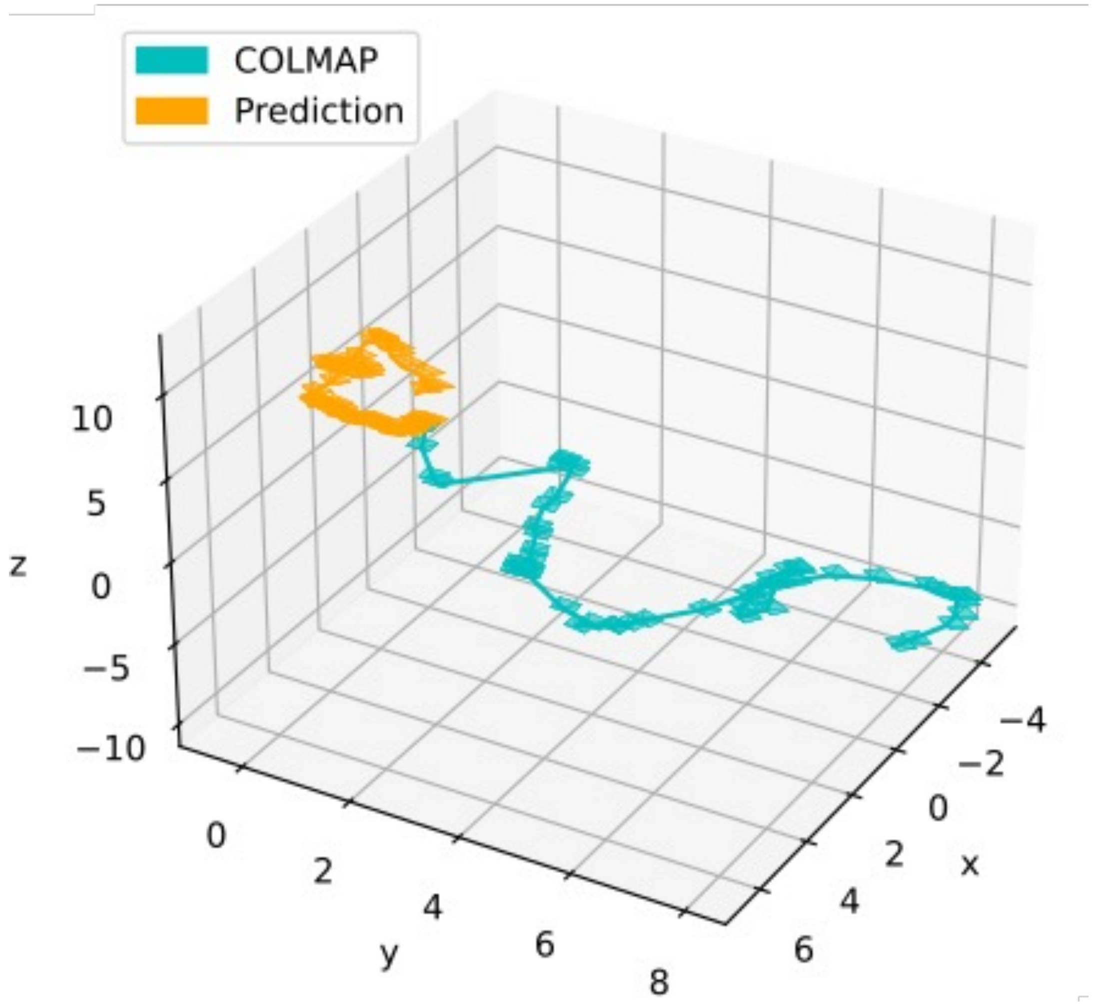
Runner-up Team's results



082_25



084_26



086_18

AWARDS

Sponsors:

Digital Surgery™ Medtronic

Awards

Winner of Task 1: £ 800 (≈ $910)

Runner-up of Task 1: £ 500 (≈ $570)

Winner of Task 2: £ 600 (≈ $680)

Winner of Task 3: £ 600 (≈ $680)

Sponsors:

Digital Surgery™ Medtronic

Awards

And the winner for task 2 is…

EndoAI


ENDOSCOPIC VISION CHALLENGE

MICCAI2022 Singapore

Endoscopic Vision Challenge

Digital Surgery SimCol3D Award

Sub-Challenge

"SimCol-to-3D 2022 - 3D Reconstruction During Colonoscopy"

1st Place

Category

"Task 2 - Camera pose estimation in simulated colonoscopy"

For

Jiwoon Jeon[1], Jae Young Lee[2], Dong Jae Lee[2], Woonghyun Ka[2]

[1] *EndoAI, Korea*

[2] *Korea Advanced Institute of Science and Technology, Korea*

25th International Conference
on
Medical Image Computing and Computer Assisted Interventions
held from September 18th to September 22nd, 2022, in Singapore

Anita Rau — Sophia Bano

Yueming Jin — Danail Stoyanov

Digital Surgery™ Medtronic wellcome EPSRC centre interventional + surgical sciences

Sponsors:

Digital Surgery™ Medtronic

Detailed Results on Task 2

	Syn_Col_I			Syn_Col_II			Syn_Col_III		
	ATE (dm)	RTE (mm)	ROT (°)	ATE (dm)	RTE (mm)	ROT (°)	ATE (dm)	RTE (mm)	ROT (°)
Winner	EndoAI	EndoAI	MIVA	MIVA	EndoAI	EndoAI	EndoAI	MIVA	MIVA
Runner-up	MMLAB	MMLAB	EndoAI	EndoAI	MMLAB	MIVA	MIVA	EndoAI	EndoAI
Third	MIVA	MIVA	MMLAB	MMLAB	MIVA	MMLAB	MMLAB	MMLAB	MMLAB

And the winner for task 3 is…

MIVA

Sponsors:

Digital Surgery™ Medtronic

ENDOSCOPIC VISION CHALLENGE

MICCAI2022 Singapore

DIGITAL SURGERY SIMCOL3D AWARD

SUB-CHALLENGE

"SimCol-to-3D 2022 - 3D Reconstruction During Colonoscopy"

1ST PLACE

CATEGORY

"Task 3 - Camera pose estimation in real procedures"

FOR

Zhengwen Li, Yichen Zhu, Yihe Chen, Yutong Hu, Xiaoyan Zhang, Jiquan Liu

Zhejiang University, China

25th International Conference on Medical Image Computing and Computer Assisted Interventions

held from September 18th to September 22nd, 2022, in Singapore

Anita Rau | Sophia Bano

Yueming Jin | Danail Stoyanov

Digital Surgery™ Medtronic wellcome EPSRC centre interventional+ surgical sciences

Detailed Results on Task 3

	082_6	082_12	082_25	084_25	084_26	084_30	086_18
	ATE	ATE	ATE	ATE	ATE	ATE	ATE
Winner	MIVA	MIVA	MIVA	EndoAI	EndoAI	MIVA	MIVA
Runner-up	EndoAI	EndoAI	EndoAI	MIVA	MIVA	EndoAI	EndoAI

Awards

And the runner-up for task 1 is...

MIVA

MICCAI2022 Singapore

ENDOSCOPIC VISION CHALLENGE

DIGITAL SURGERY SIMCOL3D AWARD

SUB-CHALLENGE
"SimCol-to-3D 2022 - 3D Reconstruction During Colonoscopy"

2ND PLACE

CATEGORY
"Task 1 - Depth prediction in simulated colonoscopy"

FOR

Zhengwen Li, Yichen Zhu, Yihe Chen, Yutong Hu, Xiaoyan Zhang, Jiquan Liu

ZheJiang University, China

25th International Conference
on
Medical Image Computing and Computer Assisted Interventions
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Anita Rau	Sophia Bano
Yueming Jin	Danail Stoyanov

Digital Surgery™ Medtronic wellcome EPSRC centre interventional+surgical sciences

Sponsors:

Digital Surgery™ Medtronic

Awards

And the winner for task 1 is...

CVML


ENDOSCOPIC VISION CHALLENGE

DIGITAL SURGERY SIMCOL3D AWARD

SUB-CHALLENGE

"SimCol-to-3D 2022 - 3D Reconstruction During Colonoscopy"

1ST PLACE

CATEGORY

"Task 1 - Depth prediction in simulated colonoscopy"

FOR

Edward Sanderson and Bogdan J. Matuszewski

Computer Vision and Machine Learning (CVML) Group,

University of Central Lancashire, Preston, UK

25th International Conference
on
Medical Image Computing and Computer Assisted Interventions
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Anita Rau | Sophia Bano

Yueming Jin | Danail Stoyanov

Digital Surgery™ Medtronic wellcome EPSRC centre interventional + surgical sciences

Sponsors:

Digital Surgery™ Medtronic

Detailed Results on Task 1

	Syn_Col_I			Syn_Col_II			Syn_Col_III		
	L1	Rel	RMSE	L1	Rel	RMSE	L1	Rel	RMSE
Winner	CVML	CVML	CVML	CVML	CVML	CVML	CVML	CVML	CVML
Runner-up	MIVA	MIVA	MIVA	MIVA	MIVA	EndoAI	MIVA	MIVA	MIVA
Third	EndoAI	EndoAI	EndoAI	EndoAI	EndoAI	MIVA	EndoAI	EndoAI	EndoAI
Fourth	IntuitiveIL	IntuitiveIL	IntuitiveIL	IntuitiveIL	IntuitiveIL	IntuitiveIL	IntuitiveIL	MMLAB	IntuitiveIL
Fifth	MMLAB	MMLAB	MMLAB	KLIV	KLIV	KLIV	MMLAB	IntuitiveIL	MMLAB
Sixth	KLIV	KLIV	KLIV	MMLAB	MMLAB	MMLAB	KLIV	KLIV	KLIV

Discussion

Summary

- 6 Teams participated
- At least 2 teams participated in each task
- Most interest in depth prediction
- While depth prediction in virtual environments is very stable, pose estimation remains challenging

Next steps:

- Challenge paper preparation

ENDOSCOPIC VISION CHALLENGE

Thank you! ☺

MICCAI2022 Singapore

Anita Rau

Sophia Bano

Yueming Jin

Danail Stoyanov

UCL

wellcome EPSRC centre interventional + surgical sciences

SURGICAL ROBOT VISION research group

Clinical Partners and affiliated project:

EndoMapper

Universidad Zaragoza 1542

Sponsors:

Digital Surgery™

Medtronic