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Proceedings of the

EndoCV 2021
3rd International Workshop and Challenge on Computer Vision in Endoscopy

in conjunction with the 18th International Symposium on Biomedical Imaging (ISBI2021), Nice, France, April 13, 2021

https://biomedicalimaging.org/2021/challenges-2

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Preface for EndoCV2021 Challenge

Endoscopy is a widely used clinical procedure for early detection and prevention of cancer and inflammations in hollow organs such as oesophagus, stomach, colon, rectum and bladder. EndoCV is a crowd sourcing initiative to bring together both the computational scientists and clinical colleagues together to solve imminent challenges in endoscopy image analysis. EndoCV tackles existing challenges that is critical for success in clinical application of computer-aided systems. As part of EndoCV road-map, we have already achieved some important milestones that includes:

- Identifying artefacts in endoscopy imaging for quality quantification (see our EAD2019 [1] and EAD2020 [2] editions)
- Detection and segmentation of multi-class disease instances in the entire GI tract (see our EDD2020 [2] edition)

Albeit there are important steps taken to solve computer-based detection and segmentation problems for polyps, a known cancer precursor, however, due to limited publicly available datasets and lack of heterogeneous population samples robustness and accuracy of methods cannot be guaranteed for varied clinical settings. This is a current bottleneck in robust and accurate method development. This year we extended our collaboration further to Faculty of Medicine, University of Alexandria, Egypt (Prof. Osama E. Salem); Medical Department, Sahlgrenska University Hospital-Mölndal, Sweden (Prof. Thomas de Lange); and Oslo University Hospital Ullevål, Oslo, Norway (Kim V. Ånonsen). Together with our senior gastroenterologists from previous editions of this challenge and new collaborators from these three centers we have put an effort to establish a diverse multi-population dataset from 6 different centers. We believe that this initiative will further assist in the development of endoscopy image analysis research for improved patient care. EndoCV2021 possess important generalisabilty questions and the participants were challenged to address issues of data shifts due to population variability, acquisition variability and modality under the theme: **Addressing generalisability in polyp detection and segmentation**.

Training data was released in two phases with all together 5050 frames released at the final phases II consisting of data from 5 centers and sequence data (mixed center). The data from 6th center was

hidden and was part of generalisability test data. Related dataset paper is already available [3]. All algorithms were evaluated online with the same evaluation metrics for detection, localisation and semantic segmentation. To steer the detection (with localisation) and segmentation tasks research in the right direction we used classically used state-of-the-art metrics[1] in computer vision. We established an online leaderboard for round I and round II based on which challenge winners were decided. For the first time, we introduced a cloud-based inference on NVIDIA V100 GPU to assess methods potential for clinical translation. A third round is the organiser's evaluation round which will be based on rigorous generalisability tests whose results will be presented in a prospective joint-journal paper.

We would like to thank all the participants, organising committee members, and IEEE ISBI 2021 challenge committee for their tremendous support. We would also like to thank all the keynotes, reviewers and sponsors.

Sharib Ali, Ph.D.
(Lead organiser)

[1] `https://github.com/sharibox/EndoCV2021-polyp_det_seg_gen`

Preface for EndoCV2021 Workshop Proceeding

This volume contains the proceedings of the third edition of the international workshop and challenge on computer vision in endoscopy-(EndoCV). Due to the COVID-19 outbreak, the workshop was virtually held as a webinar on the 13th Arpil 2021 (initially planned to be held in Nice, France). For the third time this challenge was co-located with the 18th IEEE International Symposium on Biomedical Imaging (ISBI2021).

This year we received 15 full paper submissions. All the papers were reviewed through CMT by at least 3 reviewers and 1 meta-reviewer. Ten high quality papers were accepted for publication.

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(Vol. Editors)

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EndoCV2021 Challenge Organization

Organising committee

Sharib Ali (lead)	IBME, Big Data Institute, University of Oxford, Ofxord, UK
Debesh Jha	SimulaMet, Oslo, Norway
Noha Ghatwary	University of Lincoln, UK

Program committee

Christian Daul	University of Lorraine, CNRS, CRAN, UMR 7039, Nancy, France
Michael A. Riegler	SimulaMet, Norway
Pål Halvorsen	SimulaMet, Norway and Oslo Metropolitan University, Norway
Jens Rittscher	Department of Engineering Science, Big Data Institute, University of Oxford, UK

Clinical collaborators

Dominique Lamarque	Consultation Gastroenterology, Hôpital Ambroise Paré, Paris, France
James East	Translational Gastroenterology Unit, John Radcliffe Hospital, Oxford, UK
Osama Ebada Salem	Faculty of Medicine, University of Alexandria, Egypt
Stefano Realdon	Istituto Oncologico Veneto, IOV-IRCCS, Padova, Italy
Renato Cannizzaro	Centro di Riferimento Oncologico di Aviano (CRO) IRCCS, Italy
Thomas de Lange	Medical Department, Sahlgrenska University Hospital-Mölndal, Sweden

IT support for GPU cloud inference

Adam Huffman	Big Data Institute, University of Oxford, Oxford, UK

Event support

Charlotte Rush	BRC Coordinator for Cardiovascular and Imaging Themes, Division of Cardiovascular Medicine, University of Oxford, Oxford, UK

Sponsors

NIHR Oxford Biomedical Research Centre, Oxford, UK

Workshop Organization

Workshop (co)-chair(s)

Sharib Ali	IBME, BDI, Department of Engineering Science, University of Oxford, Ofxord, UK
Pål Halvorsen	SimulaMet, Oslo, Norway

Keynote Speakers

James East	Translational Gastroenterology Unit, John Radcliffe Hospital, University of Oxford, Oxford, UK
Peter Moutney	Odin Vision and University College London, London, UK
Lena M. Hein	German Cancer Research Center (DKFZ), University of Heidelberg, Heidelberg, Germany

Reviewers

Reinke, Annika	Sarikaya, Duygu	Celik, Numan
Papiez, Bartlomiej	Zhou, Felix	Gupta, Soumya
Khanal, Bishesh	Dmitrieva, Mariia	
Daul, Christian	Riegler, Michael	
Jha, Debesh	Ghatwary, Noha	

References

1. Sharib Ali, Felix Zhou, Barbara Braden, Adam Bailey, Suhui Yang, Guanju Cheng, Pengyi Zhang, Xiaoqiong Li, Maxime Kayser, Roger D. Soberanis-Mukul, Shadi Albarqouni, Xiaokang Wang, Chunqing Wang, Seiryo Watanabe, Ilkay Oksuz, Qingtian Ning, Shufan Yang, Mohammad Azam Khan, Xiaohong W. Gao, Stefano Realdon, Maxim Loshchenov, Julia A. Schnabel, James E. East, Georges Wagnieres, Victor B. Loschenov, Enrico Grisan, Christian Daul, Walter Blondel, and Jens Rittscher. An objective comparison of detection and segmentation algorithms for artefacts in clinical endoscopy. *Scientific Reports*, 10(1):2748, 2020.
2. Sharib Ali, Mariia Dmitrieva, Noha Ghatwary, Sophia Bano, Gorkem Polat, Alptekin Temizel, Adrian Krenzer, Amar Hekalo, Yun Bo Guo, Bogdan Matuszewski, Mourad Gridach, Irina Voiculescu, Vishnusai Yoganand, Arnav Chavan, Aryan Raj, Nhan T. Nguyen, Dat Q. Tran, Le Duy Huynh, Nicolas Boutry, Shahadate Rezvy, Haijian Chen, Yoon Ho Choi, Anand Subramanian, Velmurugan Balasubramanian, Xiaohong W. Gao, Hongyu Hu, Yusheng Liao, Danail Stoyanov, Christian Daul, Stefano Realdon, Renato Cannizzaro, Dominique Lamarque, Terry Tran-Nguyen, Adam Bailey, Barbara Braden, James E. East, and Jens Rittscher. Deep learning for detection and segmentation of artefact and disease instances in gastrointestinal endoscopy. *Medical Image Analysis*, 70:102002, 2021.
3. Sharib Ali, Debesh Jha, Noha Ghatwary, Stefano Realdon, Renato Cannizzaro, Osama E. Salem, Dominique Lamarque, Christian Daul, Kim V. Anonsen, Michael A. Riegler, Pål Halvorsen, Jens Rittscher, Thomas de Lange, and James E. East. Polypgen: A multi-center polyp detection and segmentation dataset for generalisability assessment. *arXiv*, 2021.