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Enrico Grisan (Eds.)

Proceedings of the

EndoCV 2020
2nd International Workshop and Challenge on Computer Vision in Endoscopy

in conjunction with the 17th International Symposium on Biomedical Imaging (ISBI2020), Iowa, USA, April 3, 2020

http://2020.biomedicalimaging.org/challenges

Preface for EndoCV2020 Challenge

Endoscopy is a widely used clinical procedure for the early detection of numerous cancers (*e.g.,* nasopharyngeal, oesophageal adenocarcinoma, gastric, colorectal cancers, bladder cancer etc.), therapeutic procedures and minimally invasive surgery (e.g., laparoscopy). Endoscopy is growing as an essential diagnostic and treatment tool for hollow-organs that also minimises tauma of procedures. Whilst many technologies are built around endoscopy, there is a need to have a more comprehensive dataset collection to address the generalisation issues with most deep learning frameworks built today. Quantitative clinical endoscopy analysis, in general, is immensely challenging due to inevitable video frame quality degradation from various imaging artefacts due to the non-planar geometries and deformations of most organs. We addressed this problem as a challenge for the detection and segmentation of 7 different artefacts in clinical endoscopy video frames (EAD2019)[1]. A comprehensive analysis was published[2] as a joint-journal together with the inputs from EAD2019 participating teams. Our analysis revealed that there is a need to have a comprehensive dataset collected from multiple centers to address the generalization issues and guarantee clinical translation of most deep learning frameworks. The study suggested that the large variability in the appearances (both intra- and inter-class) present in endoscopy frames is hard-to-generalize which implicates to the fact that training a neural network architecture effectively on endoscopy data will require a tremendous amount of samples per class.

After EAD2019, EndoCV2020[3] is introduced this year with two sub-challenge themes that include disease detection, localisation and segmentation in addition to the EAD challenge. EndoCV2020 is a crowd sourcing initiative to test the feasibility of recent deep learning methods and to promote research for building robust technologies.

- Sub-theme I: Endoscopy Artefact Detection and Segmentation (EAD2020)
- Sub-theme II: Endoscopy Disease Detection and Segmentation (EDD2020)

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[1] `https://ead2019.grand-challenge.org`
[2] `https://doi.org/10.1038/s41598-020-59413-5`
[3] `https://endocv.grand-challenge.org`

Through our extensive network of clinical and computational experts, we have collected, curated and annotated gastrointestinal endoscopy video frames. This year, our clinical collaboration was extended with Prof. Renato Cannizzaro (Centro Riferimento Oncologico IRCCS, Aviano, Italy), and Prof. Dominique Lamarque (Consultation Gastroenterology, Hôpital Ambroise Paré, France) joining our team. We released curated and annotated datasets for EAD and EDD challenges to the participants. Each sub-challenge consisted of detection, semantic segmentation and out-of-sample generalisation sub-tasks for each unique dataset. For EAD2020, we added a blood class in addition to the seven existing classes in EAD2019 dataset and provided additional multiple video sequence data from different organs and modalitites acquired by several centers. For EDD2020, we released clinical endoscopy data from 4 different organs and 5 classes with multiple population data and varied endoscopy modalities associated with pre-malignant and diseased regions that included polyps in colon, Barrett's oesophagus, suspected and high-grade dysplasia in upper gastrointestinal tract, and cancer. The released video frames were annotated by four post doctoral researchers and cross validated by the clinical team of this challenge.

All algorithms were evaluated online with the same evaluation metrics for detection, localisation and semantic segmentation for both challenge sub-themes. To steer the detection (with localisation) and segmentation tasks research in the right direction we used classically used state-of-the-art metrics[4] in computer vision.

Thirty-two teams participated in EAD2020 challenge and 13 teams in EDD2020 challenge. Test data were released in two phases. In the first phase only 50% test samples were released and participants were able to check the sub-scores per class, while in the final test release only aggregated scores were published.

We would like to thank all the participants, organising committee members, and IEEE ISBI 2020 committee for their tremendous support. We would also like to thank NIHR Oxford Biomedical Research Center and Karl Storz for supporting our challenge and workshop.

Sharib Ali, Ph.D.
(Lead organiser)

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[4] https://doi.org/10.1007/s11263-014-0733-5

Preface for EndoCV2020 Workshop Proceeding

This volume contains the proceedings of the second 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 3rd Arpil 2020 (initially planned to be held in Iowa, USA). For the second time this challenge was co-located with the 17th IEEE International Symposium on Biomedical Imaging (ISBI).

This year we had an increment of nearly 60% in paper submission with a total of 32 papers. All the papers were reviewed through CMT by at least 2 reviewers and 1 meta-reviewer. Twelve papers were directly accepted while 7 papers were sent for rebuttal. In the second round, 2 papers were accepted as full paper (in total 14 out of 32) and 4 papers were included as 1 page short papers.

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