INTERNATIONAL UNIVERSITY OF APPLIED SCIENCES

PROJECT REPORT

Task for Course: DLBAIPCV01 – Project: Computer Vision

CONTENT

1. TASK

You can choose from the following tasks for your project report. Please choose one of them to work on in your project report.

Note on copyright and plagiarism:

Please take note that IU Internationale Hochschule GmbH holds the copyright to the examination tasks. We expressly object to the publication of tasks on third-party platforms. In the event of a violation, IU Internationale Hochschule is entitled to injunctive relief. We would like to point out that every submitted written assignment is checked using a plagiarism software. We therefore suggest not to share solutions under any circumstances, as this may give rise to the suspicion of plagiarism.

1.1 Task 1: Monitoring Health Protocols Against COVID-19 in Indoor Public Spaces

Background: The COVID-19 pandemic has changed the modern world, and the way people interact with each other. Many countries have enforced protection measures through lockdowns and other means, such as face masks and social distancing in indoor public spaces, among others.

Task: Develop a computer vision system that can perform the following tasks.

- Describe a selected dataset.
- Detect people in a monocular video sequence using a deep learning detection algorithm.
- Detect if a person is wearing a mask.
- Report precision and recall values in a comparative table.
- Include a link to a video presenting the output of the developed system in the report. You can upload the video on YouTube, OneDrive or any other secure cloud provider. Make the video available only if the link to the video is provided.

Introductory literature:

Gupta, P., Sharma, V., & Varma, S. (2022). A novel algorithm for mask detection and recognizing actions of human. *Expert Systems with Applications*, *198*, 116823.

Opencv (2023). Open Computer Vision Library. https://opencv.org/

Note: Whichever task you choose, please always consider the following:

- The report should be between 7 to 10 pages + code. Attach a pdf of the python notebook after it run with all results. Alternatively, share the link to your repository.
- **Suggested structure of the report.** Page 1. Include a textual abstract and a graphical abstract. It should present the motivation, method, results, and conclusion. Page 2. Introduction and literature review. Page 3. Present the method in text and as a graphic representation. Page 4 and 5. Analysis of results including tables and graphics. Page 6. Conclusion. Page 7. References. Appendix: The code.

1.2 Task 2: Recognizing Objects in Video Sequences

Background: Object recognition is a task that is performed instantly and effortlessly by the human visual system. The eyes take a snapshot of the real world, which is then sent to the visual cortex of the brain through the optic nerve for processing and analysis. This part of the brain is then able to answer questions such as where, what and how an object looks like at a specific point in time. From a computer vision perspective, the eyes of a human are replaced by cameras and the visual cortex from a computer that is able to process the images captured by the camera and answer similar questions using machine learning algorithms. These questions are critical to be answered in modern computer vision applications such as autonomous driving using advanced driving assistance systems (ADAS), object recognition systems that detect abnormal behaviors in public spaces, medical applications etc.

Task: Develop a computer vision system that takes as input a video sequence and returns the same showing the position, shape and name of the objects present in the video. This requires running an object detection and object segmentation algorithm.

- Describe the dataset in use.
- Evaluate 2 approaches, and present precision and recall values in a table on the chosen dataset.
- Present a qualitative analysis of the 2 approaches.
- The link to the video with the best approach should be provided in the report. You can upload the video on YouTube, OneDrive or any other secure cloud provider. Make the video available only if the link to the video is provided.

Introductory literature:

Zhu, H., Wei, H., Li, B., Yuan, X., & Kehtarnavaz, N. (2020). A review of video object detection: Datasets, metrics and methods. Applied Sciences, 10(21), 7834.

Opencv (2023). Open Computer Vision Library. https://opencv.org/

Note: Whichever task you choose, please always consider the following:

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1.3 Task 3: A self-driving car simulated system

Background: DeepRacer Cup is an international competition on autonomous car simulators. By developing your report, you make yourself eligible to participate of this event.

Task: The goal of the self-driving car simulated system is that an autonomous car runs 3 laps in a circuit with obstacles as fast as possible. Report the results of 3 trials (each trial consisting of 3 laps) including:

a) the average speed on each trial, and

b) the number of crashes on each trial.

Resources: You will find an environment to develop your implementation for 10 hours during 30 days at: https://aws.amazon.com/deepracer/

Introductory literature:

Deep Reinforcement Learning for Autonomous Driving in Amazon Web Services DeepRacer: https://www.mdpi.com/2078-2489/15/2/113

How to Win Bosch Future Mobility Challenge: Design and Implementation of the VROOM Autonomous Scaled Vehicle: https://www.mdpi.com/2075-1702/13/6/514

Note: Whichever task you choose, please always consider the following:

- The report should be between 7 to 10 pages + code. Attach a pdf of the python notebook after it run with all results. Alternatively, share the link to your repository.
- **Suggested structure of the report.** Page 1. Include a textual abstract and a graphical abstract. It should present the motivation, method, results, and conclusion. Page 2. Introduction and literature review. Page 3. Present the method in text and as a graphic representation. Page 4 and 5. Analysis of results including tables and graphics. Page 6. Conclusion. Page 7. References. Appendix: The code.

2 ADDITIONAL INFORMATION FOR THE EVALUATION OF THE PROJECT REPORT

When conceptualizing and writing the project report, the evaluation criteria and explanations given in the writing guidelines should be considered.

3 TUTORIAL SUPPORT

In this project report task, several support channels are open; as the student, it is your responsibility to select your preferred support channel. The tutor is available for technical consultations and for formal and general questions regarding the procedure for processing the project report. However, the tutor is not required to approve outlines or parts of texts and drafts. Independent preparation is part of the examination work and is included in the overall evaluation. However, general editing tips and instructions are given in order to help you get started with the project report.