

Possible topics for bachelor/master thesis, research internships/projects

Topic: **Improving Learning-Based Motion Estimation and Compensation with Distorted Reference**

Description: Nowadays, a large portion of video data is analyzed by algorithms. Research on Video Coding for Machines (VCM) aims to develop new coding mechanisms to optimize for this domain. One key attribute of video data for VCM is, that specific image regions do not contribute equally to the task performance. Thus, a significant amount of bit rate can be saved by encoding only the salient image regions at high quality, while decreasing the quality for non-salient regions. This approach can improve compression performance for image compression. However, when applied onto video data, the previously transmitted frames have to serve as reference for the upcoming frames. Due to their unevenly distorted nature, motion estimation and compensation is more complicated. This research aims to improve motion estimation and compensation for VCM scenarios.



Figure 1: VCM scenario

Possible topics for students can be:

- Development of a framework for the analysis of motion estimation
- Implementation of neural motion estimation networks
- Implementation of neural motion compensation networks
- Integration of developed methods into a neural video compression network

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Prerequisites:

- Experience in Python
- Prior knowledge in Deep Learning frameworks (pref. PyTorch)
- Understanding of image and video compression

Available: Immediately