THE UNIVERSITY OF HONG KONG

Faculty of Science

HKU-TCL Joint Research Centre for Artificial Intelligence

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Project Title: A Unified Approach for Image Artifact Removal with Adaptive Multi-task Learning

Abstract:

The goal of this project is a multi-task deep learning system that is capable of removing multiple types of artifacts (i.e. moire pattern and reflection) in photographs without knowing a priori the type of artifacts. Compared to separately modeling different artifact removal tasks, a single system holds the promise of improved accuracy, higher efficiency, and better deployability, as knowledge could be shared, and memory could be re-utilized among different tasks. Despite conceptually appealing, there are still many unresolved challenges including data collection, model design, multi-task optimization, video processing, and model compression for down-stream deployments.

During this project, the following objectives will be accomplished.
- An image/video data synthesize approach to simulate different types of artifacts incorporating the underlying degradation models with deep generative models.
- An adaptive multi-branch neural network with a shared encoder to remove different types of artifacts in one unified model for image/video.
- A multi-task optimization approach to re-weighting losses for different tasks to avoid converging to poor local minimal and learn robust shared representations beneficial to all tasks, and a robust learning objective to handle misalignment in collected data.
- A deep neural network compression approach to obtaining an efficient and light-weight model without compromising prediction qualities for low-cost deployment.