LWGNet - Learned Wirtinger Gradients for Fourier Ptychographic Phase Retrieval – Supplementary Material–

Atreyee Saha, Salman S. Khan, Sagar Sehrawat, Sanjana S. Prabhu, Shanti Bhattacharya, and Kaushik Mitra

Indian Institute of Technology Madras, Chennai 600036, India

1 Our real dataset

Fig 1 shows the experimental setup used for capturing the real dataset described in Section 4.2 of the main paper. Camera I is a low cost machine vision CMOS camera that allows 3 bit depth settings - 8, 12, and 16. Camera II is high cost sCMOS camera that only allows 16-bit imaging.

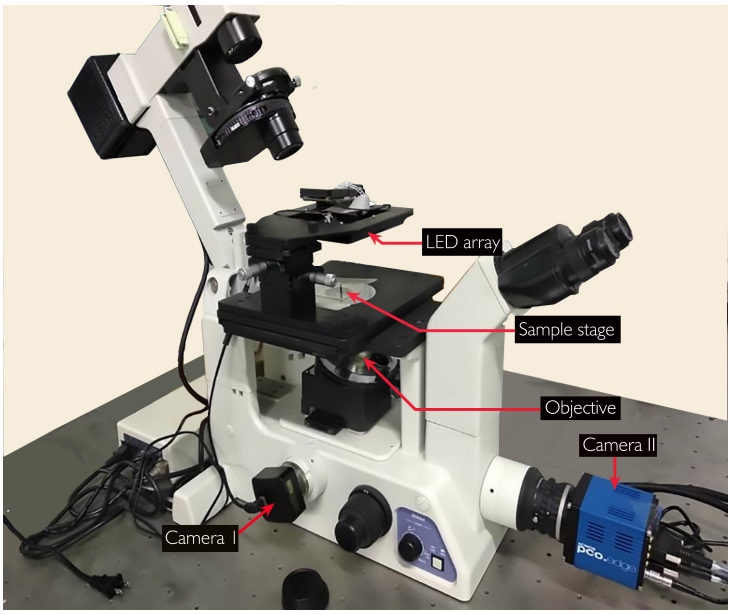

Fig. 1: FPM Experimental setup. Camera I is the low cost low dynamic range machine vision camera to capture low bit-depth images while Camera II is the expensive high-dynamic range sCMOS camera that captures 16-bit images.

Fig 2 and 3 shows some histological samples used in our real data experiments. Here, we only show the brightfield images and the corresponding phase reconstructions for the sCMOS camera.

For obtaining the real data pairs used for finetuning and testing the proposed approach, we used 2 slides each of lung carcinoma, osteosarcoma, and cervical cells, and 1 slide of cerebral cortex. 1 slide each of lung carcinoma and cerebral cortex and 2 slides of cervical cells were used for training and the rest were kept for testing. From each slide, multiple regions were captured by translating the slides laterally. Specifically, from the training slides, 4 regions were captured while from the test slides 5 different regions were captured. For each region, 225 low-resolution sequential images were obtained corresponding to the 225 LEDs using 4 different imaging settings: 3 using the 3 bit-depth (8,12 and 16-bit) settings of camera I and 1 using 16-bit setting of camera II. The low resolution images from the two camera were registered to account for the misalignment.

For obtaining groundtruth, AP reconstruction[1] was performed on the sequential FPM measurements captured using the *sCMOS* camera. Finally, before training, the 4 regions were divided into 640 non-overlapping patches. During training on 16-bit captured images the entire FoV of Camera I of size 1552×2080 pixels was considered. The entire FoV was divided into 160 samples, each of size 128×128 pixels. For fine-tuning the model on lower bit-depth (12-bit and 8-bit) images, the same slides were reused. For inference on the 5 different regions of size 688×688 pixels FoV were cropped from the 3 slides shown in Fig 3. Each of these were again divided into 64 patches of size 128×128 with overlap of 48 pixels. In Fig 3, exemplar FoV representing each of 3 slides is shown.

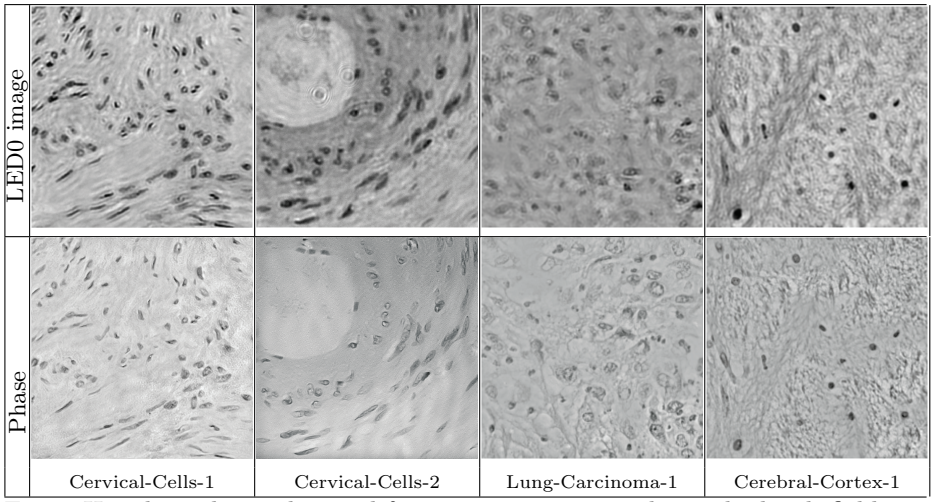

Fig. 2: Histological samples used for training. Top row shows the brightfield images captured using sCMOS camera while the bottom row shows the corresponding AP phase reconstructions.

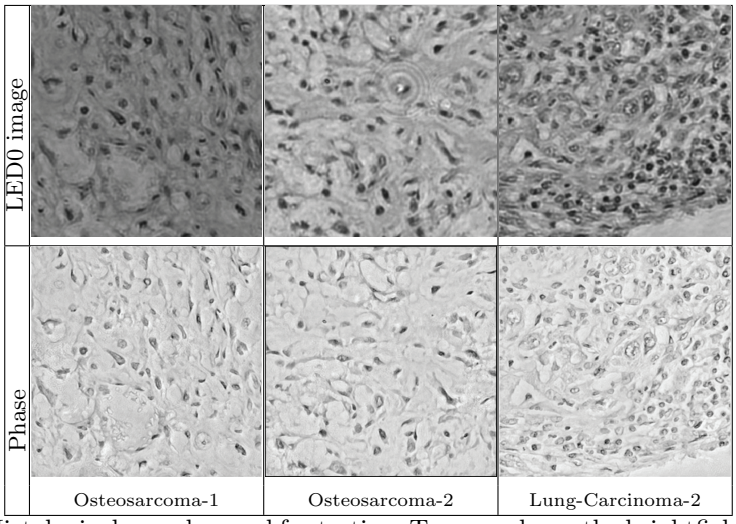

Fig. 3: Histological samples used for testing. Top row shows the brightfield images captured using sCMOS camera while the bottom row shows the corresponding AP phase reconstructions.

References

1. Tian, L., Li, X., Ramchandran, K., Waller, L.: Multiplexed coded illumination for fourier ptychography with an led array microscope. Biomed. Opt. Express **5**(7), 2376–2389 (Jul 2014). https://doi.org/10.1364/BOE.5.002376, http://www.osapublishing.org/boe/abstract.cfm?URI=boe-5-7-2376