DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING, UCLA
ECE 239AS: COMPUTATIONAL IMAGING

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QUIZ 0 : COMPUTATIONAL PHOTOGRAPHY

SL. NO.	TOPIC	MAX. POINTS	GRADED POINTS	REMARKS
1	Assessment Q1	04		
1	Assessment Q2	05		
2	Assessment Q3	01		
	Total	10		

1 Motivation

tl;dr: *One day, computational photography might be able to turn your smart-phone into a professional-quality imager.*

Photography hardware has come a long way from roll films to the digital single-lens reflex (DSLR) camera. These devices provide considerable control to the users enabling them to capture extraordinarily creative images.

Although smart-phones have democratized digital photography, the quality of images taken in a DSLR camera is ordinarily better than those taken by a smart-phone camera due to the size of the sensor/lens. The small size of the smart phone imaging platform leads to a depth of field that cannot be made small and low light efficiency.

By way of contrast, DSLR cameras have adaptable optical zoom, adjustable depth of field (can be both small and large), as well as high-performance in low-light scenarios. However, DSLR cameras are bulky to carry around and are more complicated to operate.

Figure 1: The size and weight of DSLR cameras have benefits in image quality and flexibility.

What if it was possible to use computer science to modify pictures taken by smartphones? Could they approach the capabilities of a DSLR? The answer to that question may lie in the nascent field of **Computational Photography**. Researchers in this field have been developing synthetic methods that bring capabilities to smart-phone cameras that would not be possible based upon their optics alone. As one example, it is possible to computationally introduce a shallow depth of field to cell phone photographs.

The following online article [1] explains Computational Imaging & Photography along with some of its key applications. Read through it to answer the questions that follow.

2 Assessment

Q1) How would you describe the difference between Computational Imaging and Computational Photography? [Hint: please read the article] (4 points)

> Computational imaging couples image capture and image processing techniques (hardware and software) to provide an indirect method of capturing an enhanced image. Computational photography is the application of computational imaging techniques to day-to-day photography for developing imaging capabilities not achievable by conventional means and extend camera capabilities by emulating optical phenomena in software.

Q2) The article talks about shallow depth of field. Find an image online that clearly shows effects of a shallow depth of field in the box below. Make sure you use an image with a Creative Commons License. For credit, replace our image below with the one you found. [Hint: you can search flickr with a filter for CC license] (5 points)

Figure 2: Shallow Depth of Field.

Q3) We will allow you to revise each quiz after seeing the solutions if you promise not to share the solutions with students not taking the class. Please type your name in the box below if you agree with this policy. (1 points)

> Swapnil Sayan Saha

References

[1] T. Sullivan, "Computational photography is ready for its close-up," Aug 2018. [Online]. Available: https://www.pcmag.com/article/362806/computational-photography-is-ready-for-its-close-up