Anh Huy Bui - 293257

ICIP – Report

A. PLENARY - Katie Bouman: Capturing The First Picture Of A Black Hole & Beyond

1. Speaker: Katie Bouman
2. Description:

The speech was about how the first image of black hole was taken. In the theory, light near the black hole is bend around it which then leave a light ring around the black hole. So to capture that light, a telescope system called Event Horizon is used. It is a network of telescopes scattered around the globe, capturing image in frequency measurement not pixel space. Together with the rotation of the earth, filtering the atmospheric noise, 4 independent team was about to produce first image of the black hole.

The second part was about variational model optimization. It is applying a deep learning method to estimate the result image, by calculating likelihood, prior part and distribution entropy (with flow-based network). This method was tested with black hole image reconstruction.

3. What I learned from the session:

There are many things new to me from very little things such as calculation unit: micro arc second. I can see that there are many factors, variables that need to be brought into consideration when collecting and processing data or images, especially images of faraway objects. It is important of the calculation that we must confirm the correctness of reconstructed data and avoid shared human bias. In addition, if we know the expected result, we can narrow it down from infinite possibility to one that fit the most. Finally, deep learning is a powerful tool to help increase productivity.

4. Question that the most important to me:

Interpretability issue of deep learning in this space application.

B. Learned Optics — Improving Computational Imaging Systems Through Deep Learning And Optimization

1. Speaker: Wolfgang Heidrich
2. Description:

The speech was about computational imaging system including design of optics and image reconstruction algorithms.

First part is imaging problem when dealing with sparsity. In this case, a blurred image was an example problem. “Standard Deblurring” and “Cross Channel Prior” were introduced to solve the issue.

The second part was optimizing computational imaging system. Speaker introduced diffractive optical elements (DOEs) then end-to-end differential image formation model, which outperforms classical solutions.

The last part showed other features/optimization of DOEs such as Wide field of view, HDR Imaging and Hybrid optical-electronic convolutional neural networks

3. My experience about the session:

The session was not only about software but also in the side of hardware part. As a photographer, I am excited to see that there are modern technologies which later may become modern cameras. I am surprised with kind of things that we can do with information of an image. For example, I always try to eliminate chromatic aberration (CA) as much as possible, but now I find that with CA, we can reconstruct a blurred image into a sharp image. Finally, to produce a good image, we can optimize not just hardware but software side of system and same as above, neural system can also be applied to produce an optimized hardware part.

4. Question that the most interesting to me:

What part of microscopy can be optimized by neural network?